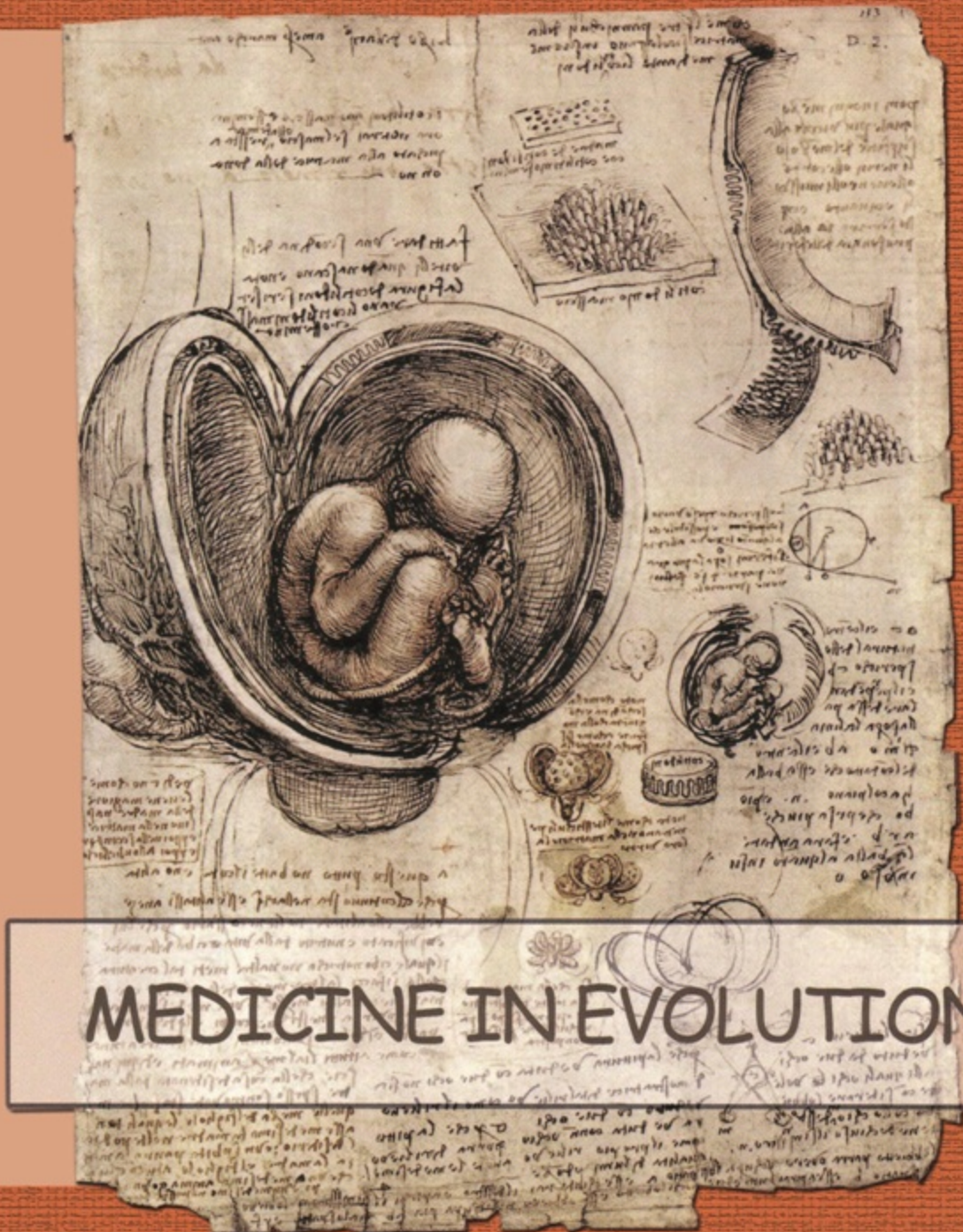


Volume XXIII, Nr. 3, 2017

ISSN 2065-376X



MEDICINE IN EVOLUTION

medicineinevolution.umft.ro

CENTER OF PROMOTING HEALTH EDUCATION AND MOTIVATION
FOR PREVENTION IN DENTISTRY
CENTER FOR CONTINUOUS MEDICAL EDUCATION

REDUCE ȘI AJUTĂ LA PREVENIREA PROBLEMELOR GINGIVALE ÎN 4 SĂPTĂMÂNI PENTRU A ÎNTRERUPE CICLUL GINGIVITEI



blend-a-med

Oral-B



CLINIC LINE
GUM PROTECTION SYSTEM

Recomandați Sistemul blend-a-med Oral-B Clinic Line Gum Protection
Este dovedit clinic că reduce și ajută la prevenirea problemelor gingivale în 4 săptămâni pentru a ajuta pacienții să întrerupă ciclul gingivitei. Sistemul combină acțiunea chimică puternică a fluorurii de staniu stabilizate, suplimentată de apă de gură, cu acțiunea mecanică a periuței de dinți Pro-Flex, suplimentată de ață dentară, făcând din acesta completarea perfectă a tratamentului din cabinetul dumneavoastră.

Volume XXIII, Nr. 3, 2017, Timișoara, Romania
ISSN 2065-376X

MEDICINE IN EVOLUTION



CENTER OF PROMOTING HEALTH EDUCATION AND
MOTIVATION FOR PREVENTION IN DENTISTRY
CENTER FOR CONTINUOUS MEDICAL EDUCATION

Journal edited with the support of

ROLF MARUHN
GERMAN CONSUL TO TIMISOARA
&



Printed at: WALDPRESS, Timisoara,
17 Brandusei Street,
Phone/Fax: 0040256422247

Edited at: EUROSTAMPA, Timisoara
26, Revolutiei 1989 Street,
Phone: 0040256204816

EDITORIAL BOARD

FOUNDING EDITOR

Prof. Ancusa Mircea
MD, PhD

ASSOCIATE EDITORS	EDITOR IN CHIEF	ASSISTANT EDITOR
Prof. Daniela Jumanca DMD, PhD, Timișoara Prof. Virgil Păunescu MD, PhD, Timișoara Prof. Borțun Cristina DMD, PhD, Timișoara	Prof. Angela Codruța Podariu DMD, PhD, Timișoara	Mădălina-Victoria Coccoceanu EC., Timișoara

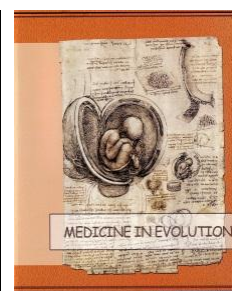
NATIONAL EDITORIAL BOARD		
Assoc. Prof. Anghel Mirella DMD, PhD, Timișoara Prof. Ardelean Lavinia DMD, PhD, Timișoara Prof. Avram Rodica MD, PhD, Timișoara Prof. Bechir Anamaria DMD, PhD, București Prof. Belengeanu Valerica MD, PhD, Timișoara Brehar-Cioflec Dana MD, PhD, Timișoara Prof. Bîrlean Lucia DMD, PhD, Iași Prof. Borza Claudia MD, PhD, Timișoara Assist. Prof. Bucur Adina MD, PhD, Timișoara Prof. Bunu Panaitescu Carmen MD, PhD, Timișoara Prof. Câmpian Radu DMD, PhD, Cluj-Napoca Assoc. Prof. Chirileanu Dana Ruxanda MD, PhD, Timișoara Assoc. Prof. Chevereșan Adelina MD, PhD, Timișoara Assist. Prof. Ciobanu Virgil MD, PhD, Timișoara Prof. Cristescu Carmen MD, PhD, Timișoara Assoc. Prof. Cornianu Mărioara MD, PhD, Timișoara	Prof. Drăgulescu Ștefan, I. MD, PhD, Timișoara Prof. Dumitrașcu Victor MD, PhD, Timișoara Prof. Dănila Ioan DMD, PhD, Iași Prof. Dumitrache Adina DMD, PhD, București Prof. Forna Norina Consuela DMD, PhD, Iași Prof. Gălușcan Atena DMD, PhD, Timișoara Assist. Prof. Goția Laura DMD, PhD, Timișoara Prof. Hanganu Carmen Stela DMD, PhD, Iași Assoc. Prof. Ianeș Emilia DMD, PhD, Timișoara Prof. Ionescu Ecaterina DMD, PhD, București Prof. Ioniță Hortensia MD, PhD, Timișoara Assoc. Prof. Iliescu Alexandru Andrei DMD, PhD, București Assoc. Prof. Jivănescu Anca DMD, PhD, Timișoara Prof. Kurunczi Ludovic MD, PhD, Timișoara Prof. Lazăr Fulger MD, PhD, Timișoara Prof. Mancaș Silvia MD, PhD, Timișoara	Prof. Mercuț Veronica DMD, PhD, Craiova Lecturer Mesaros Anca Stefania DMD, PhD, Cluj-Napoca Prof. Negrutiu Meda Lavinia MDM, PhD, Timișoara Assist. Prof. Oancea Roxana DMD, PhD, Timișoara Prof. Popovici Ramona Amina DMD, PhD, Timișoara Prof. Porojan Liliana DMD, PhD, Timisoara Assoc. Prof. Porojan Sorin DMD, PhD, Timisoara Prof. Păcurar Mariana DMD, PhD, Târgu-Mureș Assoc. Prof. Pricop Marius DMD, PhD, Timișoara Prof. Poenaru Dan MD, PhD, Timișoara Prof. Poenaru Mărioara MD, PhD, Timișoara Prof. Popșor Sorin DMD, PhD, Târgu Mureș Popescu Nicolae MD, PhD, Drobeta Turnu Severin Prof. Puiu Maria MD, PhD, Timișoara Prof. Romînu Mihai DMD, PhD, Timișoara Prof. Romoșan Ioan MD, PhD, Timișoara

Assist. Prof. Rusu Darian MD, PhD, Timisoara	Assoc. Prof. Tatu Carmen MD, PhD, Timisoara	Assoc. Prof. Vasile Liliana MD, PhD, Timisoara
Assoc. Prof. Rusu Laura Cristina DMD, PhD, Timisoara	Prof. Tatu Fabian MD, PhD, Timisoara	Assoc. Prof. Vasile Nicolae DMD, PhD, Sibiu
Assist. Prof. Sava-Roșianu Ruxandra DMD, PhD, Timisoara	Prof. Tănăsie Gabriela MD, PhD, Timisoara	Prof. Vlădescu Cristian MD, PhD, București
Prof. Sinescu Cosmin DMD, PhD, Timisoara	Assoc. Prof. Teodorescu Elina DMD, PhD, București	Assoc. Prof. Zaharia Agripina DMD, PhD, Constanța
Prof. Stratul Stefan-Ioan MD, PhD, Timisoara	Prof. Székely Melinda DMD, PhD, Târgu-Mureș	Prof. Zetu Irina DMD, PhD, Iași
Assoc. Prof. Suci Mircea DMD, PhD, Târgu-Mureș		

INTERNATIONAL EDITORIAL BOARD		
Prof. Abdellatif Abid Tunis	Prof. Gruner Wolfgang Germany	Prof. Pine Cynthia U.K
Prof. Baez Martha USA	Prof. Hartmut Hildebrand France	Prof. Plesh Octavia USA
Prof. Baez Ramon USA	Assoc. Prof. Julijana Nikolovska Macedonia	Prof. Radnai Marta Hungary
Prof. Bracco Pietro Italy	Prof. Kielbassa Andrej M. Austria	Prof. Lucien Reclaru Switzerland
Prof. Borutta Annerose Germany	Prof. Kotsanos Nikolaos Greece	Prof. Sculean Anton Switzerland
Prof. Daniel Rollet France	Prof. Lange Brian USA	Prof. Soltani Mohamed Tunis
Prof. Djukanovic Dragoslav Serbia	Prof. Lopes Luis Pires Portugal	Prof. Sasic Mirjana Serbia
Assoc. Prof. Dorjan Hysi Albania	Prof. Lynch Denis P. USA	Prof. Veltri Nicola Italy
Prof. Eaton Kenneth A U.K.	Prof. Marthaler Thomas Switzerland	Prof. Zimmer Stefan Germany
Prof. Edwards Gwyn U.K.	Prof. Meyer Georg Germany	Prof. Wember Matthes Germany
Prof. Feng Chai France	Prof. Nagy Kathalin Hungary	
Prof. Fusun Ozer Turkey	Prof. Paganelli Corrado Italy	

CONTENTS

ARTICLES



<i>Bădițoiu L. M., Dehelean L., Laza R., Crișan A., Lăzureanu V. E., Nicolescu N.D., Musta V.F., Marinescu A.R., Popovici E.D.</i>	
Correlations between coping strategies, psychiatric symptomatology and quality of life in patients with chronic viral hepatitis C: a case-control study	255
<i>Bujor I.S., Cioca A.R., Ceașu R.A., Veaceslav F.</i>	
The prognostic utility of Prox-1 expression in molecular subtypes of breast carcinomas	263
<i>Hadmaș R.M., Tarcea M., Neghirlă A., Mărginean O., Martin A., Martin Ș.A.</i>	
Nutritional value of kindergartens menus from Mures / Romania, related to national and international dietary recommendations	271
<i>Lazăr AC., Păcurar M., Câmpian R.S.</i>	
Osteonecrosis of the jaw (ONJ) - a literature review	279
<i>Vinereanu A., Garret-Bernardin A., Munteanu A., Bratu A.M., Luca R.</i>	
Oral health of athletes with intellectual disabilities in Romania: evolution over a decade (2006-2016)	288
<i>Jumanca D., Galuscan A., Matichescu A., Balean O., Podariu A.C., Sfeatcu R.I., Dumitrache A.</i>	
The role of oral-dental hygiene in maintaining the results of dental whitening treatment	294
<i>Stana A.H., Porumb A., Stana O.L., Ciobanu G., Balean O., Ciobanu C.G., Ratiu C., Todor L.</i>	
Cyst maxillary treatment	304
<i>Galuscan A., Jumanca D., Sava Rosianu R., Balean O., Matichescu A., Podariu A., Popovici R.A., Sfeatcu R.I., Dumitrache A.</i>	
Comparative study on health status assessment of children in Timisoara and Bucharest	310
<i>Pascal I., Răducanu A.M., Păuna M.R.</i>	
Consequences of premature loss of primary teeth and space maintainers need in children with mixed dentition	318
<i>Iamandoiu A.V.</i>	
Review of dental implant materials and surface treatments and their influence in different types of tissue integration	326

<i>Mesaroş A.Ş., Matichescu A., Munteanu A., Costea C., Mesaroş M.</i>	
Management of mandibular crowding by expansion- Is it a viable option? Clinical observations	333
<i>Hajaj T., Talpos S., di Mauro L.I., Negrutiu M.L., Popa M., Szuhaneck C., Rominu M., Stoian C.D., Sinescu C.</i>	
A correlation between the maxillary transversal growth and the width of the upper central incisor	339
<i>Todor L., Popovici R.A., Todor S.A., Matei R.I., Ciavoi G., Coroi M.C., Todor P.C., Cuc A., Porumb A.</i>	
Study concerning the eruption of third maxillary molar	345
<i>Marian D., Rusu D., Stratul S.-I., Calniceanu H., Belengeanu V., Freiman P., Anghel A.</i>	
The association of low serum levels of 1.25 dihydroxy vitamin D3 with chronic periodontitis	350
<i>Radulescu V., Boariu M., Rusu D., Calniceanu H., Stratul S.-I.</i>	
Tooth loss and survival rate in chronic moderate to severe periodontitis. A synthetic search of non-surgical therapy studies.	355
<i>Hodobeţ A.C., Bîcleşanu C., Florescu A., Tudose A., Pangică A.M.</i>	
ERRATA - Clinical statistical study on the performance of posterior composite resin restorations using direct, semidirect and indirect technics	362



Dental Hygienist

Full title: European Training Platform for Continuing Professional Development of Dental Hygienist

Start: 2015/09/01

Finish: 2018/08/31

Programme: ERASMUS+

Sub-Programme: Key Action – Strategic Partnership

Coordinator: Karolinska Institutet

Oral health is a determinant factor for quality of life, essential for well-being, and an integral part of general health.

Our mission is to promote oral health and the cost effective prevention of oral diseases in Europe. In the EU, the socio-economic burden of oral diseases is considerable: they affect the majority of school-aged children and adults and account for 5% of public health spending". The European Platform for Better Oral Health.

The dental hygienist is the key provider of preventive oral care in order to promote and improve the oral health of individuals, families and groups in society. The European inequality in access to oral health care can be tackled by harmonisation of dental hygienist education on ground level and increasing access to continuing education.

The goals of EuHyDens are:

- ✓ Demonstrate the importance and role of dental hygienists in the society by improving skills and knowledge.
- ✓ Harmonization of dental hygienists qualifications in Europe.
- ✓ Recognition of the dental hygienist profession in all EU-member states.
- ✓ Mobility of dental hygienists and cross-border cooperation among stakeholders
- ✓ Strengthen the position of dental hygienists by encouraging entrepreneurship activities and by promoting communication and mobility among the dental hygienists within the EU-nations.



**Karolinska
Institutet**

KAROLINSKA INSTITUTET, Sweden



Institute of Entrepreneurship Development, Greece



UNIVERSITATEA DE MEDICINA SI FARMACE VICTOR BABES TIMISOARA, Romania



UNIVERSIDADE DE LISBOA, Portugal



European Dental Hygienists Federation, Spain w



SC AFRA SRL, Romania



Praktikertjänst AB, Sweden

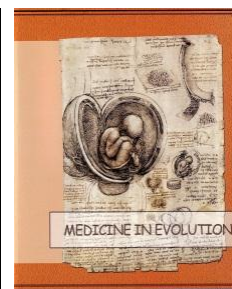


UNIVERSITATEA DE MEDICINA SI FARMACIE 'CAROL DAVILA' DIN BUCURESTI, Romania



Erasmus+

Correlations between coping strategies, psychiatric symptomatology and quality of life in patients with chronic viral hepatitis C: a case-control study



Bădițoiu L. M.¹, Dehelean L.², Laza R.^{3,4}, Crișan A.^{3,4}, Lăzureanu V. E.^{3,4}, Nicolescu N.D.^{3,4}, Musta V.F.^{3,4}, Marinescu A.R.³, Popovici E.D.^{1,5}

¹Epidemiology Department, "Victor Babeș" University of Medicine and Pharmacy, Timișoara, Romania

²Psychiatry Department, "Victor Babeș" University of Medicine and Pharmacy, Timișoara, Romania

³Infectious Diseases II Department, "Victor Babeș" University of Medicine and Pharmacy, Timișoara, Romania

⁴"Dr. Victor Babeș" Infectious Diseases and Pneumophthysiology Hospital, Timișoara, Romania

⁵Regional Public Health Centre, Timișoara, Romania

Correspondence to:

Name: Ruxandra Laza

Address: 13 Gheorghe Adam, Timisoara, Romania

Phone: +40 745170868

E-mail address: ruxi_martincu@yahoo.com

Abstract

Aim and objectives: This study aimed to investigate the impact of chronic viral hepatitis C on psychological coping mechanisms, psychiatric syndromology and quality of life as compared to mild acute infections with no chronicization potential and long-term physical discomfort.

Material and methods: We conducted a case-control study including 55 patients monitored for chronic hepatitis C and 55 patients examined for other acute mild infections, between 01.01–30.06.2015. Each patient filled out a questionnaire with main demographic data, the COPE Inventory, Symptom Checklist-90 and Short-Form Health Survey-36 questionnaires. The variables were assessed applying the Spearman rank correlation coefficient (ρ). The multivariate analysis was performed by ordinal logistic regression.

Results: Patients with chronic hepatitis C had higher scores for denial ($p < 0.001$), religious coping ($p = 0.003$) and mental disengagement ($p = 0.010$). As for psychiatric disorders, these subjects had significantly higher scores for subclinical anxiety, depression or psychosis. The most significant were correlations between emotion expression focusing and somatisation ($\rho = 0.519$, $p < 0.001$), and obsessive-compulsive elements, respectively ($\rho = 0.503$, $p < 0.001$), as were those between somatisation and the Physical Component Summary ($\rho = -0.692$, $p < 0.001$).

Conclusions: Patients with chronic hepatitis C have higher levels of psychiatric disorders (especially anxious-depressive disorders) with a higher proportion of guilt and suicidal ideas, sleep disorders and a lower quality of life, as compared to those with acute mild infections of other causes.

Keywords: Chronic Hepatitis C, Coping Strategies, Depression, Quality of life

INTRODUCTION

Hepatitis C virus infection (HCV) is the major cause of chronic liver disease, with an important impact on life quality, given the fact that 15–20% of chronic patients develop liver cirrhosis within 20 years, and 5–10% of these evolve towards primary hepatocellular carcinoma.[1]

According to the World Health Organization (WHO), there are approximately 130-150 million persons chronically infected with HCV, of whom approximately 700,000 die annually.[2] In the WHO European region there are an estimated 9 million people chronically infected with HCV, around one adult in 50.[3] In 2015, 28 countries from the European Union reported 34,651 hepatitis C cases, with a rate of 8.6 per 100,000 inhabitants.[4] In Romania, the results of the seroepidemiologic prevalence study conducted in 2013 showed that 5.6% tested positive for anti-HCV antibodies and in 2.8% serologic proof of dual HBV and HCV infection was detected.[5]

Generally, cognitive dysfunction and psychiatric disorders in chronic hepatitis patients are associated with hepatic encephalopathy, treatments with Interferon and high-risk behaviours (alcohol consumption). Moreover, the disease itself has a negative impact on the psychological status, decreasing life quality even in the absence of advanced staging, by extrahepatic symptoms, cognitive dysfunctions or consecutive psycho-social implications.[6]

Aim and objectives

This study aimed to investigate the impact of chronic viral hepatitis C on psychological coping mechanisms, psychiatric syndromology and quality of life as compared to mild acute infections, with no chronicization potential and, consecutively, no long-term physical discomfort.

MATERIAL AND METHODS

Study design: We conducted a case-control study, including 110 patients in the outpatient department of the „Victor Babeş” Clinical Hospital of Pneumophthisiology and Infectious Diseases in Timisoara, between 01.01. – 30.06.2015. The subjects were allocated to 2 samples:

- The first included 55 community cases undergoing standard treatment for chronic hepatitis C (with Interferon pegylat α -2a + Ribavirin), who were being monitored by the medical staff of the hospital;
- The second included 55 community patients who were examined during the same interval for acute mild infections of other aetiologies (respiratory viral infections, erythematous angina) and who did not require hospital admission – sample similar to healthy population.

We included cases aged 18 years or above, with no psychiatric history, who agreed to be included into the study. All subjects in sample I had a confirmed diagnosis of chronic hepatitis C (anti-HCV Ab by third-generation enzyme-linked immunosorbent assay and detectable HCV RNA by polymerase chain reaction, for over 6 months) but without cirrhosis or liver failure (ascites, hepatic encephalopathy) as determined by laboratory tests or ultrasound investigation, autoimmune pathology, alcoholic hepatitis or liver transplantation. Also, we did not include patients with coinfections (HBV, HIV), malignant comorbidities, diabetes mellitus, iv. drug consumption or homeless people. All subjects in sample II had liver tests within normal range. Patients with acute mild infections but with histories of significant chronic comorbidities were excluded. Patients with mental or linguistic disabilities were excluded from both study groups.

Questionnaires: During 30-40 minutes, each patient, regardless of sample classification, filled out:

- A personal questionnaire regarding main demographic data, stressful events during the previous year, data on social support network and addictive behaviours, if any. This was needed because life quality is not only influenced by the main pathology but also by any comorbidities, educational level, income and marital status;[7]
- A COPE Inventory (COPE) regarding coping strategies (Romanian translation, with an average α -Cronbach index of 0.70) [8];
- A Symptom Checklist-90 (SCL-90) for estimate the symptoms of psychopathology (internal consistency value=0.92)
- and a Short-Form Health Survey questionnaire (SF-36) vers.2, with 36 items included into 8 scales for life quality (internal consistency value =0.75).

This study was approved by the Ethics Committee of the "Victor Babeş" Clinical Hospital of Pneumophthisiology and Infectious Diseases, and written informed consent of all patients included in the study was obtained.

Statistical analysis: The database was processed using SPSS version 20 (SPSS Inc., Chicago, IL). Numeric variables were characterised by mean and standard deviation (SD) values, while categorical/ordinal data were characterised by absolute and percentual value. These variables were compared by the chi-square test, continuous numeric variables with Gaussian distribution were compared by the unpaired t-test and for those with non-Gaussian distribution, the Mann-Whitney U test was used. Bivariate correlation of variables was performed applying the Spearman coefficient. Multivariate analysis was done by ordinal logistic regression to control confounding factors. All statistical tests were two-tailed and statistical significance was defined as $p \leq 0.05$.

RESULTS

The 2 study groups were similar in terms of demographic/socio-economic characteristics, but different in pathology and its direct consequences – employment situation (higher number of retired persons, especially for disease-related reasons, among patients with chronic hepatitis), Mean hospitalization days during previous year and Mean Charlson comorbidity index score (where medium severity liver pathology is assigned a score of 3). (Table I)

Table I. Descriptive characteristics of the two samples (only with statistical difference)

Characteristic	Chronic hepatitis C sample (N=55)	Other acute infections sample (N=55)	p
Employee [n (%)]	30 (54.54)	43 (78.18)	0.015
Retired [n (%)]	21 (38.18)	9 (16.36)	0.018
Mean Charlson comorbidity index score (SD)	3.42 (0.79)	0.25 (0.70)	<0.001
Mean hospitalization days during previous year (SD)	10.40 (27.73)	1.60 (5.65)	0.001

Average values were higher to patients of sample I on passive coping strategies (denial - $p < 0.001$, religious coping - $p=0.003$) and dysfunctional coping strategies (mental disengagement - $p=0.010$). (Table II)

Table II. COPE questionnaire - comparative results

Variable	Chronic hepatitis C sample (N=55)	Other acute infections sample (N=55)	p
Positive reinterpretation and growth - Mean (SD)	11.87 (2.53)	12.67 (2.11)	0.075

Variable	Chronic hepatitis C sample (N=55)	Other acute infections sample (N=55)	P
Mental disengagement - Mean (SD)	8.56 (2.74)	7.35 (2.10)	0.010
Focus on and venting of emotions - Mean (SD)	8.85 (9.94)	8.24 (2.57)	0.263
Use of instrumental social support - Mean (SD)	11.49 (3.34)	11.16 (2.76)	0.576
Active coping - Mean (SD)	11.98 (2.84)	12.18 (2.11)	0.676
Denial - Mean (SD)	7.84 (2.85)	5.91 (2.06)	<0.001
Religious coping - Mean (SD)	12.44 (3.89)	10.16(3.97)	0.003
Humour - Mean (SD)	8.16 (3.75)	7.75 (3.39)	0.541
Behavioural disengagement - Mean (SD)	7.02 (2.90)	6.15 (1.63)	0.055
Restraint - Mean (SD)	10.33 (2.93)	9.91 (2.60)	0.430
Use of emotional social support - Mean (SD)	10.71 (3.30)	10.29 (2.79)	0.475
Substance use - Mean (SD)	4.82 (2.31)	4.27 (0.95)	0.470
Acceptance - Mean (SD)	11.18 (2.55)	11.11 (3.18)	0.895
Suppression of competing activities - Mean (SD)	10.42 (2.95)	9.91 (2.36)	0.320
Planning - Mean (SD)	12.33 (2.81)	13.05 (2.56)	0.159
Active coping strategies - Mean (SD)	55.76 (12.25)	55.35 (8.68)	0.917
Passive coping strategies - Mean (SD)	54.82 (8.99)	51.02 (7.81)	0.019
Dysfunctional Coping Strategies - Mean (SD)	29.25 (7.73)	26.00 (4.88)	0.031

Both samples had statistically significantly lower values as compared to the general population regarding active coping strategies ($p=0.010/<0.001$), and patients with acute infections had significantly lower scores for passive ($p<0.001$) and dysfunctional coping ($p<0.001$) as well. (Fig. 1)

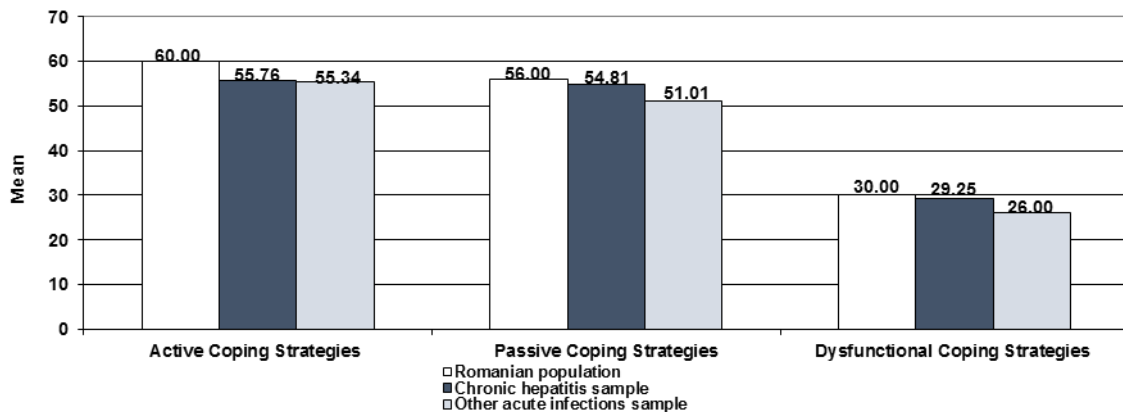


Figure 1. Scores for coping strategies in the 2 samples versus the general Romanian population

There are statistically significant differences between the two samples in all 9 syndrome-based samples of SCL-90. Subjects with liver disease have significantly higher scores for overall subclinical and sometimes even clinical anxious, depressive or psychotic disorders. Statistically significant differences between the two samples were also revealed for anxious symptoms – sleep-onset insomnia, interrupted sleep and depression, respectively – poor appetite, guilt and suicidal ideation. (Table III)

Table III. Comparative results of SCL-90 questionnaire

Variable	Chronic hepatitis C sample (N=55)	Other acute infections sample (N=55)	P
Somatisation - Mean (SD)	1.09 (0.79)	0.65 (0.57)	0.003
Obsessiveness - Mean (SD)	0.96 (0.71)	0.44 (0.38)	<0.001
Interpersonal sensitivity - Mean (SD)	0.67 (0.66)	0.31 (0.33)	0.002
Depressiveness - Mean (SD)	0.92 (0.72)	0.39 (0.43)	<0.001

Variable	Chronic hepatitis C sample (N=55)	Other acute infections sample (N=55)	p
Anxiety - Mean (SD)	0.71 (0.61)	0.34 (0.28)	0.001
Hostility - Mean (SD)	0.71 (0.67)	0.23 (0.28)	<0.001
Phobic fear - Mean (SD)	0.38 (0.52)	0.12 (0.20)	0.006
Paranoid thinking - Mean (SD)	0.56 (0.65)	0.25 (0.35)	0.006
Psychoticism - Mean (SD)	0.52 (0.59)	0.14 (0.25)	<0.001
Poor appetite - Mean (SD)	1.00 (1.02)	0.45(0.72)	0.002
Overeating - Mean (SD)	0.35 (0.82)	0.36 (0.78)	0.694
Sleep-onset insomnia - Mean (SD)	1.09 (1.06)	0.65 (0.97)	0.026
Early morning awakening - Mean (SD)	0.76 (0.94)	0.53 (0.92)	0.186
Restless or disturbed sleep - Mean (SD)	1.29 (1.13)	0.64 (0.91)	0.001
Thoughts of death or dying - Mean (SD)	0.27 (0.85)	0.01(0.13)	0.027
Feelings of guilt - Mean (SD)	0.85 (1.08)	0.29 (0.53)	0.003
Global severity index GSI - Mean (SD)	0.75 (0.29)	0.36 (0.19)	<0.001

All scales of the SF-36 questionnaire reveal statistically significant differences between the 2 samples. (Table IV)

Table IV. Comparative results of the SF-36 questionnaire

Variable	Chronic hepatitis C sample (N=55)	Other acute infections sample (N=55)	p
Physical functioning- Mean (SD)	66.97 (26.70)	89.45 (14.03)	<0.001
Role physical - Mean (SD)	64.65 (32.68)	82.95 (20.25)	0.005
Bodily pain - Mean (SD)	65.90 (24.93)	81.81 (21.62)	0.001
General health - Mean (SD)	54.43 (20.36)	71.36 (18.22)	<0.001
Vitality - Mean (SD)	58.52 (24.18)	68.97 (18.51)	0.022
Social functioning - Mean (SD)	72.04 (26.45)	84.31 (10.15)	0.011
Emotional role - Mean (SD)	68.78 (32.87)	85.00 (18.03)	0.024
Mental health - Mean (SD)	68.90 (20.87)	77.27 (16.38)	0.021
Physical Component Summary - Mean (SD)	62.99 (20.89)	81.39 (14.76)	<0.001
Mental Component Summary - Mean (SD)	67.07 (22.64)	78.89 (14.07)	0.008

Weak to medium correlations were detected between psychiatric symptomatology and coping strategies. For chronic hepatitis patients, the most significant are direct correlations between emotion expression focusing and somatisation ($\rho=0.519$, $p<0.001$), obsessive-compulsive elements, respectively ($\rho=0.503$, $p<0.001$). Catharsis is regarded as a means to reduce stress, anxiety, depression, frustration, including the feeling of isolation.

For chronic hepatitis patients, inverted correlations with values between -0.6 and -0.7 were obtained between somatisation and scales for vitality and the Physical Component Summary (with the highest value $\rho= -0.692$, $p<0.001$); depression and scales for general health and the Physical/Mental Component Summary; obsessiveness/psychoticism and scale for general health.

In the first sample, we identified, by ordinal logistic regression, that occupational status of employee is involved in a small proportion in somatisation (Nagelkerke pseudo- $R^2=0.282$, $p<0.001$), anxiety (Nagelkerke pseudo- $R^2=0.270$, $p<0.001$) and phobic-anxious ideation (Nagelkerke pseudo- $R^2=0.265$, $p=0.002$). In sample II, the occupational status of the employee is involved weak only in somatisation (Nagelkerke pseudo- $R^2=0.162$, $p=0.007$).

DISCUSSIONS

Generally, chronic patients go through a period of denial, rejection of disease/reality, as a defence mechanism aiming to reduce the disease-generated stress. Turning to religion in the hope of healing or alleviation is especially involved during periods of disease activation or when there is uncertainty regarding the evolution. As compared to the general population, both samples are characterised by active coping strategies (restraint from action), behavioural acceptance/disengagement at significantly lower levels reflecting a higher degree of impulsiveness. Both samples also scored significantly higher than the general population in psychoactive substance consumption.

In a paper published in 2011, the most frequently used coping strategies identified in HCV patients were positive reassessment, seeking of social support and turning to religion, with an increased use of avoidance strategies and decreased use of active strategies.[9] In another review article of 2013, the following coping strategies in HCV patients were identified – behaviour focused on problem-solving, followed by distraction, self-reassessment, religious approach, cognitive avoidance, dissimulation and depression.[10]

Regarding the presence of a psychiatric impairment, chronic hepatitis C subjects have significantly higher scores for anxious, depressive or psychotic subclinical disorders. An aspect requiring attention is the presence of guilt and suicidal ideation, with high risk for suicidal behaviour, especially considering that the sample in question exhibits a reduced control of impulsivity and a tendency toward psychoactive substance consumption.

Literature data show that between 25% and over 50% of HCV-infected patients exhibit signs of clinical depression and/or anxiety.[11] The genotype 1 of HCV could also be associated with an increased risk for depression. [12] Sleep disorders occur in around 60% of HCV patients, with increased rates of disturbed sleep, sleep apnoea, and possibly the restless legs syndrome as well.[10] Extrahepatic manifestations in HCV infection usually include central type fatigue (with a prevalence around 50%), somatic dysfunctionality perception, sexual dysfunctions, depression and cognitive disorders.[10,13] Fatigue is more frequently associated with older age, female gender, lack of family support, and psychological and psychiatric comorbidities. [10,14] In 15-30% of chronic HCV patients discrete but still significant neuro-cognitive defects may be present – hypoprosia, hypomnesia, reduced information processing and decreased speed in visual-motor processing.[10,11]

One of the aetiological mechanisms might be represented by the action of HCV on the central nervous system, where viral replication has been detected, the changes in the neurotransmitters located in the frontal white substance being correlated to hypoprosia. Another explanation might be the activation of cerebral inflammation. [10,11,15,16,17,18] Additionally, the adverse effects of antiviral treatment are also involved – α interferon is known to generate fatigability, headache, insomnia, irritability, depression and focusing disorders.[19,20] Even the new schemes interferon free often causes insomnia and fatigability.

The limitations in our study are generated by the relatively small sample size and the impossibility to extrapolate the results to all patients with HCV in Romania (as they rely on patients under constant monitoring, receiving antiviral treatment, while the majority of community patients are not diagnosed).

CONCLUSIONS

The study revealed scores for denial, religious approach, and mental disengagement that were statistically significantly higher in patients with chronic hepatitis C versus those with other acute mild infections, but both samples scored lower in active coping strategies when compared to the general population in Romania. Chronic hepatitis C patients have higher levels of psychiatric impairment (especially anxious-depressive) with a higher

proportion of guilt and suicidal ideas, sleep disorders and a lower quality of life, as compared to those with acute mild infections of other causes.

Acknowledgements

We gratefully acknowledge the generous contribution and assistance of Dr. Dana Brehar Cioflec in preparing the manuscript.

Competing Interest: The authors declare that they have no competing interests.

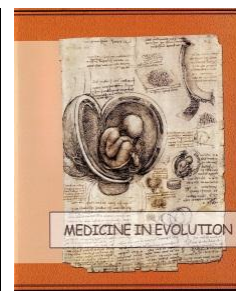
Funding: Our study did not benefit from any funding.

REFERENCES

1. Hsu PC, Krajden M, Yoshida EM, Anderson FH, Tomlinson GA, Krahn MD. Does cirrhosis affect the quality of life in hepatitis C virus-infected patients? *Liver Int.* 2009; 29(3):449-58.
2. WHO. Hepatitis C. Fact sheet N°164. Available from: <http://www.who.int/mediacentre/factsheets/fs164/en/>. Accessed 02.12.2016
3. Hope VD, Eramova I, Capurro D, Donoghoe MC. Prevalence and estimation of hepatitis B and C infections in the WHO European Region: a review of data focusing on the countries outside the European Union and the European Free Trade Association. *Epidemiol Infect.* 2014; 142(2):270-86.
4. ECDC. Annual Epidemiological Report for 2015 – Hepatitis C. Available from: http://ecdc.europa.eu/en/healthtopics/hepatitis_C/Pages/Annual-Epidemiological-Report-for-2015.aspx. Accessed 10.04.2017
5. Centrul Național de Supraveghere și Control al bolilor transmisibile. Rezultatele studiului sero-epidemiologic de prevalență pentru infecția cu virus hepatitic B și virus hepatitic C 2013. Available from: <http://www.cnsrbt.ro/index.php/analiza-date-supraveghere/hepatita-virala-tip-b-si-c/82-rezultatele-studiului-sero-epidemiologic-de-prevalenta-pentru-infecția-cu-vhb-vhc-2013/file>. Accessed 02.06.2015
6. Isaacs D, Abdelaziz N, Keller M, Tibble J, Haq I. Measuring the Response of Extrahepatic Symptoms and Quality of Life to Antiviral Treatment in Patients with Hepatitis C. *Hepatitis Research and Treatment*, 2013. Available from: <https://www.hindawi.com/journals/heprt/2013/910519/>. Accessed 23.07.2016.
7. Orr JG, Homer T, Ternent L, et al. Health-related quality of life in people with advanced chronic liver disease. *J.Hepatology* 2014, 61:158-65.
8. Crașovan DI, Sava FA. Translation, adaptation and validation on Romanian population of Cope questionnaire for coping mechanisms analysis. *Cogn Brain Behav.* 2013; 17(1):61-76
9. Kausar R, Yusuf S. State Anxiety and Coping Strategies Used by Patients with Hepatitis C in Relation to Interferon Therapy. *PJSCP.* 2011; 9:57-61
10. Modabbernia A, Poustchi H, Malekzadeh R. Neuropsychiatric and Psychosocial Issues of Patients with Hepatitis C Infection: A Selective Literature Review, *Hepat Mon.* 2013; 13(1):e8340.
11. Foster GR. Quality of life considerations for patients with chronic hepatitis C. *J Viral Hepatitis.* 2009; 16:605-11.
12. Cunha EC, Behrens MF, Bavaresco V, et al. Genotype 1 of hepatitis C virus increases the risk of major depression: a 12-week prospective study. *Gen Hosp Psychiatry.* 2015; 37(4):283-87.
13. Fábregas BC, de Ávila RE, Faria MN, Moura AS, Carmo RA, Teixeira AL. Health related quality of life among patients with chronic hepatitis C: a cross-sectional study of sociodemographic, psychopathological and psychiatric determinants. *Braz J Infect Dis.* 2013; 17(6):633-39.
14. Chang SC, Yang SS, Chang CC, Lin CC, Chung YC, Li TC. Assessment of health-related quality of life in antiviral-treated Taiwanese chronic hepatitis C patients using SF-36 and CLDQ. *Health Qual Life Outcomes.* 2014; 12:97.
15. Senzolo M, Schiff S, D'Aloiso CM, et al. Neuropsychological alterations in hepatitis C infection: the role of inflammation. *World J Gastroenterol.* 2011;17:3369-74.
16. Adinolfi LE, Nevola R, Lus G, et al. Chronic hepatitis C virus infection and neurological and psychiatric disorders: An overview. *World J Gastroenterol.* 2015; 21(8): 2269-80.
17. Fletcher NF, Wilson GK, Murray J, et al. Hepatitis C virus infects the endothelial cells of the blood-brain barrier. *Gastroenterology.* 2012; 142:634-43.

18. Solinas A, Piras MR, Deplano A. Cognitive dysfunction and hepatitis C virus infection. *World J Hepatol.* 2015; 7(7): 922-25.
19. Pai MS, Yang SN, Lin JC, Shiah IS. Antiretroviral agent entecavir exacerbates major depression. *Psychiatry Clin Neurosci.* 2013; 67(5):364-65.
20. Teodor D, Juganariu G, Miftode E. Use of SF-36 questionnaire in evaluating the quality of life of hepatitis C patients on antiviral therapy – Pilot Study. *Revista de cercetare si interventie sociala,* 2014, 44: 253-65.

The prognostic utility of Prox-1 expression in molecular subtypes of breast carcinomas



Bujor I.S.¹, Cioca A.R.¹, Ceașu R.A.¹, Veaceslav F.²

¹Department of Macroscopic/Histologic Morphology, Angiogenesis Research Center,

"Victor Babeș" University of Medicine and Pharmacy, Timișoara, Romania

²Department of Histology, Cytology and Embryology, Nicolae Testemitanu University of Medicine and Pharmacy, Chișinău, Republic of Moldova

Correspondence to:

Name: Ionela Sevilla Bujor

MD

Address: "Victor Babeș" University of Medicine and Pharmacy, Department of Microscopic/Histologic Morphology, Angiogenesis Research Center, Timișoara, Piața Eftimie Murgu nr.2, 300041, Timișoara, Timiș, Romania

Phone: +40 740872707

E-mail address: sevilabujor@gmail.com

Abstract

Background: The assesement of Prox-1 expression in molecular subtypes of breast cancer might bring new prognostic data for approaching this pathology.

Patients and Methods: A retrospective study of 45 cases of ductal carcinomas diagnosed between 2009 and 2013, including 20 axillary lymph nodes metastasis, was performed. The primary tumors and their corresponding lymph nodes were assessed histologically and immunohistochemically, taking into account the tumoral grading, staging and patients' age.

Results: Out of 45 cases, 34 were luminal A. For these cases, the Prox-1 expression in tumor cells has correlated with the peritumoral lymphovascular microdensity ($p=0,06$). Referring to the lymph nodes metastasis, we observed a decrease of the Prox-1 expression in the lymphatic vessels and tumor cells, comparing to the primary tumors.

Conclusion: The Prox-1 plays a key role in the tumor's lymphangiogenesis process, its expression being usable also as a prognostic marker in evaluating breast cancer.

Key words: molecular subtypes, breast cancer, metastases, lymphangiogenesis

INTRODUCTION

Breast cancer is a heterogeneous entity [1]. Similar to other neoplasia types, lymph nodes metastases represent an important prognostic factor. It is well known that a raise in the intratumoral and peritumoral lymphovascular micro density can be associated with an unfavorable prognosis. Recent studies show that breast tumors have the capacity to induce the remodeling of locoregional lymphatic vessels, and of the lymphatic network inside the sentinel ganglion and inside any remote lymph nodes [2]. This increases significantly the risk of tumor metastasis.

For lymphatic differentiation of endothelial cells, the presence of Prox-1 transcription factor is necessary [3]. For the embryo, the Prox-1 expression is located in a subpopulation of venous endothelial cells. The functional inactivity of Prox-1 is resulting in a cease of development for the lymphatic vessels. For the adult, Prox-1 is exclusively expressed by the lymphatic endothelial cells [4].

Prox-1 gene has been cloned by homology with the prosperous gene of *Drosophila*. For the mouse, the functional inactivity of Prox-1 results in the death of the embryo and determines alterations in the development of the crystalline, the liver and the lymphatic vessels. For the null Prox-1 mouse, the sprouting and proliferation of lymphatic endothelial cells take place, but the process is prematurely interrupted and the animal is bare of lymphatic system [5].

Until now, the Prox-1 expression has been evaluated only at the lymphatic vessels level, but also in relationship with different types of tumors: vascular tumors, pancreatic tumors, ovarian tumors, colon cancer, and hepatocellular carcinoma [6-11].

Related to breast cancer, it has been observed that Prox-1 hypermethylation is associated with the ER superexpression, also known as being an inductor of tumor angiogenesis through VEGF stimulation. It seems that the hypermethylation of a certain CpG region of Prox-1 gene is frequently encountered in breast cancers and is associated to a decrease of the Prox-1 expression. Considering that a continuous decrease of the Prox-1 transcription starting from the primary breast tumors to the associated cerebral metastases has been observed, we can assume that Prox-1 expression is involved in the evolution of breast cancer and might represent a distinct marker for the remote metastases [12]. Furthermore, the Prox-1 supraexpression at the blood vessels level is accompanied by the reprogramming of the vascular endothelial cells' transcription with the entire modification of their phenotypes and the steering towards the lymphatic endothelial cells [13].

For a better understanding of the interaction between Prox-1 gene and the vascular endothelial and lymphatic cells, as well as for the ways through which this is involved in the breast tumors' metastasis process, additional studies are necessary.

Starting from these considerations, we have decided to evaluate the Prox-1 expression from the endothelial cells and the tumor cells of the molecular subtypes of breast cancer.

MATERIAL AND METHODS

1. Patients

45 patients that had radical modified mastectomy diagnosed with invasive ductal carcinoma between 2009 and 2013 have been included in this study. The average age of patients was 52 years (38-82 years). Out of these cases, 20 presented metastases in the axillary lymph nodes. For the immunohistochemical assessment we selected the biggest lymph node (3,5 cm diameter).

The paraffin blocks were obtained from Pathology Department of Oncology Institute, Chisinau. All procedures were done according with the principles of the Declaration of

Helsinki and were approved by International Review Board of "Victor Babeş" University of Medicine and Pharmacy, Timișoara.

2. Specimen processing

Surgical specimens were fixed in 10% buffered formalin for 48 hours and paraffin embedded. Five µm thick step sections were performed for each case. One slide from each case was stained with hematoxylin-eosin, for the pathologic diagnosis. The grading was performed according to Scharf Bloom Richardson score [13] and the staging according to TNM staging system.

3. Immunohistochemistry

Immunohistochemical techniques included heat-induced epitope retrieval with Bond Epitope Retrieval Solution 2, a ready-to-use, pH 9.0 solution (Leica Biosystems, Newcastle Ltd, Newcastle UponTyne NE 12 8EW, U. K.) for 20 minutes. The immunohistochemical technique continued with the blocking of the endogenous peroxidases, using hydrogen peroxide 3% for 5 minutes. Incubation with VEGF-A primary antibody (clone A20, Santa Cruz Biotechnology, dilution 1:100) had a duration of 20 minutes. The Bond Polymer Refine Detection System (Leica Biosystems, Newcastle uponTyne, UK) was used for visualisation. 3,3 diamino-benzidine dihydrochloride was applied as chromogen and hematoxyline was used for counterstain. The entire immunohistochemical procedure was performed with Leica Bond- Max (Leica Biosystems, Newcastle uponTyne, UK) autostainer.

4. The assesement of Prox-1 staining

PROX1 assesement in tumoral cells and endothelial cells was performed by quantification of nuclear immunostaining.

5. Statistical analysis

Pearson's test was applied to assess the relationship between clinico-pathological parameters and Prox-1 expression in primary breast tumors and their corresponding axillary lymph nodes metastases. P-values of less than 0.05 were considered statistically significant. All statistical analysis was performed using the commercially available SPSS 22.0 software for Windows.

RESULTS

From the morphology point of view, all 45 breast tumors included in the study have been identified as infiltrative ductal carcinomas. The tumors' dimensions varied between 1.5 and 11 cm. Grossly, they were solid, white, firm and poorly circumscribed.

34 (75,55%) cases were luminal A subtype, 5 (11,11%) luminal B cases, other 5 (11,11%) HER2neu cases and last one of the cases (2,22%) has been triple negative.

In percentages, the distribution for breast tumor subtypes case has been rendered in fig 1.

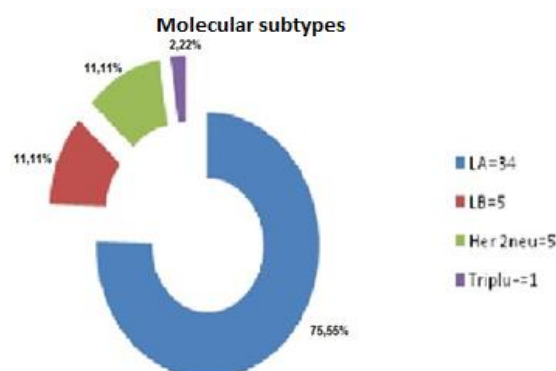


Figure 1. Percentage distribution of breast cancer molecular

Out of the total of 45 cases of breast carcinomas included in the study, 20 (44,44%) of them have been accompanied by metastases at axillary lymph nodes level. Related to the breast tumors molecular types, out of the 34 luminal A cases, 14 have been lymph nodes metastases; all 5 luminal B cases included in the study have been accompanied by metastases; 2 out of 5 Her 2+ cases have been associated to metastases and the only triple negative case did not present any lymph nodes metastases. The distribution for the number of cases of breast tumors accompanied by lymph nodes metastases in relationship to the total number of cases included in the study was illustrated in figure 2.

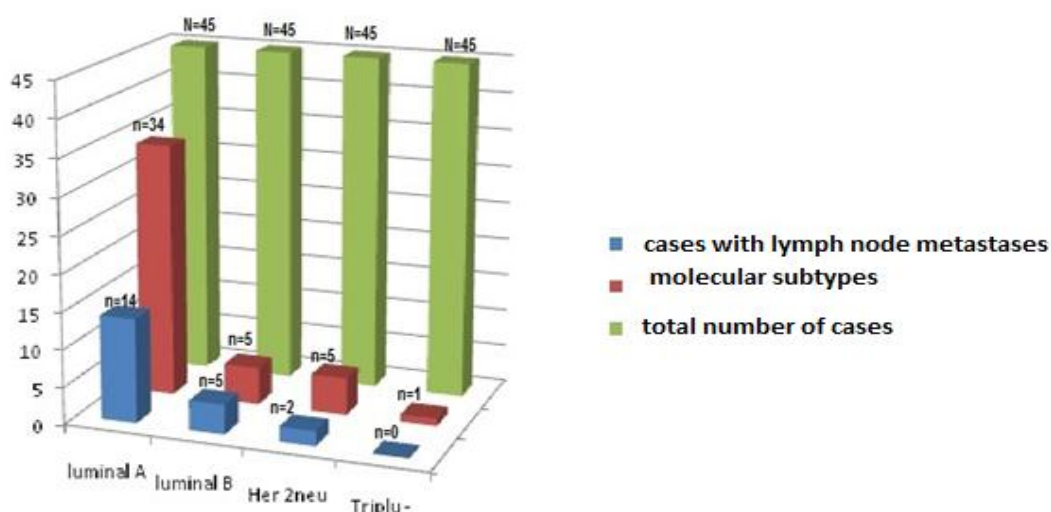


Figure 2. The distribution for the number of cases of breast tumors accompanied by lymph nodes metastases in relationship to the total number of cases included in the study

For all primary tumors included in the study, the immunoreactivity for Prox-1 has been detected at the nuclear and cytoplasmic level, both in the tumor cells and at the lymphatic endothelium level, figure 3.

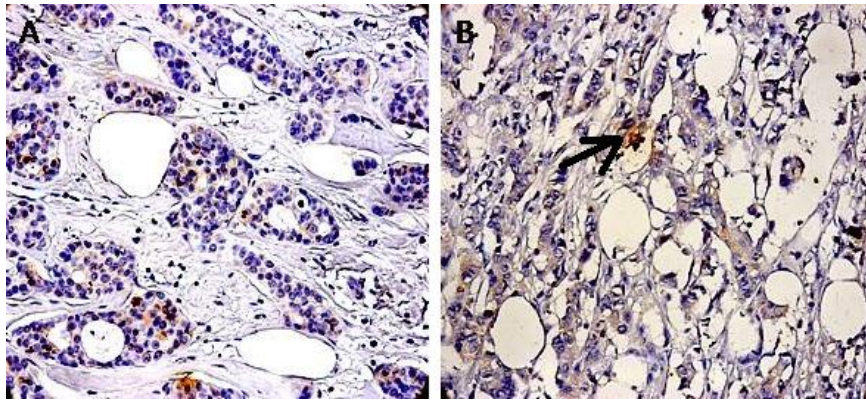


Figure 3. Prox-1 expression at nuclear and cytoplasmic level; A. in tumor cells; B. at the endothelial cells level (arrow) from the primary tumor, X1000, immersion

For the intratumor lymph vessels and the tumor cells that expressed Prox-1 we have obtained a significant correlation from statistic point of view ($p=0,05$).

As part of the primary tumors' observation, we have noticed the tendency of lymph vessels towards the formation of secondary lumens, which demonstrates that the positive Prox-1 lymphatic endothelial cells are active (Figure 4, figure 5).

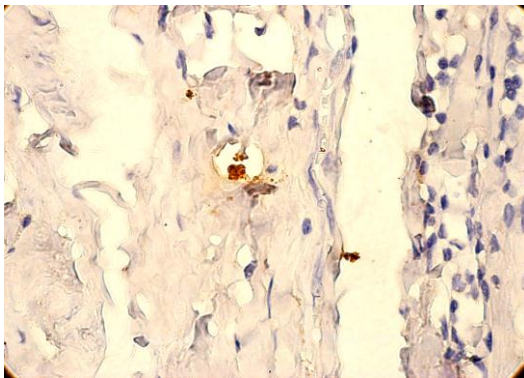


Figure 4. Positive Prox-1 endothelial cells with the tendency towards forming secondary lumens, nuclear immunomarking, image captured at the primary tumor level, X400

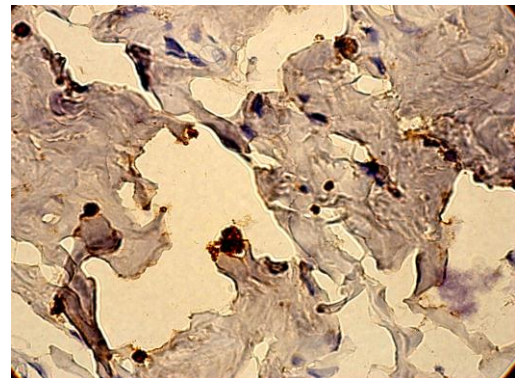


Figure 5. Positive Prox-1 endothelial cells with the tendency towards forming secondary lumens, nuclear immunomarking, image captured at the primary tumor level, X1000, immersion

Regarding the tumor edge, we have obtained a weak correlation, statistically insignificant ($p= -0,08$) for the Prox-1 expression in the tumor cells and the peritumoral lymphatic vessels (figure 6).

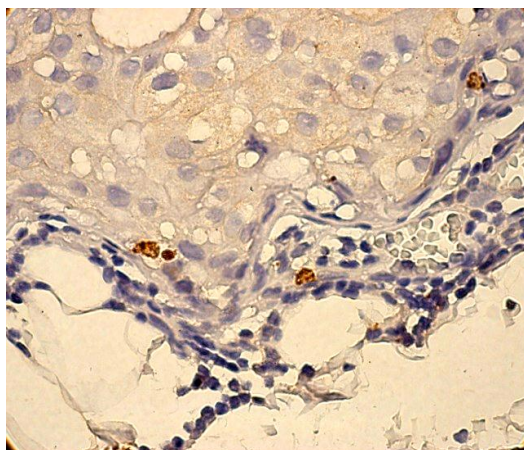


Figure 6. Positive Prox-1 tumoral cells, nuclear immunomarking, at the level of tumor edge, X400

In the current study, the most numerous evaluated cases proved to be luminal A type (34 - 75,55%). Due to this we have recorded a high correlation from statistical point of view between the Prox-1 expression inside the tumor cells and the lymphatic vessels ($p=0,05$). Also, for the luminal A cases, the Prox-1 expression inside the tumor cells has correlated with the peritumoral lymphovascular microdensity ($p=0,06$).

Regarding luminal B cases included in the study, Prox-1 expression inside the tumor cells has not significantly correlated from statistical point of view with the lymphatic vessels which have expressed this marker.

Referring to lymph nodal metastases, we have observed a decrease of the Prox-1 expression in comparison to the primary tumors, both at the lymphatic vessel level and at the tumor cell level.

Table 1. The correlation between clinico-pathological parameters and Prox-1 expression in primary breast tumors and their corresponding axillary lymph node metastases

Case number	Age	Histological grade	TNM stage	Primary tumor		Axillary lymph node metastasis	
				Tumoral cells	Lymphatic endothelial cells	Tumoral cells	Lymphatic endothelial cells
1	39	G2	T1N1M0	22	10	18	7
2	45	G3	T3N1M0	26	18	16	8
3	42	G2	T2N1M0	24	16	19	9
4	65	G2	T2N1M0	22	14	17	11
5	57	G1	T1N1M0	16	12	12	8
6	53	G2	T2N1M0	18	11	15	7
7	42	G2	T1N1M0	9	5	6	4
8	51	G3	T2N1M0	13	11	11	6
9	66	G3	T4N1MX	28	22	18	12
10	72	G3	T3N1M0	22	13	17	8
11	75	G2	T2N1M0	14	11	4	2
12	59	G1	T2N1M0	12	7	5	2
13	63	G2	T2N1M0	6	4	4	1
14	69	G2	T1N1M0	8	4	6	2
15	71	G2	T2N1M0	15	11	12	8
16	41	G1	T1N1M0	5	3	3	1
17	54	G3	T2N1M0	10	6	7	2
18	78	G3	T3N1MX	19	15	11	8
19	81	G3	T4N1MX	33	27	19	11
20	46	G2	T2N1M0	13	9	8	16

DISCUSSION

Distant metastases represent an important prognostic factor in breast cancer [13]. Not to be neglected also the micrometastases that are present even since the moment the diagnostic is set, but which can't be detected during a routine histopathological check [4]. It has been proven that an increase of intratumoral and peritumorallymphovascular microdensity is accompanied by an unfavorable prognosis. Also carcinoma cells within the breast tumors can induce the remodeling of locoregional lymphatic vessels, significantly increasing the risk of tumor metastasis [2]. Therefore, the implementation of new diagnostic and prognosis markers is required for approaching this pathology.

For lymphatic differentiation of the endothelial cells, the presence of Prox-1 transcription factor is necessary (prosperohomeobox 1 protein), [13].

Concerning the breast cancer, it has been proven that Prox-1 hypermethylation is associating the ER superexpression, the last one being an inductor for tumor angiogenesis. Therefore it seems that Prox-1 expression is involved in breast cancer evolution. Also, Prox-1

can be used as distinct marker for remote metastases. On the other hand, it seems that Prox-1 hypermethylation is accompanied by the decrease of this gene's transcription. This has been observed for primary breast tumors, with a high degree of metastases and mostly in cerebral metastases of breast cancer [12].

Starting from these observations, recent studies focus on the Prox-1 gene application as therapeutically target for breast cancer.

In the current study we have observed that Prox-1 expression for carcinoma cells inside the primary tumor seem to positively influence intratumorallymphovascularmicrodensity. Therefore we have obtained a statistically significant correlation ($p=0.05$) between positive Prox-1 tumor cells and the number of intratumoral lymphatic vessels. Likewise, our attention has been drawn by the intratumoral lymphatic vessels, Prox-1 positive, that had the intention to form secondary lumens. This demonstrates that the positive Prox-1 lymphatic endothelium cells are active.

Relating to the molecular subtype, in the breast cancer luminal A subtype, the Prox-1 expression within the tumor cells has correlated significantly at statistical level with the peritumorallymphovascularmicrodensity ($p=0.06$).

Versmold and his assistants have noticed a decrease of Prox-1 expression inside breast tumors in comparison to normal breast tissue from a histological point of view [14]. Also, for the current case we have observed a decrease of Prox-1 expression, this time in lymph nodal metastases, in comparison to the corresponding primary tumors.

CONCLUSIONS

The results of this study suggest that the Prox-1 expression inside the tumor cells positively influence intratumoral lymphovascular microdensity for the luminal A subtype of breast cancer. Given the importance of lymphatic metastases for breast cancer, Prox-1 expression could be used as a prognostic marker in approaching this pathology.

Conflict of interest

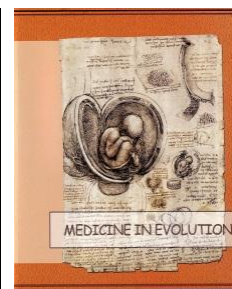
We declare that there are no conflicts of interest.

REFERENCES

1. Dumitru A., Georgescu T.-A., Tampa M., Georgescu S.-R., Matei C., Oancea R., Lăzăroiu A., Costache M. Sajin, Insight into the histopathological and immunohistochemical heterogeneity of multiple breast carcinomas, *Medicine in evolution*, Volume XXIII, No. 2, 118-127 (2017).
2. Ran S, Volk L, Hall K, Flister MJ. Lymphangiogenesis and lymphatic metastasis in breast. *Pathophysiology*. Sep 17(4), 229-51 (2010).
3. Tatiana V. Petrova, Taija Mäkinen, Tomi P. Mäkelä, Janna Saarela, Ismo Virtanen, Lymphatic endothelial reprogramming of vascular endothelial cells by the Prox-1 homeobox transcription factor. *EMBO J*. Sep 2; 21(17), 4593–4599(2002).
4. Raica M, Cîmpean A.M. et al., Angiogeneza și limfangiogeneza tumorală, *Timișoara*, 284-286 (2010).
5. Oliver G, Sosa-Pineda B, Geisendorf S, Spana EP, Doe CQ, Gruss P. Prox 1, a prospero-related homeobox gene expressed during mouse development. *Mech Dev*. 44(1), 3-16 (1993).
6. Hong YK, Foreman K, Shin JW. Lymphatic reprogramming of blood vascular endothelium by Kaposi sarcoma-associated herpesvirus. *Nat Genet*. 36, 683-685 (2004).
7. Huu AR, Jokinen CH, Rubin BP. Expression of Prox1, lymphatic endothelial nuclear transcription factor, in Kaposiform hemangioendothelioma and tufted angioma. *Am J Surg Pathol*. 34, 1563-1573 (2010).
8. Takahashi M, Yoshimoto T, Shimoda M. Loss of function of the candidate tumor suppressor prox1 by RNA mutation in human cancer cells. *Neoplasia*. 8, 1003-1010 (2006).

9. Mazurek M, Bednarek W, Jach R et al., Expression of lymphangiogenic marker PROX1 in ovarian cancer. *Przegląd Menopauzalny*. 3,121-126 (2009).
10. Petrova TV, Nykänen A, Norrmén C, Ivanov KI. Transcription factor PROX1 induces colon cancer progression by promoting the transition from benign to highly dysplastic phenotype. *13*(5), 407-19 (2008).
11. Y Liu, X Ye, J-B Zhang, H Ouyang. PROX1 promotes hepatocellular carcinoma proliferation and sorafenib resistance by enhancing β -catenin expression and nuclear translocation. *Oncogene*. 34, 5524-5535 (2015).
12. Beatrix Versmold, Jeorg Felsberg, Thomas Mikeska, Denise Ehrentaut, Juliane Keohler, Juergen A. Hampl, Gabriele Reohn. Epigenetic silencing of the candidate tumor suppressor gene PROX1 in sporadic breast cancer. *Int. J. Cancer*. 121, 547-554 (2007).
13. Britta Weigelt, Johannes L. Peterse & Laura J. van't Veer, Breast cancer metastasis markers and models. *Nature Reviews Cancer*. 5, 591-602 (2005).
14. Bloom HJ, Richardson WW. Histological grading and prognosis in breast cancer; A study of 1409 cases of which 359 have been followed for 15 years. *Br J Cancer*. 11(3), 359-77 (1957).
15. Versmold, B., Felsberg, J., Mikeska, T., Ehrentaut, D., Kohler, J., Hampl, J. A., et al. Epigenetic silencing of the candidate tumor suppressor gene PROX1 in sporadic breast cancer. *International Journal of Cancer*, 121(3), 547-554 (2007).

Nutritional value of kindergartens menus from Mures / Romania, related to national and international dietary recommendations



**Hadmaş R.M.¹, Tarcea M.², Neghirlă A.³, Mărginean O.⁴, Martin A.⁵,
Martin Ş.A.¹**

¹PhD School, University of Medicine and Pharmacy Tîrgu Mureş, Romania

²Department of Community Nutrition, University of Medicine and Pharmacy Tîrgu Mureş, Romania

³School Physicians Association, Mureş county, Romania

⁴Department of Pediatrics I, University of Medicine and Pharmacy Tîrgu Mures, Romania

⁵Department of Radiology, Emergency Clinical County Hospital of Tîrgu Mureş, Romania

Correspondence to:

Name: Roxana Maria Hadmaş

Address: 38 Gheorghe Marinescu street, Tîrgu-Mureş city, postal code 540139, Romania

Phone: +40 265 210407

E-mail address: roxanahadmas@yahoo.com

Abstract

Aim: The aim of the paper was to analyze the dietary intake from kindergartens with extended schedule from Mures, in reference to the national and international legal recommendations.

Methods: We conducted an observational study between February – June 2016, in Mures County, Romania. The sample analysed in the study consisted of 18 kindergartens. For the quantitative analysis of the menus, we have used the daily food records during 10 days. **Results:** We observed a significant overshoot of protein and lipid, and an increased caloric intake due to the high amount of carbohydrates. The energy requirements recommended by the Romanian Ministry of Health, were exceeded in 95% of the 180 menus monitored, while in 83.33% an excess in the level of proteins was recorded as well. **Conclusions:** The nutrition of the preschoolers enrolled in kindergartens with extended schedule from Romania, does not comply with the national dietary recommendations and neither international ones, therefore a closer monitoring of the institutions is required.

Keywords: school, energy intake, lipids, obesity, kindergartens menu

INTRODUCTION

The recommendations on preschool nutrition are constantly reviewed and amended to ensure proper physical and mental development, due to the worldwide phenomenon of obesity encountered in preschool groups (1,2). According to WHO (World Health Organization) more than 50% of European people are obese or overweight, the number of overweight children being constantly increasing, the real percentage of children aged between 0 and 9 years old with obesity being unknown in Romania (3). However, it is known that between 2009 and 2010, 52% of children aged 11 years old were overweight in this country (4). Thus, both on a national and a European level, there are laws set up to ensure proper nutrition in educational institutions. In Romania, the current laws are in effect since 2008, without any changes made to them until present (5).

The nutritional recommendations provided by the national legislation do not comply with the current recommendations of the experts in the field of dietetics or with the national recommendations applied by other nations (5,6,7). In the last 9 years here in Tirgu-Mures we started the first Nutrition and Dietetics license programs with help of specialists from all over the world (like Europe, USA, Canada) and we are working on developing of new standards and requirements in order to sustain a healthy nutrition and a healthy population through our dietitians.

Because Romania is a developing country, during the last decade, a transition can be seen from classical nutrition to a highly processed diet, with higher amounts of sugars and saturated fats, same as a general increase in the body weight of population, especially children (8,9,10). The excessive consumption of refined foods influences the national obesity curve, which follows an upward trend for adults, due to adipocyte hyperplasia at a young age, and a subsequent hypertrophy of the fat cells (11,12).

In Romania the level of obesity has an increasing trend in the last ten years and it shows us the purpose to investigate the causes (4,5,10,13). Nutritional education, theoretical and, most importantly, practical, at this age is very important for acquiring tastes and developing correct eating habits, which will mark the evolution of the children and their lives as future adults. Also the training of kindergarten managers, school physicians and nutritionists it has to be improved, and the knowledge and cooking habits of chefs to be adapted to children's nutritional and growth requirements.

The purpose of this paper is to evaluate the dietary intakes (lipids, proteins, carbohydrates, energy value) from the kindergartens with extended schedule from Mures county, Romania, by relation to the intake values recommended by law.

METHODS

A retrospective study was conducted between February - June 2016 in Mures County, central Romania. The analysed sample consisted of 18 kindergartens with extended schedule (between 8 to 18 o'clock daily, except Saturdays and Sundays) from Mures county, which is the total number of this kind of public kindergartens currently activating in this area.

For the quantitative analysis of the menus, we have used the daily food records during two weeks time (10 days), also the exact quantities of product used/day and the number of children present in kindergarten each day, making it possible to calculate the total macronutrients and calories offered to one individual.

Knowing the exact quantity of product acquired by the institution per day (x) and the total number of children present each day (y), the quantity offered to each pre-schooler (z) could be determined, as follows: $z=x/y$. For each food item consumed by a single individual, the amount of constituent macronutrients has been determined and thus, the quantity of carbohydrates, proteins, fats and calories offered to each pre-schooler during the same spent

in the institution. The food was transformed into nutrients by using the food composition table approved by the Ministry of Health from Romania (13). Since kindergartens provide the children only two main meals and two snacks, the comparison was made to 75% of the national and international RDI (recommended daily intake) for one full day.

For comparison we used the dietary recommendations (2003-2016) from Romania (Ro), United States of America (USDA), Australia (AU), United Kingdom (UK), European Union (EU) and World Health Organization (WHO), some of these being similar (5,14). Because the institutions included in this research do not differentiate between the amounts of food relative to age (the amounts remain unchanged for all age groups) the average recommended values for the age groups 3-4 and 5-6 years were used.

The caloric percentage distribution considered normal in this study was 15% for proteins, 30% for lipids and 55% for carbohydrates.

Data were statistically analysed by using GraphPad Prism 7.0. The differences between the national and international recommendations and the data from the kindergartens included in this study, were determined by using Wilcoxon signed-rank test. To see if there is a mutual influence between macronutrients, the Spearman rank correlation coefficient was calculated. The confidence interval used in all applied test was 95% and the level of significance was set at $\alpha=0.05$.

We confirm that we obtained the agreement to evaluate the menus from the Manager of each institution monitored, but in order to preserve the confidentiality of the institutions included in our study, every kindergarten has been assigned a random code from K1 to K18.

RESULTS

The analysis of the menus revealed a minimum energy level of 924 calories and a maximum one of 2674 calories, the descriptive analyse being shown in Table 1, where the amounts are expressed in kilocalories, along with the recorded amounts of macronutrients, expressed in grams in Figure 1.

Table 1. Descriptive data of the analysed menus

	Calories			Carbohydrates			Lipids			Proteins		
	25% Percentile	Median	75% Percentile	25% Percentile	Median	75% Percentile	25% Percentile	Median	75% Percentile	25% Percentile	Median	75% Percentile
K1	1622	1692	1814	749	811.3	1010	553.8	613.9	672	202.5	229.4	252.8
K2	1420	1662	1763	797.8	855.1	984.4	428.8	496.2	590.6	193.7	195.5	215.8
K3	1774	2361	2414	1003	1189	1417	568.6	796.5	840.4	241.3	248.4	259.9
K4	2105	2315	2649	1001	1099	1293	833.8	1009	1046	233.6	252.3	299
K5	1268	1390	1532	753.6	825.2	871.9	336.8	427.2	547.7	152.2	159.7	195
K6	1466	1545	1694	937.1	1015	1044	411.3	484.2	530.4	185.6	199	209
K7	1565	1616	1769	811.6	823.5	927.2	523.4	550.1	671.9	199.7	217.8	236.7
K8	1387	1445	1522	680.3	745.5	829.5	393	493.6	577.3	177.8	188.2	205.3
K9	1281	1452	1582	719.3	840.6	912.4	333.1	418.1	565.8	183.7	206	219.1
K10	2094	2158	2271	1171	1183	1318	610.4	691.5	809.4	234	258.1	265
K11	1557	1593	1763	745.5	850.3	893.4	510.9	595.8	728	185.7	199.6	219.9
K12	1447	1498	1538	629.1	661.5	730.2	445.4	515.4	551.8	196.7	210.7	285
K13	1054	1231	1468	544.2	729.6	912.1	294.8	380.6	439.4	143	160.6	203.4
K14	1215	1581	1594	624.9	755.5	967.3	409.6	452	600.5	163.8	195.6	216.7

	Calories			Carbohydrates			Lipids			Proteins		
	25% Percentile	Median	75% Percentile	25% Percentile	Median	75% Percentile	25% Percentile	Median	75% Percentile	25% Percentile	Median	75% Percentile
K15	1205	1355	1589	693.5	858.8	976.2	322.4	375.6	435.9	169.8	197.9	211.3
K16	1397	1529	1677	613.8	754.2	845.4	500.3	615.7	716.4	175.8	221.2	264
K17	1379	1496	1669	635.2	784.4	876.3	367.7	499.1	659.6	174.8	200.4	242.2
K18	1413	1499	1622	582	703.7	887	482.9	628.4	739	197.6	214.5	236.1
General*	1429	1566	1764	722.6	839.8	1007	428.7	538.6	681.3	186.6	206.4	238.5

Legend: K1-K18 are the 18th Kindergarten's monitored
**General = represents the values for the entire sample (180 menus)*

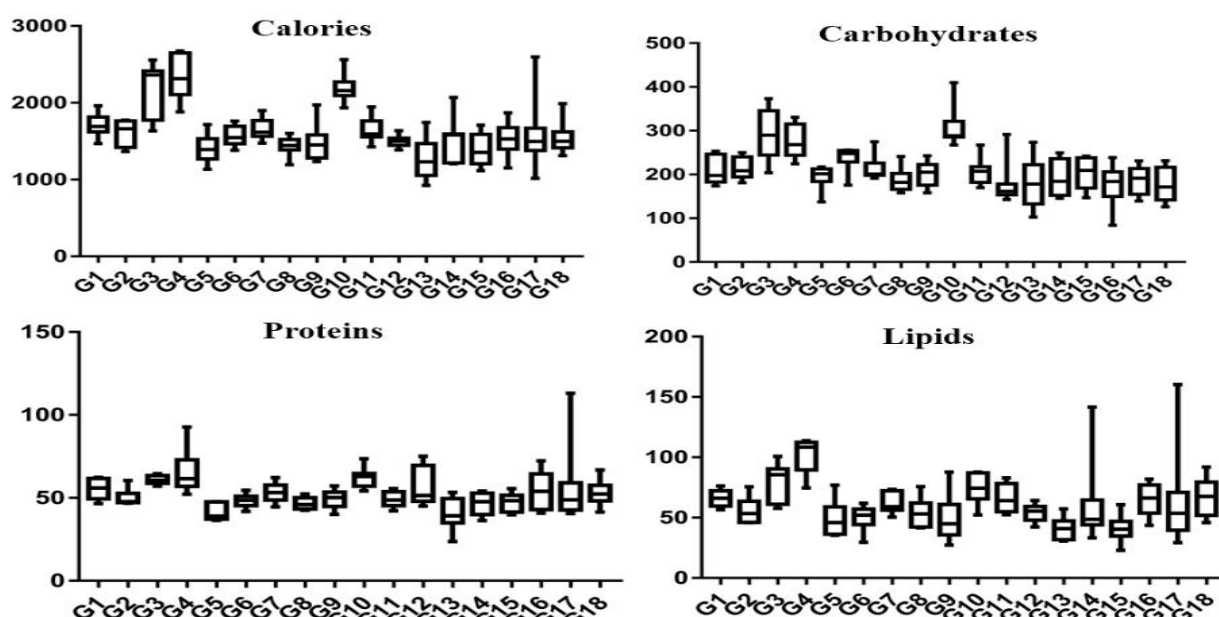


Figure 1. Nutrients composition of the analyzed menus (mean±SD)

Overall it can be seen that in 95% of the menus (n=171), the Romanian Ministry of Health's recommendations about energy requirements was exceeded, in 83.33% of cases (n=150) an exceeding protein level being also recorded. Also, from the 180 individual menus that were analysed, it was observed that in 80.56% (n=145) of it the total amount of lipids exceeded the maximum level allowed in Romania, fact observed in the case of carbohydrates too, an excess being recorded in 93.33% of the menus monitored.

Table 2 represents the individual comparisons, between the actual caloric content of the menus used by the institutions, and the amounts recommended by law in Romania, the United States of America, the United Kingdom, the European Union and the World Health Organization.

Table 2. Menu energy value correlated to national and international recommendations

	RO and USA		UK and WHO		EU	
	Discrepancy	P value	Discrepancy	P value	Discrepancy	P value
K1	-528.7	0.0058	-631.7	0.0058	-633.7	0.0058
K2	-499	0.0058	-602	0.0058	-604	0.0058
K3	-1198	0.0058	-1301	0.0058	-1303	0.0058
K4	-1152	0.0058	-1255	0.0058	-1257	0.0058

K5	-227.4	0.0141	-330.4	0.0058	-332.4	0.0058
K6	-382.3	0.0058	-485.3	0.0058	-487.3	0.0058
K7	-453.3	0.0058	-556.3	0.0058	-558.3	0.0058
K8	-281.5	0.002	-384.5	0.002	-386.5	0.002
K9	-289.1	0.002	-392.1	0.002	-394.1	0.002
K10	-994.7	0.002	-1098	0.002	-1100	0.002
K11	-430	0.002	-533	0.002	-535	0.002
K12	-334.5	0.002	-437.5	0.002	-439.5	0.002
K13	-68.09	0.3223	-171.1	0.0371	-173.1	0.0371
K14	-418.3	0.002	-521.3	0.002	-523.3	0.002
K15	-191.9	0.0098	-294.9	0.002	-296.9	0.002
K16	-366.3	0.0039	-469.3	0.002	-471.3	0.002
K17	-333.5	0.0039	-436.5	0.0039	-438.5	0.0039
K18	-335.6	0.002	-438.6	0.002	-440.6	0.002

For the quantitative determination of macronutrients, Wilcoxon signed-rank test was applied, to see if there are significant differences between the legal nutritional recommendations and the recorded data. (Table 3) The represented data are expressed in grams.

Table 3. The amount of macronutrients correlated to national and international recommendations

		Proteins	Lipids	Carbohydrates
RO	Discrepancy	-8.33	-13.91	-59.83
	P value (two tailed)	< 0.0001	< 0.0001	< 0.0001
UK	Discrepancy	-37.33	-26.91	-100.8
	P value (two tailed)	< 0.0001	< 0.0001	< 0.0001
SUA	Discrepancy	-35.33	-23.91	-89.83
	P value (two tailed)	< 0.0001	< 0.0001	< 0.0001
WHO	Discrepancy	-37.33	-26.91	-100.8
	P value (two tailed)	< 0.0001	< 0.0001	< 0.0001
EU	Discrepancy	-37.33	-26.91	-100.8
	P value (two tailed)	< 0.0001	< 0.0001	< 0.0001

Legend: RO = Romania, UK = United Kingdom, England, SUA = United States of America, WHO = World Health Organization and EU = European Union

Regarding the caloric percentage distribution, we saw a mean value of proteins of $13.24 \pm 2.19\%$. The percentage of lipids from the menu had a recorded average of $34.26 \pm 7.21\%$, and the one of carbohydrates $53.47 \pm 8.15\%$. In case of all nutrients percentages it was observed a significant discrepancy from the recommendation, for proteins and lipids being recorded a $P < 0.0001$, and for carbohydrates $P = 0.021$. The discrepancies obtained by comparing the median of the values from our kindergartens with does recommended by all the nations where: for proteins 1.81, for lipids -3.35, and for carbohydrates 1.34.

A mutual interaction was observed between macronutrients, as follows: an increase in the amount of protein was correlated with an increased intake of fat ($P < 0.0001$) and carbohydrate ($P < 0.0001$); the same correlation is valid for the relation between lipids and carbohydrates ($P < 0.0001$).

DISCUSSIONS

The food items quantities where collected through daily food records, which are fact sheets containing the exact total quantity purchased and used by the kindergartens in that day. This fact sheets have been kept by the administrative and accounting departments of each institution for an indeterminate period of time.

The recommendations regarding preschoolers' are constantly amended, but there is an observable discrepancy between the daily recommended intake endorsed by the different

countries mentioned above, the only ones complying with the World Health Organization's recommendations being the United Kingdom. Anyway, the majority of school canteens were not complying with state guidelines, that means it is needed to build the capacity for schools to improve food supply, menu's evaluation and cooking skills (12,14).

It has been observed that 94.44% (n=17) of the sampled institutions involved in preschool education have exceeded the medium values recommended by the Romanian Ministry of Health and the USA and that 100% of them are exceeding the recommendations used by the UK, AU, EU, and WHO. Constant excess of the caloric intake of preschoolers enrolled in kindergartens puts them at risk of accelerated fat cell growth and multiplication, parallel to high leptin levels. An exaggerated intake of very dense caloric foods leads to a subsequent increase in appetite and a decrease in the ability to maintain a normal bodyweight (15,16,17,18).

Thus, similar results were obtained during a study conducted in Poland, thereby the total caloric ratio was exceeded due to excess of proteins and lipids consumption during the daily nutrition program (19). At the same time, exceeded energy requirements were reported in six different cities from China due to high fat consumption, while in Brasilia was reported a failure in meeting the energy needs of the children (20,21).

Comparing our data with those obtained by the researchers from Korea (22) and Serbia (23), we can see that even if there are kindergartens which do not comply with the legal recommendations, in their country, the meals are according to the child needs. The only problem found in their menus was the distribution of the food groups, thing that was not analysed in this research.

In case of proteins, the actual intake is significantly exceeding the dietary recommendations for this age groups ($P < 0.0001$). The main sources of proteins found in the menus were meat (poultry and pig), eggs and cheese. This excessive protein intake increases the stress on the liver because of the high necessity of deamination and the increase in urea production, necessary for extracting the excess nitrogen. A higher than recommended protein consumption can result in hyperacidosis, elevated ammonia and insulin levels, nausea, vomiting and/or diarrhea (24,25). This demonstrated excess of consumed proteins, is putting the children on a higher risk to develop weight gain abnormalities like obesity or overweight. It is demonstrated that the period from 5 to 6 years of age represents one of the most sensitive periods for the connection between protein intake and body obesity (26). Most of all, it is important that in the first phase of a high protein intake the adiposity can remain unmodified but the body mass index can grow up faster after an early adiposity rebound (27).

The analysis of the menus served in the kindergartens with extended schedule has shown a significant increase of lipid intake, from both vegetal (sunflower oil and spreadable vegetable fats) and animal (red meat, butter, sour cream) sources. Researches said that an increase of the total lipid proportion in the diet can negatively influence the levels of triglycerides in the blood, can lead to an increase in the caloric value of the meals, being a significant factor for excess weight and associated cardiovascular disorders. Yet, school-aged children are not commonly included in health and nutrition surveys, especially in developing countries (28,29).

Constant intake of excess carbohydrates, through the process of stocking the unusable quantity as fat, is another factor for the increase of child obesity rates and other related disorders, such as high blood levels of cholesterol, hypertension and other cardiovascular disorders (30). High intake of simple carbohydrates has been shown to overstrain the body, in other publication of interest from Poland and Serbia (16,17,23).

The dietary excess based on high saturated fats and simple sugars, a reported deficit in vitamin intake coupled with a high protein availability will eventually impose an increase in body weight and disrupt the carbohydrate metabolism in the body and lead to an increased body weight later in life, studies reporting an increased prevalence of obesity among

adolescents who were overweight during the preschool period. Important elements included as a result of such nutritional determinations include nutrition program, physical activity and health education, actions carried out in numerous similar cases with a direct result over the child's nutritional practice (1,2,25).

CONCLUSIONS

The food intake of preschoolers enrolled in kindergartens with extended schedule activating in Mures, Romania, does not comply with the recommendations issued by the Romanian Ministry of Health, or the ones issued by the European Union or the World Health Organization. The disagreements are due to the excess of calories based on an increased intake of both proteins and other macronutrients, the high variation coefficient pointing towards a significant overshoot of the recommended intake.

We recommend that at a national level, a community nutritional intervention plan has to be endorsed and applied in kindergartens, with the goal of educating the personnel involved in creating the menus, in order to optimize the health and nutritional status of the children. We suggest a recipe book to be created and used together with special gastronomical guidelines by all the kindergartens in the country, in order to increase the efficacy of the nutritional intervention plan.

Acknowledgement

We are grateful to the Mures County School Inspectorate, to all teachers and educational coordinators from the 18th kindergartens included in the study.

Conflict of interests

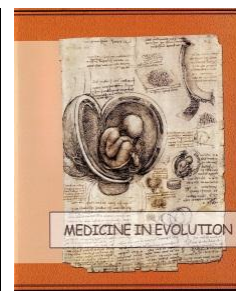
We declare that we have no conflict of interest and no funding was involved.

REFERENCES

1. Vilchis-Gil J, Galván-Portillo M, Klünder-Klünder M, Cruz M, Flores-Huerta S. Food habits, physical activities and sedentary lifestyles of eutrophic and obese school children: a case-control study. BMC Public Health. 2015; 15:124.
2. Kostecka M. Eating habits of preschool children and the risk of obesity, insulin resistance and metabolic syndrome in adults. Pak J Med Sci. 2014; 30(6):1299-1303.
3. World Health Organization. The challenge of obesity - quick statistics, <http://www.euro.who.int/en/health-topics/noncommunicable-diseases/obesity/data-and-statistics> accessed on the 13th of October 2016.
4. World Health Organization. Nutrition, Physical Activity and Obesity - Romania. 2013; http://www.euro.who.int/data/assets/pdf_file/0014/243320/Romania-WHO-Country-Profile.pdf?ua=1
5. Romanian Ministry of Health. Law no 1563 from 2008, sustaining the Not recommended Foodstuff List for school and pre-school children, and Principles for a healthy diet for children and teenagers, <http://www.ms.ro/?pag=186> accessed on the 9th of July 2016.
6. El Ansari W, Suominen S, Samara A. Eating habits and dietary intake: is adherence to dietary guidelines associated with importance of healthy eating among undergraduate university students in Finland? Cent Eur J Public Health. 2015; 23(4):306-313.
7. Ulijaszek SJ, Koziel S. Nutrition transition and dietary energy availability in Eastern Europe after the collapse of communism, Econ Hum Biol. 2007; 5(3):359-369.
8. Drewnowski A. The economics of food choice behavior: why poverty and obesity are linked, Nestlé Nutrition Institute, 2012; 73:95-112.
9. Gupta N, Goel K, Shah P, Misra A. Childhood obesity in developing countries: epidemiology, determinant and prevention. Endocrine Reviews. 2012; 33(1):48-70.

10. Mocanu V. Prevalence of overweight and obesity in urban elementary school children in Northeastern Romania: its relationship with socioeconomic status and associated dietary and lifestyle factors, *BioMed Res Int.* 2013; 13:537-545.
11. Riera-Crichton D, Tefft N. Macronutrients and obesity: revisiting the calories in, calories out framework, *Econ Hum Biol.* 2014; 14:33-49.
12. Woods J, Bressan A., Langelaan C, Mallon A, Palermo C. Australian school canteens: menu guideline adherence or avoidance?, *Health Promot J Austr.* 2014; 25(2):110-115.
13. Romanian Nutrition Society. Guide for healthy Nutrition, Edit. Perfomantica, 2006, http://ms.ro/documente/Ghid1_8318_6022.pdf accessed on the 13th of October 2016.
14. Michaelsen KF, Weaver L, Branca F, Robertson A. Feeding and nutrition of infants and young children, WHO Regional Publications, European Series. 2003; 87:45-66.
15. Fialkowski MK, DeBaryshe B, Bersamin A, Nigg C, Leon Guerrero R, Rojas G, Areta AA, Vargo A, Belyeu-Camacho T, Castro R, Luick B, Novotny R; CHL Team. A community engagement process identifies environmental priorities to prevent early childhood obesity: the Children's Healthy Living (CHL) program for remote underserved populations in the US Affiliated Pacific Islands, Hawaii and Alaska. *Matern Child Health J.* 2014; 18(10):2261-2274.
16. Merkiel S, Chalcarz W. The need for modifying energy intake in preschool children from Pila, Poland. *Rocz Panstw Zakl Hig.* 2016; 67(2):179-188.
17. Farris AR, Misyak S, Duffey KJ. et al. A comparison of fruits, vegetables, sugar-sweetened beverages, and desserts in the packed lunches of elementary school children. *Child Obes.* 2015; 11(3):275-280.
18. Chapman-Novakofski K. Summer is Different: What That Means for Nutrition Educators. *J Nutr Educ Behav.* 2016; 48(7):436.
19. Frackiewicz J, Ring-Andrzejczuk K, Gronowska-Senger A, Energy and selected nutrients content in pre-school children diet of Warsaw district. *Rocz Panstw Zakl Hig* 2011; 62(2):181-185.
20. Yin S, Su Y, Liu Q, Zhang M. Dietary status of preschool children from day-care kindergartens in six cities of China. *Wei Sheng Yan Jiu.* 2002; 31(5):375-378.
21. Gomes RC, da Costa TH, Schmitz BA. Dietary assessment of pre-school children from Federal District Brazil. *Arch Latinoam Nutr.* 2010; 60(2):168-174.
22. Nakatsuka H, Kim ES, Ko YS, Yang HR, Moon CS, Watanabe T, Shimbo S, Ikeda M. Food intake survey of kindergarten children in Korea: Food, energy, and nutrient intake. *Environ Health Prev Med.* 2015; 20(4):294-301.
23. Lazarevic K, Stojanovic D, Bogdanovic D. Energy and nutritional value of the meals in kindergartens in Nis (Serbia). *Rocz Panstw Zakl Hig.* 2014; 65(2):127-131.
24. Matic I, Juresa V. Compliance of menus with nutritional standards in public and private kindergartens in Croatia. *Rocz Panstw Zakl Hig.* 2015; 66(4):367-371.
25. Katz DL, Murimi M, Pretlow RA, Sears W. Exploring effectiveness of messaging in childhood obesity campaigns. *Child Obes.* 2012; 8(2):97-105.
26. Xu S, Xue Y. Protein intake and obesity in young adolescents. *Exp Ther Med.* 2016; 11(5):1545-1549.
27. Suarez-Varela MM. Nutrient intakes in early life and risk of obesity. *Int J Environ Res Public Health.* 2016; 13(6):564.
28. Yang WY, Burrows T, MacDonalds-Wicks L. et al. Quality of dietary assessment methodology and reporting in epidemiology studies examining relationship between dietary outcome and childhood obesity in Asian developing countries. *Nutr Diet.* 2014; 71(3):201-209.
29. Best C, Neufingerl N, van Gel L, van den Briel T, Osendarp S. The nutritional status of school-aged children: why should we care?. *Food Nutr Bull.* 2010; 31(3):400-417.
30. Kell KP, Cardel MI, Bohan Brown MM, Fernández JR. Added sugars in the diet are positively associated with diastolic blood pressure and triglycerides in children. *Am J Clin Nutr.* 2014; 100(1):46-52.

Osteonecrosis of the jaw (ONJ) - a literature review



Lazăr AC.¹, Păcurar M.², Câmpian R.S.¹

¹Department of Oral Rehabilitation, Oral Health and Dental Office Management, Faculty of Dental Medicine, "Iuliu Hațieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Department MD1 Orthodontics, Faculty of Dental Medicine, University of Medicine and Pharmacy, Tîrgu-Mureș, Romania

Correspondence to:

Name: Lazăr Adela Cristina

Address: 21 Simion Bărnuțiu Str., Oradea, Bihor County, Romania

Phone: +40 748290425

E-mail address: lazar_adela@yahoo.ro

Abstract

Osteonecrosis of the jaw is a disease in which an area of the jaw is not covered by soft gingival tissue. The disease must have a duration of more than eight weeks to be considered ONJ. When the bone is exposed in the oral cavity, it is no longer sufficiently vascularized and starts to necrose. ONJ most frequently occurs after an invasive (surgical) dental procedure such as dental extraction. ONJ can develop in patients with viral infections such as herpes zoster, in those under radiotherapy of the head and neck (radiation osteonecrosis), in patients with osteomyelitis (bone infection) and persons on corticosteroid therapy

Keywords: bisphosphonates, osteonecrosis jaw, treatment

INTRODUCTION

Bisphosphonate therapy for osteoporosis, bone metastases, Paget's disease etc., have a number of benefits to the quality of life of the patient, the evolving of localized or generalized bone degradation. In addition to these benefits, any treatment involves risks and side effects that may occur. It is very important for the dentist general to know these types of drugs in detail and to keep monitoring the patients undergoing treatment and to identify possible changes in the jaw bone.

In addition to the substantial benefits of these types of medicines, there is, of course, the possibility of risk. In the early 2000s, when zoledronate was introduced into the market and often being administered to patients with bone pathologies, cases of necrosis exposed bone in the oral cavity in patients during treatment with intravenous bisphosphonates were reported (1). Novartis, a manufacturer of injectable bisphosphonates (zoledronate and pamidronate), admitted and subsequently changed the possibility of jaw bone necrosis in the drug prospectus. In this regard, professional care and close monitoring of these groups of patients receiving bisphosphonates both per se and as an injection (2) have been indicated.

PREVALENCE OF OSTEONECROSIS OF THE JAW

Prevalence of osteonecrosis of the jaw in the case of oral bisphosphonate administration

Oral bisphosphonate administration to patients diagnosed with osteoporosis has good cell efficiency and positive clinical results. This is reflected in the treating doctors' option to prescribe this form of treatment. Osteonecrosis of the jaw also develops in this category of patients with oral administration, but the risk is significantly diminished compared to that of patients receiving injectable bisphosphonates.

The pharmaceutical manufacturer Merk, which produces alendronate among other pharmaceutical products, provided in a report data regarding the prevalence of osteonecrosis of the jaw: 0.7/100,000 patients/year (3,4). These data were summarized in statistical data based on the reported cases and the incidence of avascular bone necrosis. Patients on treatment with alendronate administered weekly have an incidence of osteonecrosis of 0.01-0.04% (5). If the general dental practitioner is not informed about these aspects of bisphosphonate therapy and performs surgical dental procedures such as extractions or other invasive alveolar bone procedures in the oral cavity, the prevalence of osteonecrosis of the jaw is higher than 0.09-0.34% (6).

Prevalence of osteonecrosis of the jaw in the case of injectable bisphosphonate administration

Injectable bisphosphonate treatment has benefits on the underlying disease in the human body, as well as marked side effects. The literature data regarding the prevalence of bone osteonecrosis due to injectable treatment are retrospective and do not provide accurate information about the incidence of this pathology. In terms of percentage, the risk of development ranges between 0.08-0.12%, being higher compared to oral bisphosphonate treatment. It is estimated that over the next period, the proportion of this disease will increase as the number of osteonecrosis cases becomes increasingly visible, and more and more cases are reported (7).

CLINICAL ASPECTS OF OSTEONECROSIS OF THE JAW

Osteonecrosis of the jaw is a disease in which an area of the jaw is not covered by soft gingival tissue. The disease must have a duration of more than eight weeks to be considered ONJ. When the bone is exposed in the oral cavity, it is no longer sufficiently vascularized and starts to necrose. ONJ most frequently occurs after an invasive (surgical) dental procedure such as dental extraction. ONJ can develop in patients with viral infections such as herpes zoster, in those under radiotherapy of the head and neck (radiation osteonecrosis), in patients with osteomyelitis (bone infection) and persons on corticosteroid therapy (8).

Clinically, ONJ appears as an exposed hypodynamic bone area, with a decrease of biomechanical competence, tissue dehiscence, chronic bone devitalization, hypocellularity, bone lysis observed radiologically (9,10), located in the maxillary, mandibular or palatal bone, with delayed or no healing over a period of 6-8 weeks (11,12), having several evolution stages (Table I). In 80% of the cases, the lesions are painful, characterized by a sensation of burning, and 69% of the cases occur following dental extraction surgery or other dental alveolar surgeries (13). ONJ is not a new pathological entity; in the past, the development of mandibular bone lesions was associated with head and neck radiation, osteomyelitis and even corticosteroid treatment (14,15).

Table I. Classification of osteonecrosis of the jaw depending on the presentation stage

Stage 0	Lack of exposure of necrotic bone
Stage 1	-Asymptomatic exposed necrotic bone in the oral cavity -Presence of a single intra-oral fistula
Stage 2	-Exposure of a necrotic bone segment in the oral cavity associated with pain and local infections
Stage 3	-Exposure of necrotic bone in the oral cavity associated with pain, inflammation, abscess -Multiple intra-oral fistulas -Radiologically: extensive osteolysis
Stage 4	-Exposure of necrotic bone associated with pain -Infections associated with inflammation and even abscesses -Pathological bone fractures -Naso-oral fistula -Extra-oral fistulas -Radiologically: osteolysis extending to the basilar margin of the mandible

PARACLINICAL ASPECTS OF ONJ

According to the definition, ONJ is characterized by the presence of an unhealed area in the oro-maxillo-facial region, with bone exposure for more than 8 weeks after dental surgery. This is characterized by tissue dehiscence, chronic bone devitalization, hypocellularity, bone lysis observed radiologically (16,17), infection, possibly the presence of purulent secretion, altered sensations (for example, a sensation of dumbness or heaviness) (18). Described for the first time in 2003, BRONJ is generally defined as the transmucosal or transcutaneous exposure of the jaw for at least eight weeks, a history of bisphosphonate administration and no history of head and neck radiation (19,20,21).

Biologically, the jaw has a higher blood supply compared to other bone structures and thus, bone remodeling occurs more rapidly because of daily mechanical stimulation caused by mandibular teeth during mastication. Another factor that favors osteonecrosis in this location is that mandibular arteries are terminal arteries. These circumstances, along with the frequent presence of dental disorders and odontological therapy which is aggressive for bone, explain the high risk of mandibular necrosis, and the fact that the bone is separated from the oral cavity by a thin mucosal layer increases the risk of infection given by the presence of

necrotic bone (18). Despite bisphosphonate administration by oral route, lesions of the oral mucosa can appear (apparently resulting from the disadvantage of direct contact).

In one of our studies, we focus on clinical and radiological aspects of bisphosphonate-related osteonecrosis of the mandible, as well as on the presentation of three clinical cases with BRONJ. In 2003, Marx described 36 cases of exposure of necrotic jaw bone detected in patients treated with intravenous bisphosphonates, as part of cancer treatment. 78% of the cases with painful exposure of the jaw occurred following dental extractions, and 22% were spontaneous (Marx 2003) (16).

For a clear and accurate diagnosis, diagnostic X-rays should be performed to certify the presence of BRONJ stages. Current studies show the need for radiological investigations in BRONJ and also provide data such as case reports or case studies, following which various stages of BRONJ are described in patients with associated diseases (22,23,24). There are several types of X-rays used for a clear and accurate BRONJ diagnosis.

Plain radiographic film – one of the most frequently used radiographic methods in current dental practice is plain radiographic film. This category includes retroalveolar X-ray and orthopantomography (OPT, panoramic X-ray), which provide data on lamina dura thickening, osteosclerosis, osteolysis, diffuse sclerosis, dense bone tissue, subperiosteal bone deposition, postsurgical remodeling failure, deficient healing or even the lack of healing at the extraction sites (25,26,27). The association between clinical signs and radiological BRONJ stages has shown that the initial stage presents alveolar margin sclerosis with lamina dura thickening. As BRONJ progresses, it seems that the degree of sclerosis increases. Stages 3 and 4 show clear radiological evidence of a narrowing of the mandibular canal, and patients can present clinical signs of paresthesia (25).

Computed tomography – over the past years, CBCT X-rays have become increasingly popular in oral and maxillofacial surgery. A great advantage of CBCT is three-dimensional (3D) access to bone structures at a very high resolution. Radiation exposure is higher than for retroalveolar X-ray or OPT, but lower than for multislice computed tomography (MSCT) (23). Cone beam computed tomography is an indispensable radiological diagnostic method for BRONJ. CBCT provides accurate data, which in most cases can seem confusing or unclear on a plain radiographic film. A correlation between the sensitivity of cone beam computed tomography and panoramic X-rays in the diagnostic assessment of BRONJ has shown that panoramic X-rays tend to underestimate the degree of lesion and they frequently do not identify the presence of small sequestra. CBCT findings show that focal sclerosis is present in early stages, along with a disorganized trabecular pattern and a poor corticomedullary differentiation. The affected bone site shows total bone involvement. As the disease progresses, periosteal reaction and bone sequestra occur. CT findings for BRONJ also include cervical lymphadenopathy, which is related to the presence of infection in the exposed bone (25).

RISK FACTORS IN THE DEVELOPMENT OF BISPHOSPHONATE RELATED OSTEONECROSIS OF THE JAW

In the development of osteonecrosis of the jaw, risk factors that potentiate the development of this bone disease play an important role. Keeping informed about the etiology of bone necrosis, the patient in collaboration with the treating doctor and the dentist can determine and at the same time avoid these factors that can potentiate the development and progression of bisphosphonate-related osteonecrosis of the jaw.

These factors can be classified depending on location, demographic distribution etc.

A. Local risk factors

- oral cavity anatomy: the sharp internal oblique line in patients wearing removable dentures, the presence of palatal or mandibular tori increase the risk of osteoporosis under conditions of inadequate prosthetic decubitus.

- surgical dental procedures: dental extractions, dental implant placement, apical resections and other invasive bone procedures. These patients are 7 times more predisposed to develop bone osteonecrosis compared to patients without such interventions.

- periodontal disease (apical periodontitis, marginal periodontitis) of dental etiology (26).

B. General and therapeutic risk factors

- effect of bisphosphonates: injectable bisphosphonates have a stronger action than oral bisphosphonates, thus increasing the risk of osteonecrosis of the jaw.

- duration of treatment: long-term bisphosphonate administration increases the risk of avascular bone necrosis (27).

C. Systemic and demographic factors

- the anatomopathological type of lesion for which bisphosphonate treatment is indicated; patients with multiple myeloma are much more predisposed to develop osteonecrosis compared to those with other cancer diseases.

- the treatment of osteoporosis or osteopenia frequently results in the development of osteonecrosis of the jaw.

- advanced patient age is a risk factor.

- Caucasians have the highest risk (28).

D. Other risk factors: poor oral hygiene, smoking, alcohol consumption, diabetes mellitus, corticoid therapy, chemotherapy (29).

TREATMENT OF OSTEONECROSIS OF THE JAW

Before starting bisphosphonate therapy, it is important to have some clear objectives:

- -sustained cancer treatment in patients who can benefit from the advantages of bisphosphonate treatment
- -maintenance and improvement of quality of life by: patient education, control of infections and pain, early detection of new bone necrosis areas.

Prevention of osteonecrosis

The general dental practitioner must know the category of drugs termed bisphosphonates, their clinical implications as well as their potential adverse effects. Thus, well conducted anamnesis and a clear and accurate diagnosis established at the right time can ensure a satisfactory quality of the medical approach. Thus, if the patient reports a history of bisphosphonate treatment or is currently on bisphosphonate therapy, the treating dentist will know when to choose the time for dental extractions (30,31).

Collaboration with the treating oncologist and even the psychologist is also important in some situations. Before starting bisphosphonate therapy, it is extremely important for the patient diagnosed with osteoporosis or cancer disease to visit the dental practice, where following a thorough check-up, odontal, periodontal, prosthetic diagnosis is established. If the presence of dental foci such as caries lesions, endodontic disease, presence of residual roots, inadequate prosthetic restorations, poor oral hygiene is detected, the dentist must treat all existing dental foci and improve together with the patient the patient's oral hygiene by tooth brushing instructions and the use of related products.

After initiating bisphosphonate therapy, the general dental practitioner must ask the patient to come for periodic check-ups, where following clinical and paraclinical examination (OPT, CT), potential radiological and clinical bone changes can be detected. In case of development of osteonecrosis of the jaw, the dentist must refer the patient to the service of Oral and Maxillofacial Surgery, where adequate treatment will be administered.

The prevention of osteonecrosis is important for a successful bisphosphonate treatment and for ensuring patient quality of life. The general dental practitioner must follow

up these patients periodically, even after the successful completion of bisphosphonate therapy, because bisphosphonates have a long-term action on bone after the cessation of treatment.

Treatment of osteonecrosis

In approaching patients with already established osteonecrosis following bisphosphonate treatment, it is important for the general dental practitioner to know how to identify and subsequently refer patients to the service of maxillofacial surgery for optimal treatment. Thus, a correct identification and classification of patients at risk for developing osteonecrosis of the jaw is required:

-Absence of exposed necrotic bone in the oral cavity of patients on oral or injectable bisphosphonate treatment

-Already established osteonecrosis of the jaw with specific symptoms depending on the severity stage:

Stage 0	Lack of exposure of necrotic bone
Stage 1	-Asymptomatic exposed necrotic bone in the oral cavity
	-Presence of a single intra-oral fistula
Stage 2	Exposure of a segment of necrotic bone in the oral cavity associated with pain and local infections
Stage 3	-Exposure of necrotic bone in the oral cavity associated with pain, inflammation, abscess
	-Multiple intra-oral fistulas
	-Radiologically: extensive osteolysis
Stage 4	-Exposure of necrotic bone associated with pain
	-Infections associated with inflammation and even abscesses
	-Pathological bone fractures
	-Naso-oral fistula
	-Extra-oral fistulas
	-Radiologically: osteolysis extending to the basilar margin of the mandible

Table II. Recommended treatment for each stage of osteonecrosis of the jaw in patients on bisphosphonate treatment (32,33)

Stage 0	- Patients at risk, - No treatment required, -Information about potential complications.
Stage 1	- Cleaning and washing of the exposed bone with antiseptic solutions, - No surgical treatment is required, - Continuous patient monitoring.
Stage 2	- Cleaning and washing of the exposed bone with antiseptic solutions, - Treatment with wide-spectrum antibiotics over a long time period (penicillin, clindamycin), - Pain control, - Superficial soft tissue procedures.
Stages 3, 4	- Resection of pathological bone, - Treatment with wide-spectrum antibiotics, - Removal of mobile segments of bone sequestra, - Pain control, - NO dental extractions are performed in these stages.

CONCLUSIONS

When a diagnosis of avascular necrosis of the jaw has been established, it is important to administer the treatment recommended by the maxillofacial surgeon as soon as possible. In stage 0 osteonecrosis, patients should be periodically monitored and they should be informed by the treating oncologist about the potential complications of both oral and injectable bisphosphonate treatment. Stage 1 osteonecrosis is characterized by exposure of a small segment of necrotic bone in the oral cavity. In this case, cleaning and washing with antiseptic solutions such as chlorhexidine or chloramine 3% are recommended. Continuous patient monitoring is also necessary in this case.

In stage 2 osteonecrosis of the jaw, the patient should be admitted to a service of maxillofacial surgery, where wide-spectrum antibiotic treatment will be administered. It is known that osteonecrosis of the jaw does not have a primary infectious etiology. In microbial cultures, it has been discovered that the majority of bacteria are sensitive to penicillin. However, there are cases when patients are sensitive to this group of antibiotics and thus, metronidazole, clindamycin, erythromycin, etc. can be successfully administered.

Stages 3 and 4 are the most aggressive, because acute pain is present at the bone necrosis sites. These cases require hospitalization and surgical treatment associated with adequate antibiotic treatment. It is important, particularly for the general dental practitioner, to know that dental extractions during bisphosphonate treatment are strictly forbidden, and so is the continuation of surgical dental treatment when a segment of necrotic bone has been detected in the oral cavity. In addition, any invasive alveolar bone procedure (apical resection, dental implant placement, periodontal procedures) in this category of patients is forbidden.

Acknowledgements

This work is part of author's research work during doctoral studies at "Iuliu Hatieganu" University of Medicine and Pharmacy Cluj-Napoca and covered in the doctoral thesis with the theme "Bisphosphonate Therapy in Dental Medicine" awarded with Magna cum Laude.

REFERENCES

1. Berenson JR, Hillner BE, Kyle RA, Anderson K, Lipton A, Yee GC, Biermann JS; American Society of Clinical Oncology Bisphosphonates Expert Panel. American Society of Clinical Oncology clinical practice guidelines: the role of bisphosphonates in multiple myeloma. *J Clin Oncol*. 2002;20(17):3719-36.
2. Marx RE. Pamidronate (Aredia) and zoledronate (Zometa) induced avascular necrosis of the jaws: a growing epidemic. *J Oral Maxillofac Surg* 2003;61(9):1115.
3. Mulligan R, Sobel S. Osteoporosis: diagnostic testing, interpretation, and correlations with oral health implications for dentistry. *Dent Clin North Am*. 2005;49(2):463-84.
4. Report of the Council of Scientific Affairs. Expert panel recommendations: dental management of patients on oral bisphosphonate therapy. American Dental Association. 2006;(6):3-6.
5. Advisory Task Force on Bisphosphonate-Related Osteonecrosis of the Jaws, American Association of Oral and Maxillofacial Surgeons. American Association of Oral and Maxillofacial Surgeons position paper on bisphosphonate-related osteonecrosis of the jaws. *J Oral Maxillofac Surg*. 2007;65(3):369-76.
6. Mavrokokki T, Cheng A, Stein B, Goss A. Nature and frequency of bisphosphonate-associated osteonecrosis of the jaws in Australia. *J Oral Maxillofac Surg*. 2007;65(3):415-23.
7. Estilo CL, Van Poznak CH, Williams T, Bohle GC, Lwin PT, Zhou Q, Riedel ER, Carlson DL, Schoder H, Farooki A, Fornier M, Halpern JL, Tunick SJ, Huryn JM. Osteonecrosis of the maxilla

- and mandible in patients with advanced cancer treated with bisphosphonate therapy. *Oncologist*. 2008;13(8):911-20.
8. Durie BG, Katz M, Crowley J. Osteonecrosis of the jaws and bisphosphonates. *N Engl J Med Surg*. 2007;65(3):369-76.
 9. <http://www.rheumatology.org/I-Am-A/Patient-Caregiver/Diseases-Conditions/Osteonecrosis-of-the-jaw-ONJ>. Accessed October 2, 2015.
 10. Federico II S Ferrara, L Califano From de Senectute, Current perspectives in the management of patients with drug-induced osteonecrosis of the maxilla: experience of the school of Naples. Available at: <http://www.Biomedcentral.com/content/pdf/1471-2318-10-S1-info.pdf>. Accessed September 3, 2015.
 11. SR Torres, CSK Chen, BG Leroux, PP Lee, LG Hollender and MM Schubert, Fractal dimension evaluation of cone beam computed tomography in patients with bisphosphonate-associated osteonecrosis, *Dentomaxillofacial Radiology*, The British Institute of Radiology. 2011; 40:501–505.
 12. Unro Yamashita, Laurie K. McCauley. Antiresorptives and Osteonecrosis of the Jaw, *J Evid Base Dent Pract* 2012; 1:233-247.
 13. Van den Wyngaert T, Huizing MT, Vermorken JB. Bisphosphonates and osteonecrosis of the jaw: Cause and effect or a post hoc fallacy? *Ann Oncol*. 2006;17:1197-1204.
 14. Assouline-Dayana Y, Chang C, Greenspan A, et al. Pathogenesis and natural history of osteonecrosis. *Semin Arthritis Rheum*. 2002; 32:94-124.
 15. Capsoni F, Longhi M, Weinstein R. Bisphosphonate-associated osteonecrosis of the jaw: The rheumatologists role. *Arthritis Res Ther*. 2006;8:219.
 16. Ferlito S, Puzzo S, Liardo C. Preventive Protocol for Tooth Extractions in Patients Treated With Zoledronate: A Case Series. *J Oral Maxillofac Surg*. 2011;69(6):1-4.
 17. SR Torres, CSK Chen, BG Leroux, PP Lee, LG Hollender and MM Schubert, Fractal dimension evaluation of cone beam computed tomography in patients with bisphosphonate-associated osteonecrosis, *Dentomaxillofacial Radiology*. The British Institute of Radiology 2011; (40):501–505.
 18. Philipp Stockmann & Fabian M. Hinkmann & Michael M. Lell & Matthias Fenner & Eleftherios Vairaktaris & Friedrich-Wilhelm Neukam & Emeka Nkenke, Panoramic radiograph, computed tomography or magnetic resonance imaging. Which imaging technique should be preferred in bisphosphonate-associated osteonecrosis of the jaw? A prospective clinical study. *Clin Oral Invest* 2010; 14:311–317.
 19. Sven Otto, Karl Sotlar, Michael Ehrenfeld and Christoph Pautke, Osteonecrosis of the jaw as a possible rare side effect of annual bisphosphonate administration for osteoporosis: A case report. *Journal of Medical Case Reports*. 2011 (5):477.
 20. Vogt-Ferrier NB, Hugentobler M, Uebelhart B, Tramèr M, Rollason V, Interventions for treating osteonecrosis of the jaw bones associated with bisphosphonates (Protocol). *Cochrane Database of Systematic Reviews* 2010, Issue 4. Art. No.: CD008455. DOI: 10.1002/14651858.CD008455.
 21. Yiu-Kai Wong, FRACDS, FDSRCS, FFDRCSI, FCDSHK(OMS), FHKAM(DS), Bisphosphonate-related osteonecrosis of the jaws—Report of 2 cases and strategies on prevention and management. *The International Journal of Oral & Maxillofacial Implants*. 2008;39(3):195-201.
 22. A. Agrillo, F. Filiaci, V. Ramieri, E. Riccardi, D. Quarato, C. Rinna, P. Gennaro, F. Cascino, V. Mitro, C. Ungari, Bisphosphonate-related osteonecrosis of the jaw (BRONJ): 5 year experience in the treatment of 131 cases with ozone therapy, *European Review for Medical and Pharmacological Sciences*, 2012; 16: 1741-1747.
 23. Rudolf Boeddinghaus, Andy Whyte, Current concepts in maxillofacial imaging, *European Journal of Radiology*. 2008;66: 396.
 24. SR Torres, CSK Chen, BG Leroux, PP Lee, LG Hollender and MM Schubert. Fractal dimension evaluation of cone beam computed tomography in patients with bisphosphonate-associated osteonecrosis. *Dentomaxillofacial Radiology* 2011;40:504.
 25. Nicolau Conte-Neto, Alliny Souza Bastos, Rosemary Adriana Chierici Marcantonio and Elcio Marcantonio Junior, Epidemiological aspects of rheumatoid arthritis patients affected by oral bisphosphonate-related osteonecrosis of the jaws. *BioMed Central* 2012;doi: 10.1186/1746-160X-8-5.
 26. G. Sanna, L. Preda, R. Bruschini, M. Cossu Rocca, S. Ferretti, L. Adamoli, E. Verri, L. Franceschelli, A. Goldhirsch, F. Nole. Bisphosphonates and jaw osteonecrosis in patients with advanced breast cancer, *Annals of Oncology* (2006)17: 1512–1516.

27. J.L. del Castillo Pardo de Vera, J.A. García de Marcos, S. Arroyo Rodríguez, M. Galdeano Arenas, J. Calderón Polanco, Osteonecrosis de los maxilares asociada al empleo de bifosfonatos Bisphosphonate-associated osteonecrosis of the jaw, *Rev Esp Cir Oral y Maxilofac* 2007;29,5:295-308.
28. Frank Wilde, Marcus Heufelder, Kai Lorenz,,Susanne Liese, Jan Liese, Jens Helmrich, Alexander Schramm, Alexander Hemprich, Edgar Hirsch,Karsten Winter Rostock. Prevalence of cone beam computed tomography imaging findings according to the clinical stage of bisphosphonate-related osteonecrosis of the jaw. (2012) 114; 6:805.
29. Durie BG, Katz M, Crowley J. Osteonecrosis of the jaw and bisphosphonates. *N Engl J Med*. 2005;353(1): 99-102.
30. Bamias A, Kastritis E, Bamia C, et al. Osteonecrosis of the jaw in cancer after treatment with bisphosphonates: incidence and risk factors. *J Clin Oncol* 2005; 23, 8580-7.
31. Hoff AO, Toth BB, Altundag K, et al. Osteonecrosis of the jaw in patients receiving intravenous bisphosphonate therapy2006,24:8528.
32. Pozzi S, Marcheselli R, Sacchi S, et al. Analysis of frequency and risk factors for developing bisphosphonate associated necrosis of the jaw. *Blood*. 2005; 106:5057.
33. Migliorati CA, Epstein JB, Abt E, Berenson JR. Osteonecrosis of the jaw and bisphosphonates incancer: a narrative review. *Nat Rev Endocrinol* 2011;7(1):34-42.

Meine Zukunft in Deutschland.

Der Start als Zahnarzt in Deutschland beginnt mit uns.



Ob eigene Praxis oder angestellter Zahnarzt

Mit unseren Kenntnissen und Erfahrungen stehen wir Ihnen in allen Fragen zur Verfügung. Wir helfen Ihnen beim Umgang mit Behörden, dem Erlangen einer Kassenzulassung, der Standort- und Praxissuche, der Beschaffung des Startkapitals und Finanzierungen jeglicher Art.

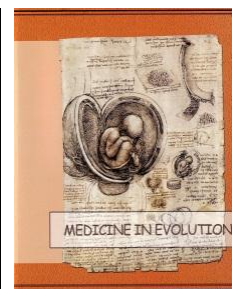
Als führendes Dental-Labor in Deutschland in den Bereichen **CNC-Fräsung, digitale Fertigung, 3D-Druck** und **Intraoral-Scannen** bieten wir ein großes und hoch- modernes Portfolio an dentalen Leistungen an. Nehmen Sie Kontakt zu uns auf. **Wir kümmern uns um Ihre Formalitäten.**

HARTL GmbH
DENTALE TECHNOLOGIEN

Renthof 1
34117 Kassel
Deutschland

Fon: +49 561 - 560 24
+49 561 - 570 390
Email: hartl@web.de

Oral health of athletes with intellectual disabilities in Romania: evolution over a decade (2006-2016)



Vinereanu A.¹, Garret-Bernardin A.², Munteanu A.³, Bratu A.M.⁴, Luca R.⁵

¹National Clinical Director Special Smiles (SS) Romania

²Unit of Dentistry, Bambino Gesù Children's Hospital, IRCCS, Rome, Italy, SS volunteer

³Carol Davila University of Medicine and Pharmacy Bucharest, Romania; SS volunteer

⁴specialist in Orthodontics, private practice, Bucharest; SS volunteer

⁵Paedodontics Department, Carol Davila University of Medicine and Pharmacy Bucharest, Romania

Correspondence to:

Name: Vinereanu Arina

Address: CMI Dr Vinereanu, Calea Plevnei 186, Ap.2-4, Bucharest 6

Phone: +40 723661164

E-mail address: avinereanu2002@yahoo.co.uk

Abstract

Our **aim** was to assess the evolution of the oral health of Romanian Special Olympics (SO) athletes with intellectual disabilities over a decade (2006-2016).

Methods. Subjects were examined under field conditions, during SO competitions. Demographic data, dental status and periodontal conditions were recorded. DMF-T and restoration index $RI = [F/(F+D) \times 100]\%$ were calculated. Data from 2006 (n=293, aged 8-27 years) and 2016 (n=249, aged 6-44 years) were compared using SPSS 20.0.

Results. Caries-free subjects: 13.3% (2006), 23.7% (2016). DMF-T: 5.84 (2006), 7.76 (2016). RI: 10.07 (2006), 25.75 (2016) (ss, $p < 0.01$). Subjects with $RI \geq 80\%$: 3.6% (2006), 17.2% (2016). Athletes with $RI \leq 10\%$: 79.4% (2006), 59% (2016). Subjects with sealants: 2% (2006), 4.4% (2016). Athletes with gingivitis: 50.5% (2006), 73.5% (2016).

Conclusions. Romanian SO athletes still have relatively poor oral health and limited access to dental treatment. Their treatment needs tend to be better managed now than in the past.

Key words: mentally challenged, oral health, Special Olympics

INTRODUCTION

Oral health has a high impact on general health, contributes to self-esteem and can therefore be regarded as an indicator for the quality of life of any individual. People with special needs often have an underprivileged oral health situation [1, 2]. High rates of dental caries, periodontal disease, missing or supernumerary teeth, overretention of primary teeth and malocclusion are as many indicators of poor oral health in adults with disabilities [3] and have a negative impact on all the functions of the dento-maxillar complex [4]. Studies comparing intellectually challenged people to general population show significant differences: mentally challenged subjects have poorer oral hygiene, more periodontal disease, higher rates of untreated caries and more extracted or compromised first permanent molars [4, 5, 6].

There are many factors that may contribute to this situation. On one hand, specific oral and dental features of some diseases or syndromes (e.g. specific subgingival bacterial species and impaired immunological responses in patients with Down syndrome [7, 8]), bad habits or side effects of certain drugs (such as anti-convulsivants) can induce or enhance oral pathology, while motor impairments and poor coordination sometimes make self-toothbrushing insufficiently effective.

On the other hand, the severeness of the general pathology of these persons pushes oral health on a secondary place of concern for the family. Oral hygiene, as a first and main preventive method, gets no privileged place in the time and energy-consuming complex global care for special needs patients and is often overlooked by parents and caregivers [9, 10].

Moreover, many dentists still tend to avoid dealing with disabled patients, especially with mentally challenged, due to little knowledge on approaching and treating this category, together with fear of uncontrollable consequences of dental treatment on patient's general condition and behaviour [9]. In addition to the above, when disabled persons live in suburban or rural areas their access to dental treatment can be even more limited.

In Romania, prevention and oral health education programs targeted on mentally challenged people and their caregivers are scarce and so are reported data concerning oral health of this category of population [10]. Special Olympics (SO) is an international organization aiming to improve general health, personal abilities and social integration of mentally challenged people (children and adults) through sports. Through its Healthy Athletes (HA) program, SO also provides healthcare information adapted to SO athletes' perception and abilities. Special Smiles (SS) is the oral health branch of HA. SS events are run by trained volunteer dental professionals and consist of oral screenings for athletes taking part in SO competitions. SS also provides athletes with comprehensive information on oral health and with personal kits for oral hygiene. SS was implemented in Romania in september 2005, on the occasion of an international SO event.

Aim

The purpose of the present study is to evaluate the evolution of oral health of Romanian mentally challenged athletes over a 10 years' period of time by comparing oral health parameters of SO athletes collected in 2006 to the corresponding data in 2016.

MATERIAL AND METHODS

The subjects of the study were self-selected Romanian mentally challenged athletes taking part in SO-SS events carried out in 2006 and 2016 respectively. Subjects were orally examined by volunteer dentists under field conditions (dental mirror and probe, natural light and electric light torch) in accordance with the WHO criteria for field examination [11].

Personal data (name, age, gender), dental status (sound, sealed, decayed, restored, extracted), and signs of periodontal condition were recorded for each subject. Congestion or significant deviation from normal contour or texture of free or attached gingival margins or papillae on three or more teeth within the same area was recorded as a sign of gingival disease. DMF-T was calculated and recorded as a single variable for each subject. Restoration index RI= $[F/(F+D) \times 100]$ was also calculated and recorded for each examined athlete. All recorded data were transferred to an SPSS file and analyzed using IBM SPSS 20.0. Cases with missing data were deleted row-wise.

Data collected during the SO-SS events in 2006 (4 regional events, n=293 subjects aged 8 to 27 years) and 2016 (1 national event, n=249 subjects aged 6 to 44 years) were gathered into two study groups (group 2006 and 2016 respectively) and compared. In order to make comparison more relevant, a third group was subsequently made by applying the narrower age limits of athletes examined in 2006 (8-27 years) to those examined in 2016 (group 2016 A, n=184, age 8 - 27 y).

RESULTS

In order to give a suggestive global image of the oral health of Romanian SO athletes in 2006 versus 2016 and to make comparison easy, main parameters calculated for the two initial study groups (2006 and 2016), as well as for the subsequently selected group 2016A, are given in *Table I*.

Table I. Oral health status of Romanian SO athletes in 2006 versus 2016

	2006	2016	2016 A
n	293	249	184
Age range	8-27 years mean age 15.57 [SD2.55]	6-44 years mean age 21.45 [SD8.82]	8-27 years mean age 17.42 [SD5.23]
% caries free	13.3	23.7	25.2
DMF-T	5.84 [4.49]	7.76 [6.79]	6.04 [5.42]
RI (%) (ss differences, p<0,01)	10.07 [23.27]	25.75 [37.02]	21.14 [34.79]
%Athletes with RI ≥80%	3.6	17.2	13.5
%Athletes with RI ≤10%	79.4	59	64.1
Sealants (%)	2	4.4	4.9
Gingivitis (%)	50.5	73.5	70.7
% subjects with one or more extracted molars (ss differences, p≤0.01)	17.1	34.5	23.4

DISCUSSIONS

Over the studied decade, the proportion of caries-free SO athletes increased from 13.3 % in 2006, to 23.7% in 2016, or, for the same age range (8-27 years), to 25.2%. Mean DMFT index for 2006 was 5.84 [SD 4.49]. The corresponding value for the same age range in 2016 (group 2016A) was 6.04 [SD 5.42], while for the whole 2016 group DMFT was 7.76 [SD 6.79]. Comparing the two main study groups, DMFT and RI are ss higher (p≤0.01) in 2016 versus 2006. Athletes in group 2016 also had significantly more extracted molars than those in group 2006 (p≤0.01). All these findings show that in 2016 athletes had more dental treatments (either restorations or extractions) than in 2006. Therefore, DMFT is more likely to be higher in 2016 due to the increase of the "M" and "F" components rather than due to the "D" component.

Restoration index RI = $[F/(F+D) \times 100]$, giving the proportion of treated teeth within the overall number of teeth needing treatment, was 10.07% in 2006 versus 25.75% in 2016 and

21.14% in 2016 A groups respectively. In 2006, 3.6% of the athletes had RI=80% or higher and 79.4% had RI=10% or below. RI values for the two 2016 groups were: 25.75% (2016) and 21.14% (2016 A); RI was 80% or higher in 17.2% of the subjects in group 2016 and 13.5% in group 2016 A while 59% of group 2016 and 64.1% in group 2016 A had a RI of 10% or less. Given that only 2 of the athletes examined in 2016 (0.4%) were under 8 years of age, differences between groups 2016 and 2016 A are actually given by subjects over 27 years of age. It is therefore expectable that RI has higher values for the entire 2016 group than for group 2016 A, as with age subjects tend to have more treatment done. The same rationale can explain the DMFT values obtained for 2016 and 2016A groups, as well as the proportions of subjects with at least one extracted molar or with 80% or more of the needed treatment already done (RI $\geq$ 80%).

Sealants were found in only 2% of the examined athletes in 2006. The proportion doubled in 2016 to 4.4 %. The corresponding figure for the subsequently selected age group (2016 A) was 4.9%.

In 2006 17.1% of the examined subjects had at least one extracted molar, versus 34.5% in 2016 or 23.4% for group 2016. The different values for 2016 and 2016A groups are again explainable by the older age of subjects in the wider 2016 group.

50.5% of the Romanian SO athletes examined in 2006 exhibited signs of gingivitis. The corresponding proportion for groups 2016 and 2016 A were 73.5% and 70.7% respectively.

For all the examined athletes (2006+2016), RI is positively correlated ($p \leq 0.01$) with the presence of fissure sealants ($p \leq 0.01$), showing that athletes benefiting from professional dental care tend to have also benefited from caries prevention means. This may suggest that: *a*) treatments are more likely to have been provided on the basis of regular check-ups rather than under emergency or *b*) after having had emergency dental care subjects continued to see the dentist. Both hypothesis can be regarded as good evolution.

Although comparison is not rigorously valid, as the study groups were not selected by statistic rules but merely made of self-selected participants to SO competitions in 2006 and 2016 respectively, some positive trend of the oral health status of the athletes can be reported for the last decade. This trend could partly be due to athletes' and caregivers' increased awareness regarding the importance of oral hygiene, dietary habits and dental check-ups. As many of the athletes repeatedly participate in SO competitions and implicitly in the satellite health programs, it is likely that these programs contributed to the favourable evolution of their oral health status.

Previous reports show that oral health of SO athletes is different for different parts of the world. Dellavia et al [12] reported in 2009 a DMF-T score of 10.3 for Italian SO athletes. Fernandez and co-workers found that 28% of SO athletes in New-York screened between 2005 and 2008 had untreated caries, while 32% exhibited periodontal conditions [13]. In Belgium, Leroy et al found periodontal signs in 44% of the SO athletes, untreated caries in 22% and over 70% subjects with one or more extracted molars for a mean age of 33 years [14]. For German SO athletes (mean age 25 years), Schüller et al (2011) reported a DMF-T index of 5.9 for a group of German SO athletes ($n=169$, age 8 - 59 y, mean age 25 y); 43% of the athletes had periodontal signs and 35% had untreated caries [15].

A previous study on Romanian SO athletes examined in 2012 ($n=102$, mean age 17.94 y) reported that 77.5% of the subjects had untreated caries, 14.7% were caries-free and 7.8% only had treated lesions. Mean DMF-T was 6.49 [SD 6.0] and 19.6% of the athletes had at least one extracted molar. Previous dental treatments were found in 29.4% of the athletes. Mean RI was 16.8%. 78.4 of the subjects had signs of gingivitis. Regarding preventive care, 5.2% had sealants [16]. These findings are consistent with the results of the present study, putting 2012 within the ascending trend of the oral health of Romanian SO athletes since 2006.

Fernandez et al [17] compared oral health of SO athletes from Poland, Romania and Slovenia for SS screenings performed in 2011-2012. Polish and Romanian athletes had less

sealants (only 4.3% and 3.8%, respectively) than Slovenians (37.7%). Of the Romanian athletes (mean age 22.9 y), 38.4% had at least one extracted tooth, 33.9% had fillings and 70.4% exhibited signs of gingivitis. The results of the present study are also consistent with those reports.

While noting the relatively encouraging findings regarding the evolution of the oral and dental status of Romanian SO athletes, we need to point out that SO athletes are a particular self-selected category of intellectually disabled people. They have better general health than other mentally challenged individuals, exhibit more physical skills and social abilities and usually are better taken care of. Their families and caregivers have understood the role of physical activities in improving the quality of life of intellectually challenged people and have already agreed to encourage the enhancing of their personal performance and social integration through sports. Therefore, oral health status of SO athletes should not be extrapolated to other categories of mentally challenged people who may be even less privileged.

CONCLUSIONS

Although still having serious dental and oral problems, Romanian SO athletes tend to have an improved oral health status in 2016 as compared to 2006. Access to dental care and caregivers' awareness seem to have improved over the last decade. However, oral hygiene is still not satisfying, given the high percentage of gingival condition in both study groups. Over the last decade, oral screenings and educational programs provided by Special Smiles may have played a role in raising awareness of families and caregivers regarding the importance of oral health in the bigger picture of general health of Romanian SO athletes. The situation is, however, still far from ideal. More prevention programs targeted on mentally challenged people are still needed in Romania. Specialized dental clinics, the implementation of the concept of "dental home" and more dental professionals especially trained to work with this less privileged category of population could further help improve mentally challenged people's oral health and ultimately their quality of life.

Acknowledgements

The authors are very grateful to:

- All SS volunteers who took part in the SOSS events during these years;
- Colgate Palmolive Romania for providing the examined athletes with oral hygiene kits;
- All dental universities in Romania who constantly support SOSS events and encourage dental students and young professionals to be part of this long-term project.

Ethics approval: This study was approved by the Ethics Committee of Carol Davila University of Medicine and Pharmacy Bucharest (No. 110/17.02.2017)

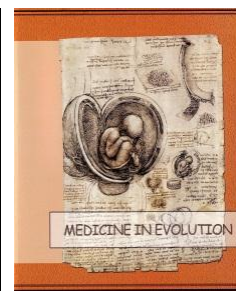
Conflict of interest: The authors declare they have no conflict of interests.

REFERENCES

1. Faulks D, Hennequin M: Evaluation of a long-term oral health program by carers of children and adults with intellectual disabilities. *Spec Care Dentist*. 2000 Sep-Oct; 20(5):199-208.
2. Beange HP: Caring for a vulnerable population: Who will take responsibility for those getting a raw deal from the health care system? *Med J Aust*. 1996 Feb 5; 164(3):159-60.
3. Gordon SM, Dionne RA, Snyder J: Dental fear and anxiety as a barrier to accessing oral health care among patients with special health care needs. *Spec Care Dentist*. 1998 Mar-Apr; 18(2):88-92.

4. Scott A, March L, Stokes ML. A survey of oral health in a population of adults with developmental disabilities: Comparison with a national oral health survey of the general population. *Aust Dent J*. 1998;43:257–261.
5. Anders PL, Davis EL: Oral health of patients with intellectual disabilities: a systematic review. *Spec Care Dentist*. 2010 May-Jun; 30(3):110-7.
6. Vinereanu A., Luca R., Munteanu A., Olaru A., Dumitraşcu I., Georgescu M. – Needs for prosthetics in first permanent molars of mentally-impaired athletes. *International Journal of Pediatric Dentistry*, 2007, 17 (Suppl. 1): 7-8.
7. Khocht A, Janal M, Turner B. Periodontal health in Down syndrome: contributions of mental disability, personal and professional dental care. *Spec Care Dentist* 2010 30: 118–123.
8. Sakellari D, Arapostathis KN, Konstantinidis A. Periodontal conditions and subgingival microflora in Down syndrome patients. A case-control study. *J Clin Periodontol* 2005 32: 684–690
9. Vinereanu A, Luca R, Amariei C, Totolici I, Vaida L: Oral health of special needs patients in Romania – from individual to community concern. *Oral Health and Dental Management in the Black Sea Countries*, 2008, 2(24):11-14.
10. Vinereanu A, Baltag I, Popescu D, Bratu AM, Luca R: Prevention for mentally challenged athletes: programs, preliminary outcomes, perspectives. *Revista Romana de Medicina Dentara* 2014, XVII(3): 74-84
11. WHO: Oral health surveys – basic methods. 4th Edition. Geneva: World Health Organization; 1997
12. Dellavia C, Allievi C, Pallavera A, Rosati R, Sforza C: Oral health conditions in Italian Special Olympics athletes. *Spec Care Dentist*. 2009 Mar-Apr; 29(2):69-74.
13. Fernandez JB, Lim LJ, Dougherty N, LaSasso J, Atar M, Daronch M: Oral health findings in athletes with intellectual disabilities at the NYC Special Olympics. *Spec Care Dentist*. 2012 Sep-Oct: 32(5):205-9.
14. Leroy R, Declerck D, Marks L: The oral health status of Special Olympics athletes in Belgium. *Community Dent Health*. 2012 Mar; 29(1):68-73.
15. Schüller IM, Kaschke I, Heinrich-Weltzien R: Special Olympics Special Smiles: Oral healthcare for people with special needs. EADPH 16th annual meeting, Rome 2011. <http://www.eadph.org/downloads/meetings/2011.pdf>, page 48
16. Vinereanu A, Ivan A, Popescu D, Bratu AM, Luca R: Oral health in a group of Romanian Special Olympics athletes. *Sanatatea orala la un lot de sportivi Special Olympics din Romania*. *Revista Romana de Stomatologie* 2014 LX(1): 30-33
17. Fernandez Rojas C, Wichrowska-Rymarek K, Pavlic A, Vinereanu A, Fabjanska K, Kaschke I, Marks LAM: Oral health needs of athletes with intellectual disability in Eastern Europe: Poland, Romania and Slovenia. *International Dental Journal* 2016; 66: 113–119

The role of oral-dental hygiene in maintaining the results of dental whitening treatment



Jumanca D.¹, Galuscan A.¹, Matichescu A.¹, Balean O.¹, Podariu A.C.¹, Sfeatcu R.I.², Dumitrache A.²

¹Victor Babes University of Medicine and Pharmacy Timisoara

²Carol Davila University of Medicine and Pharmacy Bucuresti

Correspondence to:

Name: Galuscan Atena

PHD MD

Address: Splaiul Tudor Vladimirescu nr. 14A

Phone: +40 756050084

E-mail address: atedent@yahoo.com

Abstract

During recent years, there is highlight on the importance the self image has for shaping and developing the system of concepts and attitudes of an individual, with respect to health problems. The smile is a veritable business card nowadays. Dental veneers represent devices that cover the vestibular surfaces of teeth by a thin layer of esthetic material.

The aim of this paper was to study the degree of satisfaction of the patient with dental veneers, after being instructed and motivated to keep a correct oral-dental hygiene.

Material and method: The study included 24 patients who received treatment by veneer application. This was a longitudinal, prospective cohort study with patients monitored for a 6 months period. They were monitored before the dental intervention as well as after the dental veneers were set into place. Data were processed with Microsoft Excel and Epi Info v7.

Results: By applying the Chi squared test for proportions we found that there are extremely significant differences ($p < 0.001$) between the group of content patients and those who are discontent, the content group being significantly larger. When comparing the second category we found that for our group there are no significant differences ($p = 0.422 > 0.05$) between the proportion of those who choose veneers for purely esthetic reasons and those who choose dental veneers as a response to certain dental problems. All the results are shown in the following tables.

As a general **conclusion**, we might state that for a patient decided for this type of treatment and adequately motivated for a correct oral-dental hygiene and nutrition, dental veneers may be a reliable and safe solution for solving the inesthetic aspect of the smile.

Keywords: oral-dental hygiene, dental whitening, motivation

INTRODUCTION

During recent years, there is highlight on the importance the self image has for shaping and developing the system of concepts and attitudes of an individual, with respect to health problems. Lifestyle is a determinant factor for health. In a positive sense, self esteem induces the acknowledgement of one's own capacity, social competence and resistance to external pressure. On the contrary, a low level of self esteem leads to difficulties in adaptation and social integration [1]. In this sense, the existence of healthy, white and perfectly aligned teeth is the ideal for every person who wishes to be successful. The smile is a veritable business card nowadays.

Dental veneers represent devices that cover the vestibular surfaces of teeth by a thin layer of esthetic material. This may be a polymeric or ceramic material. In the case of polymeric veneers (composite diacrylic resins), they may be produced either by a direct or indirect technique. Regarding the portion of the vestibular surface of the tooth which is to be covered, composite resin veneers may be partial or total. Partial veneers are recommended in case of pigmentations or loss of substance (caries, abrasions) limited to small areas of the vestibular surface of the teeth. Total veneers are applied on teeth with dyschromia and/or extensive defects on the entire vestibular surface. When deciding on the therapeutic veneer application the following factors must be taken into account: the age of the patients, the quality of occlusion, but also the state of dental structures. Special attention must be paid to the conformation of the veneer at cervical level in order to keep the health of the marginal periodontium. The onset of gingival disease – gingivitis would cause repeated bleeding and increase the risk of microinflammations and veneer peripheral dyschromia.

Total veneer application, by the direct technique, is very time consuming but represents the first option in the case of single teeth with dyschromia in teenagers. For patients who request solving during a single session, restorations with composite resins represent a solution prior to ceramic veneers application.

Veneer application by the indirect technique requires two treatment sessions, but presents two advantages: the operatory technique is less pretentious, artistic abilities being left to the dental technician, and they are more resistant in time (especially ceramic veneers). In the present study, we only chose patients who received ceramic veneers.

The reason for which a patient choses the treatment with dental veneers varies from person to person; we enumerate some of these reasons below: dental caries which continue to represent a major problem affecting all age groups, including children and adolescents, while dental fillings become pigmented and inesthetic in time [2]. Another reason is represented by minor dental anomalies unsolved for various reasons such as the difficulties involved by the application of an orthodontic device. In this case, the adult patient may choose the solution of dental veneer application [3]. Intrinsic dental staining (caused by melanic pigments, intrapulpal hemorrhages, endodontic therapy or tetracycline treatment) may also represent a justified reason to choose such a treatment.

Regardless of the reason, the results of the treatment are obvious, but their durability is influenced by the way the patient will understand and adhere to the recommendations of the dentist and of the prevention nurse regarding nutrition and oral-dental hygiene.

The key of success in keeping the results is a good communication between the dental team and the patient. The instructions given to the patient must be correctly understood and strictly applied. The individual oral-dental hygiene with all the auxiliary means and regular visits to the dental office will ensure the durability of the obtained results.

Aim

The aim of this paper was to study the degree of satisfaction of the patient with dental veneers, after being instructed and motivated to keep a correct oral-dental hygiene. For this, a questionnaire was designed and objectively answered by patients.

MATERIAL AND METHODS

The study included 24 patients who received treatment by veneer application. This was a longitudinal, prospective cohort study with patients monitored for a 6 months period. They were monitored before the dental intervention as well as after the dental veneers were set into place. Data were processed with Microsoft Excel and Epi Info v7.

With this study we intended to determine the degree of satisfaction in patients after veneer application, the main characteristics of the target group (age, profession). All patients attended a session of thorough training regarding the nutrition and oral-dental hygiene after the treatment. We then performed descriptive statistic analyses, frequency tables, histograms, statistical tests and risk analysis studies. The informed consent for participation in the study and for data processing was obtained from all the patients.

Table 1. Questionnaire

1. Name and surname – initials
2. Your age
3. Which is your professional field
4. Gender
5. The reason you chose dental veneers
6. Results of the intervention (were you content?) 1 – YES 2 – NO
7. Justification for choosing this type of treatment (1-individual; 2-imposed by the workplace; 3-imposed by external factors (family, friends)
8. Describe your perception before and after the treatment
9. Are you content by the ratio between the costs and the results? (1-YES; 2-NO)
10. Did you experience postoperative dental sensitivity? (1-YES; 2-NO)
*These data are confidential and serve to a biostatistical analysis.

Table 2. Presents the answers of patients which represent the database we statistically processed

No	Initials	Age	Profession	Gender	Reason	Code Reason	Results	Choice motivation	before / after	Results / Cost	Sensitivity
1	C I	32	cosmetologist	F	Impeccable smile	2	1	1	After-very good	1	1
2	F A	28	Free lancer	F	Smile improvement	2	1	3	Very content	1	1
3	A R	38	Flight instructor	F	Position correction	1	1	2	Very content	1	2
4	B I	30	Physician	M	Colour correction	2	1	2	Content	1	2
5	C C	25	Nurse	F	Perfect smile	2	1	1	Content	1	2
6	E D	45	manager	M	Smile correction	2	1	2	Very content	1	2
7	G R	31	professor	F	Shape correction	1	1	2	Very content	1	1
8	S I	27	TV anchor	F	Colour correction	1	1	2	Very content	1	1
9	I D	44	Hairdresser	F	Malposition	1	1	1	Content	2	1
10	M L	41	Teacher	F	Dyschromia	1	1	3	Very content	2	1
11	P N	27	project manager	F	abrasion	1	1	1	Very content	1	2
12	D F	40	director	M	fissures	1	1	2	Content	1	2
13	P C	33	Pharmacist	M	Multiple fillings	1	1	1	Very content	1	2
14	F D	23	student	F	Stains	2	1	1	Content	1	2
15	B L	42	Executive director	F	Multiple fillings	1	1	2	Very content	1	1

No	Initials	Age	Profession	Gender	Reason	Code Reason	Results	Choice motivation	before / after	Results / Cost	Sensitivity
16	C A	28	IT specialist	M	Malposition	1	1	1	Content	1	1
17	C R	27	Engineer	M	Multiple stains	2	1	3	Content	2	2
18	F M	39	Sales consultant	F	Stains caused by coffee consumption	2	1	2	Content	2	2
19	S C	27	Model	F	Aligned teeth	1	1	1	Content	1	2
20	V R	26	Hair stylist	M	Correcting position	1	1	2	Content	1	2
21	AM	28	personal trainer	M	Impeccable smile	2	2	1	discontent	2	1
22	NC	29	Teacher	M	Position correction	1	2	1	Discontent	2	1
23	AA	31	Bank employee	F	Impeccable smile	2	2	2	Discontent	2	1
24	NN	25	Flight attendant	F	Impeccable smile	2	2	2	Discontent	2	1

RESULTS

In the first part of the statistical study we intended to classify our patients according to age, and detect any significant differences between men and women regarding the choice to undergo a treatment by dental veneers. We obtained a mean age in our group of 32 years, both when globally assessing the group (N=24), as well as when splitting it according to gender. This may be observed in the descriptive statistics applied on the age variable which is shown in Table 3 but also after applying the unpaired T test ($p=0.94$) which leads to the conclusion that there are no significant differences between the mean age in women and in men (see Table 4). The age distribution is presented in Fig1. The data showed that there is a significant difference between the proportion of female and male patients ($p=0.009$), with women being much more numerous ($N_{\text{women}}=15$, $N_{\text{men}}=9$). In order to obtain the p value we applied the Chi squared test for proportions. Data are shown in figures 2 and 3. We also wanted to compare the justification offered by patients to explain their choice for dental veneers (esthetic – 11 patients, versus dental problems – 13 patients), we wanted to see the satisfaction degree in patients (cost/results – content: 20 patients, discontent: 4 patients), the occurrence of side effects (sensitivity present – 12 patients / sensitivity absent – 12 patients) and, last but not least, what was the motivation for choosing dental veneers (individual – 10 patients, profession – 11 patients, family – 3 patients). We also wanted to find out if there were any significant differences between

- The proportion of content versus discontent patients regarding the results of the dental intervention
- The proportion of those who choose veneers for strictly esthetic reasons and those who see this as a solution for various dental problems.

By applying the Chi squared test for proportions we found that there are extremely significant differences ($p<0.001$) between the group of content patients and those who are discontent, the content group being significantly larger. When comparing the second category we found that for our group there are no significant differences ($p = 0.422 > 0.05$) between the proportion of those who choose veneers for purely esthetic reasons and those who choose dental veneers as a response to certain dental problems. All the results are shown in the following tables.

Table 3. Descriptive statistics for the age variable. In the first column we presented all the patients, in the second column we presented the female patients, and in the third column the patients of male gender

<i>Age of the subjects</i>		<i>Age women</i>		<i>Age men</i>	
Mean	32	Mean	32	Mean	31,77
Standard Error	1	Standard Error	2	Standard Error	2
Median	30	Median	31	Median	29
Mode	27	Mode	27	Mode	28
Standard Deviation	7	Standard Deviation	7	Standard Deviation	7
Sample Variance	44	Sample Variance	49	Sample Variance	42
Kurtosis	-1	Kurtosis	-1	Kurtosis	1
Skewness	1	Skewness	1	Skewness	1
Range	22	Range	21	Range	19
Minimum	23	Minimum	23	Minimum	26
Maximum	45	Maximum	44	Maximum	45
Sum	766	Sum	480	Sum	286
Count	24	Count	15	Count	9

Table 4. The results of the unpaired T test. We tested for any significant differences between the mean age in women and in men

	<i>Women</i>	<i>Men</i>
Mean	32	31.77
Variance	48.71	42.44
Observations	15	9
Hypothesized Mean Difference	0	
df	18	
t Stat	0.078746	
P(T<=t) one-tail	0.469052	
t Critical one-tail	1.734064	
P(T<=t) two-tail	0.938103	
t Critical two-tail	2.100922	

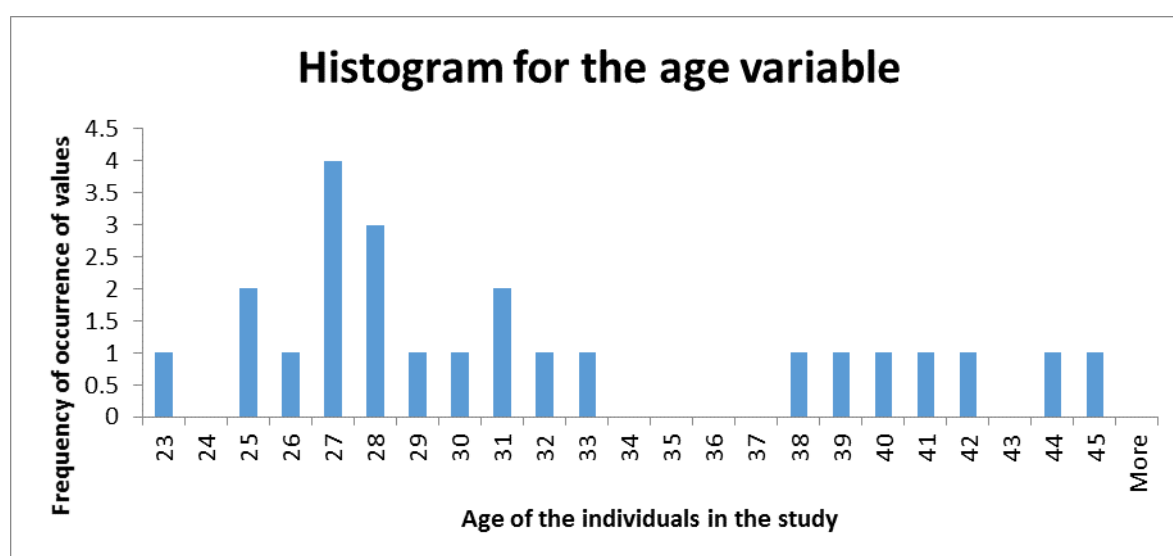


Figure 1. Histogram for the age variable

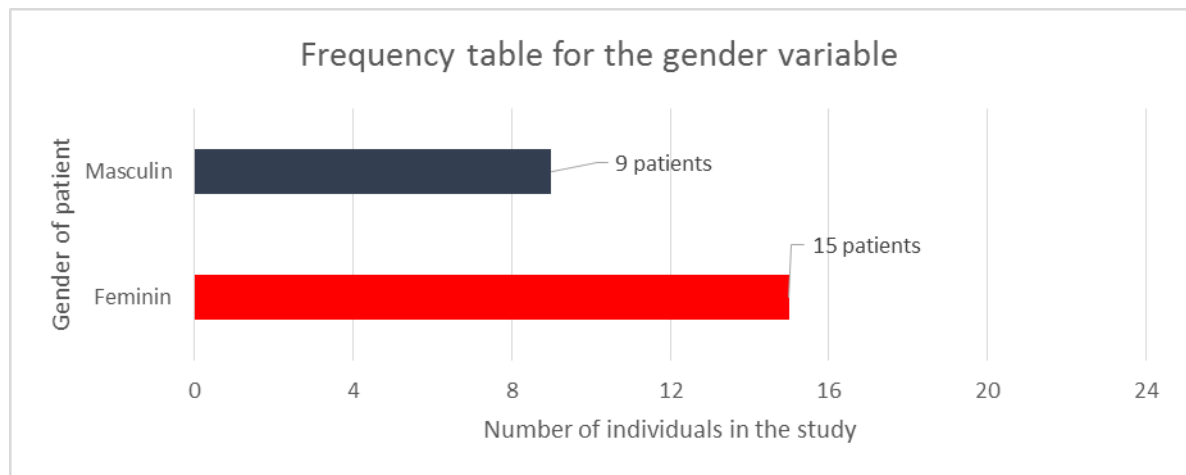


Figure 2. Frequency for the gender variable

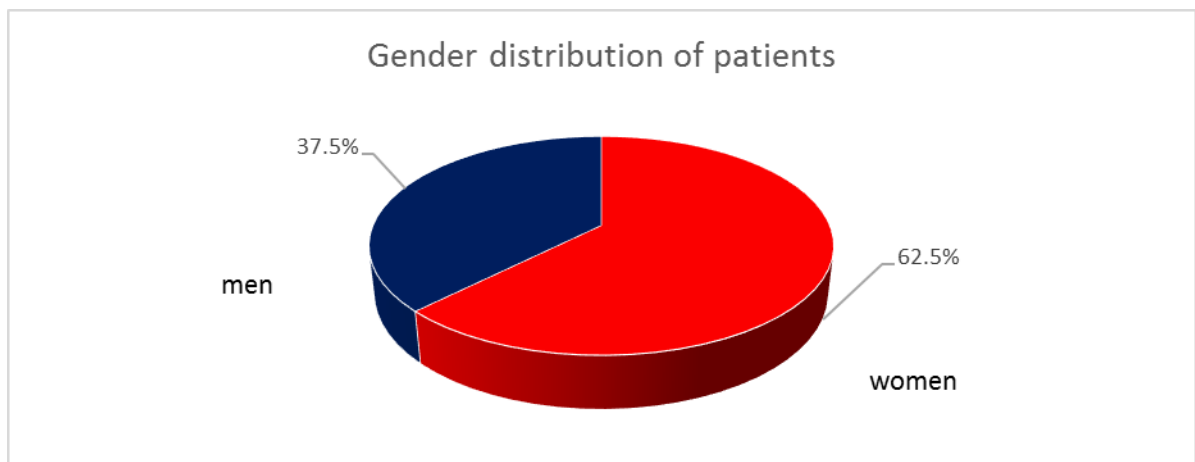


Figure 3. Gender distribution of patients

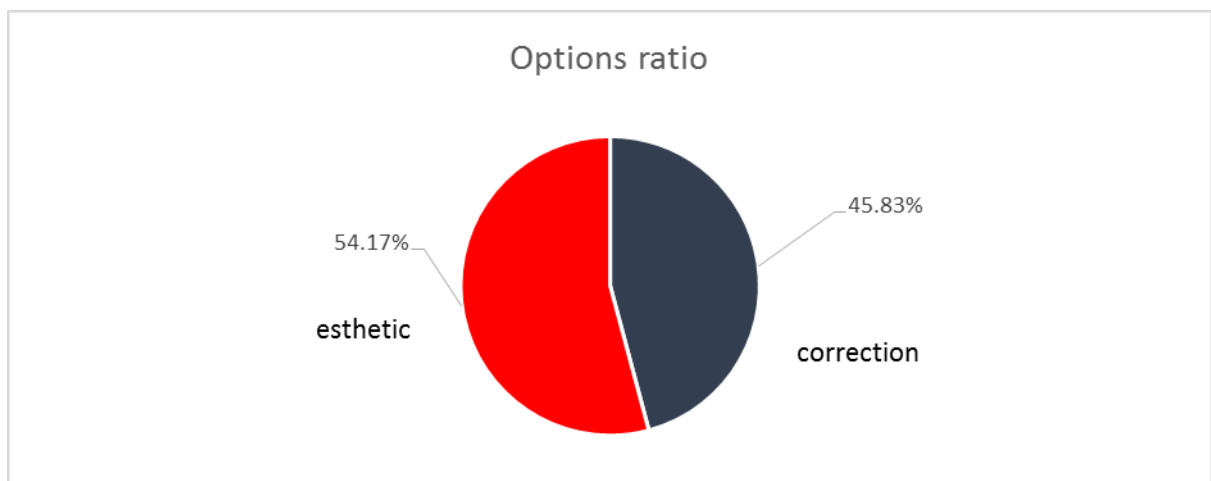


Figure 4. Ratio between patients' options. We wanted to see if there are any differences between motivations for applying veneers

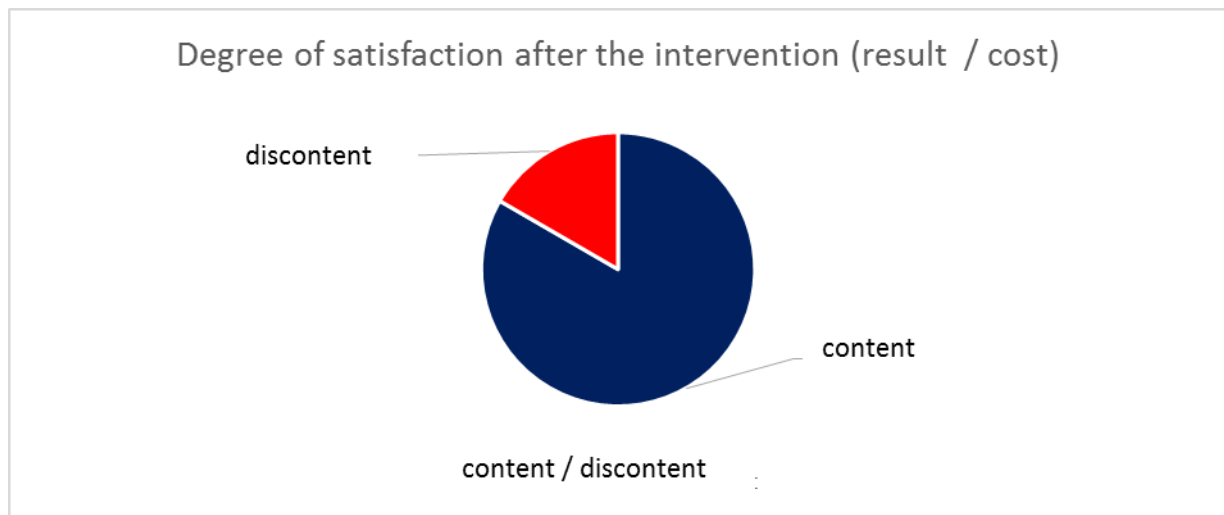


Figure 5. How content are the patients after the dental intervention

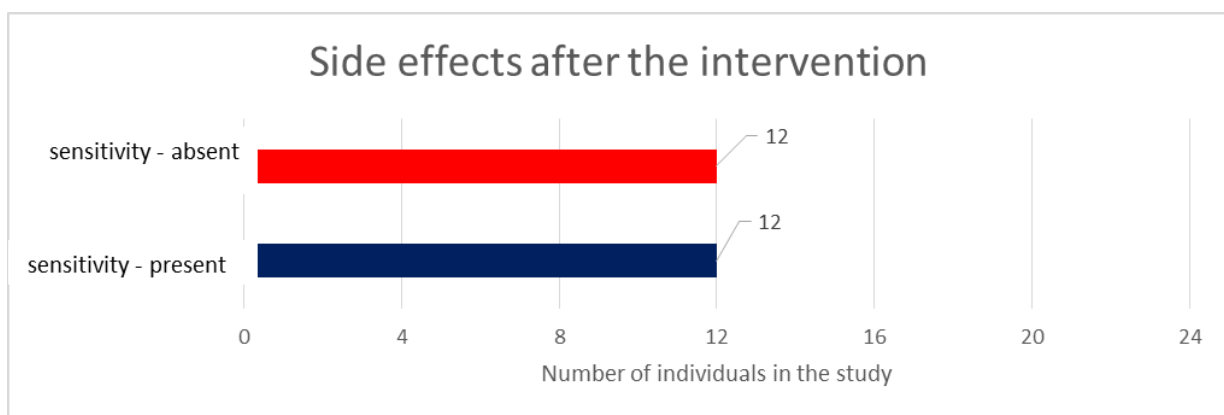


Figure 6. Occurrence of side effects

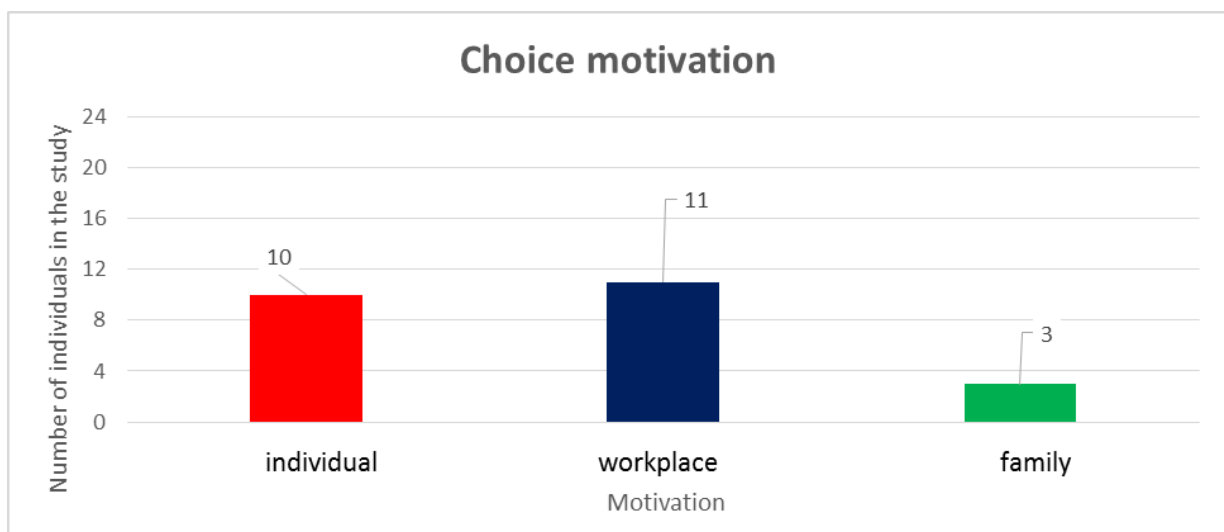


Figure 7. Choice motivation

In the second part of the statistical study we ran a risk analysis for more statistical hypotheses. We wanted to see if the feminine gender is easier to constrain to take certain decisions, namely we wanted to see if the society, and the workplace, respectively, may exert pressure on certain decisions regarding the esthetic aspect. We found that for our group the feminine gender represents a protection ($\text{riscul} < 1$), yet not statistically significant ($p > 0,05$), factor.

Table 5. Presents the risk analysis performed in order to find if the feminine gender is more vulnerable than the masculine gender

CONTINGENCY TABLE				STATISTICAL ANALYSIS (p -value, risk)	
	Motivation Personal	Imposed by profession	Total	$p = 0.86$ $RR = 0.92$, 95%(0.37 ; 2.29) $OR = 0.86$, 95%(0.15 ; 4.49)	
Women	6	7	13		
Men	4	4	8		
Total	10	11	21		
	Personal reasons	Family	Total	$p = 0.83$ $RR = 0.93$, 95%(0.352 ; 1.69) $OR = 0.75$, 95%(0.05 ; 11.31)	
Women	6	2	8		
Men	4	1	5		
Total	10	3	13		
	Imposed by profession	Family	Total	$p = 0.92$ $RR = 0.97$, 95%(0.55 ; 1.70) $OR = 0.87$, 95%(0.06 ; 12.98)	
Women	7	2	9		
Men	4	1	5		
Total	11	3	14		

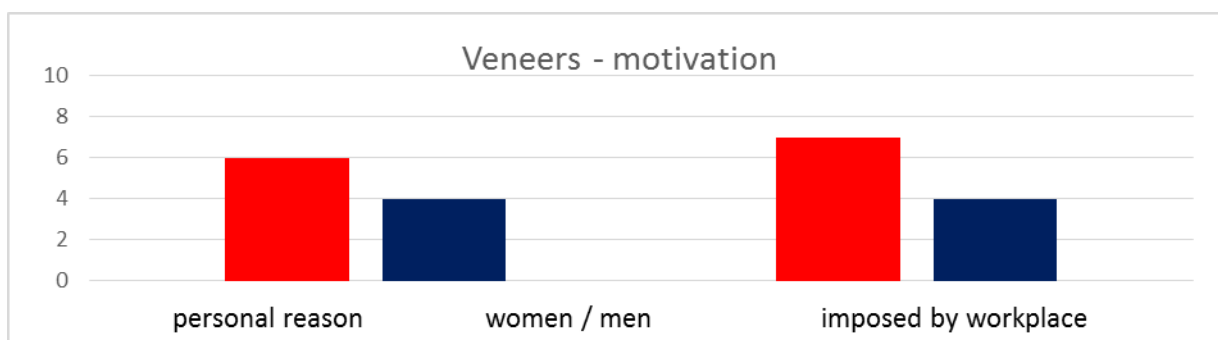


Figure 8. Veneers – motivation. The personal motivation or that imposed by society are stronger for the feminine gender, than for the masculine gender

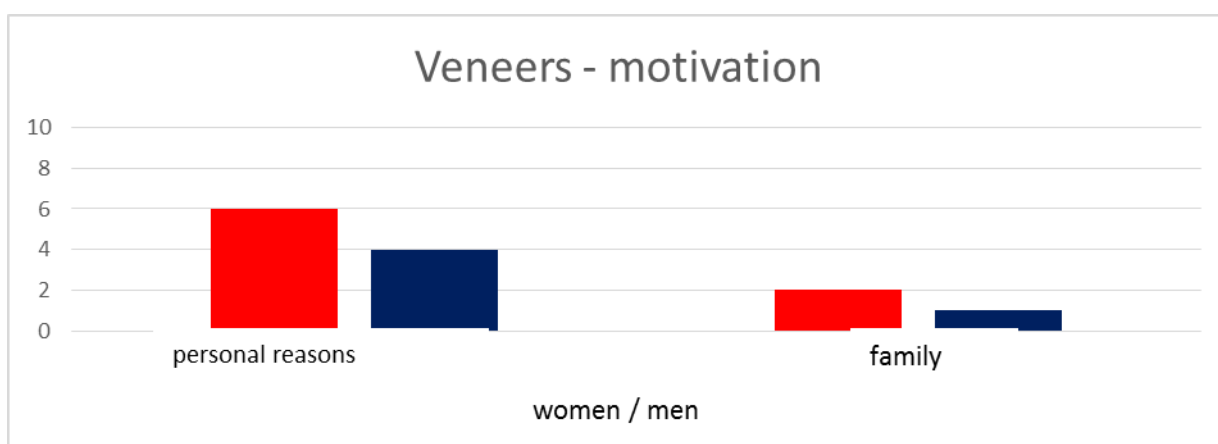


Figure 9. Veneers – motivation. The personal motivation or that imposed by family is more important for the feminine gender, than for the masculine gender

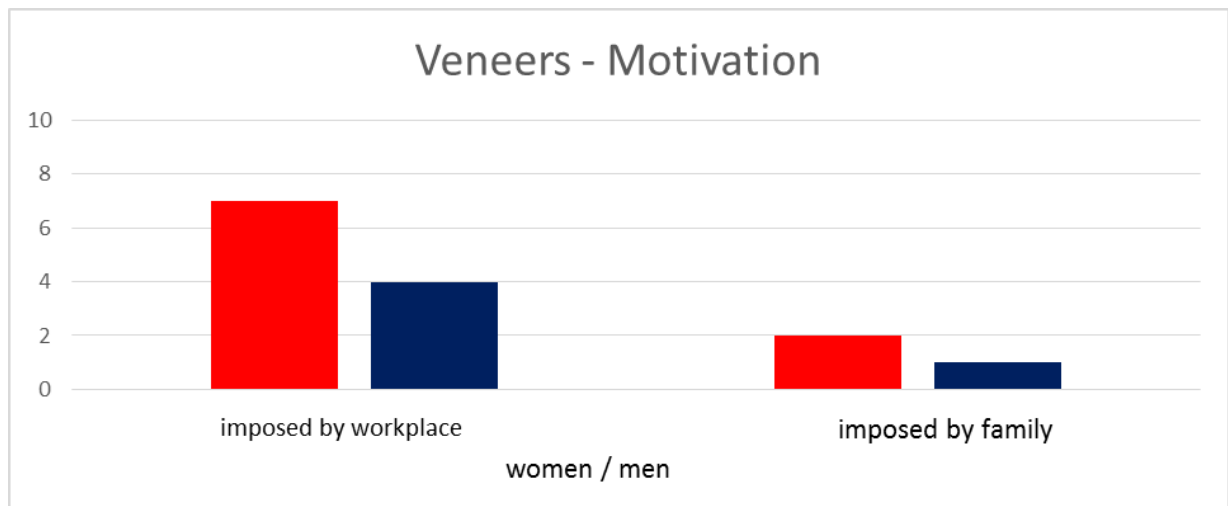


Figure 10. Veneers – motivation. The motivation imposed by society, workplace or by family is stronger for the feminine gender, than for the masculine gender

Another hypothesis we wanted to test was if the feminine gender represents a risk factor for an increased sensitivity occurring after the application of dental veneers. The data are synthesised in table 6 and Fig.11. We wanted to find out if the feminine gender increases the chance of developing dental sensitivity. After applying the test we found that women are much more sensitive than men (risk>1), but the recorded risk is not statistically significant ($p>0.05$)

Table 6. Degree of sensitivity

CONTINGENCY TABLE				STATISTICAL ANALYSIS (p - value, risk)	
	Sensitivity+	Sensitivity-	Total	$p = 0.21$ $RR = 1.8$, 95%(0.65 ; 4.95) $OR = 3$, 95%(0.53 ; 16.89)	
Women	9	6	15		
Men	3	6	9		
Total	12	12	24		

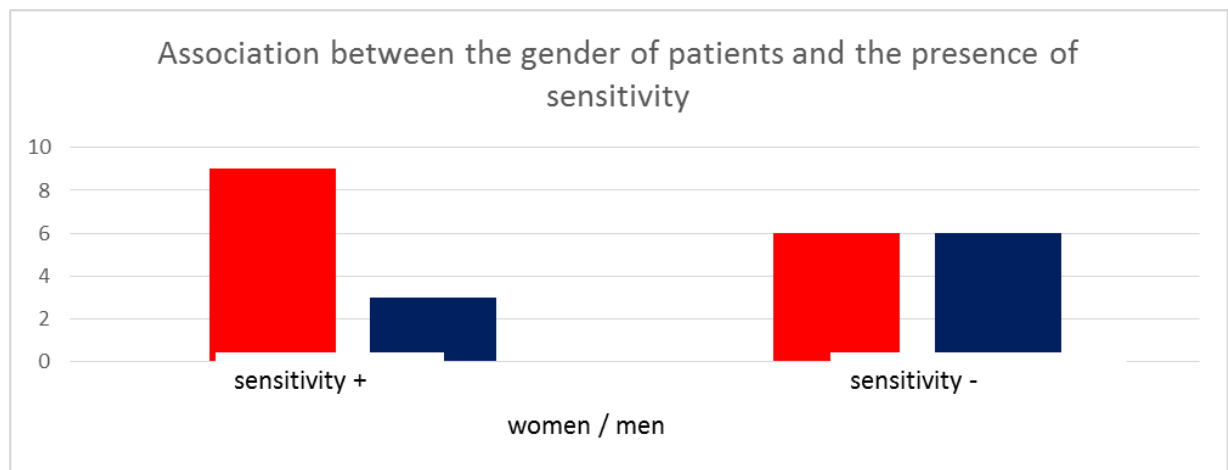


Figure 11. Connexion between the gender of the patient and the occurrence of dental sensitivity as a side effect after applying dental veneers

In the last part of the study we applied the Chi squared test to test various hypotheses:

- Whether women are more pretentious than men, regarding esthetics
- Whether there are differences regarding the gender of patients and the motivation/justification for which they chose dental veneers.

Table 7. By applying the Chi squared test for proportions we found that there are no significant differences ($p > 0.05$) between the groups of women and men regarding the standards/ expectations of patients and the justification for choosing dental veneers, respectively

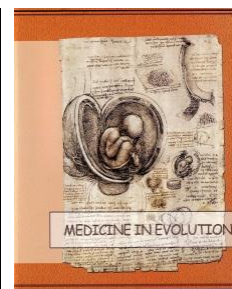
CONTINGENCY TABLE				STATISTICAL ANALYSIS (p - value of the test)
	Content	Discontent	Total	$p = 0.57 > 0.05$
Women	13	2	15	
Men	7	2	9	
Total	20	5	24	
	Esthetic	Dental problems	Total	$p = 0.92 > 0.05$
Feminine	7	8	15	
Masculine	4	5	9	
Total	11	13	24	

As a general conclusion, we might state that for a patient decided for this type of treatment and adequately motivated for a correct oral-dental hygiene and nutrition, dental veneers may be a reliable and safe solution for solving the inesthetic aspect of the smile.

REFERENCES

1. Krawczyk D, Pels E, Prucia G, Kosek K, Hoehne D. Students' knowledge of oral hygiene vs its use in practice. • Advances in Medical Sciences • Vol. 51 2006 • Suppl. 1:122-125
2. Jumanca D., Galuscan A., Popescu L.A., Ghiorghe A., Sinescu C.: Comparative Study On Available Sealing Materials. Revista de Chimie, 2016 vol 67, nr.2, Pagina 241-244.
3. Daniela Jumanca, Atena Galuscan, Angela Podariu, Lavinia Ardelean, Rusu Infiltration Therapy - an Alternative to Fluoride Varnish of White Spot Lesion After Fixed Orthodontic Treatment Application for Treatment. Revista de Chimie, (Bucuresti) 2012, vol. 63(8) Pg 783-786. ISSN 0034-7752
4. Valceanu A. Estetica în medicina dentară. Timișoara: Brumar, 2004 pag 13-14, 172-177
5. Sinescu C., Yikili L.P., Maroiu A. Tehnici de albire a dintilor. Timisoara Eurobit, 2014.
6. Watts A. and Addy M. Tooth discolouration and staining: a review of literature: Br. Dent. J., 2001.
7. Jumanca D., Podariu A.C., Galuscan A., Oancea R., Popovici R.A., Oancea R. Preventia oro-dentara. Editura Eurostampa, Timisoara 2010.

Cyst maxillary treatment



Stana A.H.¹, Porumb A.², Stana O.L.³, Ciobanu G.¹, Balean O.⁴, Ciobanu C.G.¹, Ratiu C.², Todor L.²

¹*University of West "Vasile Goldis" Arad, Faculty of Medicine*

²*University from Oradea, Faculty of Medicine and Pharmacy, Department of Dentistry*

³*University of West "Vasile Goldis" Arad, Faculty of Dentistry*

⁴*University of Medicine and Pharmacy Victor Babes, Timisoara, Faculty of Dentistry*

Correspondence to:

Name: Anca Porumb

Address: University of Oradea, Faculty of Medicine and Pharmacy, Department of Dentistry, P-ta 1 Decembrie 10, Oradea, Bihor

Phone: +40 726286237

E-mail address: anca.porumb@yahoo.com

Abstract

The radiological examination has a particular importance for establishing a correct diagnosis due to the fact that the clinical manifestations of maxillary cysts have common elements with different tumor formations present at the level of the maxillary bone.

Radiographic examinations can show cysts from the endoscopic stage even before the clinically evident symptomatology. Also, the radiological examination is useful in highlighting the ratio that the cyst has either with its teeth or with other adjacent anatomical elements, such as the maxillary sinus, mandibular canal or nasal passages.

It is possible to establish appropriate treatment methods and surgical technique, giving indications of the possibility of maintaining the arches in the arch using apical resection or when extraction is indicated, indicating also the degree of bone resorption.

Keywords: cyst, bone resorption, diagnosis, radiological and clinical aspect, treatment

INTRODUCTION

Four basic principles are used when applying the maxillary cyst treatment, namely the complete removal of the cyst membrane; Keeping arches of healthy teeth; Protection of adjacent anatomical elements, maxillary sinus, nasal fossa, mandibular canal, as well as prosthetic rehabilitation of the affected area, aiming as much to normality as possible. These are principles developed by Laskin [1,2,3].

Partsh has worked out the surgical method of treating the maxillary cyst developed by Breslau. They are still used today. In 1892 he recommended marsupialization or Partsh I surgery, and then in 1910 complete cyst removal or Partsh II surgery. Subsequently, the term cystectomy and chistotomy appeared.

Surgical treatment involves in the initial stage the rigorous anamnesis of the patient, local clinical and locoregional examination. When examining the oral cavity, the vitality of the adjacent teeth to cystic lesion, mobility, or eventually their displacement as well as periodontal disease [1,2,3,4,5] will be noted.

Radiological examinations include orthopantomography (standard panoramic radiography), retrovealing and occlusal radiography, ASF (anterior sinuses of the face), CT, and MRI. These investigations are useful for establishing the appropriate surgical technique. However, details of localization, shape, peripheral appearance, relationship with neighboring teeth, and disorders affecting the adjacent anatomical elements are very important.



Figure 1. Orthopantomographic radiography illustrating the circumscribed radiotransparency surrounding a dental bud - characteristic of a follicular cyst

These can help to establish the diagnosis and give some information about the stage of swelling and the aggressive tendency of the cystic formation, thus contributing to the choice of the optimal therapeutic method [6].

The shape of the cyst depends on the anatomical structure because in most cases the maxillary cyst develops towards the direction of the minimum resistance.

The peripheral appearance of the maxillary cyst is often well delimited by a normal bone portion resulting from slow growth, thus resulting in normal bone apical phenomenon.

Thus, the radiotransparent area has an outlined contour formed by a thin radiopaque area of the same thickness over its entire extent around the bone lesion [6].

Cystic formation is well delimited by the surrounding healthy bone through a osteoconcentration line.

CHISTOTOMY OR PARTSH I SURGERY

Chistotomy or Partsh I surgery consists in removing a wall of the cystic formation, which will lead to its transformation into an adjacent cavity after the entire contents of the cystic cavity are removed. In this case, the cystic membrane will remain in place, being in fact a decompression method. This was also adapted in the case of large cysts that extend to the maxillary sinus and nasal fossils [1,2,4,5].

Two types of this method are described, namely marsupialization (the actual cystotomy) and fenestration (modified chistotomy).

Marsupialization is considered to be a defining treatment method consisting of opening the cyst cavity and turning it into a cavity adjacent to either the oral cavity or adjacent cavities such as the maxillary sinus and the nasal passages.

Fenestration is the method of decompression, which consists in opening the cyst cavity, with the permanent opening to diminish the size of the maxillary cyst by reducing the pressure inside the cyst, thus stimulating the bone at the edge of the cystic cavity.

With this temporary treatment method it is allowed to preserve the anatomical elements adjacent to the bone lesion.

Indications of fenestration (modified chistotomy) are superinfected cysts until the acute phase is resolved; In the case of an uncertain diagnosis on the harvesting of a portion of the cyst membrane for histopathological examination as well as for large cysts in order to reduce the size of the cyst, and subsequent cystectomy.

Chistectomy is indicated when there is a difficult access that could prevent complete removal of the cyst membrane. Also, this surgical technique is indicated for large sized cysts from the mandibular bone that invades the mandibular canal, and the cyst membrane adheres to the vasculo-nervous pack.

Chistotomy is the method of choice when the cystic wall is the only barrier between the cyst cavity and the sinus cavity, respectively the nasal fossa; Where pathological bone fracture is possible; With the purpose of maintaining vital adjacent teeth; If the dentist cyst has a relationship with dental buds or teeth that are undergoing eruption, and when the general condition of the patient does not allow for the complete removal of the cystic membrane [7].

The major advantage of this surgical technique is the simplicity of the surgical method. There is also a rapid postoperative recovery of the patient with minimal discomfort, with the possibility of preserving the anatomical elements adjacent to the cyst.

Disadvantages are the possible malignant degeneration of the overlying cystic membrane. When bone regeneration is slowed, early closure of the cyst cavity may lead to recurrence. Postoperative recovery requires a long time and close monitoring of the case.

PARTSH II SURGERY OR CYSTECTOMY

Partsh II or cystectomy is actually the method of choice for maxillary cysts, and as described above, consists in the complete removal of the cyst membrane by preserving the adjacent teeth and the alveolar crest.

The indications of this surgical technique are inflammatory cysts, odontogenic or non-dendritic cysts, large cysts when the radiological examination indicates the existence of a thick wall of the cavity, avoiding the damage of neighboring anatomical elements, as well as in the case of small cysts, up to 3 cm.

Advantages of the technique are reduced risk of relapse, bone regeneration is not felt by the patient, suture suppression is performed one week postoperatively, bone wound healing occurs per primate, and histopathological examination may allow early detection of tumor changes.

However, the disadvantages are the possibility of traumatization of the adjacent nasal sinus maxillary anatomy, vital dental teeth, lower dental nerve, and blood clot infection.

In the case of cysts with high dimensions it is possible to dehiscence the wound with clot infection, therefore it is preferable to extirpate the cyst by cystic cavity.

INTRAOPERATIVE ACCIDENTS

The gingival-mucous membrane flexion during take-off maneuvers occurs especially in cysts that have been incised either due to over-infection, or due to a misdiagnosis or mistaken for abscesses. This is prevented by submucosal infiltration of the anesthetic substance, performing in a first step a hydrodecoloration. The incision will be placed away from the scar, allowing the detacher to be intimately with the bone, and at the level of the scar, the take-off will be made almost close, avoiding the rough maneuvers. If the torn tear is linear and the mucosa is lined with a thick coat, it will be sutured at the end of the intervention. If the tissues are thin and the anfractured wound, the margins are excised to healthy tissue and sutured, taking care not to damage the quality of the flap in its entirety. If there is insufficient mucosa to cover the defect left after cyst removal, it is preferable to make marsupialization without waiting for the flap-covered wound dehiscence to occur [1,8]. Perforation of the nasal mucosa during cystic membrane take-off maneuvers - a crash frequently occurring in the radical cure of odontogenic and non-odontogenic cysts and inflammatory cysts in the incisive-canine area. If the wound is torn, apply a few stitch threads away from the edges of the wound so that the mucous floor of the withering floor is exposed. The plaque will be protected with the iodine insert introduced for 24-48 hours and monitored for at least 10-14 days to track the occurrence of the fistula.

Perforation of the sinus mucosa can occur during a radical cure of the jaw cyst from the canine to the molar. If the drilling is punctiform and the sinus muscle is normal, the radicality of the cystic membrane extirpation is controlled very thoroughly, the correctness of the apical resection is then washed with the physiological saline followed by the suture. The patient is warned to avoid blowing the nose for at least 2-3 weeks, maintaining a rigorous local hygiene. Antibiotic protection is indicated.

If the sinus lining is perforated over a very wide area, the rhinological method should be followed, ensuring antero-nasal drainage in the lower meatus.

Burning nerve trunks that can traverse the cystic cavity or can be adherent to the cystic membrane. Once the nerve trunks have been identified, they can be protected with a decolor without exaggerating elongations. If the cystic membrane adheres to the nervous trunk, gentle take-off maneuvers will be made in a logical sense, avoiding the nerve segmentation. If the nervous trunk has been cut, it is advisable to make the nerve suture, using microsurgery.

Perforation or segregation of an important vascular pack is usually accompanied by significant bleeding that floods the cavity, thus preventing cystic membranes from taking off. A small compressible buffer is applied to the vessel, stopping the bleeding after 10-15 minutes, after which the cystic membrane takes off. Once the cystic membrane is removed, the two aspects of the vessel are identified and two cauterization points are applied. In identifying vessels, care must be taken to be perfectly isolated from any nerve trunks that usually have the same tract [9,10].

Fragmentation of the mandible occurs in large cysts that have eroded bone cortical. After removing the cystic membrane, taking care that surgical maneuvers do not cause shifts of the fractured heads, the mandible is restrained, restoring the normal occlusion ratios. If possible, will be applied osteosynthesis plates, fixed monocortically. Both the healing process of the defect left after the removal of the cyst and the fractured mandible [8,11] will be monitored.

POSTOPERATIVE EVOLUTION

Postoperative edema is always present, its dimensions depending on the size and location of the cyst, the adjacent structures that have been taken off, and the duration of the intervention that will be longer as long as the preservation of several teeth or possibly the autotransplant Iliac sponge. Edema is higher after 48 hours, remitting after 6-7 days.

Rapid swelling may be ruled out by the application of cold compresses or the administration of an anti-inflammatory medication [12].

Postoperative pain is emitted after antalgic administration. The endobuccal dressing that clogs the flap in the remaining cavity after cyst removal is replaced after 48-72 hours, but is not given up until after complete wound healing and suture removal.

Sensitivity disturbances on the trajectory of the trigeminal ram on which the cyst has been located may be immediately post-operative. These may be simple hypoaesthesias or paresthesia and even anesthesia. If the nerve was not traumatized excessively or even severally, these phenomena resolve in a few weeks.

However, the intracavitary evolutionary hematoma is the most unpleasant complication, as it is followed by the suture dehiscence and most often its infection [13,14,15].

If a superinfection occurs, it is advisable to irritate the wound with poorly antiseptic solutions. In these cases the healing process will be delayed 2-3 weeks. When the remaining cavity is large and the retention of pus is important, it is preferable to make a shutter that will be progressively reduced following the technique previously described. If the suture is maintained, the wires are removed after 7 days.

Cystic recurrences are more common in keratocysts, and the patient is advised of this possibility and regularly called for control.

The other cysts recur if incompletely extirpated, which occurs especially in the case of suppressed maxillary cysts [13,16].

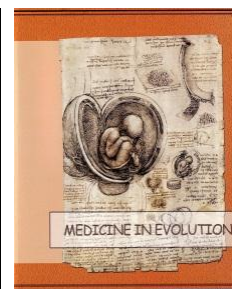
In relation to peacemakers, medical staff must understand that they have unnatural behavior, caused by suffering, and when this is prolonged, there is also a depressing feeling of mistrusting the doctor and the treatment solutions. For a better understanding of all the implications of the medical act, with direct effects on it, the patient benefits from the right to be informed about the possible treatment solutions. In order to guarantee the right of the patient to express his / her own knowledge in an informed manner, the legislation of the informed patient is a mandatory condition, the absence of which signifies an abuse of the medical staff on the patient[18,19,20]. In this regard, communicating with the patient is important in order to provide all the information necessary for the patient to make decisions about the acceptance or refusal to perform the medical act as well as a clear understanding by providing information at a level adapted to the ability of the patient to understand the patient [21,22].

REFERENCES

1. Peterson's-Principles of oral and maxillofacial Surgery, Bc decker inc London, 2004
2. Bucur A.: Compendiu de chirurgie oro-maxilo-facială 2009, Editura Q Med Publishing, 2009 vol. 2. 450, 473;
3. Bucur A., Băciuț G., Surpăteanu M., Băciuț Mihaela, Hurubeanu L., Creangă A., Ianeș Emilia, Pricop M., & all -2012- Managementul afecțiunilor chirurgicale oro-maxilo-faciale, Editura Didactică și Pedagogică, R.A.
4. Burlibașa C., Chirurgie orală și maxilo-facială, Editura Medicală, 2005
5. Neville B., Damm D, Allen C, Bouquot j. Odontogenic cysts and tumors. Philadelphia:WB Saunders;2002 p.589-642

6. Celikoglu M, Kamak H, Oktay H 2010 Investigation of transmigrated and impacted maxillary and mandibular canine teeth in an orthodontic patient population. *Journal of Oral & Maxillofacial Surgery* 68: 1001-1006
7. Whitw SC, Pharoah MJ. *Oral Radiology. Principles and interpretation*, Mosby 5th ed, 2004, 384-409
8. Coulthard P., horner K., Sloan P., Theaker E. *Master Dentistry vol.1, Oral and Maxillofacial surgery, radiology, pathology and oral medicine* 2003, Churchill LLIVINGSTONE, 149-157
9. Macintosh R -The role of osseous resection in the management of odontogenic keratocysts. *American Association of oral and Maxillofacial Surgeons Scientific Session*; 2002 oct 5, Chicago
10. Laskin D. M., *Oral and Maxilo-facial Surgery, vol. II*, Mosbz, Delhi, reprint 2003.
11. Greendberg A.-*Cranio-maxillofacial Reconstructive and Corrective Bone Surgery*, Springer Verlag, New York, 2002
12. Sciubba JJ et al. *Atlas of Tumour pathology, Tumors and cysts of the jaw*, Afip Whashington Dc, 2001, 1-69
13. Laskin D. M., *Oral and Maxilo-facial Surgery, vol. II*, Mosbz, Delhi, reprint 2003
14. Cavalcanti M.G.P., Veltrini V.C., Ruprecht A., Vincent S.D., Robinson R.A., *Squamous -Cell carcinoma arising from odontogenic cyst the importance of computed tomography in the diagnosis of malignancy oral surg oral med oral pathol oral radiol endod*, 2005
15. Pogrel M, Jordan R *Marsupialization as a definitive treatment for odontogenic Keratocysts. American Association of oral and Maxillofacial Surgeons Scientific Sessions*; 2002 oct 4; Chicago American Association of oral and Maxillofacial Surgeons 2002
16. Pricop M., Urtila E., Ianes E *Studiu Clinic al Tumorilor benigne oro-maxilo-faciale* Editura Mirton 2009
17. Whitw SC, Pharoah MJ. *Oral Radiology. Principles and interpretation*, Mosby 5th ed, 2004, 384-409
18. Levai M.C., Popovici R.A., Rusu L.C., Tofan S.A., Talpoş Ş., Podariu A.C., *Historical legislative governing doctor-patient relationship, Medicine in Evolution*, 2016, Vol. XXII, Nr. 4, p. 390-396, ISSN: 2065- 376X.
19. Mihaela-Codrina Levai, Angela Codruţa Podariu, Ramona Amina Popovici, Alexandra Podariu, Melania Lavinia Bratu, *Medical Malpractice In Romania - Towards A Terminological And Conceptual Rigor, Medicine In Evolution*, 2015, Vol. XXI, Nr. 4, p. 574-579, ISSN 2065-376X
20. Mihaela Codrina Levai, Codruta Angela Podariu, Ramona Amina Popovici, *The Principles Of Basic Medical Attendance Keys For The Development Of The Health System Management, Medicine In Evolution*, 2015, Vol. XXI, Nr. 3, p. 359-364, ISSN 2065-376X
21. Levai M.C., Rusu L.C., Podariu A.C., Tofan S.A., Anculia R.C., Popovici R.A., *Communication barriers in the doctor's office or medical organizations, Medicine in Evolution*, 2016, Vol. XXII, Nr. 4, p. 585-594, ISSN: 2065- 376X
22. Popovici R.A., Podariu A.C., Rusu L.C., Porumb A., Todor L., Motoc O., Levai M.C., *Leadership in dental health services, Medicine in Evolution*, 2016, vol. XXII, Nr. 4, p. 578-584, ISSN: 2065-376X

Comparative study on health status assessment of children in Timisoara and Bucharest



Galuscan A.¹, Jumanca D.¹, Sava Rosianu R.¹, BaLEAN O.¹, Matichescu A.¹, Podariu A.¹, Popovici R.A.¹, Sfeatcu R.I.², Dumitrache A.²

¹Victor Babes University of Medicine and Pharmacy Timisoara

²Carol Davila University of Medicine and Pharmacy Bucuresti

Correspondence to:

Name: Ruxandra Ionela Sfeatcu

Address: Bucuresti, Str. Poet D. Neculuta, nr.78, sect. 2

Phone: +40 722627601

E-mail address: ruxandra.sfeatcu@gmail.com

Abstract

The main problems of the Romanian health system are dramatically reflected by the oral health of children, in reported indicators which prove a high risk for oral diseases. The underfunding of the system, lack of access to health services, lack of education and interest for oral health lead to alarming levels of these diseases among children. Material and Method: The study included 3613 pupils from schools in two major cities in Romania, Timisoara and Bucharest, in order to assess oral health, the degree of oral hygiene, the presence of preventive treatments, as well as sealings and the need for orthodontic treatment. The WHO assessment chart was used. The results prove that caries disease is widely spread in temporary as well as in permanent dentition – two-thirds of children. Only one in 11 children benefited from preventive measures (sealing). Oral hygiene is inadequate, with only a quarter of children being found without bacterial plaque. Moreover, 1 in 10 children had the examined dental surfaces entirely covered with microbial dental plaque. Gingival bleeding was found in few cases. (7,8,9,11). Conclusions: The study shows that larger efforts are required for the treatment of the existing carious lesions, in temporary as well as in permanent teeth, prevention of new caries by sealing, encouraging children to practice correct oral hygiene and the use of auxiliary products to avoid the emergence of caries in predisposed areas, once orthodontic treatments are started. The present study demonstrates that even in large cities, oral health problems are not solved and, as a consequence, increased efforts are expected from state authorities to change the indicators and fulfil the WHO objectives.

Keywords: oral health, caries prevalence, temporary dentition, permanent dentition, oral hygiene, health indicators, dental prevention

INTRODUCTION

The main WHO oral health objectives for the year 2020, (1,2,3,4) are a significant reduction of morbidity by oral diseases and their impact on general health, using modern prediction methods, approaching the target population characterized by an increased risk for oral diseases, but also by increasing the access to health care systems already in place. Nevertheless, all the studies conducted until now on oral health in Romania, (1,5,6,8,9,10,11,12,13,14,15), proved a series of problems of the healthcare system, for general health and particularly for oral health.

The main problem is represented by the underfunding of the oral health system, followed by the lack of data on the oral health of the population which could support public policy changes in the system. Also, the access to dental health care services for the Romanian population represents, in the XXI-st century a goal which is difficult to reach as only 13% of the dental practices function in rural areas. Another important aspect is the lack of clear and objective information on oral health, hygiene and periodic follow-up. (10,11,12,13,14,15).

According to the Centre for Public Policies Monitoring, the main problems in public policies in the field of oral health in Romania are:

- The lack of a common policy in the field of oral health - there are only isolated provisions regarding various prevention or education measures
- The insufficiency of data to fundament public policies in the field of oral health
- The lack of a data collection mechanism required for an adequate design of public policies in the field, i.e. legal provisions stating the duty of dental practices to provide data on the incidence of certain oral diseases, such as caries or gingival diseases
- The underfunding of the general health system and, particularly, of the oral health system
- The insufficient coordination of public institutions with attributions in the field of prevention and health education (Ministry of Health -MS, Ministry of National Education and Scientific Research - MENCS,)
- The low level of involvement of relevant actors (professional associations, NGOs, private sector) in the elaboration of public policies

The main issues related to public policies in the field of oral health are (according to the Public Politics Monitoring Center): (1,2,3,15):

- The lack of unity policies in the field of oral health - there are some dispersed regulations in different preventive or educational measures.
- Insufficient data to sustain public policies
- The lack of a data collecting mechanism necessary for an adequate design of public policies, meaning regulations which should oblige practices to supply data regarding different oral conditions, like dental caries, periodontal disease.
- Underfinancing of the general health system and especially of the oral health system.
- Insufficient coordination of public institutions involved in health prevention and education
- the reduced involvement of major actors (professional associations, non-governmental organisations, private sector) in the process of public policies. (1,4, 5,13,15)

Also, an important component in oral health promotion is represented by the position and resources of patients regarding their own oral health care. Regarding the patient's position towards oral health, there are differences connected to the level of education, with differences between those with a higher degree of education and higher income compared to those living in poverty, with limited or no resources. The latter have no access to health infrastructure or to accurate oral hygiene information, adapted to each audience group (5,6,7,15).

Another important aspect regarding patients is the lack of a pre-established calendar for follow up visits in the dental practice, both for adults and especially for children. In children, the situation is alarming, the lack of a regular visitation schedule leading to the late detection of oral health problems only with the occasion of changing dentition, with all the resulting problems. Parents do not realise the importance of a good oral health for their children and postpone the visits to the dental practice, and in the education system, there are no school dental practices. The lack of school dental practices makes the implementation of prevention measures impossible, and moreover, under these circumstances, the accurate information of children on oral health also becomes impossible. (13,14,15,)

Regarding the patient's attitude towards oral health, one can encounter several situations according to the educational level of the patients, patients with a higher level of education and higher income and patients living in poverty. The latter category has no access to the oral health infrastructure, to correct information regarding oral health behaviours.

Another aspect concerns regular dental check-ups for adults as well as for children. In the case of children, the situation is very concerning because, in most cases, problems are seen only during the change of dentition, creating all types of problems. Parents do not realise the importance of good oral health and postpone dental check-ups, and in the educational system, the school dental practices were closed. The lack of school practices makes it impossible to prevent but also to inform and educate children regarding oral health.

For a better description of the oral health situation in Romania, we made an analysis of secondary data on oral health provided by National Institute for Statistics (INS), National Health Insurance System (CNAS) or EUROSTAT, but also by various national and European research programmes (EUROBAROMETRU – special 330, GSK Oral Care Segment studies). The document analysis included the reports of the National Institute of Public Health, European Oral Health Platform (European Oral Health Report Card, State of Oral Health in Europe Report) and the Platform “Smile Romania” of the World Health Organisation (Oral Health Surveys), but also of professional associations of dentists.

Aim and objectives

The study took into consideration the WHO objectives for the year 2020, among which the significant reduction of the morbidity by oral diseases and their impact on general health, using modern prediction methods, approaching the target population characterised by an increased risk for oral diseases, but also the increased access to existing healthcare systems. The aim of the study was to assess the oral health, the degree of oral hygiene, the presence of preventive treatments, as well as sealing and the orthodontic treatment requirements in primary school children in Bucharest and Timisoara.

MATERIAL AND METHODS

In order to achieve the aims, a transversal study was designed in Bucharest and Timisoara, between April - May 2013. The study was developed by collaboration between the Faculty of Dental Medicine of the „Carol Davila” University of Medicine and Pharmacy Bucharest, the “Victor Babeş” University of Medicine and Pharmacy Timișoara and Glaxo-Smith-Kline Romania.

A total of 3613 pupils were included, of whom 2599 aged between 6 and 11 years in the Ist-IVth grades, from 12 primary schools in Bucharest and 1014 pupils in Timisoara aged between 6 and 12 years, in preparatory classes and Ist -IVth grades, respectively. They were examined in the classrooms, using disposable consultation kits. The examiners were dentists previously instructed for examination, supported in filling out clinical files by dental medicine students in the 5th and 6th years of study. The WHO chart was used, including 4 sections: demographic data, dental inventory and status, gingival status and orthodontic

treatment requirements. The evaluation used cao indicators (caries-extraction-obturation), both for teeth and for surfaces in the case of temporary teeth, the CAO (caries-extraction-obturation) index for teeth and surfaces in permanent dentition, the Gingival Index (GI), the Index of Orthodontic Treatment Need (IOTN) and the simplified Plaque Index (sPI). [6,7,8,9,]

At the end of the examination, pupils were offered information on oral hygiene and diet together with aged adapted oral hygiene techniques demonstrated on models. They also received, at the end of the class, oral hygiene products and a letter addressed to the parents to inform them on the oral health of their children and on the treatment requirements. Data were recorded and processed with SPSS version 13.0. [5,6,7,8]

RESULTS

Results for Bucharest:

Of the 2599 examined subjects, statistical analysis was done only for 2395, after recording the results in the database, with only 2288 valid entries, the rest being excluded due to incorrectly filled out charts.

For Bucharest – Gender distribution is even: girls: 49.9% and boys 50.1% (missing data for 50 pupils), ages were between 5 and 12 years (percent age distribution 27% - 7 years, 37% - 8 years and 22% - 9 years and for years of study: 36% Ist grade, 42% IInd grade and 16% IIIrd grade, 5.3% IVth grade and 1.5% preparatory class).[6,7,8]

For Timisoara – Gender distribution: girls: 51.6% and boys 48.4% (tab. 1), their age is between 6 and 12 years (tab. 2). Distribution according to the year of study: 36.7% Ist grade, 18.6% IInd grade, 11.2% IIIrd grade, 7.8% IVth grade and 25.6% preparatory class (Table 1).

Table 1. TM-B Group distribution

Distribution	TM-percent	B
girls	51.6	49.9
boys	48.4	50.1
Preparatory class	25.6	1.5
Ist grade	36.7	36
IInd grade	18.6	42
IIIrd grade	11.2	16
IVth grade	7.8	5.3
total	1014	2288

Dental indicators in temporary teeth (Table 2)

The prevalence of dental caries of temporary teeth in the Timisoara group has a rather increased medium value, 74.8%, the percent of caries free teeth (severity zone 1 – no carious lesions) being 25.2%.[7,8,9]

The prevalence of dental caries of temporary teeth in the Buchares group has a rather increase medium value, 71.1%, with the percent of caries free teeth (severity zone 1 – no carious lesions) being 28.9%.

Table 2. The prevalence of dental caries in temporary teeth

Temporary teeth	Timisoara	Bucharest
Caries prevalence	74.8%	71.1%
Caries free teeth	25.2%	28.9%
cao-d index	5.81	3.18

Regarding the location of caries on temporary teeth (Table 3) in TM, we observed that occlusal surfaces (zone 2) – 24.3%, proximal surfaces (zone 3) – 26.1% and vestibular/oral surfaces, together with frontal teeth (zone 4) – 20.6% are equally affected. Only 29% of surfaces are lesion free (zone 1). Regarding the defs index, for the entire study group, an

average of 5.44 (SD=6.606) surfaces are affected (caries, obturations and extractions caused by caries), mostly by untreated caries, average sd = 4.78 ± 6.244 surfaces (8).

For the entire **Bucharest** group we have an average cao-d index of 3.18 (SD=2.93), of which mostly, in average 2.84 (SD=2.85) teeth with carious processes, 0.29 (SD=.896) teeth with fillings and 0.07 (SD=.404) extracted teeth (3.5% of the total number of affected teeth were extracted and 15% obturated). We analysed medium values of caries indexes on surfaces, cao-s and teeth, cao-d, with the variable represented by the year of study.

TM- Temporary teeth: The mainly affected are proximal surfaces (33.4%), occlusal surfaces (24.7%) and vestibular and oral surfaces of frontal teeth - 16.7%. Only 25.2% of surfaces are unaffected. [8,9,10]

The def-s index

For the entire study group, an average of 5.81 surfaces are affected (caries, fillings and tooth extractions caused by caries), mostly by untreated caries, with an average of carious surfaces = 4.40, post-extraction areas = 0.86 and obturated surfaces 0.58. [7,8,9]

The def-t index. In the entire study group, 3.45 teeth are affected (caries, fillings and tooth extractions caused by caries), of which 2.79 teeth affected by carious processes, 0.18 extracted teeth and 0.48 obturated teeth.

Table 3. Distribution of caries severity areas - temporary dentition TM_B comparison

Evaluated surfaces	TM -cumulative percentage	B -cumulative percentage
Healthy teeth	25.2	28.9
Occlusal caries	49.8	53.2
Mesial and distal caries	83.3	79.3
Vestibular, oral and frontal area caries	100.0	99.9
Total	1013	2288

Bucharest – In permanent teeth, the prevalence of dental caries has a medium value of 31.8%, the percentage of caries free teeth being 68.2% (severity zone 1).

Most of the examined surfaces are caries free (zone 1) - 68%, followed by occlusal surfaces (zone 2) - 24.5%, and in a very low percent proximal surfaces (zone 3) - 2.3%, vestibule-oral surfaces and frontal teeth (zone 4) - 4.9%.

Table 4. Distribution of severity zones

	TM-cumulative percentage	B- cumulative percentage
Caries free	59.7	68.2
Occlusal caries	90.8	92.8
Proximal caries	94.4	95.1
Smooth surface caries	100.00	100.0
Total	1013	2288

The mean CAO-S index for the entire group is 0.92 (SD=1.778) with mostly untreated caries - 0.88 (SD=1.735). The mean CAO-D index is 0.82 (SD=1.693), the examined teeth being equally caried (31%), obturated (32%) or even extracted (37%). [8,9,10,11,12]

Dental indicators in permanent teeth - TM

The prevalence of dental caries in permanent teeth has an average value of 40.3%, the percentage of caries free teeth being 59.7% (severity zone 1 - no carious lesions). [7,8,9]

Location of caries

- Permanent teeth: Occlusal surfaces are more affected (31.1%), followed by vestibulo-oral ones and frontal teeth (5.6%) and by proximal surfaces (3.6%)

DMF-S index

For the entire study group, 1.33 surfaces are affected (caries, obturations and extractions caused by caries), mostly by untreated caries – 1.15 surfaces and 0.14 obturated.

DMF-T index

For the entire study group an average of 1.06 teeth are affected, the DT components being 0.93 teeth with carious processes and 0.13 teeth with obturations.

The distribution of pupils according to **orthodontic treatment requirements** is synthetized in table 5.

In Timisoara, most subjects do not require orthodontic treatment (44%), 35.6% have a medium orthodontic treatment requirement and 20.3% have an increased orthodontic treatment requirement. [8,9,14]

In Bucharest, regarding the assessment of orthodontic treatment requirement, the study reveals relatively equal proportions of pupils with low (34%), medium (32%) and increased (33%) orthodontic treatment requirements (table 5).

Table 5. Orthodontic treatment requirements TM-B

Orthodontic treatment requirement	Timisoara-	Bucharest
Not needed	44.0	34.7
Medium	35.6	32
High	20.3	33
total	1013	2288

In the assessment of prophylactic procedures the study demonstrates that in Bucharest dental sealings were only present in 8.5% of the examined molars, most subjects having two sealed molars (2.8%), followed by one molar (2.7%) and only very few children with four sealed molars (1.8%).

In Timisoara – The percentage of teeth with **dental sealings**: 8.2% of molars present sealings, most (3.1%) with two sealed molars (3.1%), followed by those with one sealed molar (3%) and those with four (2.3%), and three (0.7%) sealed molars, respectively (tab. 6)

Table 6. Situation of dental sealings

sealings	TM	B
Total /molars	8.2	8.5
One sealed molar	3.1	2.7
Two sealed molars	3.1	2.8
Three sealed molars	0.7	
Four sealed molars	2.3	1.8

Microbial plaque index (table 7)

Regarding the quality of personal oral hygiene habits, we found that in Bucharest 35% of pupils present around 1/3 dental surfaces covered with dental plaque, 28% have 2/3 of dental surfaces covered with dental plaque and in 28% of cases all surfaces were covered with dental plaque. Regarding the gingival bleeding index, the average number of zones assessed as being inflamed was

0.87 for the entire group.

In TM Dental surfaces covered by microbial plaque: 1/3 of the dental surface: (34.2%), 2/3 of the surface (34.6%), totally covered by microbial plaque: 5.5%, and 25.7% of the examined dental surfaces without plaque (tab. 13).

Table 7. Visible plaque index

Surface covered by plaque	TM-cumulative percentage	B- cumulative percentage
0	25.7	25.5
0.1-0.6	59.9	60.9
0.7-1.8	94.5	89.1
1.9-3	100.0	100.0
total	1013	2288

Table 8. Comparative results Bucharest - Timișoara (Dumitrache MA, GaluscanA.) (7,8,9,10)

Results	Bucharest	Timișoara
Prevalence of caries in temporary teeth	71.1%	74.8%
Caries free surfaces in temporary teeth	29%	25.2%
defs	5.44	5.81
Prevalence of caries in permanent teeth	31.8%	40.3%
Caries free	68%	40.3%
caod	3.18	1.06
CAO	0.82	1.3
Sealings	8.5%	8.2%
Bacterial plaque	35%(1/3)	34.2% (1/3)
	28%9(2/3)	34.6(2/3)
	28% (1/1)	5.5 (1/1)
Gingival bleeding	0.87	1.65

CONCLUSIONS

The assessment of pupils in Bucharest and Timisoara proves that carious lesions are widely spread both in temporary and in permanent teeth – two thirds of the children. For temporary teeth, the indices of caries experience are increased mostly by untreated caries, without differences regarding the location of carious lesions, all dental surfaces being equally involved. The most caries affected children are those in preparatory classes, and the less affected are those in the IIIrd grade. Regarding permanent teeth, children have an average of 1 tooth and 1 dental surface, respectively, affected by caries, these being equally untreated, treated by obturation or with extractions in case of severely affected teeth. (8,9,10) When monitoring the location of carious lesions, we observe that none of the subjects had caries on the vestibular or oral surfaces, but occlusal and proximal surfaces are equally affected. Regarding the requirement for orthodontic treatment, the distribution of children was even for the three levels – low, medium and high. In the case of the present group, only 1 in 11 children benefited from preventive measures (sealings). Oral hygiene is inadequate, only one quarter of children having dental surfaces entirely free of microbial dental plaque. In equal proportions, children with one third or two thirds of the dental surfaces covered by plaque were encountered. Moreover, 1 in 10 children had dental surfaces entirely covered by microbial dental plaque. Gingival bleeding was found in few cases. (7,8,9,11)

As compared to similar studies previously conducted in our country, the caries index in temporary teeth had lower values in the present study, so an improved situation is found, but only in permanent teeth, in the case of the present study, even though the caries prevalence is lower, the number of dental surfaces affected per individual is higher. (8,9)

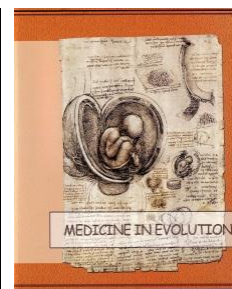
The results of this study show that higher efforts are needed for treating carious lesions, both in temporary and in permanent teeth, preventing new lesions, including by sealing, encouraging pupils to practice correct oral hygiene and using auxiliary products in order to avoid the occurrence of caries in predisposed areas, once orthodontic treatments are initiated. The present study demonstrates a high number of permanent molars already extracted to this age, requiring increased awareness of parents on the importance of these teeth. Parents must be informed on the importance of molars in the development of the dento-maxillary apparatus, in the correct functioning of the child and, consequently, they must be encouraged to maintain these teeth by early treatment, avoiding extractions or adopting new interceptive post-extraction methods. (8,9,10,11).

REFERENCES

1. The World Oral Health Report 2003, www.who.int/oral_health/media/en/orh_report03_en.pdf

2. 10/90 Report on Health Research 2003-2004, http://announcementsfiles.cohred.org/gfhr_pub/assoc/s14789e/s14789e.pdf
3. Petersen PE. Priorities for research for oral health in the 21st Century – the approach of the WHO Global Oral Health Programme, *Community Dental Health* 2005;22:71-74
4. Dumitrache MA, Sfeatcu IR, Buzea CM, Dumitrascu LC, Lambescu DG. Concepte și tendințe în sănătatea orală. Editura Universitară Carol Davila, București, 2009
5. Dumitrache MA, Ranga R, Sfeatcu R, Ionescu E, Dănila I. Modelul regresiei lineare de predicție al riscului carios la elevii din București. *Medico-Surgical Review* 2009;113(2) Supliment Nr. 2:812-820
6. Funieru C, Twetman S, Funieru E, Dumitrache AM, Sfeatcu RI, Baicus C. Caries experience in schoolchildren in Bucharest, Romania: The PAROGIM study. *J Public Health Dent*. 2013;73(3).
7. Galuscan A, Podariu A, Jumanca D, Vacaru R. Health Dentistry Education and the Incidence of Caries at Children from the Primary School. *Journal of Dental Research*, 2002/81.
8. Administrația Prezidențială și Ministerul Sănătății, 2016, Planul Multianual Integrat de Promovare a Sănătății și Educație pentru Sănătate, disponibil la http://www.ms.ro/upload/plan-integrat-tipar_mic-ultima-versiune.pdf
9. Cancelaria Primului Ministru, 2016, Pachet Integrat pentru Combaterea Sărăciei
10. INSP, 2016, Analiza de situație ocazionată de celebrarea Zilei Mondiale a Sănătății Orale
11. IPSOS, 2012, Oral Care Habits, Usage and Attitudes, raport pentru GSK Oral Care Segment
12. IPSOS, 2016, Oral Care Habits, Usage and Attitudes, raport pentru GSK Oral Care Segment
13. Ministerul Educației Și Cercetării, Consiliul Național Pentru Curriculum, 2004, Educație pentru sănătate, programă școlară pentru clasele I – a XII-a, disponibil la http://programe.ise.ro/Portals/1/Curriculum/Progr_Pri/CD/Educatie%20pentru%20sanatate_clasele%20I%20-%20a%20XII-a.pdf
14. Ministerul Sănătății, 2014, Strategia Națională de Sănătate 2014-2020, disponibil la <http://www.ms.gov.ro/upload/Anexa%201%20%20Strategia%20Nationala%20de%20Sanatate%202014-2020.pdf>
15. TNS Opinion & Social, 2010, Special Eurobarometer 330, Oral Health, at the request of Directorate General Health and Consumers
16. Centru pentru Monitorizarea Politicilor Publice, Sanatatea Orala in Romania, raport de Cercetare 2016, (office@cmpp.ro, www.issuemonitoring.ro)

Consequences of premature loss of primary teeth and space maintainers need in children with mixed dentition



Pascal I.¹, Răducanu A.M.², Păuna M.R.³

¹PhD student, Prosthetic Dentistry Department, UMF "Carol Davila", Bucharest, Romania

²Paediatric Dentistry Department, UMF "Carol Davila", Bucharest, Romania

³Prosthetic Dentistry Department, UMF "Carol Davila", Bucharest, Romania

Correspondence to:

Name: Anca Maria Răducanu

Address: Paediatric Dentistry Department, UMF Carol Davila, 8 Aleea Barajul Iezeru, Bucharest, Romania

Phone: +40 744489595

E-mail address: raducanu2000@yahoo.com

Abstract

Objective. The aim of the study was to evaluate the consequences of premature loss of deciduous teeth and the space maintainers need in a study group of patients with mixed dentition.

Material and method. The study was conducted on casts of a study group of 150 patients (56% boys, 44% girls; mean age $8,707 \pm 0,169$ years), who presented 253 extracted teeth requiring the application of a space maintainer.

Results. Space maintainer treatment was necessary in 41% of patients, mainly in boys (56%), aged 8-10 years (70%). Band&loop (37%) was the most indicated space maintainer, for both arches and genders.

Space maintainer treatment was needed in 62% of edentations, especially at mandibular first molars (20%). Dimensional changes were found in 92% of edentulous spaces. In most cases, both horizontally (21%) and vertically (49%), edentulous spaces were reduced with 0,1-1 mm.

Conclusions. Premature loss of deciduous teeth has multiple consequences, of which the most important is minimized space for permanent teeth, that can be avoided by applying space maintainers

Keywords: premature extraction, space maintainer, reduced space

INTRODUCTION

Premature loss of deciduous teeth has a complex etiology and multiple consequences: disorders in the rhythm of eruption and position of permanent teeth; changes of the dental alveolar arches associated with midline deviation; disruptions of vertical dimension of occlusion, static and dynamic inter-maxillary relationships, skeletal development; appearance of dysfunctions, malocclusion, vicious habits and possible psychological damaged development [2,14,20,24].

Early loss of deciduous molars, considered the most common due to the prevalence of dental caries in children around the world, is associated with adverse consequences for occlusion [13,15,20].

These repercussions can be avoided by applying space maintainers. Criteria for choosing a space maintainer are: number of missing teeth; time elapsed since the extraction of deciduous teeth; space length; presence, position and time until the eruption of permanent teeth; patient's age and cooperation [8,18,20].

Aim

The aim of this study was to evaluate the consequences of premature loss of deciduous teeth and the space maintainers need in a study group of patients with mixed dentition.

MATERIAL AND METHOD

The retrospective study was performed on study casts of patients of Paediatric Dentistry Department of "Carol Davila" Medicine and Pharmacy University Bucharest, during one year (2015).

The study was carried out on a study group of 150 patients (aged 6 to 12, mean age $8,707 \pm 0,169$ years), who presented 253 extracted teeth requiring the application of a space maintainer, selected from an initial group of 366 patients with mixed dentition (51% boys, 49% girls; mean age $8,766 \pm 0,0646$ years), among which 411 extracted deciduous teeth were identified. Criteria for inclusion in the study were: patients with mixed dentition and at least one deciduous tooth precocious extracted (with more than 1 year until the eruption of successor tooth), associated or not with horizontal and/or vertical migrations, as a consequence of early extraction. From the study were excluded: on-term edentations (± 1 year until the eruption of successor tooth), frontal edentations occurred after primary canines' eruption (when a space maintainer is no longer necessary), anodontia, patients with general diseases that could influence teeth' early loss and dental arches' changes.

Examination of the cast of the patients was performed by the first author of the paper in good lighting conditions, at different time intervals (intra-examiner reliability test score = 0.96). Interpretation of the cast was accomplished analyzing the following variables:

- dental age (divided into 3 categories: under 8 years, 8-10 years, 11-12 years), relying on patients' gender and erupted permanent teeth; dental status;
- horizontal and vertical dimensions of edentulous spaces (in millimeters, using a compass and a ruler), appreciating migration type of neighboring teeth $\pm$ alveolar process. To establish the dimensional changes of the edentulous spaces, measured dimensions of the primary teeth were compared with standardized primary teeth' dimensions (Răducanu, 2013);
- type of the edentation. Formula [dental age (years) - permanent tooth's eruption age (years)] was used to assess edentation type: precocious (anticipated loss of the tooth, with more than 1 year before the eruption of the successor), on-term (edentation occurred during permutation time);
- type of space maintainer, using Proffit's recommendation (Fig. 1).

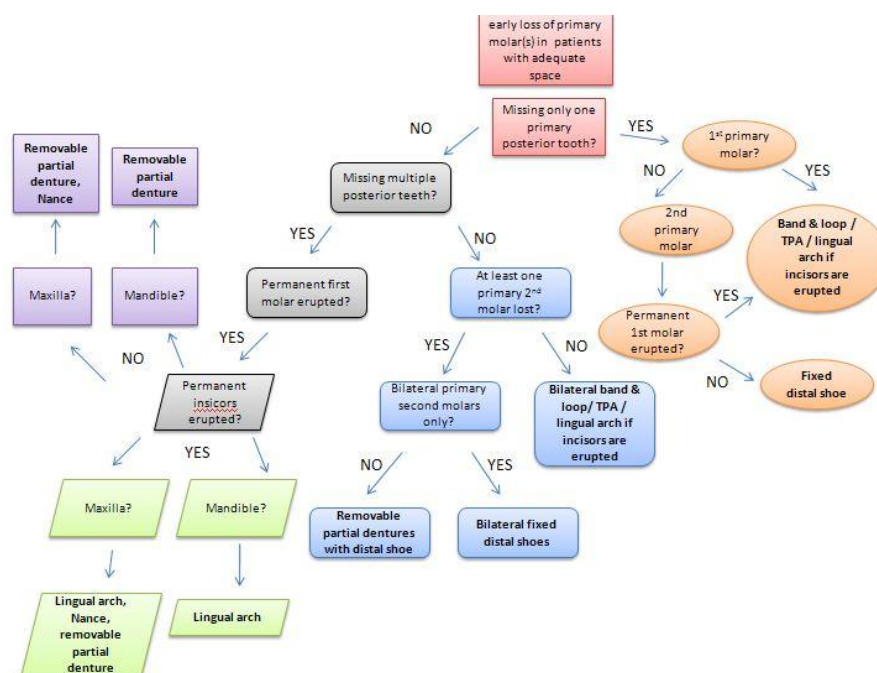


Figure 1. Space maintainer treatment planning (Proffit, 2000) [21]

The data base and statistical analysis was performed using Stata 11IC version 2009 (StataCorp, Texas, USA). For statistical interpretation kappa, Pearson's chi-square, Anova, t-test, Bonferroni, linear regression were used, with significance level set below 5%. Presentation of the results was performed by graphs in Microsoft Excel.

RESULTS

Space maintainer need

The overall patients with space maintainer treatment need was 40,98%.

Boys represented 56% (n=84) of patients requiring a space maintainer. The age distribution of the patients was as follow: 70% (n=15) patients aged between 8 and 10 years, 23,3% (n=35) smaller then 8 years, 6,7% (n=10) aged 11-12 years.

Consequences of deciduous teeth precocious extractions occurred on all patients (100%, n = 150), 41,3% (n= 62) of them required a space maintainer for lower arch, 39,3% (n=59) for upper arch and 19,3% (n = 29) for both arches, gender difference being statistically significant (ANOVA, F = 5.445, p =.021). The average number of teeth early extracted was 1 ± 0.978 / patient (minimum: 1 tooth/patient, maximum: 9 teeth/patient).

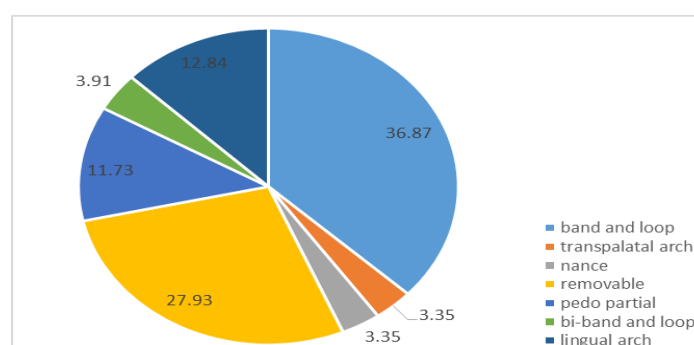


Figure 2. Space maintainer treatment need - recommended type (%)

Referring to the type of space maintainer, band&loop (36,87%, n=66) was the most indicated, followed by removable prosthesis (27,93%, n = 50) and lingual arch (12,84%, n =

12.84) (Fig. 2). Band and loop was the most indicated space maintainers for both boys (38,9%, n=35 - Pearson Chi2 14,812, p=.011) and girls (34,6%, n=31 - Pearson Chi2 14,812, p=.011), for both maxilla (31,4%) and mandible (39,4%) (Fig. 3).

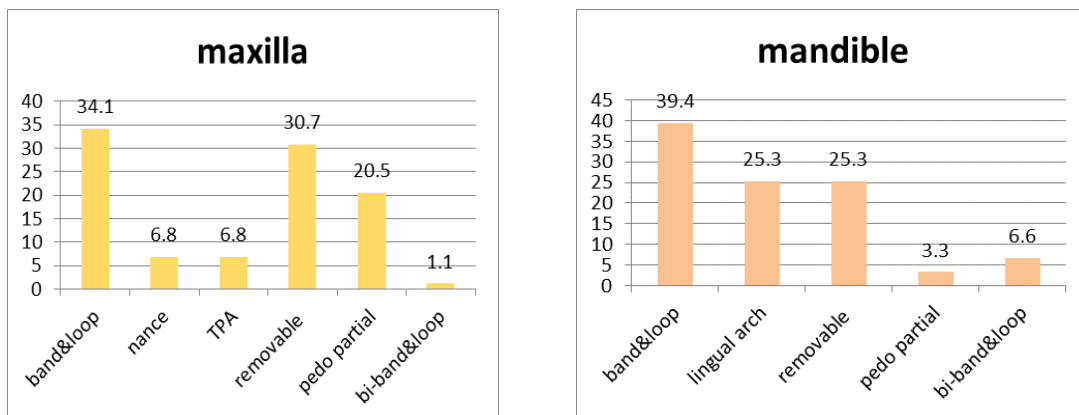


Figure 3. Space maintainer treatment need depending on the dental arch (%)

Frequency and consequences of premature loss of deciduous teeth

The overall primary teeth with space maintainer treatment need was 61,55%.

Edentulous spaces were more frequently localized in the posterior part of the arches (58,5%, n = 148), on the right side (55,4%, n=140), at mandible (57,4%, n = 145).

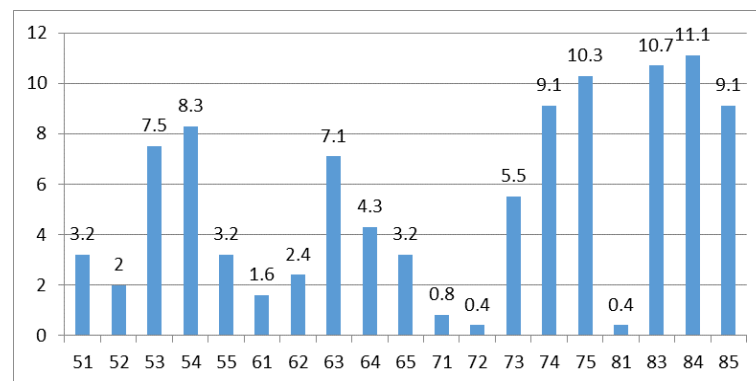


Figure 4. Distribution of the edentulous spaces with space maintainer treatment need

Distribution of the extracted teeth was: lower first molars (20,2%, n = 51), lower second molars (19,4%, n = 49), lower canines (16,2%, n = 40), upper canines (14,6%, n = 36), upper first molars (12,6%, n = 32), upper second molars (6,3%, n = 16), upper central incisors (4,8%, n = 12), upper lateral incisors (4,4%, n = 11), lower central incisors (1,2%, n = 3), lower lateral incisors (0,4%, n = 1) (Fig. 4).

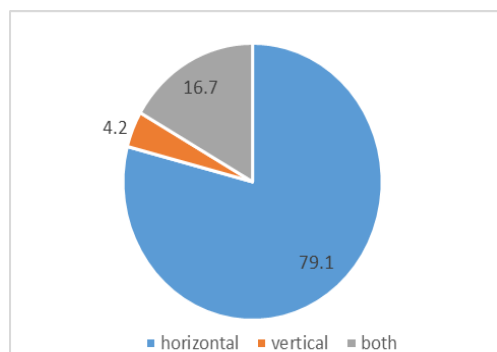


Figure 5a. Spatial consequences of early loss of deciduous teeth

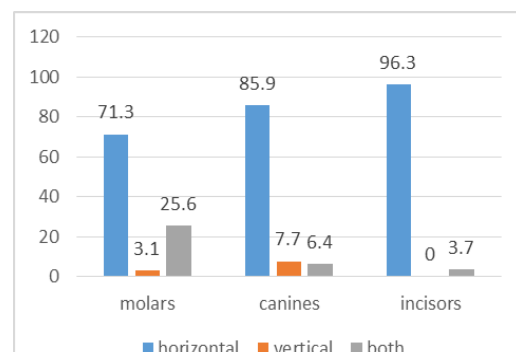


Figure 5b. Spatial consequences of early loss of deciduous teeth - by groups of teeth

Spatial consequences had been identified in 92,49% (n = 234) of the edentulous spaces, both horizontally and vertically, being statistically significant associated with teeth' topography (Pearson Chi2 = 52.3, p =.000) (Fig. 5 a, b).

Analyzing the *horizontal space*, 88,5% (n=224) of the edentulous sites presented reduced space. The most affected teeth were lower second molars (18,3%, n = 41), followed by lower first molars (17%, n = 38), upper first molars (13,39%, n = 30), upper canines (16,1%, n = 36), lower canines (16,1%, n = 36), upper second molars (7,14%, n = 16), upper central incisors (5,35%, n = 12), upper lateral incisors (4,91%, n = 11), lower central incisors (1,33%, n = 3), lower lateral incisors (0,44%, n = 1) (Pearson Chi2 = 58.429, p =.000). Reduction with 0,1-1 mm was found in 21% (n = 47) of edentulous spaces, the difference between teeth' groups being statistically significant (ANOVA, F = 10.5, p =.000) (Fig. 6).

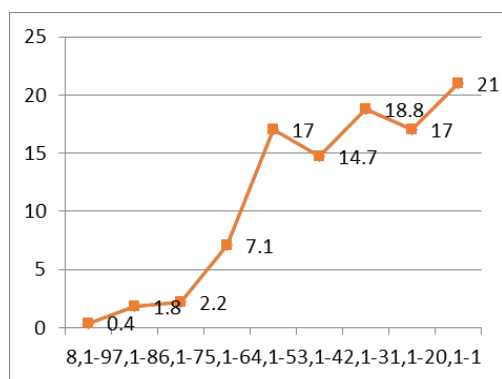


Figure 6. Horizontally space reduction (%)

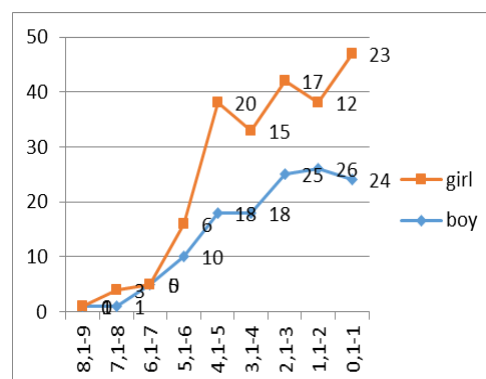


Figure 8a. Horizontally space reduction - by gender

Analyzing the *vertical space*, 19,4% (n=49) of the edentulous sites presented reduced space, 63,3% (n=31) as egresions, 36,7% (n=18) as extrusions. Girls were more often affected (53,01%, n=26, p>.005) than boys. The most affected teeth were lower second molars (42,85%, n = 21), followed by lower first molars (26,5%, n = 13), lower canines (16,3%, n = 8), upper canines (6,1%, n = 3) upper second molars (4,1%, n = 2), upper first molars (2%, n = 1), upper lateral incisors (2%, n = 1) (p>.005). Reduced space with 0.1-1 mm was found in 49% (n = 24) of cases (Fig. 7).

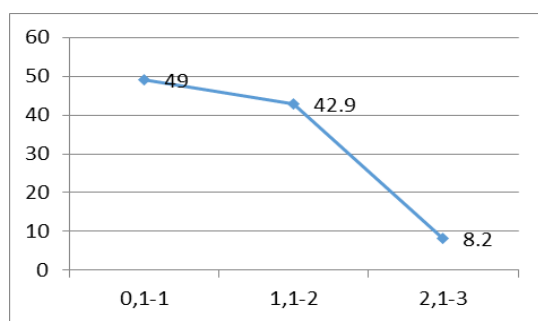


Figure 7. Vertically space reduction (%)

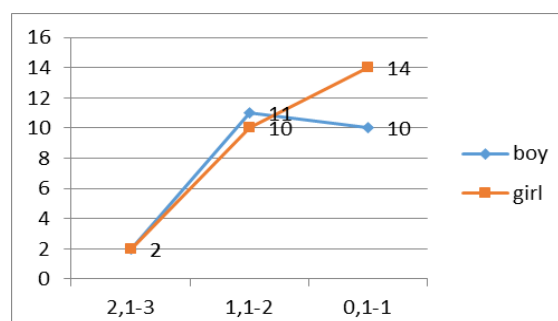


Figure 8b. Vertically space reduction - by gender

In boys, more frequently the edentulous spaces were reduced with 1,1-2 mm (20,31%, n = 26 horizontally, 23,95%, n=23 vertically) compared with girls, where the most frequent reduction was of 0,1-1 mm (23,95%, n = 23 horizontally, 20,31%, n=26 vertically) (Pearson Chi2 = 15.411, p =.7 horizontally, p=.7 vertically) (Figure 8 a,b).

DISCUSSIONS

Precocious edentations and therefore, space maintainers requirements, were identified in 41% of subjects, in agreement with data obtained by Beldiman et al. (41,6% - Iasi), in

disagreement with other authors: 6,2% in Bulgarian children aged 7 to 14 years, 9,28% in Brazil, 16,5-25,6 % in Saudi Arabia (Hammad, 2011), 16,5% in India [1,4,5].

No similar studies, analyzing space maintainers needs, were found in the literature.

According to Linjawi, 75,2% of children with precocious deciduous teeth extractions, didn't received space maintainers [12], while Hammad points out that 3,8% of patients with early edentations received space maintainers, for molars only [3]. Andreeava highlights that only 8% of the dentists recommend space maintainers.

Regarding the type of space maintainer, band & loop (36,87%) was the most recommended space maintainer, similar to Andreeava (33%) and Hammad (50%) [3, 4]. Similar with Andreeava (31%), removable prosthesis was the second type of space maintainer (28%) indicated [4].

In this study, more than half of the subjects with precocious deciduous teeth (56%) were boys, similar to other studies (64,40% - Ahamen et al., 22,3% - Beldiman et al.) [5, 1]. Precocious extractions were more common in subjects aged between 8 and 10 years (70%), in agreement with Ahamed et al. who highlighted that subjects aged 8 years were the most affected [1].

Precocious edentations had been identified in more than half of the patients in lower (57,4%), posterior (58,5%), right (55%) part of the arches, as well as in studies conducted by Beldiman, Mehdi, Ahamed et al. [1,5,15].

Molars' edentations were recorded in 62% of patients, in disagreement with Pedersen et al. quoted by Petcu (45%) [20], Cavalcanti et al. (24,9%) [5], Kobylińska et al. (7,39%) [10] who obtained lower frequencies.

Lower molars were the most affected teeth (20%), in accordance with Martinez quoted by Beldiman (45,8%) [5] and Ahamed (60,36% - M1) [1], in disagreement with Hammad and Kobylińska [3,10] and Cerna et. al, who found upper molars (38,6%), respectively second maxillary molars (61,3%) [6] were more affected. The most affected tooth was 8.4 (11%), in agreement with Ahamed and Cavalcanti (16,82% and 22,3%) [1,5], in disagreement with Batista quoted by Beldiman, respectively Cerna et al., which highlights frequently edentations of 8.5 and 7.4 (37,7%) [5,15].

In this study, 31% of early extractions were affecting the canines, Ahamed et al and Hammad obtaining lower frequencies - 3,6% and respectively 5,8% [1, 3]. Early incisors' extractions represented 10,6%, value similar to Hammad (9,13%), but higher than Ahamed (6,3%) [1,3]. However, frontal teeth precocious edentations were rarer, in agreement with Andreeava [4].

In this study, 89% of the edentulous spaces presented horizontally reductions and 19% vertical reductions. Spatial changes were identified more frequently at second mandibular molar (18% horizontal, 43% vertical). Kronfeld quoted by Petcu et al demonstrated that 51% of first molars and 70% of second molars lost prematurely presented space reductions [19,20], Petcu also highlighted that reduced space is more frequent in cases of early loss of lower molars [19].

Spatial changes were recorded also at frontal teeth, 43% of canines presented significant horizontal reduction. In accordance, Borum and Andreasen quoted by Holan and Needleman highlighted that 2% of the edentations of anterior teeth showed dimensional changes [9], Hammad that 50% of prematurely lost canines showed mid line deviation [3], Miyamoto, Chung and Yee emphasized that premature loss of one or more deciduous canines increased orthodontic treatment necessary [16] and MacGregor quoted by Holan and Needleman recommends applying a space maintainer in cases of deciduous incisors extracted before canines' eruption [7]. In disagreement, Moss and Maccaro reported no space change in cases of early lost of incisors.

CONCLUSIONS

Space alterations were identified in 92% of edentations, as a consequence of premature teeth loss.

Although space maintainer treatment need was identified in 41% of patients, none of the patients received this treatment.

To reduce malocclusion appearance, parents' knowledge regarding consequences of premature deciduous teeth loss and space maintaining importance must be improved, but also practitioners' encouraged to apply preventive and curative treatment in cases of patients with primary teeth.

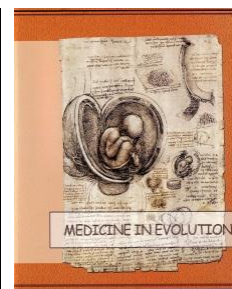
This study treats a subject with few information in the specialized literature, that can serve as a starting point for other researches.

REFERENCES

1. Ahamen S.S.S., Reddy V.N., Krishnakuman R., Mohan M.G., Sugumaran D.K., Rao. P. Prevalence of Early Loss of Primary Teeth in 5-10 year old School Children in Chidambaram Town. *Contemporary Clinical Dentistry*. 2012; 3(1): 27-30
2. AL-Dulayme D.A., AL-Khannaq M.R. Mandibular dental arch dimensional changes following prematurely lost deciduous molars. *Journal of Oral and Dental Research*. 2014; 2(1): 22-28
3. Al Hammad N.S. Space Maintainers Utilization by 6-7 years Old Girls in Riyadh Saudi Arabia. *J Pak Dent Assoc*. 2011; 20 (1): 23-28
4. Andreeava R., Arnautska H., Belcheva A. Awareness of the dental practitioners about the possibility to use space maintainers when premature temporary teeth extractions. *International Journal of Scientific and Research Publications*. 2015. 5(11): 194-196
5. Beldiman M.A., Maxim A., Bălan A. On The Frequency and Localization of Premature Loss of Temporary Teeth in Pre-school Children from the Urban Area of Iași. *Journal of Romanian Medical Dentistry*. 2010; 14(3): 234-238
6. Cavalcanti A.L., de Alencar C.R.B., Medeiros Bezerra P.K., Granville-Garcia A.F. Prevalence of Early Loss of Primary Molars in School Children in Campina Grande, Brazil. *Pakistan Oral & Dental Journal*. 28(1): 113-116
7. Cernei E.R., Maxim D.C., Zetu I.R. The Influence of Premature Loss of Temporary Upper Molars. *Rev Med Chir Soc Med Nat*. 2015; 8(1): 236-242
8. Chhabra N, Chhabra A. Parental knowledge, attitudes and cultural beliefs regarding oral health and dental care of preschool. *European Archives of Paediatric Dentistry*. 2012; 13(2):76-82
9. Holan G., Needleman H.L. Premature Loss of Primary Anterior Teeth due to Trauma – Potential Short and Long-Term Sequelae. *Dental Traumatology*. 2014; 30: 100-106.
10. Kobylińska A., Borawska J., Chojnowska A., Janczewska J., Turska-Szybka A., Olczak-Kowalczyk D. Frequency and causes of premature extractions of deciduous molar teeth – a retrospective study. *Nowa Stomatol* 2015; 20(1): 3-9
11. Laing E., Ashley P., Naini FB., Gill D.S. Space maintenance. *Int J Paediatr Dent*. 2009;19(3):155-162
12. Linjawi A.I., Alajlan S.A., Bahamman H.A., Alabbadi A.M., Bahammam M.A. Space Meintainers: Knowledge and Awareness among Saudi Adult Population. *Journal of International Oral Health*. 2016; 8(6): 733-738
13. Macena M.C.B., Katz C.R.T., Heimer M.V., de Oliveira e Silva J.F., Costa L.B.. Space changes after premature loss of deciduous molars among Brazilian children. *American Journal of Orthodontics and Dentofacial Orthopedics*. 2011; 140(6): 771-778
14. Matsuo G, Horowitz AM, Beck KH, Wang MQ, Kleinman DV. What Maryland Dentists Know and Do about Preventing Dental Caries in Children. *Journal of Theory and Practice of Dental Public Health*. 2014; 2(3): 9-18
15. Mehdi H., Lakhani M.J., Hassan S.H.U., Griffin M., Faizan S.M., Thobani A., Khan A.H. Pattern of Early Loss of Deciduous Molars. A cross-sectional study. *Pakistan Oral & Dental Journal*. 2013; 33(3): 502-504

16. Miyamoto W., Chung C.S., Yee P.K. Effect of Premature Loss of Deciduous Canines and Molars on Malocclusion of the Permanent Dentition. *J Dent Res.* 1976; 55(4): 584-590
17. Northway W.M., Wainright R.L., Demirjian A. Effects of Premature Loss of Deciduous Molars. *Tha Anghe Orthodontist.* 1984; 54(4): 295-329
18. Quaranta A, De Giglio O, Coretti C, Vaccaro S, Barbuti B, Strohmenger L. What do parents know about dental trauma among school-age children? A pilot study. *Ann Ig* 2014; 26: 443-446
19. Petcu A., Bălan A., Gavrilă L.M.V., Savin C. Assesment of the Consequences in Premature Loss of Temporary Lower Molars. *Rev Med Chir Soc Med Nat.* 2014; 4(3): 833-840
20. Petcu A., Bălan A., Haba D., Mârțu Ștefanache A.M., Savin C. Implications of Premature Loss of Primary Molars. *Pediatric Dentistry.* 2016; 6(2): 130-134
21. Proffit W. Contemporary orthodontics. 3rd edition. Mosby 2000; 421-423
22. Răducanu A.M. Pedodontie. *Îndrumar practic.* Ed. Bren, 2013; 252, 292, 293
23. Tatjana Tanić T., Blažej Z., Radojičić J. The Effects Of Early Loss Of Primary Lateral Teeth. *Facta Universitatis.* 2008; 15(2): 68 – 73
24. Tunison W., Flores-Mir C., El-Badrawy H., Nassar U., El-Bialy T. Dental Arch Space Changes Following Premature Loss of Primary First Molars: A Systematic Review. *Pediatric Dentistry.* 2008; 30(4): 297-302

Review of dental implant materials and surface treatments and their influence in different types of tissue integration



Iamandoiu A.V.

Division of Anatomy, Faculty of Dental Medicine, "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania

Correspondence to:

Name: Andrei Iamandoiu

Address: "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania

Phone: +40 721208033

E-mail address: andrei.v.i@gmail.com

Abstract

The goal of modern dentistry is to restore patient's oral health in a predictable way and dental implants have become a part of routine dentistry. Since the early 1970s, thanks to Prof Brånemark work, who observed that the titanium firmly attaches to the bone, the use of titanium-based dental implants in humans begun. Osseo integration or Osteo integration refers to a direct bone-to-metal interface without interposition of non-bone tissue. However, fibrosis or fibrous integration is not an uncommon result of the soft tissue repair surrounding the implant and may negatively affect the implant function. The rationale of this review is to evaluate the basic science work performed on the concept of implant Osseo integration, "Chondro-integration", Fibro integration, Epithelial integration and to discuss the specific factors that may lead to implant "Chondro-integration", Fibro integration, Epithelial integration instead of Osseo integration.

Keywords: dental implants; oral implants; Osseo integration; fibro integration.

INTRODUCTION

Osseo integration comes from the Greek 'osteon' meaning bone, and the Latin word 'integrare', meaning to make whole. Osseo integration is defined as a direct structural and functional connection between living bone and the surface of a load-bearing artificial implant but the definition: "Osseo integration is the formation of a direct interface between an implant and bone, without intervening soft tissue" is more complex and highlights better the need for the lack of soft tissue surrounding the implant. In the past, Osseo integrated intraosseous dental implants have been made in a variety of shapes, including hollow baskets, tripods, blades, disks, truncated cones, needles, cylinders, and screws.

IMPLANT BODY MATERIAL

Osseo integration comes from the Greek 'osteon' meaning bone, and the Latin word 'integrare', meaning to make whole. Osseo integration is defined as a direct structural and functional connection between living bone and the surface of a load-bearing artificial implant but the definition: "Osseo integration is the formation of a direct interface between an implant and bone, without intervening soft tissue" is more complex and highlights better the need for the lack of soft tissue surrounding the implant. In the past, Osseo integrated intraosseous dental implants have been made in a variety of shapes, including hollow baskets, tripods, blades, disks, truncated cones, needles, cylinders, and screws.

Implant body material

The materials used for the production of this implants were: Stainless steel, Cobalt base alloys, Titanium base alloys and latest material used with encouraging outcome, ceramic implants. Many of the materials used today in the production of dental implants were first developed and used in the orthopedics in making prostheses for heavily loaded joints such as the knee and hip. The first metal alloy developed specifically for human use was the "vanadium steel" but it was no longer used in implants because its corrosion resistance is inadequate after in vivo tests. Later, stainless steel was introduced and is still used for implant fabrication but not in dental field any more. This alloy has a very good resistance to chloride solutions and poor sensitization. The Cobalt base alloy has been used for many decades in dentistry. The implant has gained importance with the work of Professor Per Ingvar Brånemark, who inserted in rabbit and dog legs, stainless steel optical chambers to investigate the anatomy and physiology of tissue injury. In some specimens the structure of stainless steel was replaced by titanium structure. At the end of the experiments, Prof Brånemark observed that the titanium chamber was firmly attached to the bone (Branemark and Breine, 1964). In fact, the titanium chamber couldn't be removed from the surrounding bone once it had healed. Histological studies showed complete integration of titanium with the bone and after this observation, Brånemark developed a new concept of Osseo integration. Despite the benefits and successes the use of implants is not without risk of adverse effects. Titanium implants generally develop an oxide layer which allows it to integrate with living bone tissue as demonstrated above but sometimes, the body can have adverse reactions to titanium like fibrosis and inflammation which may affect its long term functional performance (Branemark et al., 2001).

Commercially pure titanium and titanium alloy

After the latest classifications, there are six principal distinct types of titanium available as implant biomaterials. Amongst these six materials, there are four grades of commercially pure titanium and two titanium alloys. The commercially pure titanium materials are called pure Grade I, Grade II, Grade III and Grade IV titanium. The two alloys are Ti-6Al-4V (Grade V) and Ti-6Al-4V-ELI (Grade XXIII).

Ceramic implants

In the beginning, ceramics were first introduced to implant dentistry in the form of coatings onto metal-based implants to improve Osseo integration. In the last years, different type of ceramic coatings have been used for the treatment of dental implants surfaces. There were used both inert ceramics, including aluminum oxide and zirconium oxide and bioactive ceramics, such as calcium phosphates and bio glasses. Coatings can be dense or porous, with a thickness ranging from 1 to 100 μm , depending on the coating method that is used. Different methods to coat metal implants comprise plasma spraying, sputter-deposition, sol-gel coating, electrophoretic deposition or biomimetic precipitation ([Lacefield, 1998](#)). Bioactive ceramics have been shown to release calcium phosphate ions around the implants, resulting in enhanced bone apposition compared with the more inert ceramic and metallic surfaces ([Lacefield, 1998](#)). With the development of biomaterials science and industrial technology, interest in ceramics for dental application has grown and ceramics, in specially the yttrium-stabilized tetragonal polycrystalline Zirconia (Y-TZP), exhibit improved mechanical properties that make them suitable substrates for the fabrication of dental implants ([Kohal et al., 2008](#)).

Osseo integration

The desired outcome of dental implants is osseointegration but unfortunately there are two types of not desired implant-tissue responses ([Rossi et al., 2008](#), [Migirov et al., 2011](#)). The first type is the response of the hosts tissues to the toxicity of the implanted material. The second response which is the most common is the formation of a non-adherent fibrous capsule between the implant and the hosts' tissues termed fibrosis leading to the fibrointegration of dental implants. This is a natural response to protect the body from a foreign object which may eventually lead to complete fibrous encapsulation ([Suska et al., 2008](#)). Typically implants are intended to stay fixed in the human body for a long time and bone is expected to grow on the surface of the implant. Unfortunately this does not always happen. Fibrosis referred to as foreign body reaction, develops in response to almost all implanted biomaterials and consists of overlapping phases similar to those in wound healing and tissue repair processes([Kyriakides et al., 2001](#)). Despite the biocompatibility of metallic implants used, titanium materials are generally encapsulated by fibrous tissue after implantation into the living body([Nebe et al., 2008](#)). It has been suggested that osteoblastic cells adhere more quickly to rough surfaces of titanium than to smooth surfaces ([Puleo and Bizios, 1992](#), [Puleo and Bizios, 1992](#)). In the adult, the osteoblast is derived from a bone marrow stromal fibroblastic

stem cell termed the mesenchymal stem cell (MSC), a non-hematopoietic multipotent stem-like cell vital for the osteogenic process and capable of differentiating into both osteoblastic and non-osteoblastic lineages ([Zhang et al., 2012](#)).

Implant surface and the "chondro-integration"

There is also another hypothesis regarding the chondrointegration of dental implants, that was highlighted in the literature regarding the environment of placed implants. It is already known that during the production of dental implants in the presence of oxygen, the titanium oxidates forming a layer of TiO_2 , and the Titanium implant continues to be oxidized after surgical placement in the bone. The hypothesis is that the oxygen level of the microenvironment near the Ti surface may be depleted, thus potentially creating a hypoxic zone ([Nishimura, 2013](#)). It is well established that a hypoxic environment can induce chondrogenic differentiation as indicated by the expression of the chondrogenic transcription factor Sox9 and cartilage-related ECM molecules ([Kanichai et al., 2008](#), [Adesida et al., 2012](#)). But taking in consideration that Titanium can form an oxide layer 10 angstroms thick in a millisecond and 100 angstroms in a minute and the fact that Titanium reacts with oxygen electrochemically rapidly in the presence of water to form a fine oxide layer of TiO_2 that prevents further oxidation ([Anusavice, 2003](#); [Jones, D.A. 1996](#)). In the passivated state, TiO_2

biomaterials generally corrode less than 20 $\mu\text{m}/\text{year}$ (Gittens et al., 2011). Also the TiO_2 surface layer protects titanium under normal biologic conditions to regenerate if removed by reactive Be corrosion equilibrium products as passivation barrier formation and confers high corrosion resistance. Due to this facts the chondro-integration can't be named as an independent entity like osseointegration or fibrointegration of dental implants.

Implant surface and the fibro integration

Fibro integration of implants can be defined as the presence of a layer of fibrous connective tissue intervening between an implant and the adjacent bone. The "fibro integration" concept is that there is a soft tissue interface surrounding an implant or a dense collagen tissue between implant and bone, whereas the term Osseo integration in optical microscopy analysis refers to the physical contact between new bone and the implant, without the interposition of connective tissue. Even though if placed in fresh extraction sockets or neo-alveolas, beeing allowed to permanently penetrate the gingiva and skin the dental implant caused no adverse tissue effects an intact bone-implant interface was analyzed by TEM, revealing a direct bone-to implant interface contact suggesting the possibility of a direct chemical bonding between bone and titanium (Albrektsson et al., 1981). Before this studies done in the 80s by Prof Branemark, in the 70s, other studies concluded that when a metal implant is placed into the will always develop a layer of fibrous tissue around it which subsequently will never be as secure in the bone as it was at the time it was implanted (Southam et al 1970). Later some researchers believe that a direct contact between implant and bone is possible only if the implant is a ceramic and not if it is a metal (Muster and Champy, 1978). Taking in consideration that in fact the surface of titanium becomes instantaneously coated with an oxide layer of of about 100 Å thickness during the fabrication of the implant. This means in fact that titanium as an implant material may be regarded as a ceramic, not as a metal (Albrektsson et al., 1981).

Implant surface and epithelio integration. Preventing the migration of epithelial cells on the implant

Both the surgical and restorative advantages of immediately placing dental implants in fresh extraction sockets have been debated by a large number of researchers (Becker et al., 1998, Gelb, 1993, Schwartz-Arad and Chaushu, 1997, Nyman et al., 1990), and Osseo integration was achieved and demonstrated in these situations (Araujo et al., 2006, Kohal et al., 1997, Gotfredsen et al., 1993, Karabuda et al., 1999, Becker et al., 1991). To place the implant immediately after extraction into the fresh socket can be considered more efficient regarding the less invasive surgical technique then the classic approach where multiple surgeries were needed in order to conserve the amount of bone during the initial healing process. Sometimes, the immediate implant placement procedure can be limited by the dimensions of the fresh extraction socket that may be greater than the diameter of a regular implant, which at many times results in the presence of a substantial gap between the implant and the socket walls (Botticelli et al., 2003), and also different shapes of the fresh socket. This can conduct to the resorption of the buccal bone wall (Araujo et al., 2005). Healing of a wide marginal defect around an implant is characterized by appositional bone growth from the lateral and apical bone walls of the defect (Botticelli et al., 2003). There were some studies involving the possibility to overcome this problems of bone resorption by using a conical and wider implant minimizing this way the gap between the implant and the bone (Romanos, 2009, Carlsson et al., 1988). It has been suggested that full regeneration of the bone is difficult, since it seems that alveolar bone resorption is unavoidable if no other bone conservation techniques are used, regardless of the type, shape and volume of the implant placed (Sanz et al., 2010). The peri-implant junctional epithelium may reach a greater final length under certain conditions such as implants placed into fresh extraction sockets versus conventional implant procedures in healed sites (Sculean et al., 2014). Therefore, the use of a membrane material can create a contained atmosphere to exclude deep soft tissue invasion and sustain

blood clots in place for maturation without Infiltration of epithelial cells and can allow the time for bone forming, and simultaneously promote Osseo integration (Caneva et al., 2010, Bassett et al., 1956, Lekovic et al., 1998, Jimbo et al., 2012)

The biological seal around implants

The soft tissue, so blamed till now for interfering with the Osseo integration show its importance in acting as biological seal around the implants and maintaining exactly the so needed Osseo integration (Abrahamsson et al., 1996, Albrektsson and Wennerberg, 2004, Albrektsson and Wennerberg, 2004, Berglundh et al., 1991, Berglundh et al., 1994). So, it was concluded that the success of long-term Osseo integrated implants depends on the adherence of the epithelium and of the connective tissue to the titanium surface, protecting the osseous tissue against microorganism from the oral cavity, and this adherence depends on the topography and chemical composition of the biomaterial (Weber et al., 1992). The epithelial cells can adhere to the implant surface and establish a barrier that has common characteristics with the junctional epithelium of the tooth (Spray et al., 2000). In the case of teeth, transseptal collagen fibers are inserted into the root surface in a cellular cement, forming bundles of fibers that attach the tooth gingival complex, preventing the apical migration. In the case of implants, connective tissue is also present but is not inserted directly on the surface of the implant. In relation to connective tissue, the main difference between the implant and the tooth is given by the orientation of the collagen fibers underneath the epithelial attachment. The supracrestal gingival tissue has a perpendicular orientation to the tooth surface while the peri-implant tissues have their collagen fibrils oriented parallel to the implant surface, forming a ring around it. In the case of teeth, there is an insertion of collagen fibers while there is no binding to the implants (Berglundh et al., 1991). This interaction between the tissue and the titanium implant surface is essential, as in teeth, to inhibit the apical migration of the junctional epithelial (Berglundh and Lindhe, 1996). Thus, the attachment of the soft connective tissue to the transmucosal portion of an implant is regarded as being weaker than soft connective tissue attachment to the surface of a tooth root (Sculean et al., 2014). This peri-implant junctional epithelium terminates 2 mm apical to the coronal soft tissue margin and 1.0–1.5 mm coronal from the peri-implant bone crest. Thus, the mean biological width (including the sulcus depth) was 3.80 mm around implants and 3.17 mm around teeth (Sculean et al., 2014). With no Influence of material on collagen fibre orientation on the surface of implant (Tete et al., 2009).

REFERENCES

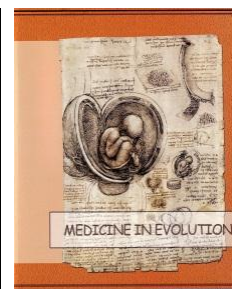
1. Branemark PI, Breine U. Formation of Bone Marrow in Isolated Segment of Rib Periosteum in Rabbit and Dog. *Blut.* 1964;10:236-52.
2. Branemark R, Branemark PI, Rydevik B, Myers RR. Osseointegration in skeletal reconstruction and rehabilitation: a review. *J Rehabil Res Dev.* 2001;38(2):175-81.
3. Lacefield WR. Current status of ceramic coatings for dental implants. *Implant Dent.* 1998;7(4):315-22.
4. Kohal RJ, Att W, Bachle M, Butz F. Ceramic abutments and ceramic oral implants. An update. *Periodontol 2000.* 2008;47:224-43.
5. Rossi S, Tirri T, Paldan H, Kuntsi-Vaattovaara H, Tulamo R, Narhi T. Peri-implant tissue response to TiO₂ surface modified implants. *Clin Oral Implants Res.* 2008;19(4):348-55.
6. Migirov L, Kronenberg J, Volkov A. Local tissue response to cochlear implant device housings. *Otol Neurotol.* 2011;32(1):55-7.
7. Suska F, Emanuelsson L, Johansson A, Tengvall P, Thomsen P. Fibrous capsule formation around titanium and copper. *J Biomed Mater Res A.* 2008;85(4):888-96.
8. Kyriakides TR, Hartzel T, Huynh G, Bornstein P. Regulation of angiogenesis and matrix remodeling by localized, matrix-mediated antisense gene delivery. *Mol Ther.* 2001;3(6):842-9.

9. Nebe JB, Muller L, Luthen F, Ewald A, Bergemann C, Conforto E, Muller FA. Osteoblast response to biomimetically altered titanium surfaces. *Acta Biomater.* 2008;4(6):1985-95.
10. Puleo DA, Bizios R. Mechanisms of fibronectin-mediated attachment of osteoblasts to substrates in vitro. *Bone Miner.* 1992;18(3):215-26.
11. Puleo DA, Bizios R. Formation of focal contacts by osteoblasts cultured on orthopedic biomaterials. *J Biomed Mater Res.* 1992;26(3):291-301.
12. Zhang Y, Khan D, Delling J, Tobiasch E. Mechanisms underlying the osteo- and adipogenic differentiation of human mesenchymal stem cells. *ScientificWorldJournal.* 2012;2012:793823.
13. Nishimura I. Genetic networks in osseointegration. *J Dent Res.* 2013;92(12 Suppl):109S-18S.
14. Kanichai M, Ferguson D, Prendergast PJ, Campbell VA. Hypoxia promotes chondrogenesis in rat mesenchymal stem cells: a role for AKT and hypoxia-inducible factor (HIF)-1 α . *J Cell Physiol.* 2008;216(3):708-15.
15. Adesida AB, Mulet-Sierra A, Jomha NM. Hypoxia mediated isolation and expansion enhances the chondrogenic capacity of bone marrow mesenchymal stromal cells. *Stem Cell Res Ther.* 2012;3(2):9.
16. Gittens RA, Olivares-Navarrete R, Tannenbaum R, Boyan BD, Schwartz Z. Electrical implications of corrosion for osseointegration of titanium implants. *J Dent Res.* 2011;90(12):1389-97.
17. Albrektsson T, Branemark PI, Hansson HA, Lindstrom J. Osseointegrated titanium implants. Requirements for ensuring a long-lasting, direct bone-to-implant anchorage in man. *Acta Orthop Scand.* 1981;52(2):155-70.
18. Muster D, Champy M. [Problem of bone-biomaterial interface]. *Actual Odontostomatol (Paris).* 1978(121):109-24.
19. Becker BE, Becker W, Ricci A, Geurs N. A prospective clinical trial of endosseous screw-shaped implants placed at the time of tooth extraction without augmentation. *J Periodontol.* 1998;69(8):920-6.
20. Gelb DA. Immediate implant surgery: three-year retrospective evaluation of 50 consecutive cases. *Int J Oral Maxillofac Implants.* 1993;8(4):388-99.
21. Schwartz-Arad D, Chaushu G. Placement of implants into fresh extraction sites: 4 to 7 years retrospective evaluation of 95 immediate implants. *J Periodontol.* 1997;68(11):1110-6.
22. Nyman S, Lang NP, Buser D, Bragger U. Bone regeneration adjacent to titanium dental implants using guided tissue regeneration: a report of two cases. *Int J Oral Maxillofac Implants.* 1990;5(1):9-14.
23. Araujo MG, Sukekava F, Wennstrom JL, Lindhe J. Tissue modeling following implant placement in fresh extraction sockets. *Clin Oral Implants Res.* 2006;17(6):615-24.
24. Kohal RJ, Hurzeler MB, Mota LF, Klaus G, Caffesse RG, Strub JR. Custom-made root analogue titanium implants placed into extraction sockets. An experimental study in monkeys. *Clin Oral Implants Res.* 1997;8(5):386-92.
25. Gottfredsen K, Nimb L, Buser D, Hjorting-Hansen E. Evaluation of guided bone generation around implants placed into fresh extraction sockets: an experimental study in dogs. *J Oral Maxillofac Surg.* 1993;51(8):879-84; discussion 85-6.
26. Karabuda C, Sandalli P, Yalcin S, Steflik DE, Parr GR. Histologic and histomorphometric comparison of immediately placed hydroxyapatite-coated and titanium plasma-sprayed implants: a pilot study in dogs. *Int J Oral Maxillofac Implants.* 1999;14(4):510-5.
27. Becker W, Becker BE, Handelsman M, Ochsenein C, Albrektsson T. Guided tissue regeneration for implants placed into extraction sockets: a study in dogs. *J Periodontol.* 1991;62(11):703-9.
28. Botticelli D, Berglundh T, Buser D, Lindhe J. The jumping distance revisited: An experimental study in the dog. *Clin Oral Implants Res.* 2003;14(1):35-42.
29. Araujo MG, Sukekava F, Wennstrom JL, Lindhe J. Ridge alterations following implant placement in fresh extraction sockets: an experimental study in the dog. *J Clin Periodontol.* 2005;32(6):645-52.
30. Botticelli D, Berglundh T, Buser D, Lindhe J. Appositional bone formation in marginal defects at implants. *Clin Oral Implants Res.* 2003;14(1):1-9.
31. Romanos GE. Bone quality and the immediate loading of implants-critical aspects based on literature, research, and clinical experience. *Implant Dent.* 2009;18(3):203-9.
32. Carlsson L, Rostlund T, Albrektsson B, Albrektsson T. Implant fixation improved by close fit. Cylindrical implant-bone interface studied in rabbits. *Acta Orthop Scand.* 1988;59(3):272-5.

33. Sanz M, Cecchinato D, Ferrus J, Pjetursson EB, Lang NP, Lindhe J. A prospective, randomized-controlled clinical trial to evaluate bone preservation using implants with different geometry placed into extraction sockets in the maxilla. *Clin Oral Implants Res.* 2010;21(1):13-21.
34. Sculean A, Gruber R, Bosshardt DD. Soft tissue wound healing around teeth and dental implants. *J Clin Periodontol.* 2014;41 Suppl 15:S6-22.
35. Caneva M, Botticelli D, Salata LA, Scombatti Souza SL, Carvalho Cardoso L, Lang NP. Collagen membranes at immediate implants: a histomorphometric study in dogs. *Clin Oral Implants Res.* 2010;21(9):891-7.
36. Bassett CA, Campbell JB, Girado JM, Rossi JP, Seymour RJ. Application of monomolecular filter tubes in bridging gaps in peripheral nerves and for prevention of neuroma formation; a preliminary report. *J Neurosurg.* 1956;13(6):635-7.
37. Lekovic V, Camargo PM, Klokkevold PR, Weinlaender M, Kenney EB, Dimitrijevic B, Nedic M. Preservation of alveolar bone in extraction sockets using bioabsorbable membranes. *J Periodontol.* 1998;69(9):1044-9.
38. Jimbo R, Marin C, Witek L, Suzuki M, Tovar N, Chesnoiu-Matei I, Dragan IF, Coelho PG. Bone Morphometric Evaluation around Immediately Placed Implants Covered with Porcine-Derived Pericardium Membrane: An Experimental Study in Dogs. *Int J Biomater.* 2012;2012:279167.
39. Abrahamsson I, Berglundh T, Wennstrom J, Lindhe J. The peri-implant hard and soft tissues at different implant systems. A comparative study in the dog. *Clin Oral Implants Res.* 1996;7(3):212-9.
40. Albrektsson T, Wennerberg A. Oral implant surfaces: Part 2--review focusing on clinical knowledge of different surfaces. *Int J Prosthodont.* 2004;17(5):544-64.
41. Albrektsson T, Wennerberg A. Oral implant surfaces: Part 1--review focusing on topographic and chemical properties of different surfaces and in vivo responses to them. *Int J Prosthodont.* 2004;17(5):536-43.
42. Berglundh T, Lindhe J, Ericsson I, Marinello CP, Liljenberg B, Thomsen P. The soft tissue barrier at implants and teeth. *Clin Oral Implants Res.* 1991;2(2):81-90.
43. Berglundh T, Lindhe J, Jonsson K, Ericsson I. The topography of the vascular systems in the periodontal and peri-implant tissues in the dog. *J Clin Periodontol.* 1994;21(3):189-93.
44. Weber HP, Buser D, Fiorellini JP, Williams RC. Radiographic evaluation of crestal bone levels adjacent to nonsubmerged titanium implants. *Clin Oral Implants Res.* 1992;3(4):181-8.
45. Spray JR, Black CG, Morris HF, Ochi S. The influence of bone thickness on facial marginal bone response: stage 1 placement through stage 2 uncovering. *Ann Periodontol.* 2000;5(1):119-28.
46. Berglundh T, Lindhe J. Dimension of the periimplant mucosa. Biological width revisited. *J Clin Periodontol.* 1996;23(10):971-3.
47. Tete S, Mastrangelo F, Bianchi A, Zizzari V, Scarano A. Collagen fiber orientation around machined titanium and zirconia dental implant necks: an animal study. *Int J Oral Maxillofac Implants.* 2009;24(1):52-8.

Management of mandibular crowding by expansion- Is it a viable option?

Clinical observations



Mesaroş A.Ş.¹, Matichescu A.², Munteanu A.³, Costea C.³, Mesaroş M.³

¹Department of Dental Propaedeutics and Aesthetics, Faculty of Dental Medicine, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

²Department of Preventive Dentistry, Faculty of Dental Medicine, "Victor Babes" University of Medicine and Pharmacy, Timisoara, Romania

³Department of Paediatric Dentistry, Faculty of Dental Medicine, "Iuliu Hatieganu" University of Medicine and Pharmacy, Cluj-Napoca, Romania

Correspondence to:

Name: Anca -Stefania Mesaroş

Address: Department of Dental Propaedeutics and Aesthetics, Faculty of Dental Medicine, "Iuliu Hatieganu" University of Medicine and Pharmacy, Marinescu 23 Street, 3rd floor, Cluj-Napoca, Romania

Phone: +40 723568822

E-mail address: mesaros.anca@umfcluj.ro

Abstract

Orthodontic treatment goals are different for patients and orthodontists. While the first think more in terms of tooth alignment the others have a more complete agenda, addressing also stability. Mandibular crowding has always been a topic for debate regarding its treatment. The present study analyses factors and limits that influence the treatment of mandibular crowding from a clinical point of view. An observational study on 30 patients was developed and conducted. It was found that the treatment options employed varied according to tooth movement limits. Limits were also found to be in accordance with skeletal facial patterns and mandibular morphological characteristics. While mandibular expansion is a common treatment option for managing and correcting mandibular crowding it should be employed carefully due to increased periodontal and relapse risks.

Keywords: Orthodontic Treatment, Mandibular Crowding, Stability, Expansion

INTRODUCTION

In every orthodontic treatment done, there are two types of goals involved. First there are the goals set up by patients and mostly coincide with their expectations. Usually these are represented by the fixing of the chief complaint which determined the patient to seek an orthodontic specialist (alignment of teeth in order to fix smile esthetics, space closure, etc.) The other type of goals are the ones set up by the orthodontist after a thorough assessment of the case and are more complex than patients' expectations.

If for the first category the most common are aligning teeth and re-establishing esthetics of the smile, for the second category goals are more precise due to specific orthodontic training and addressing also functional aspects, periodontal health, stability of desired results and airway volume improvement.

Teeth alignment and achievement of all orthodontic goals are usually linked to the alveolar space offer (1). While some orthodontic philosophies emphasize the importance of the setting of the upper central incisors in the facial pattern(2), others focus on the limitations offered by the mandibular alveolar process and the importance of respecting these boundaries.(3) The differences in morpho-physiological characteristics between the maxilla and the mandible make the mandibular crowding more difficult to treat.



Figure 1. Differences between patients' and orthodontists' goals

Aim and Objectives

The present study wishes to determine what are the factors influencing tooth movement and tooth positioning in the mandibular arch and where are the limits.

MATERIALS AND METHODS

An observational study of the morphology of the mandible and focused on the alveolar process was done in correlation with different facial types. Radiological records of orthodontic patients with complex pathology that required CBCT investigations were analyzed and measured to find correlations between mandibular bone morphology and treatment limitations. Measurement of bone density of the alveolar process, thickness of the cortical bone, height and width of alveolar process and of dental roots was considered.

The study was done on 30 consecutive patients for which CBCT was indicated due to complex pathology but also presented mandibular crowding. Thorough clinical and para-

clinical analysis were performed. Measurements on models, CBCT images and intraorally allowed to study the limits of mandibular expansion. The methods through which the mandibular crowding was resolved in the cases that benefitted from orthodontic treatment, as well as the stability of the achieved result was also monitored.

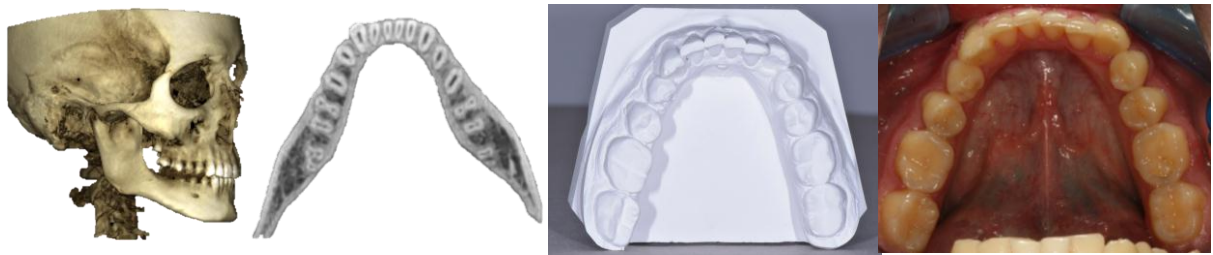


Figure 2-5. Documents analyzed for each patient (Tele-radiographic measurements on CBCT images to establish facial pattern, CBCT images for mandibular measurements of cortical bone, Stone model for dental analysis, intra-oral images for clinical assessment)

RESULTS

There were significant clinical differences found between different facial typologies and alveolar bone characteristics for the studied population. It was found that there are more treatment limitations in terms of tooth movement in the hyper-divergent people than in hypo-divergent and normo-divergent ones due to mandibular morphological characteristics.

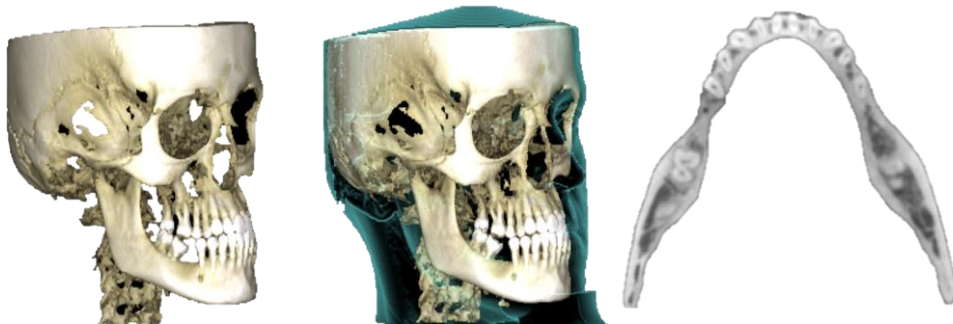


Figure 6-8. Example 1- Case with Angle Class III malocclusion, hyper-divergent facial pattern, narrow mandibular alveolar process, very thin cortical bone, dento-alveolar compensations present, low level of tooth implantation in the alveolar bone due to bone resorption



Figure 9-11. Example 2 - Case with Angle Class II malocclusion, hypo divergent facial pattern, normal mandibular alveolar process, normal to thick cortical bone, light dento-alveolar compensations, normal level of tooth implantation in the alveolar bone.



Figure 12-14. Example 3- Case with Angle Class II malocclusion, normo-divergent facial pattern (Hyper-divergent tendency), normal to narrow mandibular alveolar process, thin cortical bone, no dento-alveolar compensations, normal level of tooth implantation in the alveolar bone

Orthodontic treatments performed in order to align the mandibular arches for the 30 patients were as follows:

- Expansion by correcting the lateral torque with regular oversized buccal arch (in adolescents and adults) -12 cases
- Extractions to create space for aligning (in adolescents and adults) - 8 cases
- Mandibular lingual expanding arch (in adolescents and adults) -6 cases
- Rapid mandibular expansion with corticotomies (in adults) -2 cases
- Mandibular midline distraction (in adults)-2 cases

In follow-up sessions after the end of the treatment, it was observed that the stability of the results was better for the extraction cases and for the cases that used the mandibular expanding arch in growing adolescents together with functional therapy to counteract the muscle imbalance.



Figure 15-16. Example of case with mandibular first bicuspid extractions and no expansion

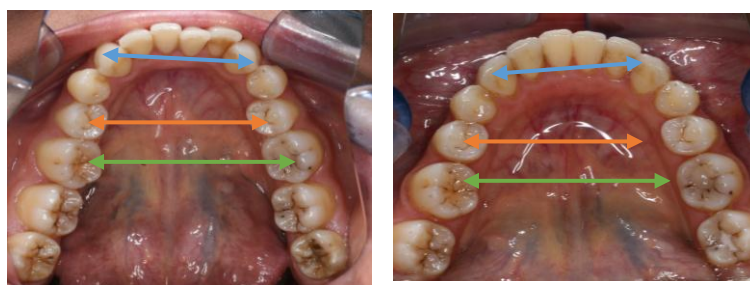


Figure 17-18. Example of case with mandibular expansion with lingual arch and extraction of wisdom teeth

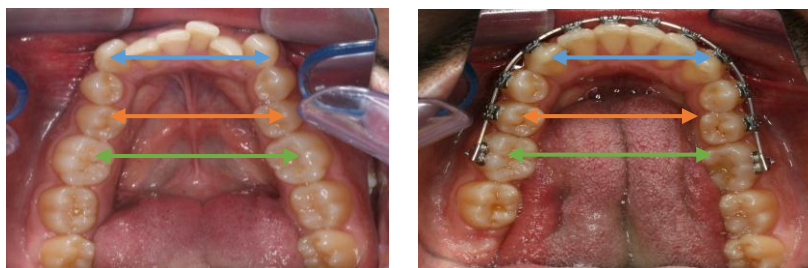


Figure 19-20. Example of case with mandibular expansion with regular oversized buccal arch

DISCUSSIONS

While the factors that contribute to dental crowding are multiple, the most common ones can be classified in hereditary and environmental (4). Certain characteristics such as excessive tooth size, deficient arch length, narrow arch width, supernumerary or missing teeth or abnormal crown morphology are considered of being hereditary while others like premature loss of deciduous teeth, interproximal caries, transpositions or disturbances in dental eruption and most of all muscle imbalance are influenced by the environment. (5)

Regardless of the cause, the orthodontic treatment must be performed and address the crowding problem. However, the stability of the achieved result is dependent on the treatment strategy and that is why the etiology must be discovered (6).

Achievement of substantial mandibular dental expansion with fixed appliances can sometime lead to undesirable incisor and canine proclination, tooth repositioning outside the supporting bone resulting in bone dehiscences and fenestrations and gingival recession(5). It is all depending on the initial morphology of alveolar bone as well as on the amount of tooth movement. Important tooth movement are also responsible for a high risk of relapse in expansion cases.

Moderate increases in mandibular inter-canine width may be possible, however, if expansion is begun prior to the eruption of the permanent canines (7).

The stability of mandibular arch expansion has been an issue for debate in the orthodontic world for decades. Nance reported that mandibular expansion is unstable and that intercanine width returns to pre-treatment values over time; therefore, he advocated maintenance of intercanine width during orthodontic treatment. Herberger reported that 68% of expansions due to increase in mandibular intercanine width remained in place 4 - 6 years after retention. In this case, long-term retention and a fixed lingual retainer were planned to preserve gains in the intercanine width. Teeth with eccentric positions in the alveolar ridge, as crowded incisors and canines, constitute risk factors for bone dehiscences and fenestrations (7)

CONCLUSIONS

For precise and accurate mandibular tooth movement, the orthodontist needs to consider the individual bone characteristics of the patient. Limitations of sound tooth repositioning are not only frequent but appear in both extractional and expansion cases and therefore while expansion is a viable treatment option it should be always balanced with considerations upon the stability and periodontal health issues.

Acknowledgements

All authors had equal contributions and should be considered main authors.

The present study is part of the Iuliu Hatiegnau University of Medicine and Pharmacy Cluj-Napoca, Internal Research Grant Nr. 4944/15/08.03.2016- Grant Director Dr. Anca Stefania Mesaros.

REFERENCES

1. Philippe J. [The vocation of orthodontics]. *Orthod Fr.* 2009 Dec;80(4):387-90.
2. Martin AJ, Buschang PH, Boley JC, Taylor RW, McKinney TW. The impact of buccal corridors on smile attractiveness. *Eur J Orthod.* 2007 Nov 1;29(5):530-7.
3. Sakamoto T, Hayakawa K, Ishii T, Nojima K, Sueishi K. Bilateral Scissor Bite Treated by Rapid Mandibular Expansion Following Corticotomy. *Bull Tokyo Dent Coll.* 2016;57(4):269-80.
4. Housley JA, Nanda RS, Currier GF, McCune DE. Stability of transverse expansion in the mandibular arch. *Am J Orthod Dentofacial Orthop.* 2003 Sep 1;124(3):288-93.

5. Philippe J. The origin of treatment expansion. *Am J Orthod Dentofac Orthop Off Publ Am Assoc Orthod Its Const Soc Am Board Orthod*. 2007 Apr;131(4):446; author reply 446.
6. Philippe J. [About retention]. *Orthod Fr*. 2010 Sep;81(3):221–6.
7. Alves AC de M, Maranhão OBV, Janson G, Garib DG. Mandibular dental arch short and long-term spontaneous dentoalveolar changes after slow or rapid maxillary expansion: a systematic review. *Dent Press J Orthod*. 2017 Jun;22(3):55–63.

A correlation between the maxillary transversal growth and the width of the upper central incisor



Hajaj T.¹, Talpos S.², di Mauro L.I.¹, Negrutiu M.L.¹, Popa M.²,
Szuhaneck C.², Rominu M.¹, Stoian C.D.³, Sinescu C.¹

¹Department I, Faculty of Dentistry, "Victor Babes" University of Medicine and Pharmacy, Timisoara, Romania

²Department II, Faculty of Dentistry, "Victor Babes" University of Medicine and Pharmacy, Timisoara, Romania

³Faculty of Medicine, "Vasile Goldis" West University Arad, Romania

Correspondence to:

Name: Talpos Serban

MD PhD

Address: "Victor Babes" University of Medicine and Pharmacy, Faculty of Dentistry, Department II, 2 Eftimie Murgu square, 300041, Timisoara, Romania

Phone: +40 722434390

E-mail address: talpos@yahoo.com

Abstract

Objectives: Dentoalveolar discrepancies are more common nowadays, due to a general trend of the viscerocranium to decrease its size. In this context, early orthodontic treatment - after an early and correct diagnosis - can prevent the orthodontic problems from becoming permanent. Therefore, the dentist needs simple and efficient methods of detection and interception of dentoalveolar discrepancies, which can be applied easily on as many patients as possible. On this matter, starting from Bolton's analysis and the Cephalometric landmarks, the objective of this study is to determine the correlation between the permanent upper central incisor's width, first permanent tooth erupting on the maxillary arch in the frontal area (making it easily accessible in practice), and the development of the maxilla, respectively.

Materials and methods: We used 300 study models of adult patients. On these, the width of the maxillary central incisors (M-D) measured incisally and the cross dimension of the maxillary arch, between the craniometric Ectomolare-Ectomolare points, were measured with a digital caliper. Subsequently, the correlation between the mesio-distal width of the central incisor and the transversal development of the upper jaw was examined.

Results: After analysis, it was found that there is a correlation between the mesio-distal width of the central incisor and the development of the upper jaw, and a growth index was established.

Discussion: This study wants to help the practitioners to easily identify the maxillary growth disturbances, by determining the upper jaw's future approximate dimensions from an early stage, using only the upper central incisor's width. Also, knowing the correlation between the two, the practitioner can easily recreate the correct dimension and shape of the frontal teeth, when dealing with edentulous patients.

Conclusions: The growth index can provide valuable data in intercepting the dentoalveolar discrepancies and other orthodontic problems, being a fast, easily available and noninvasive method of diagnosis. For the elderly, edentulous patients, it can give the dentist a guide for the aesthetic outcome of the future prosthetic restoration.

Keywords: growth index, orthodontic disturbances, maxillary central incisor, implant retained restorations, complete edentations.

INTRODUCTION

The lack of space for the normal development of the dental arches is an increasingly common phenomenon in today's dental practice. The main reasons incriminated in the literature are the general trend of decreasing of the viscerocranium¹, the genetic disparity between the size of the jaws and teeth^{2, 3} and syndromes with craniofacial deformities⁴. Of course, a very important role is played by the functions that originate or take place in the nasal and oral pharyngeal territories, such as breathing, eating or speaking.^{5, 6, 7, 8, 9, 10}

Clinically, the reduction of available space on the dental arches translates through ectopic teeth, rotations or dental inclusions¹¹. It is well known that most commonly the third molars and the canines are affected by this kind of problems, but the etiologies may be different.^{12, 13, 14} While mostly genetics causes the anatomical characters of the teeth and the dental inclusions, functional factors may increase or, conversely, slow down or even prevent the installation of such occlusal imbalances.^{15, 16, 17}

Normally, the jaw size is proportional to the size of the teeth¹⁸. Obviously, this rule is not always observed in practice, there are many variants of genetic combinations that result in a variety of size ratios between the teeth and their bone support.¹⁹

Tooth size analysis was presented by Bolton in 1958 when he computed the specific ratios of the mesial-distal widths that must exist between the maxillary and mandibular anterior segments, as well as for the whole arch from the right first molar to left first molar, for proper coordination of maxillary and mandibular teeth.

Additionally, numerous studies have concluded that a specific ratio often seen in nature, the Golden Ratio or the Divine Proportion, is also present in the development of the human body. For example Leonardo da Vinci found that the total height of the body and the height from the toes to the navel depression are in Golden Ratio.²⁰ Regarding dentistry, the Golden Ratio has been found in teeth dimensions, between the upper teeth and the mandibular ones and even in correlation with the smile.²¹

The present study wants to identify the growth relationship between the two components, the upper jaw and maxillary teeth, using only the first frontal permanent tooth that erupts on the upper arch as a guide - the central incisor - in order to approximately predict the future transversal growth of the upper jaw. On the other hand, for elderly edentulous patients, it can become a predictable guide for choosing the correct shape and dimension of the future teeth, starting from central incisors, especially when all teeth are lost.

MATERIAL AND METHODS

For the study there were used 300 study plaster models of adult patients, of which 148 were females and 152 males (fig.1). All patients were adults, chosen respecting a minimum age of 18 years, at which the bone growth is considered completed, in order for the study to be relevant. The age of all participants was between 18 and 28.

The inclusion criteria were: 1. Permanent dentition, 2. Presence of all permanent teeth from second molar to second molar in both arches, 3. No massive loss of substance on the central incisors.

The exclusion criteria were: 1. Presence of any deciduous teeth, 2. Presence of any major morphologic dental anomaly 3. History of orthodontic treatment.

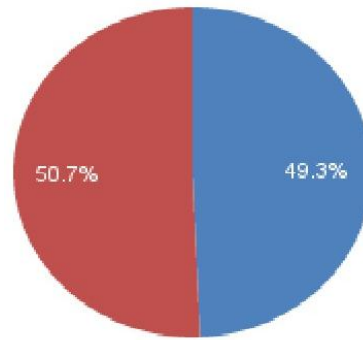


Figure 1. Sex distribution among patients

Each model was numbered on the base and was prepared for measurement fig.2: the Ectomolare (EKM) points were marked on each side of the dental arch, after which the distance between them was measured with a digital caliper with a range of 0-150 mm.



Figure 2. Measurement of the maxillary central incisor

Subsequently, the mesial-distal dimensions of the maxillary right central incisors were measured, at the incisal edge level. The results were then collated into tables and the relationship between the width of superior central incisors and maxillary cross development was determined. Further on, an index of development of the jaw was identified by calculating the ratio between the incisor's width and the EKM-EKM distance on each model.

RESULTS

After analysis it was found that there is a direct proportionality correlation between the medial-distal width of the central incisor at the incisal level and jaw width in all patients; the bigger the incisor's crown width, the greater size of the upper jaw.

Further on, by calculating the ratio between the width of the central incisor and the jaw cross dimension a growth index was identified, with a value of 0.16.

In table 1, there are presented the ratio values of all the patients included in the study - Row Labels. 76% of the patients have values around 0.16 (0.15 - 0.17 range), with 38.33% of them having the exact value of 0.16.

Table 1. Ratio values of all the patients

Count of interval k								
Row Labels	0,13	0,14	0,15	0,16	0,17	0,18	0,19	Grand Total
f	5	15	36	74	15	3		148
m	11	25	36	41	26	10	3	152
Grand Total	16	40	72	115	41	13	3	300

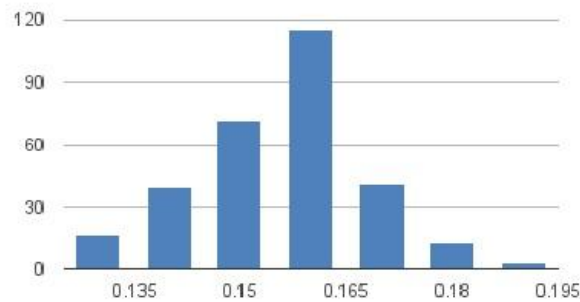


Figure 3. Ratio values distribution

As seen on the graphic from figure 4, there is a clear growth pattern with the majority of the patients. Practically one can approximate the future appropriate width of the upper jaw using the constant $k = 0.16$, with the formula:

$$\text{upper jaw width} = \frac{\text{first permanent upper incisor width}}{0.16}$$

DISCUSSIONS

Dental and alveolar anatomical features cannot be separated from the functions of the oral and facial regions or the rest of the body. Even though the growth Index can give the practitioner an approximation about the future development of the jaws, other factors can interfere with the normal growth process, such as malfunctions, accidents or even the child's diet.²²

So, in order to be more specific, the growth index (0.16) established in the present study does not take into consideration any other factors except from the anatomical ones. But, even so, as seen in the statistic, the majority of patients (+75%) have values around 0.16, confirming that the index can be useful in practice.

How much do the external factors affect the growth and bone morphology is hard to say. As most scholars agree nowadays, function gives the shape but, nevertheless, the genetic baggage of each individual is decisive. Under these circumstances the growth Index should always be correlated with the rest of the patient's information, like the family history, conditions of living, diet, presence of vicious habits and so on.

Considering all the variables, clinically, the Index can be a valuable tool as a starting point in achieving the treatment plan when dealing with growing patients. The dentist can obtain an approximate prediction of the future maxillary growth using a single measuring instrument, thus making it very accessible in practice.

Also, performing a full mouth rehabilitation on a complete edentulous patient can be very difficult, for many reasons. The practitioner must take into consideration all factors when creating a prosthesis, the shape and volume of the teeth is for sure one of them. In these cases, having a stable value (the transversal development of the upper jaw) and the ratio formula, can be helpful.

In the light of the above described scientific data, the dentist is morally and professionally obliged to inform the patient the possible developmental deficiencies of the maxilla, in his area of competence. The informed written patient consent should reflect the fact that the dentist has fulfilled with dedication, patience and time, the duty to present the medical information to the person who uses the health services. The document "Informed patient consent" may represent a protection in case of a contentious situation, related to patient's health and treatment plan. The practitioner should know himself safe when

practicing and his entire capacity must be focused on the medical act and not altered by the fear of mistake or lack of communication.

CONCLUSIONS

The Growth Index is a constant which predicts the approximate future width of the upper jaw, by using only the width of the first permanent upper incisor. Its ease of use comes from the fact that it's noninvasive, has a considerably high accuracy (76% within the range 0.15-0.17) and can be used from early stages of development, around 7 years of age, when the upper central incisors erupt.

The formula could also serve as a guide for the practitioners when dealing with complete edentulous patients, treated with implant retained prosthesis or complete dentures, by calculating the average sizes of the teeth, starting from the central upper incisor. All this being possible because the transversal value of the maxillary is measurable throughout the years. Of course, the alveolar bone resorption must be taken into consideration, but the method can still be a valuable guide line, if used along with others, like pictures of the patient, facial symmetry and the aesthetic lines.

REFERENCES

1. Zegan Georgeta - Ortodonție și ortopedie dento-facială. Tehnici contemporane, Editura Pim, Iași, 2012, p. 12
2. Dorobăț Valentina, Stanciu Dragoș - Ortodonție și ortopedie dento-facială, Editura Medicală, București, 2011, p. 17-23
3. Zegan Georgeta - Ortodonție și ortopedie dento-facială. Tehnici contemporane, Editura Pim, Iași, 2012, p. 12-14
4. Ariel A. Waitzman, M.D., Jeffrey C. Posnick, D.M.D., M.D., F.R.C.S.C., Derek C. Armstrong, M.B., B.S., F.R.C.P.C., Gaylene E. Pron, Ph.D - Craniofacial Skeletal Measurements Based on Computed Tomography: Part I. Accuracy and Reproducibility, The Cleft Palate-Craniofacial Journal, March 1992
5. Yosh Jefferson, DMD, MAGD - Mouth breathing: Adverse effects on facial growth, health, academics, and behavior
6. Ahmet Yalcin Gungora and Hakan Turkkahraman - Effects of Airway Problems on Maxillary Growth: A Review
7. David C. Page, Derek Mahony - The Airway, Breathing and Orthodontics, Connective Heads
8. Mohsenin N, Mostofi MT, Mohsenin V. - The role of oral appliances in treating obstructive sleep apnea. J Am Dent Assoc. 2003 Apr; 134(4):442-9.
9. Principato JJ. - Upper airway obstruction and craniofacial morphology. Otolaryngol Head Neck Surg. 1991 Jun; 04(6): 881-90.
10. Lopatiene K, Babarskas A. - Malocclusion and upper airway obstruction. Medicina (Kaunas). 2002; 38(3):277-83.
11. Bratu D., Leretter Ardelean M., Colojoarca C., Rominu M. - Dinții umani permanenți, Editura Signata, Timisoara, 1991.
12. Al Hussain I. - Contribution à l'étude de la canine maxillaire incluse, [these 3e cycle], Strasbourg, 1988. 128 p.
13. Litsas G. - A review of early displaced maxillary canines: Etiology, diagnosis and interceptive treatment. Open Dent J. 2011; 5:39-47.
14. Ranjit Manne, ChandraSekhar Gandikota, Shubhaker Rao Juvvadi, Haranath Reddy Medapati Rama, and Sampath Anche - Impacted canines: Etiology, diagnosis, and orthodontic management, J Pharm Bioallied Sci. 2012 Aug; 4(Suppl 2): S234-S238.
15. Jukka Jernvall, Han-Sung Jung - Genotype, Phenotype, and Developmental Biology of Molar Tooth Characters, Yearbook of Physical Anthropology 43:171-190 (2000), p. 172-188
16. Glăvan Florica, Bratu Elisabeta - Ortodonție. Ortopedie dento-facială, Editura Mirton, Timișoara, 2005, p. 199-216

17. Brook A.H. – Multilevel complex interactions between genetic, epigenetic and environmental factors in the aetiology of anomalies of dental development, Archives of Oral Biology, Volume 54, Supplement 1, December 2009, p. S3-S17
18. Black, G. V. (Greene Vardiman) – Descriptive anatomy of the human teeth, 1892 Philadelphia, Wilmington Dental Manufacturing Co.
19. Bolton WA. – The clinical application of a tooth size analysis. Am J. Orthod 1962;48:504-29
20. Antony Davis – Goldan mean of the human body
21. Naveen Gopi Chander, Vaikunth Vijay Kumar, and Vedantham Rangarajan. Golden proportion assessment between maxillary and mandibular teeth on Indian population Adv Prosthodont. 2012 May; 4(2): 72-75. Published online 2012 May 30
22. Mellanby - The Influence of Diet on the Structure of Teeth, Physiological Reviews 1928 Vol. 8 pp. 545-77

Study concerning the eruption of third maxillary molar



Todor L.¹, Popovici R.A.², Todor S.A.², Matei R.I.¹, Ciavoi G.¹, Coroi M.C.³, Todor P.C.⁴, Cuc A.¹, Porumb A.¹

¹Faculty of Medicine and Pharmacy, Department of Dental Medicine, University of Oradea

²Faculty of Dental Medicine, University of Medicine and Pharmacy "Victor Babeș" Timișoara

³Department of Surgery, Faculty of Medicine and Pharmacy, University of Oradea

⁴National College "Emanuil Gojdu", Oradea

Correspondence to:

Name: Albinița Cuc

Address: Medicine and Pharmacy Faculty, University of Oradea, Piata 1 Decembrie, nr. 10

Phone: +40 723327232

E-mail address: cucalbinita@yahoo.com

Abstract

Wisdom teeth have the greatest chronological variability their eruption, their apparition on the arch occurring between 16-25 years [1]. We studied two groups of young people between the ages of 18-19 and 24-25, respectively, observing the number of upper third molars erupted in the oral cavity and the eruption axis. The eruption of the wisdom tooth can be relieved by the creation of space as a result of the extraction of another molar from the same hemiarch, followed by the dental mesialization [2].

More than a third of young people, aged 24-25 years, are missing at least one maxillary third molar, phenomenon that we can attribute to anodontia or dental impaction. Female patients have a larger percentage of vestibular upper wisdom teeth.

Keywords: maxillary third molar, eruption, oral vestibule, anodontia, inclusion

INTRODUCTION

The eruption of permanent teeth is usually without disturbances in the frontal teeth and premolars, as the progressive root resorption of the corresponding temporary teeth occurs [3]. Also, the eruption of the first two molars does not generally cause accidents. The most common eruption accidents occur at the level of the molars of the mandible as a result of the phylogenetic regression of the jaws with consequent lack of resulting space [4].

Calcification of the wisdom tooth begins around the age of five, while the root is completely formed after the age of nineteen. The final phase in tooth development is dental eruption [5].

The third molar is formed through a distal extension, which starts from the bud of the second molar at the age of 4-5 years. The final two molars are formed as if they were replacing germs of the permanent first molar. The germs of each of these molars are found in order, during their formation, in the distal part of the alveolar apophysis and occupy a high position. It has been found that the tuberosity plane is found, during development, in a constant ratio to the pterigoidian apophysis plane. During evolution, these teeth come down and straighten their axis. Thus, there is a bone growth and a forward movement of the dental system.

The third molar presents "gubernaculum dentis", which binds it to the second molar germ, being influenced by it in its evolution. The first direction of evolution is until it meets the neighboring tooth. Because it does not suffer from the resorption process, the pressure exerted by the molar in its eruption will be transmitted to it through the follicular bag. There is a "counter-wave" response force that leads to the vertical straightening of the third molar axis and its eruption to the known position, showing the most pronounced inclination. At first, the wisdom teeth have the occlusal face tilted towards posterior, and when the tuberosity does not develop sufficiently they remain included or evolve towards the vestibule.

To have a good plan of management treatment is very important to have a good relationship patient- doctor [6-9], and to respect all the legislation and the politics.[10]

The upper third molar has the eruption axis deflected especially towards the vestibule. During the eruption, it crosses a less dense bone, and the alveolar region is not directly related to lax cell spaces or muscle inserts.

MATERIAL AND METHODS

Maxillary third molars have the greatest chronological variability in their eruption, their emergence on the arch occurring between 16-25 years. Since most authors believe that the onset of the wisdom tooth eruption is around the age of 18, we have studied two groups of young people aged 18-19 and 24-25 respectively.

The first study group consisted of 527 12th-grade students, 243 male and 284 female, which had a number of 278 upper wisdom teeth erupted in the oral cavity investigated, 155 in boys and 123 in girls.

The second study group consists of 219 students aged 24-25, considered to be the end of the eruption period. Of these, 86 are male and 133 female. In the oral cavity, a total of 273 molars were shown in the upper oral cavity, 112 in boys and 183 in girls

For each group of youngsters, a comparative gender-based study was conducted: the number of upper third molars erupted in the oral cavity and eruption axis, in the axis or vestibular. Not having x-rays for all the subjects studied, we could not determine whether the lack of a molar of an arcade is due to anodontia or lack of space required for the eruption.

RESULTS

The boys from the first study group only had 31.89% of all potential molars erupted, and the girls only had 21.65%

The comparative gender-based study aims to determine the percentage of upper third molars erupted in the oral cavity. A subject can present one, two or no upper wisdom teeth. The obtained data was implemented in the graphic representation from figures 1, 2 and 3.

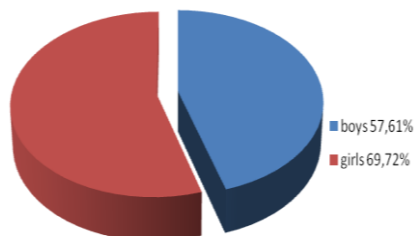


Figure 1. Percentage of students without any upper third molars erupted

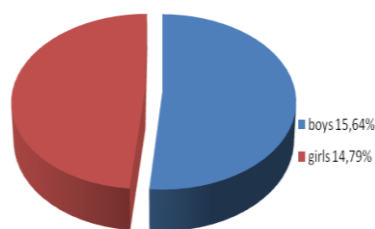


Figure 2. Percentage of students with one upper third molar erupted

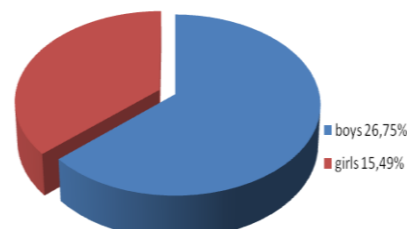


Figure 3. Percentage of students with both upper third molars erupted

The eruption of the third molar can be alleviated by creating space through extracting another molar from the same hemiarch, followed by dental mesialization. Thus, we can observe the lack of another molar, by extraction, from the same hemiarch to 17.41% of the upper third molars erupted in boys and 25.20% of them erupted in girls.

The maxillary third molars present in the oral cavity were also studied in terms of the eruption axis: in the axis or vestibular. The comparative gender-based study is represented through the graph in Figure 4.

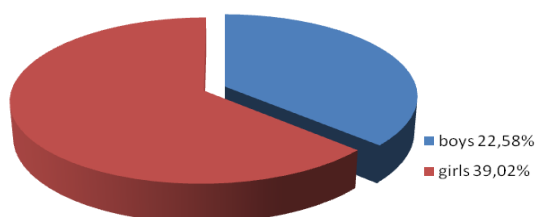


Figure 4. Percentage of vestibular maxillary third molars

Concerning the boys from the second study group, out of the total number of potential upper wisdom teeth, 65.11% erupted, while 68.79% erupted for the girls. The eruption of the upper third molar in the young is illustrated in Figure 5.

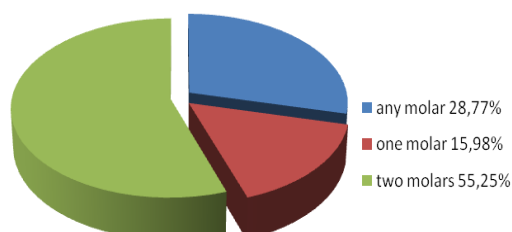


Figure 5. Percentage of youngsters presenting one, two or no upper third molars erupted in the oral cavity

Comparing the two study groups regarding the percentage of vestibular maxillary third molars, we have obtained the data seen in Figure 6.

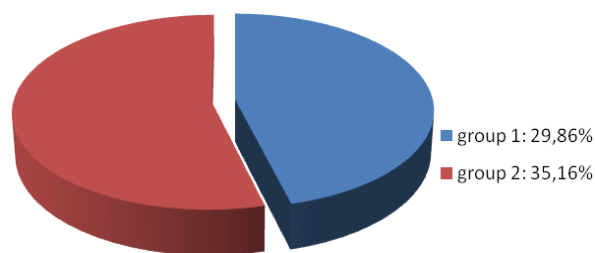


Figure 6. Percentage of vestibular maxillary third molars

Comparing the two study groups concerning erupted maxillary third molars, we can observe an accelerated eruption rhythm in the female patients (Figure 7).

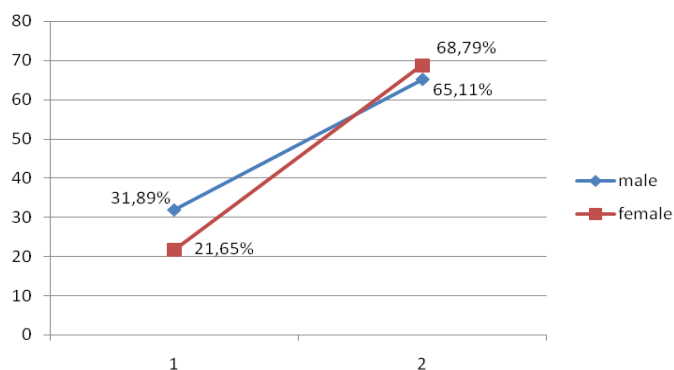


Figure 7. Eruption rhythm in the two study groups

DISCUSSIONS

Dental eruption is accompanied by numerous tissue changes such as root and periodontal development as well as resorption and deposition of the alveolar bone. The main direction of the eruptive movements is axial. However, in the life cycle of a tooth there are movements in other planes [1]. The implantation and normal arch alignment of upper wisdom teeth is accomplished by elongating alveolar processes through bone-deposition processes prior to palatal-maxillary suture.

The implantation position of the tooth in the arch is characteristic because it presents the most pronounced inclination compared to the other molars.

Upper wisdom teeth can not normally recover their occlusal surfaces by appropriate transversal migration because, starting with *Homo Sapiens Fossilis*, the alveolar process has been implanted back on the jaw base and has limited its development Sagittal. The surface of upper wisdom teeth remains so vestibular inclined, making the known helicoidal system in molars [11].

Anodontia and inclusion are phenomena that are part of the phylogenetic evolution of man. The enlargement of the skull is accompanied by a dimensional reduction of the facial skeleton, resulting in a mismatch between the sum of the teeth width and the jaw size. The upper third molar, which develops the last, will not have enough room for a correct eruption, remaining included or having a vestibular eruption.

CONCLUSIONS

Following the study of the first group of young people we found that boys have a higher percentage of presenting both upper third molars erupted in the oral cavity, while girls have a higher percentage of presenting no maxillary third molars erupted in the oral cavity. When it comes to the presence of a single upper wisdom tooth, the two sexes are balanced in percentage.

The percentage of maxillary third molars erupted in the oral cavity is higher in the second group, along with somatic development, and yet nearly 40% of subjects lack at least one wisdom tooth on the arch, a phenomenon that we account for anodontia or dental inclusion, the clinical examination eliminating the absence of the upper third molars by dental extraction.

The eruption of the maxillary third molar is accelerated to the male sex at the beginning of the eruption phase, the ratio reversing by the end in favour of the female sex. Once the eruption has finished, the percentage of upper wisdom teeth increases with the vestibular eruption axis, due to the lack of space required for the eruption.

The female sex has a higher percentage of vestibular upper wisdom teeth, as well as a higher percentage of erupted molars on the arch where the first or second molar had been extracted. So the lack of space required for the maxillary third molar eruption is more pronounced in female patients.

Functional stimulation is one of the main factors in the development of the maxilla and mandible, a prerequisite for creating the required space for the third molar eruption.

REFERENCES

1. Firu P. – Stomatologie infantilă, Ed. Didactică și Pedagogică, București, 1983
2. Todor L. – Molarul III maxilar, Ed. Imprimeriei de Vest, Oradea, 2009
3. Bratu E., Grivu O., Voinea C. – Erupția dentară normală și patologică, Ed. Helicon, Timișoara, 1996
4. Tetsch P., Wilfried W. – Operative Extraction of Wisdom Teeth, Wolfe Medical Publications Ltd, 1990
5. Todor L., Pantea C. – Molarul III mandibular, Ed. Universității din Oradea, 2010
6. Levai M.C., Rusu L.C., Podariu A.C., Tofan S.A., Anculia R.C., Popovici R.A., Communication barriers in the doctor's office or medical organizations, *Medicine in Evolution*, 2016, Vol. XXII, Nr. 4, p. 585-594, ISSN: 2065- 376X
7. Popovici R.A., Podariu A.C., Rusu L.C., Porumb A., Todor L., Motoc O., Levai M.C., Leadership in dental health services, *Medicine in Evolution*, 2016, vol. XXII, Nr. 4, p. 578-584, ISSN: 2065-376X
8. Levai M.C., Popovici R.A., Rusu L.C., Tofan S.A., Talpoș Ș., Podariu A.C., Historical legislative governing doctor-patient relationship, *Medicine in Evolution*, 2016, Vol. XXII, Nr. 4, p. 390-396, ISSN: 2065- 376X.
9. Mihaela-Codrina Levai, Angela Codruța Podariu, Ramona Amina Popovici, Alexandra Podariu, Melania Lavinia Bratu, Medical Malpractice In Romania - Towards A Terminological And Conceptual Rigor, *Medicine In Evolution*, 2015, Vol. XXI, Nr. 4, p. 574-579, ISSN 2065-376X
10. Mihaela Codrina Levai, Codruta Angela Podariu, Ramona Amina Popovici, The Principles Of Basic Medical Attendance Keys For The Development Of The Health System Management, *Medicine In Evolution*, 2015, Vol. XXI, Nr. 3, p. 359-364, ISSN 2065-376X
11. Boboc Gh. – Aparatul dento-maxilar, Ed. Medicală, București, 1996

The association of low serum levels of 1.25 dihydroxy vitamin D3 with chronic periodontitis



Marian D.^{1,4}, Rusu D.², Stratul S.-I.², Calniceanu H.³, Belengeanu V.⁵, Freiman P.⁴, Anghel A.¹

¹Department of Biochemistry, Victor Babes University of Medicine and Pharmacy, Timisoara, Romania

²Department of Periodontology, Faculty of Dental Medicine, Victor Babes University of Medicine and Pharmacy, Timisoara, Romania

³Department of Dentistry, University of Oradea, Romania

⁴Faculty of Dental Medicine, Vasile Goldiș Western University of Arad, Romania

⁵Institute of Life Sciences, Vasile Goldiș Western University of Arad, Romania

Correspondence to:

Name: Darian Rusu

Address: Department of Periodontology, Victor Babes University of Medicine and Pharmacy, P-ta Eftimie Murgu nr 2, 300041, Timisoara, Romania

E-mail address: rusu.darian@gmail.com

Abstract

Aim and objectives: To compare seric levels of 1.25-dihydroxy vitamin D3 in patients with chronic periodontitis with the values in periodontally healthy patients.

Material and methods: The study included 56 patients with chronic periodontitis and 56 controls. The measured periodontal parameters included the plaque index, periodontal probing depth, bleeding on probing, periodontal attachment level and the number of absent teeth. 2 ml of venous blood were collected from each examined patient. The quantitative determination of serum levels of Vitamin D3 was performed with ELISA (enzyme-linked immunosorbent assay).

Results: The vitamin D serum level was considerably lower in patients (mean value 13.01ng/ml) than in cases (mean value 22.10 ng/ml). The clinical periodontal parameters probing depth, bleeding on probing, periodontal attachment level were negatively correlated with the vitamin D serum levels.

Conclusions: Low seric levels of vitamin D3 are associated with chronic periodontitis.

Keywords: chronic periodontitis, periodontal parameters, vitamin D

INTRODUCTION

During the last decade, an increased attention was granted to the role of 1.25-dihydroxy vitamin D₃ (1.25(OH)₂D₃) – the active form of Vitamin D – in inflammatory, infectious and autoimmune diseases. Low serum vitamin D levels have been associated with a multitude of diseases, such as osteoarticular, metabolic, cardiovascular, digestive, endocrinal, neurologic and psychiatric.

There are a few studies which have found an association between the decreased level serum of 25(OH)D and periodontal infection (1). The study of Boggess et al. (2) found a lower serum level of 25(OH)D in pregnant women with CP than in the periodontally healthy ones. Millen et al. (2012) also reported similar findings in postmenopausal women (3); gingival bleeding and periodontal disease severity were inversely associated with serum 1.25(OH)₂D₃ levels. Zhou et al. (2012) found that increased values of probing depth, clinical attachment level loss, bleeding index, plaque index and alveolar bone loss are associated with low levels of vitamin D among patients with chronic obstructive pulmonary disease. (4)

Miley et al. (2009) and Garcia et al. (2011) have reported that a vitamin D and calcium supplementation can improve the periodontal parameters in patients with periodontal disease, when compared with patients that did not take supplements. (5, 6)

The aim of this study was to explore the association between low serum levels of 1.25(OH)₂D₃ and chronic periodontitis (CP).

MATERIAL AND METHODS

This case-control study included 56 patients with CP (29 women, 27 men) and 56 healthy periodontally patients (33 women, 23 men). All participants were patients selected among the outpatients of the Department of Periodontology of the "Victor Babeş" University of Medicine and Pharmacy in Timisoara, between 2014 and 2016.

The participants signed an informed consent to participate in the study. The research was approved by the Research Ethics Commission of the University of Medicine and Pharmacy in Timisoara (approval No.10/2013). The study was conducted in accordance with the Declaration of Helsinki, as revised in 2003.

The criteria for exclusion were: pregnancy, diabetes, hepatitis, cancers, HIV, intake of anti-inflammatory and immunosuppressive drugs.

All patients were examined by a single clinician (DR). The clinical parameters of periodontal disease measured in the present study included the plaque index (PI, Silness & Loë 1964), periodontal probing depth (PD), bleeding on probing (BOP); periodontal attachment level (CAL) and the number of absent teeth (AT).

Clinical measurements were performed at six sites per tooth, excluding the third molars (mesio-buccal, mid-buccal, disto-buccal, mesio-lingual, mid-lingual, and disto-lingual) and were recorded on the online periodontal chart of the Department of Periodontology of the University of Bern (<http://www.periodontalchart-online.com/ro/>).

The diagnosis of CP was established based on the criteria listed by the International Workshop for a Classification of Periodontal Diseases and Conditions (IWCP) in 1999. The diagnosis of CP was also confirmed radiologically. The patients in the control group were periodontally healthy (no inflammation, no losses of epithelial attachment and bone resorption).

At the end of the periodontal examination, 2 ml of venous blood were collected from each examined patient in a K2-EDTA tube and were sent to the laboratory to determine the seric vitamin D levels. Serum samples were frozen and stored at -80°C until analyzed. The quantitative determination of serum levels was performed with an ELISA (enzyme-linked immunosorbent assay) kit for Vitamin D₃ (MyBiosource, San Diego, CA, USA) using a

microplate reader StatFax 3200 (Awareness Technology, Palm City, FL, USA), according to the manufacturer's specifications. This technique was based on 1.25(OH)₂D₃ antibody-1.25(OH)₂D₃ antigen interactions (immunosorbency) and an horseradish peroxidase (HRP) colorimetric detection system to detect 1.25(OH)₂D₃ antigen targets in samples.

Statistical Analysis

Statistical analyses were conducted using the R software, version 3.3.2, R Core Team (2016). Inter-group comparisons for interval and ordinal variables were performed using the Mann-Whitney tests (unless otherwise specified), due to lack of normality of the data. Chi-square tests were used to compare proportions. Associations between vitamin D level and clinical parameters of the study subjects were assessed by computing Spearman's rank correlation coefficients. Finally, in order to investigate the influence of vitamin D level on periodontal health status, a binary logistic regression model was considered, with the presence of periodontal disease as outcome variable, and vitamin D level and patient age as predictors. The choice to also include age as a predictor in the model was motivated by its very high correlation with all clinical parameters identified as strongly associated with the outcome by the univariate analyses, and only mild correlation with vitamin D level (see Tables 1 and 2). For all analyses, p-values less than 0.05 were regarded as statistically significant.

RESULTS

Values of 30-50 ng/ml were considered as optimal level serum concentrations of 1.25(OH)₂D₃ (as in the study of Bischoff-Ferrari et al. 2006), values of 10-20 ng/ml were considered as deficiency, while suboptimal levels were considered 20-30 ng/ml (7). The demographical data and the clinical parameters for patients and control groups and p-values of inter-group comparisons are presented in Table 1. Associations based on Spearman's rank correlation analysis between vitamin D level and clinical parameters of the study subjects are presented in Table 2.

Table 1. Clinical parameters for patients and control groups and p-values of inter-group comparisons (AT - absent teeth; PD - probing depth; CAL - clinical attachment loss; PII - plaque index; BOP - bleeding on probing)

DEMOGRAPHICAL DATA	PATIENTS	CONTROLS	P-VALUE
N	56	56	
AGE (YR) (MIN-MAX)	40.55±9.52 (24-58)	35.02±8.66 (23-57)	0.002
FEMALES (%)	29 (51.79%)	33 (58.93%)	0.568
CLINICAL PARAMETERS	<i>Patients</i>	<i>Controls</i>	<i>p-value</i>
AT (NUMBER) (MIN-MAX)	8.61±5.70 (0-22)	1.14±1.68 (0-8)	<0.001
P.D. MED (MM)	4.42±0.82	2.43±0.27	<0.001
P.D. MAX (MM)	7.43±1.97	2.82±0.29	<0.001
CAL (MM)	5.12±1.12	0	<0.001
PLI (%)	29.43±32.91	23.54±19.30	0.901
BOP (%)	62.32±23.80	18.36±18.46	<0.001
VITAMIN D LEVEL (NG/ML)	13.01±5.10	22.10±5.63	<0.001

Table 2. Associations based on Spearman's rank correlation analysis between vitamin D level and clinical parameters of the study subjects (AT - absent teeth; PD - probing depth; CAL - clinical attachment loss; PII - plaque index; BOP - bleeding on probing)

	Vitamin D level	Age	A.T.	Average P.D.	P.D. max	CAL	PI
Age	-0.192 (p=0.042)						
A.T.	-0.484	0.453					

	<i>Vitamin D level</i>	<i>Age</i>	<i>A.T.</i>	<i>Average P.D.</i>	<i>P.D. max</i>	<i>CAL</i>	<i>PI</i>
<i>Average P.D.</i>	(<i>p</i> <0.001)	(<i>p</i> <0.001)					
	-0.588	0.219	0.729				
<i>P.D. max</i>	(<i>p</i> <0.001)	(<i>p</i> =0.021)	(<i>p</i> <0.001)				
	-0.616	0.261	0.700	0.924			
<i>CAL</i>	(<i>p</i> <0.001)	(<i>p</i> =0.006)	(<i>p</i> <0.001)	(<i>p</i> <0.001)			
	-0.632	0.360	0.784	0.914	0.883		
<i>PII</i>	(<i>p</i> <0.001)	(<i>p</i> <0.001)	(<i>p</i> <0.001)	(<i>p</i> <0.001)	(<i>p</i> <0.001)		
	-0.029	0.127	0.103	0.166	0.077	0.075	
<i>BOP</i>	(<i>p</i> =0.761)	(<i>p</i> =0.182)	(<i>p</i> =0.279)	(<i>p</i> =0.080)	(<i>p</i> =0.422)	(<i>p</i> =0.429)	
	-0.494	0.208	0.703	0.803	0.736	0.734	0.372
	(<i>p</i> <0.001)	(<i>p</i> =0.028)	(<i>p</i> <0.001)	(<i>p</i> <0.001)	(<i>p</i> <0.001)	(<i>p</i> <0.001)	(<i>p</i> <0.001)

*Spearman correlation coefficients; corresponding p-values provided in parentheses

The vitamin D serum level of patients (13.01±5.10 ng/ml) was significantly lower than in the control group (22.10±5.63 ng/ml) (*p* <0.001). Vitamin D levels in males (18.70±7.08 ng/ml) and females (16.63±6.90 ng/ml) included in the study were not found to be significantly different (*p*=0.123). All clinical parameters, with the exception of PII, were highly positively correlated with each other and negatively correlated with the vitamin D level.

Table 3. Coefficients of the logistic regression model characterizing periodontal health with respect to patient age and vitamin D level (patients taken as reference category)

<i>Coefficient</i>	<i>Estimate</i>	<i>Std. Error</i>	<i>p-value</i>	<i>OR</i>	<i>95% CI for OR</i>
<i>Intercept</i>	2.636	1.329	0.047		
<i>Age</i>	0.067	0.029	0.020	1.069	1.012 – 1.135
<i>Vitamin D level</i>	-0.296	0.055	<0.001	0.744	0.659 – 0.820

Coefficients of the logistic regression model characterizing periodontal health with respect to patient age and vitamin D level are presented in Table 3. Both predictors included in the logistic regression model were found to be statistically significant. It was estimated that the odds of developing periodontitis increase by 6.7% for each one year increase in age, and drop by 29.6% for each one unit increase in vitamin D level.

DISCUSSIONS

In our study, vitamin D serum levels were decreased in patients compared with vitamin D levels in controls. Additionally, a low level of vitamin D in patients with CP was associated with increased values of inflammatory indices of periodontal disease, based on high levels of PD and CAL, thus indicating the severity of the periodontal disease. Similar results can be found in Dietrich et al. study on 77,500 teeth in CP patients (8). As reported in other studies, low vitamin D levels are a risk factor for periodontal disease. Therefore, a low level of vitamin D determines susceptibility to CP, as Antonoglou et al. (2015) found in Finland. (9) Moreover, in a further study of same authors, the serum level of 1,25(OH)D showed a statistically significant increase after causative anti-infectious periodontal therapy.(10)

A limitation of the present study was the fact that the results were not correlated with the total amount of vitamin D intake for each patient, including different amounts of sun exposure. It is noteworthy that blood samples to determine vitamin D serum were taken during spring and summer.

CONCLUSIONS

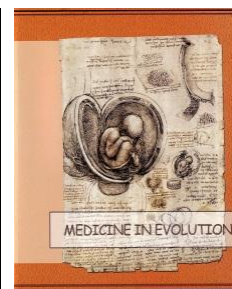
1. The mean serum level of 1.25(OH)₂D₃ in patients with CP was almost half of the mean level in controls.
2. The following periodontal parameters are negatively correlated with vitamin D serum level: PD, CAL, BOP.

3. The probability of developing CP increases by nearly 7 % with every year of age.
4. The chances of developing periodontitis decrease with almost 30 % for every increase of 1ng/ml of serum level of vitamin D.

REFERENCES

1. Grant WB, Boucher BJ. Are Hill's criteria for causality satisfied for vitamin D and periodontal disease? *Dermatoendocrinol.* 2010;2:30-36.
2. Boggess KA, Espinola JA, Moss K, Beck J, Offenbacher S, Camargo CA Jr. Vitamin D status and periodontal disease among pregnant women. *J Periodontol.* 2011; 82:195-200.
3. Millen AE, Hovey KM, LaMonte MJ. Plasma 25-hydroxyvitamin D concentrations and periodontal disease in postmenopausal women. *J Periodontol.* 2012; 84:1-17.
4. Zhou X, Han J, Song Y, Zhang J, Wang Z. Serum levels of 25-hydroxyvitamin D, oral health and chronic obstructive pulmonary disease. *J Clin Periodontol.* 2012; 39:350-356.
5. Miley DD, Garcia MN, Hildebolt CF. Cross-sectional study of vitamin D and calcium supplementation effects on chronic periodontitis. *J Periodontol.* 2009; 80:1433-1439.
6. Garcia MN, Hildebolt CF, Miley DD et al. One-year effects of vitamin D and calcium supplementation on chronic periodontitis. *J Periodontol.* 2011; 82: 25-3.
7. Bischoff-Ferrari HA, Giovannucci E, Willett W, Dietrich T, Dawson-Hughes B. Estimation of optimal serum concentrations of 25-hydroxyvitamin D for multiple health outcomes. *Am J Clin Nutr.* 2006; 84: 18-28.
8. Dietrich T, Nunn M, Dawson-Hughes B, Bischoff-Ferrari HA. Association between serum concentrations of 25-hydroxyvitamin D and gingival inflammation. *Am J Clin Nutr.* 2005; 82:575-580.
9. Antonoglou Gn, Knuttila M, Niemela O, Raunio T, Karttunen R, Vainio O, Hedberg P, Ylostalo P, Tervonen T. Low serum level of 1,25(OH)₂D is associated with chronic periodontitis. *J Periodont Res.* 2015; 50: 274-280.
10. Antonoglou G, Knuuttila M, Niemela O et al. Serum 1,25(OH)₂D level increases after elimination of periodontal inflammation in T1DM subjects. *J Clin Endocrinol Metab.* 2013; 98: 3999-4005.

Tooth loss and survival rate in chronic moderate to severe periodontitis. A synthetic search of non-surgical therapy studies.



Radulescu V.¹, Boariu M.², Rusu D.¹, Calniceanu H.¹, Stratul S.-I.¹

¹Department of Periodontology, Faculty of Dental Medicine, Victor Babes University of Medicine and Pharmacy, Timisoara, Romania

²Department of Endodontics, Faculty of Dental Medicine, Victor Babes University of Medicine and Pharmacy, Timisoara, Romania

Correspondence to:

Name: Darian Rusu

Address: Department of Periodontology, Faculty of Dental Medicine, Victor Babes University of Medicine and Pharmacy, Timisoara, Romania, Bv.Revolutiei nr.9, 300041 Timisoara, Romania

Phone: +40 744471187

E-mail address: rusu.darian@gmail.com

Abstract

Introduction: in patients suffering of chronic severe generalized periodontitis, there are teeth at borderline, rising up the question of retaining or extracting. According to systems for assigning periodontal prognosis, these are classified as having questionable, unfavorable or hopeless prognosis. It has been shown, that the prognosis can be improved in most of the cases.

Objective of this research was to review in a synthetic search the literature reporting the survival analysis (survival rate, tooth loss) of teeth with severe reduced attachment apparatus, and to assess, according to this literature, the ability of long term supportive periodontal care to modify the prognosis from hopeless to unfavorable or questionable.

Methods: articles were electronically searched in PubMed and in relevant scientific journals. The filters used referred to full text articles and human studies. The query used in the advanced search offered 1,486 results. Studies were considered for inclusion if limited to patients with moderate to severe periodontitis, who underwent active periodontal therapy (APT) and followed a supportive periodontal care (SPT) program for at least 5 years. Also, they had to report data on tooth loss, diagnosis, prognosis, treatment approach, supportive periodontal treatment, treatment outcome.

Results: from the electronic database search and the screening of the reference list of included publications, 18 articles were selected and grouped according to the treatment approach: non-surgical; surgical, non-regenerative therapy; surgical regenerative therapy. 3 articles were selected for the topic non-surgical therapy, and 15 for surgical therapy. In patients treated with non-surgical procedures alone, the **conclusions** were: 1. patients highly susceptible to periodontitis exhibit a tooth loss rate almost 6 times higher than patients with normal susceptibility; 2. the decision for tooth extraction may also reflect the experience, knowledge, skills of the dentist and economical aspects of the treatment, and not only the factors related to the tooth or the patient; 3. even teeth initially classified as questionable or hopeless can be retained in the majority of patients; 4. prognostic factors for tooth loss in SPT remain confirmed: the patient's age, the bone loss, the maximum PD after APT, multirrooted teeth and the smoking habits. Studies in this first part of the paper were selected for the non-surgical treatment regimen, and data are synthesized and briefly commented.

Keywords: survival rate, tooth loss, long term survival, maintenance, chronic periodontitis, severe periodontitis, questionable teeth, hopeless teeth, non-surgical treatment

INTRODUCTION

The first studies on the importance of supportive periodontal care program were conducted by Oliver (1) and Ross et al. (2). In 1978, Hirschfeld & Wasserman (3) stated that "the main goal of periodontal treatment is the retention of as many teeth as possible in health, function and comfort". Periodontal maintenance care (PMC), also known as supportive periodontal therapy (SPT), is an essential part of the long-term success periodontal treatment, and immediately follows the completion of active periodontal therapy (APT). Periodic recall visits form the base of the maintenance program. Preservation of periodontal health status acquired in the active periodontal phase needs time and efforts from the part of the dentist and the staff. Another essential component is compliance, and this belongs to the patient.

In a systematic review from 2008, Gaunt et al. (4) find that supportive periodontal care delivered in specialist compared with general dental practice will likely result in greater periodontal stability and higher tooth survival rates. In the same review, the cost evaluation analysis based on the Axelsson & Lindhe article from 1981 (5) showed that, for the patient the difference between SPT delivered by the general dentist is an extra 210€ (equivalent) per extra tooth per year over 30 years. PMC includes a group of procedures: update of medical and dental history, extra-and intra-oral soft tissue examination, dental examination, periodontal evaluation, radiographic review, removal of biofilm and calculus, treatment of new or recurrent sites of periodontal disease, establishment of an individualized interval for periodontal maintenance treatment. The purpose of these procedures is to prevent the progression or recurrence of periodontal disease, to reduce the incidence of tooth loss and to increase the probability of diagnosing and treating other diseases found within the oral cavity (AAP 2001). Long-term tooth retention is a fundamental objective of periodontal therapy. Most patients with a history of generalized severe chronic periodontitis that has been recently treated and stabilized are initially placed on a periodontal maintenance therapy program with a 3-month recall interval. The basis for this relatively short interval is the fact that people with a history of severe disease are, by nature, at high risk for recurrence. (6). The predictability of maintenance care program may be associated with diverse conditions, mainly when a patient is exposed to one or more risk factors that influence the host response (7,8). It is worldwide acknowledged that poor compliance with the recall and recare intervals is associated with recurrence/progression of periodontal disease, clinical attachment loss, increasing of probing depths, root caries and tooth loss (5).

Due to the frequency of severe periodontitis among Romanian patients, and the amount of extractions performed by general dentists in severe compromised periodontal patients, a synthetic search was conducted in the literature, in order to assess the predictability of different type of periodontal treatment (non-surgical; surgical non-regenerative; surgical regenerative) and the outcomes of these clinical procedures. Therefore, the objective of this paper is to characterize the quantity and quality of the available literature in order to show that severely compromised teeth can be predictably long-term maintained if they are included in a qualitative supportive periodontal treatment.

METHODS

Development of a protocol

This synthetic search was conducted following with modifications a protocol imagined by Miron et al. (9), made prior to the initiation of this search. This protocol included definition of the focused question; a PICO (patient, intervention, comparison, outcome) question; a defined search strategy; study inclusion criteria; determination of outcome measures; screening methods, data extraction and comparison.

Defining the focused question

How far can be extended the survival rate of teeth with severe reduced attachment apparatus due to periodontal disease, how long and which procedure is more predictable?

PICO question

P: Can patients with severe periodontal disease and severely compromised teeth support

I: undergoing non-surgical/surgical, non-regenerative/ surgical/ regenerative procedures

C: when compared with not treated patients

O: maintain their teeth on long-term?

Search strategy

Articles were electronically searched in the PubMed database and in scientific relevant journals. The filters used referred to full text articles and human studies. Combination of search terms and search strategies were used to find appropriate studies (Table 1).

Table 1. Search criteria for non-surgical treatment

Search Terms
'severe periodontitis' OR 'severe periodontal disease' OR 'moderate periodontitis' OR 'moderate periodontal disease' OR 'periodontal maintenance' OR 'maintenance program' OR 'supportive treatment' OR 'tooth loss' OR 'survival rate' OR 'survival tree' OR 'periodontal prognosis'
AND
'nonsurgical' OR 'non-surgical'

Table 2. Search criteria for surgical but non-regenerative treatment

Search Terms
'severe periodontitis' OR 'severe periodontal disease' OR 'moderate periodontitis' OR 'moderate periodontal disease' OR 'periodontal maintenance' OR 'maintenance program' OR 'supportive treatment' OR 'tooth loss' OR 'survival rate' OR 'survival tee' OR 'periodontal prognosis'
AND
'surgical' OR 'open flap' OR 'open- flap' OR 'gingivectomy' OR 'resective surgery' OR 'osseous surgery' OR 'widman flap' OR 'intra-bony defect' OR 'intra-bony defect' OR 'intra-bony pocket' OR 'intra-bony pocket' OR 'intra-bony defect' OR 'intra-bony defect' OR 'intra-bony pocket' OR 'intra-bony pocket' OR 'intra-bony defect' OR 'intra-bony defect'

Table 3. Search criteria for surgical, regenerative treatment

Search Terms
'severe periodontitis' OR 'severe periodontal disease' OR 'moderate periodontitis' OR 'moderate periodontal disease' OR 'periodontal maintenance' OR 'maintenance program' OR 'supportive treatment' OR 'tooth loss' OR 'survival rate' OR 'survival tee' OR 'periodontal prognosis'
AND
'surgical' OR 'open flap' OR 'open- flap' OR 'regenerative surgery' OR intrabony defect' OR 'intra-bony defect' OR 'periodontal regeneration' OR 'intrabony pocket' OR 'intra-bony pocket' OR 'infrabony defect' OR 'infra-bony defect' OR 'infrabony pocket' OR 'infra-bony pocket' OR 'intraosseous defect' OR 'intra-osseous defect' OR 'guided tissue regeneration' OR 'GTR' OR 'guided bone regeneration' OR 'GBR'

The query used in the advanced search offered 1,486 results, according to the topic of this search:

(((((periodontal[All Fields] AND (care[All Fields] OR ("maintenance"[MeSH Terms] OR "maintenance"[All Fields]) OR program[All Fields])) or survival[Title/Abstract]) or loss[Title/Abstract]) AND ((moderate[All Fields] OR severe[All Fields]) AND ("periodontitis"[MeSH Terms] OR "periodontitis"[All Fields]))) NOT apical[All Fields].

A hand search was conducted through the Journal of Clinical Periodontology, Journal of Periodontology, Journal of Periodontal Research, Periodontology 2000 from November 2016, until August 2017. The reference list of the selected articles was screened.

Criteria for study selection and inclusion

All the studies selected had to be written in English. They had to be full-text articles and to be human studies. No reviews were included. Studies were considered for inclusion if were limited to patients with moderate to severe periodontitis, who underwent active periodontal therapy (APT) and followed a supportive periodontal care (SPT) program for at least 5 years. Also, they had to report data on tooth loss, survival rate, diagnosis, prognosis, treatment approach, supportive periodontal treatment, treatment outcome. In the end, from the electronic database search and the screening of the reference list of included publications, 18 articles were selected. The 18 articles were grouped according to the treatment approach: non-surgical therapy; surgical, non-regenerative therapy; surgical regenerative therapy.

Outcome measure determination

The main outcome was tooth loss during SPT. Second endpoints were the change of prognosis and the survival rate.

Screening method

Titles and abstracts of the selected articles were screened by the first author (VR) based on the question: "which are the long term results of different treatment procedures involving non-surgical/surgical but non-regenerative/surgical regenerative procedures at severely periodontal compromised patients? Full-text articles were obtained if the follow-up period was at least 5 years, and if the outcome of the treatment was described in at least two terms of the following: tooth loss during SPT, tooth loss during APT, change of prognosis, survival rate.

Data extraction and analysis

The following data were extracted: the main author's name, the study design, the number of patients, the number of teeth, the setting where the clinical procedures were performed, the presence of systemic diseases, initial SPT prognosis, last SPT prognosis, the period of SPT, recall intervals, compliance, administration of antibiotics, the population of the study description (age range, mean age, gender), smoking habits, inclusion of the third molar, if the teeth considered in the study were abutment teeth or not, the furcation involvement, the kind of treatment the patient underwent, initial extraction, tooth loss during SPT and which of them were lost for periodontal reason and survival rate. Due to the reduced number of articles, no meta-analysis was performed. Instead, the data is reported in a synthetic fashion with an overview of all studies fitting the search descriptions. The articles selected for this synthetic search were summarized in 3 tables, according to the type of the treatment the patient underwent: non-surgical/surgical, non-regenerative/surgical, regenerative.

RESULTS AND DISCUSSIONS

From the articles generated by the initial search strategy, only 44 articles were kept for further examination. 12 were eliminated for their irrelevance of the follow-up period. From the total of 32 articles kept, 14 articles were left apart, because the variables and the data that are looked up in this review were not described. Only 18 articles kept for data extraction and data comparison: 3 for non-surgical treatment and 15 for surgical treatment. The following studies were selected for the non-surgical treatment regimen. Data are synthetized and briefly commented.

In 2001, Rosling et al. (10) assessed the longitudinal periodontal tissue alterations during supportive therapy after exclusive non-surgical periodontal therapy approach. They

used two groups: a "normal" group (NG: exhibiting a normal susceptibility of periodontal disease, 225 subjects) and a high susceptibility group (HSG: patients treated for advanced periodontal disease, 109 subjects). In both HSG and NG were lost teeth. In the first group the main reason was caries, endodontic complications and trauma and in the second one, teeth loss was associated with advanced and progressive periodontal disease. In the NG 74% of subjects retained all teeth during the 12 year interval, while in HSG 64% experienced tooth loss and 24% lost more than 4 teeth. 80% of the HSG subjects under regular supportive periodontal therapy (SPT) maintained the bone and CAL stable over a 12 year period. Under the same conditions, in the NG > 95% of the subjects prevented major tooth, bone and attachment loss and only a small subgroup experienced a significant amount of disease progression. NG lost 0.3 teeth during the 12 year period, while tooth loss corresponding to HSG was 1.9.

Ravald et al. in 2012 (11) investigated periodontal conditions, root caries, number of lost teeth and causes for tooth loss during 11.14 years after active periodontal therapy (APT) in 64 patients. At baseline, there were 1,537 teeth, and during the observation period 211 teeth were lost, of which 153 were lost due to periodontal disease. It represents a mean of 3.3 teeth/patient or 0.23 teeth/year. The authors concluded that the decision for tooth extraction may also reflect the experience, knowledge, skills of the dentist and economical aspects of the treatment and not only the factors related to the tooth or the patient.

In 2016, Graetz et al. (12) aimed to assess the risk of tooth loss under non-regenerative treatment and aimed to identify prognostic factors for tooth loss. The longitudinal study was built on a database of 315 patient diagnosed with chronic periodontitis, treated in a university setting. During APT, no pocket elimination surgery, osseous resection, augmentation of intrabony defects or any other regenerative therapy were undertaken. The mobile teeth were splinted and adjunctive metronidazole/ amoxicillin antibiotics were prescribed. SPT followed an individualized interval of 3-12 months. During the observation period, 1167 teeth of 8009 were extracted, 351 during APT and 816 during SPT, 18.5% in the maxilla versus 11.3% in the mandible. The results confirmed that tooth retention seems feasible in periodontitis patients even over long periods and that a small group of patients lost the majority of teeth- so called downhill or extreme downhill patients using a non-regenerative treatment concept. The authors considered the tooth loss in APT versus SPT a controversial topic, mentioning that "even teeth initially classified as questionable or hopeless can be retained in the majority of patients; extractions during APT should be performed with caution". Prognostic factors for tooth loss in SPT were confirmed in this study: the patient's age, bone loss (teeth with bone loss > 70% survived 19.8 years, while teeth without bone loss survived 29.8 years), maximum PPD after APT, multirrooted teeth and smoking.

Table 4. Details of the included studies: non-surgical treatment

Study	Rosling et al.	Ravald et al.	Graetz et al.
Year of publication	2001	2012	2016
Study design	Retrospective	Retrospective	Retrospective
Number of patients	NG(normal group) 225 HSG(high susceptibility) 109	64	315
Number of teeth	NG/HSG: mean nr of tooth present 24 in both groups	1537	8009
Operator	University	Not reported	University
Diagnosis	HSG: advanced periodontal disease NG: various dental lesions	Periodontal disease	Chronic Periodontitis
Systemic disease	Not reported	Diabetes mellitus Rheumatic diseases Coronary heart disease	Not reported
Initial SPT Prognosis	Not reported	Not reported	Not reported
Last SPT Prognosis	Not reported	Not reported	Confirmed prognostic

			factors: patient's age, smokers, bone level, maximum PPD, multi-rooted teeth
SPT	12 years	Not reported	9-31years Mean 18.3 years
Recall interval	3-4 months	Not reported	
Compliance	Compliers	Not reported	
Antibiotics	Not reported	Not reported	9.2% cases
Age range	Not reported	49-91	26- 73
Mean age	NG/ HSG: 41.8/ 45.5	64	48.5
Gender	NG/HSG: 46% / 42%	30 males, 34 females	Male 136, female 179
Smoking	Not reported	1-9 cigarettes/ day 7 >10 cigarettes/ day 11	Active/ former/ nonsmokers: 31/75/209
3rd molar inclusion	Excluded	Not reported	Excluded
Abutment teeth	Not reported	Not reported	
Furcation involvement	Included	Included	Tunneling Root resection
Treatment	Non-surgical	Non- surgical	OFD
Initial extraction (APT)	Not reported	Not reported	351
Teeth loss during SPT	Ng/HSG: 0.3/1.9 80% in HSG lost 0-3 teeth	211	816
No of teeth loss during SPT/ year/ patient	PAL(probing attachment level) loss in HSG/NG: 0.06/ 0.04mm/tooth surface/ year	3.3/ patient 0.23/ year	0.15
Periodontal reason	At molar sites HSG/NG exhibited deepened pockets: 18.1- 34.3/ 2.4- 16.1	153	Not reported
Survival rate	NG/HSG: 74% / 36%	Not reported	Not reported

CONCLUSIONS

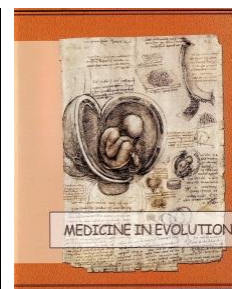
The studies selected in this synthetic search underline that patients highly susceptible to periodontitis exhibit a tooth loss rate almost 6 times higher than patients with normal susceptibility, after having underwent non-surgical periodontal therapy. The decision for tooth extraction may also reflect the experience, knowledge, skills of the dentist and economical aspects of the treatment, and not only the factors related to the tooth or the patient. Even teeth initially classified as questionable or hopeless can be retained in the majority of patients. The known prognostic factors for tooth loss in SPT remain confirmed: the patient's age, the bone loss, the maximum PPD after APT, multirooted teeth with furcations and the smoking habits.

REFERENCES

1. Oliver RC. Tooth loss with and without periodontal therapy. Periodontal Abstr. 1969 Mar;17(1):8-9.
2. Ross F.I.. The Relation Between Periodontal Therapy and Fixed Restorative Care. Journal of Periodontology. January 1971, Vol. 42, No. 1, Pages 13-20
3. Hirschfeld L, Wasserman B. A long-term survey of tooth loss in 600 treated periodontal patients. Journal of Periodontology, 1978, 225-37.
4. Gaunt F, Devine M, Pennington M, Vernazza C, Gwynett E, Steen N, Heasman P. The cost-effectiveness of supportive periodontal care for patients with chronic periodontitis. Journal of Clinical Periodontology 2008; 67-82.
5. Axelsson P, Lindhe J. The significance of maintenance care in the treatment of periodontal disease. J Clin Periodontol. 1981 Aug;8(4):281-94.

6. Armitage GC, Xenoudi P. Post-treatment supportive care for the natural dentition and dental implants. *Periodontology* 2000, 2016; 164-184.
7. Fardal O, Johannessen AC & Linden GJ. Tooth loss during maintenance following periodontal treatment in a periodontal practice in Norway. *Journal of Clinical Periodontology*, 2004; 550-555.
8. Chambrone LA, Chambrone L. Tooth loss in well maintained patients with chronic periodontitis during long-term supportive therapy in Brazil. *Journal of Clinical Periodontology*, 2006; 759-764.
9. Miron RJ, Zucchelli G, Pikos MA, Salama M, Lee S, Guillemette V, Fujioka-Kobayashi M, Bishara M, Zhang Y, Wang HL, Chandad F, Nacopoulos C, Simonpieri A, Aalam AA, Felice P, Sammartino G, Ghanaati S, Hernandez MA, Choukroun J. Use of platelet-rich fibrin in regenerative dentistry: a systematic review. *Clin Oral Investig*. 2017 Jul;21(6):1913-1927.
10. Rosling B, Serino G, Hellstrom M-K, Socransky SS, Lindhe J. Longitudinal periodontal tissue alterations during supportive therapy. *Journal of Clinical Periodontology* 2001; 241-249.
11. Raval N, Starkhammar Johansson C. Tooth loss in periodontally treated patients. A long-term study of periodontal disease and root caries. *Journal of Clinical Periodontology* 2012; 73-79.
12. Graetz C, Dorfer CE, Kahl M, Kocher T, Fawzy El-Sayed K, Wiebe J-F, Gomer K, Ruuhling A. Retention of questionable and hopeless teeth in compliant patients treated for aggressive periodontitis. *J Clin Periodontol* 2011; 707-714.

ERRATA - Clinical statistical study on the performance of posterior composite resin restorations using direct, semidirect and indirect technics



Hodobeț A.C.¹, Bicleșanu C.², Florescu A.², Tudose A.², Pangică A.M.³

¹PhD student, UTM Bucharest, Faculty of Dental Medicine

²Odontoterapie Department, UTM Bucharest, Faculty of Dental Medicine

³Endodontics Department, UTM Bucharest, Faculty of Dental Medicine

Correspondence to:

Name: Bicleșanu C.

Address: UTM Bucharest, Faculty of Dental Medicine, Gheorghe Petrascu street. 67

Phone: +40 722636335

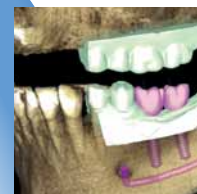
E-mail address: corneliabicle@yahoo.com

ERRATA

From a regrettable mistake, in the article "Clinical statistical study on the performance of posterior composite resin restorations using direct, semidirect and indirect technics", authors Hodobeț A.C., Bicleșanu C., Florescu A., Tudose A., Pangică A.M. published in *Medicine in evolution*, Volume XXIII, No. 2, 2017, it appeared, at page 158, row 21, the statement "the curing time was 5 seconds" which must be replaced with "the curing time was 5 seconds/4 cycles".



ProMax 3D • PlanScan • ProFace
Unique 3D combination for open CAD/CAM



Digital perfection

*Planmeca sets new standards with
world's first dental unit integrated intraoral scanner
for open connectivity to various CAD/CAM systems.*

We would like to invite you to explore the dentistry in new dimensions – see the perfect combination of digital intraoral scan, CBVT and 3D facial photo datasets in one 3D image. This digital perfection enables you to study patient's complete anatomy in detail, plan and utilise open interface with modern CAD/CAM systems according to your needs. Now you can be one of the pioneering specialists, whether you are an implantologist, endodontist, periodontist, orthodontist or maxillofacial surgeon. The new era of dentistry is reality. It's your decision.

Planmeca ProMax 3D

All volume sizes



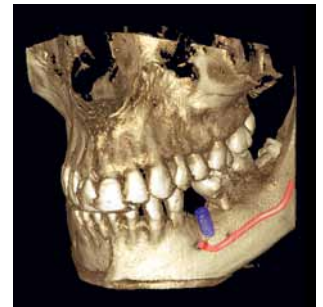
The Planmeca ProMax concept offers a full range of imaging volumes providing detailed information on patient anatomy. The comprehensive Planmeca ProMax platform complies with every need in dental radiology, offering digital panoramic, cephalometric, and 3D imaging as well as 3D face photo together with advanced imaging software.

At the heart of the concept is the robotic SCARA technology: the unique robotic arm enables any movement pattern required by existing or future program, eliminating all imaging restrictions. With the Planmeca ProMax concept superior maxillofacial radiography can be performed with a single platform, today and in the decades to come.

All volume sizes

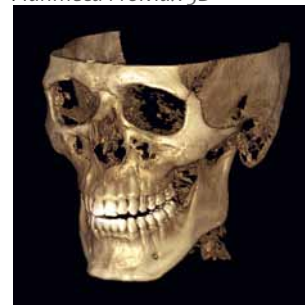


Planmeca ProMax 3D s
Ø42 x 42 mm–90 x 60 x 130 mm



Ø34 x 42 mm–140 x 105 x 130 mm

Planmeca ProMax 3D



Planmeca ProMax 3D Mid
Ø34 x 42 mm–Ø160 x 160 mm



Planmeca ProMax 3D Max
Ø42 x 50 mm–Ø230 x 260 mm

Planmeca Romexis

Software refined



Planmeca Romexis is the software of choice for all dental imaging purposes. All patient's digital images – intraoral and extraoral X-ray images, 3D volumes, and photographs – are processed and stored in one easy-to-use system. Planmeca Romexis offers a complete set of tools for image viewing, enhancement, measurement, and implant planning, and fully integrates digital imaging with the patient's other clinical data.

Thanks to its powerful printing features, stunning printouts can be produced. Planmeca Romexis provides direct image capture from Planmeca X-ray units, interfaces with 3rd party devices via TWAIN, and is fully DICOM-compatible. Planmeca Romexis is a JAVA software that runs on Windows, Mac OS, and Linux operating systems, and embraces modern IT standards.



INSTRUCTIONS FOR AUTHORS

The journal publishes general reviews, studies and clinical, epidemiological, experimental and laboratory research, clinical case presentation, papers from the history of medicine, reviews, scientific and technical state-of-the-art articles, medical informations and opinions. Only papers which have not been published or sent for publishing in other journals are accepted. The authors are responsible for the opinions expressed in the papers. *The paper must be edited both in Romanian and in English; the English version will be supervised by our collaborator Dana Brehar-Cioflec, MD, PhD; typed on white A₄ paper and on CD, DVD or Memory Stick.*

Manuscripts will not exceed:

- general reviews: 6-8 pages
- studies and researches: 5-7 pages
- case presentations: 2-4 pages
- reviews, scientific and technical state-of-the-art articles, medical informations and opinions: 1-2 pages.

The paper will be edited according to international editing rules for manuscripts. The title will be written in capital characters and it will be followed by the name and surname of the author (authors), followed by their place of work (place where the paper has been elaborated). Studies and researches will be followed by a brief abstract, followed by 3-4 key-words.

The body of the paper will be structured on the following chapters: introduction, aim, objectives, material and method, results and discussions, conclusions. The references will be presented alphabetically and in conformity to the Vancouver Convention, including:

- for articles: name of the authors and surname initials, title of the article in the original language, title of the journal according to the international abbreviation system, year of issue, volume, number, pages;
- for books: name of the authors and surname initials, volume, publisher (editors), city of publishing, year of issue.

Citation of references inside the body of the paper will be put between brackets, Harvard style (author, year) or Vancouver style (number in square brackets or superscript). Cited reference titles will be selected, maximum 6 for studies and case presentations and 12 for general reviews. Acceptance, rejection or the need of alterations in sent materials, or in iconography, will be communicated to the authors in due time. For this, the authors will indicate the person and address for correspondence (phone number, e-mail address). Given the less pleasant experience of the editorial board with some articles being rejected because they did not meet publishing criteria, we decided to support those who intend to publish in this journal by detailing the way such a paper should be elaborated, as well as our requirements.

Except some particular aspects concerning this journal, the following details are general requirements asked or imposed by other journals as well. Conditions to be met in order to propose a paper for publishing. The main author has the responsibility to make sure the article has been approved by all the other authors. The journal will have copyright

for papers accepted for publishing. The editorial board reserves the right to change the style and dimensions of an article (major changes will be discussed with the main author) and to decide the date of issue.

2. FIRST PUBLICATION

The editorial board will not consider a paper already reported in a published general review or described in a paper proposed to or accepted by another journal. This does not exclude papers which have been rejected by other journals. Also, papers which have been presented at a scientific meeting will be accepted for discussion if they have not been entirely or partially published in a similar publication. „Multiple“ publishing of the same study is seldom justified. One of the possible justifications is publishing in a second language but only if the following conditions are met:

- Editors of both journals involved are fully informed;
- Priority of the initial publication will be respected by a minimum publishing interval of two weeks;
- For the second publication, a shortened version will suffice;
- The second version strictly reflects data and interpretations in the first;
- A footnote may state: „This article is based upon a study initially published in [title of the journal]“.

3. PATERNITY

Paternity must reflect the common decision of the coauthors. Each author must have participated enough to take public responsibility for the content. A paper with collective paternity must have a key person responsible for the article.

4. COPYRIGHT

In order to reproduce materials from other sources, written agreement from the copyright owner must be obtained:

- photographer – for unpublished photographs;
- hospital where the photographer (physician) is employed – for unpublished photographs performed during the employment period;
- initial publisher – for a table, picture or text which have previously been published elsewhere.

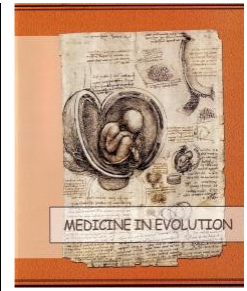
5. ETHICAL ASPECTS

Do not use name of patients, initials or hospital observation charts numbers. If a photograph of a body part which could allow direct or deductive recognition of the patient needs publishing, then the paper must be accompanied by the written consent of the patient and clinician, as well.

6. PRESENTING THE MANUSCRIPT

6.1. CONTENT OF THE PAPER - INDICATIONS FOR ORIGINAL ARTICLES

Paper title [Book Antiqua 20, bold, left alignment]



Surname N.¹, Surname N.² [Book Antiqua, 14, bold]

¹ Author Affiliation (DEPARTMENT, FACULTY, UNIVERSITY, CITY/COMPANY) [10, italic]

² Author Affiliation (DEPARTMENT, FACULTY, UNIVERSITY, CITY/COMPANY) [10, italic]

Correspondence to:

Surname Name: [10, italic]

Address: [10, italic]

Phone: +40 [10, italic]

E-mail address: [10, italic]

Abstract [Book Antiqua, 12, bold, justify alignment]

Recommendations for original studies

Original studies must include a structured abstract of maximum 150 words, containing the following titles and informations: Aim and objectives; Material and methods; Results; Conclusions; Key words: give 3-5 key words; The abstract will be translated into an international circulation language.

Keywords: Innovation, technology, research projects, etc. [Book Antiqua 9].

INTRODUCTION [Book Antiqua, 11, bold, left alignment]

Introduction presentation of general aspects, in the context of the approached theme.

Introduction include **Aim and objectives** – Define the aim of the article. Briefly expose the rationale of the presented study or observation. Make strictly pertinent referrals and do not exhaustively review the subject. Do not include data or conclusions from the paper.

There is a limitation of 4/6 pages. All pages size should be A4 (21 x 29,7cm). The top margins should be 2 cm, the bottom, right, margins should be 2cm and left margins should be 2,85 cm. All the text must be in one column and Book Antiqua font, including figures and tables, with single-spaced 10-point interline spacing.

***Aim and objectives* [Book Antiqua 11, bold italic, left alignment]**

The text included in the sections or subsections must begin one line after the section or subsection title. Do not use hard tabs and limit the use of hard returns to one return at the end of a paragraph. Please, do not number manually the sections and subsections; the template will do it automatically.

[Book Antiqua, 11 point, normal, justified alignment].

MATERIAL AND METHODS [Book Antiqua, 11, bold, left alignment]

Describe the selection of observations or subjects for the experiment (including controls). Identify methods, equipments (with the name and address of the manufacturer in brackets) and give sufficient details on procedures. Give references for the selected methods, including statistical methods; offer details and brief descriptions for previously published methods which are not well known; describe new or substantially modified methods, justify their use and assess their limitations. Precisely identify all used drugs and chemicals, including generic names, dosage and administration ways. Describe statistical methods with sufficient details for reported results to be verified. Whenever possible, quantify discovered aspects and present them with appropriate measurement indicators for the uncertainty or error of measurement (such as confidence intervals). [Book Antiqua, 11 point, normal, justified alignment].

RESULTS [Book Antiqua, 11, bold, left alignment]

Present results in a logical succession as text, tables and illustrations. Emphasize or briefly describe only important observations. [Book Antiqua, 11 point, normal, justified alignment].

DISCUSSIONS [Book Antiqua, 11, bold, left alignment]

Underline new, important aspects of the study. Do not repeat in detail data which have been presented in previous sections. Include implications of revealed aspects and their limitations, including implications for future studies. Connect your observations to other relevant studies. Relate the results to the aim proposed for the study. [Book Antiqua, 11 point, normal, justified alignment].

CONCLUSIONS [Book Antiqua, 11, bold, left alignment]

Organize conclusions which emerge from the study. In the end state: a) contributions to be acknowledged but which do not justify paternity right; b) thanks for technical support;

c) thanks for financial or material support. [Book Antiqua, 11 point, normal, justified alignment].

REFERENCES [Book Antiqua, 11, bold, left alignment]

A numbered list of references must be provided at the end of the paper. The list should be arranged in the order of citation in the text of the publication, assignment or essay, not in alphabetical order (according to the Vancouver rules). List only one reference per reference number. It is very important that you use the correct punctuation and that the order of details in the references is also correct.

- Books - Standard format - #. Author of Part, AA. Title of chapter or part. In: Editor A, Editor B, editors. Title: subtitle of Book. Edition (if not the first). Place of publication: Publisher; Year. p. page numbers.
- Journal Articles - Standard format - #. Author of article AA, Author of article BB, Author of article CC. Title of article. Abbreviated Title of Journal. year; vol(issue); page number(s).
- E-Books - Standard format - #. Author A, Author B. Title of e-book [format]. Place: Publisher; Date of original publication [cited year abbreviated month day]. Available from : Source. URL.
- E-Journals - Standard format - #. Author A, Author B. Title of article. Abbreviated Title of Journal [format]. year [cited year abbreviated month day]; vol(no); page numbers [estimated if necessary]. Available from: Database Name (if appropriate). URL.

Internet Documents - Standard format - #. Author A, Author B. Document title. Webpage name [format]. Source/production information; Date of internet publication [cited year month day]. Available from: URL. [Book Antiqua, 10 point, normal, justified alignment].

- [1] _____
[2] _____
[3] _____

6.2. CONTENT OF THE PAPER - INDICATIONS FOR CASE REPORTS

Content of the paper for case report will respect indications for original articles.

Themes may be selected from all medical fields. Manuscripts which offer a special gain for daily activity will have priority. The title must be clearly, precisely stated. It may be completed by a subtitle. It is advisable to include in the key words of the title the main message, the special element which may be observed from the case evolution. The content of a case report must be divided into three parts:

Introduction – It must include a maximum of 15 typed rows (half page). Here, the main medical problem is summarized in order to place the case in a specific domain.

Case report – It contains essential specific information on the case. In order to make a logical, chronological and didactical case report the following 5 chapters are needed:

- I. Anamnesis;
- II. Clinical examination data;
- III. Laboratory data;
- IV. Additional paraclinical investigations;
- V. Treatment and evolution.

Discussions – The reason for the case report must be stated. The report must be patient-centered. Occasional deviations from typical (characteristic) evolutions, nosologically important facts must be presented in such a manner to expose the clinical picture as completely as possible. The case report must not appear as an appendix of a general review. Dimensions of a case report: maximum 6-8 typed pages, 30 rows of 60 characters/page.

6.3. MEASUREMENT UNITS, SYMBOLS, ABBREVIATIONS

All measurements must be expressed in International System (IS) units. Abbreviations must be fully explained when first used.

6.4. TABLES

Tables are noted with Roman figures and they will have a brief and concise title, concordant with their content.

6.5. ILLUSTRATIONS

Number all illustrations in Arabic figures in a single succession. Apply a label on the back side of every illustration, containing its number and an arrow indicating the upper side. Coloured illustrations may be accepted but it is the choice of the editors, according to particular technical abilities of each journal issue, or it may involve a fee in special cases.

6.6. EXPLANATIONS FOR DRAWINGS AND GRAPHS

Explanation for drawings and graphs must be clear and in readable dimensions, considering the necessary publishing shrinkage.

6.7. PHOTOGRAPHS

Offer glossy, good quality photographs. Any annotation, inscription, etc. must contrast with the ground. Microphotographs must include a scale marker.

6.8. ILLUSTRATION LEGENDS

Include explanations for each used symbol, etc. Identify the printing method for microphotographs.

7. COPIES FOR PUBLISHING

In order to accelerate publishing, the main author will send a set of printed sheets presenting the final version of the paper, as it will appear in the journal. It is really helpful that texts to be also sent on electronic support, diacritic characters mandatory.

8. REJECTION OF PAPERS

If a paper does not meet publishing conditions, whatever these may be, the editors will notify the first author on this fact, without the obligation of returning the material. Original photographs or the whole material will be returned only if the author comes to the editor and takes them.

Papers submitted for publishing will be addressed to:

Prof. Angela Codruta Podariu, DMD, PhD

Journal Medicine in evolution
Department of Preventive, Community Dental Medicine and Oral Health
Splaiul Tudor Vladimirescu no. 14 A
300041, Timișoara
Email: proiectetm@yahoo.com

Dana Brehar-Cioflec, MD, PhD

Institute of Public Health "*Prof. Dr. Leonida Georgescu*" Timișoara
Bd. Victor Babeș no. 16
300226, Timișoara
Phone: 0256-492101
Email: danabreharcioflec@yahoo.com

