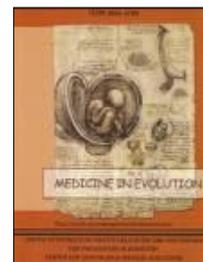


AN INVESTIGATION INTO ORAL HYGIENE, NUMBER OF MISSING TEETH AND FAILURE OF FIXED PARTIAL DENTURES IN A GROUP OF DENTAL PATIENTS IN CLUJ-NAPOCA, ROMANIA



I. MOGA¹, R. A. MOGA², R. CHIFOR¹,
M. E. BADEA¹, R. AVRAM¹

1. Department of Prevention in Dental Medicine, University of Medicine and Pharmacy "Iuliu Hatieganu", Cluj-Napoca, Romania
2. Department of Odontology-Endodontics, University of Medicine and Pharmacy "Iuliu Hatieganu", Cluj-Napoca, Romania

ABSTRACT

Aims: To investigate causes of failure of fixed prosthetic restorations (FPR) at the time of their removal in 2009-2010.

Patients and Methods: 5 pre-calibrated dentists in 3 randomly selected dental clinics examined the 45 patients who asked for dental care due to failure of a FPR. Dentists assessed O'Leary Plaque Index and both they and the patients answered a pre-validated questionnaire. Descriptive statistic analysis and multivariate logistic regression were employed.

Results: The most frequent failure causes were periodontal pockets deeper than 6 mm in the abutments associated with at least I/II mobility at 12 subjects (26.67%). 33 subjects (73.33%) never received information regarding interdental and FPR cleaning aids (ICAs). There was a statistically significant influence of the frequency of using ICAs on the number of missing teeth and on failure causes related to dental plaque.

Conclusions: Patients wearing FPR must be informed and motivated for using daily ICAs.

Key words: teeth supported, fixed prosthetic restoration, failure, oral hygiene

Correspondence to:

Mindra Eugenia Badea
Address: str. Victor Babes nr. 15 Cluj-Napoca, Romania
Phone: +40 729 918 433
E-mail: mebadea@umfcluj.ro

INTRODUCTION

Assessing the longevity of dental restoration is very difficult due to the various confusing factors that arise, such as: individual oral hygiene, appropriate design and quality of the initial restorations, quality of occlusion, parafunctions, dental recalls attended, associated general diseases that may influence the periodontal support and/or the salivary flow and caries risk etc).

The prognostic of tooth-supported fixed prosthetic restorations (FPR) is evaluated mainly by the self-assessment of patient's quality of life. For example, in 2008, Shigli *et al.* **Error! Reference source not found.** used a closed-ended questionnaire followed by a clinical examination to record a patient assessment of intraoral prostheses among 125 subjects. They found a statistically significant difference between the opinion regarding existing prostheses and age, sex and duration of prostheses.

In 2007 Güngör *et al.* **Error! Reference source not found.** focused on overall clinical performance over 7 years, determined by using modified United States Public Health Services criteria and evaluated with Kaplan-Meier survival analysis.

Regarding the causes of failure of FPR, the prospective study of Laurell *et al.* **Error! Reference source not found.** in which following periodontal therapy, 36 cross-arch fixed partial dentures with two or more cantilever units unilaterally or bilaterally were fitted in 34 patients. After completion of therapy, the patients were enrolled in a regular maintenance care program and were followed up for a period of 5 to 12 years. During this follow-up period, one abutment tooth was fractured in one patient. One fixed partial denture with extremely reduced periodontal support was lost as a result of complete

periodontal breakdown from occlusal trauma. For 33 fixed partial dentures, neither periodontal nor technical complications occurred in this study.

Most previous epidemiological studies have focused on subject-level risk factors for periodontal destruction, but the tooth-related factors have not been fully explored. In order to evaluate both tooth-related and subject-related factors affecting periodontal disease progression using a two-level multilevel model, Hirotsu *et al.* **Error! Reference source not found.** carried out a longitudinal survey over a period of 10 years carried out in 286 community-dwelling elderly subjects aged 70 years at baseline. The authors measured the clinical attachment level (CAL) at six sites per tooth on all teeth present and periodontal disease progression was defined as CAL $>$ or $=$ 3 mm. Periodontal disease progression was found in 79% of the subjects and most frequently in maxillary molars. Multilevel logistic regressions revealed that subjects wearing removable dentures were significantly at risk for periodontal disease progression. Abutment teeth for removable/fixed dentures were also significantly more likely to suffer periodontal breakdown. Furthermore, the following tooth-related variables were found to be possible risk factors for periodontal disease progression: maxillary and multirooted teeth. Multirooted teeth and abutments for a fixed denture were possible risk factors for periodontal disease progression.

Regarding the dental hygiene of adults wearing FPR, the periodontal data on 4153 adults in 304 survey locations from all Hungarian regions were analyzed in a study published by Hermann *et al.* in 2009 **Error! Reference source not found.** which used the Community Periodontal Index (CPI) to

report the occurrence of probing pocket depth, calculus, and gingival inflammation. Age, gender, socioeconomic and health status, oral hygiene and lifestyle habits, dental office attendance, level of education, and fixed partial denture (FPD) treatment were evaluated for their association with periodontal conditions. CPI score as an outcome was dichotomized using an accepted threshold as low (<3) and high ^{3, 4} for multiple logistic regression modelling. CPI2 was the most prevalent score in all age groups. CPI scores were also strongly associated with the independent variables. Approximately 66% of subjects visited a dentist only in the case of an emergency. The lack of periodontal aspects of restorative care was demonstrated by the result of CPI0

among 16% of non-FPD wearers compared with only 9% of individuals treated with FPD. This survey indicated that oral hygiene standards and periodontal health conditions need improvement in Hungary. Effective intervention programs for the prevention and control of periodontal disease were recommended by the authors to be performed at a national level.

The extensive search we performed on Medline PubMed and in the available literature for the relationship between oral hygiene and the causes of failure of FPR, other than the periodontal breakdown in the above mentioned study, although on an intuitive level it is obvious that a bad oral hygiene would lead to premature tooth loss due to caries and periodontitis.

AIMS AND OBJECTIVES

The main objective of our study was to investigate the causes of failure of fixed prosthetic restorations (FPR) at the time of their removal in the period 2009-2010 and to assess the relationship between oral hygiene (information re-

ceived about oral hygiene procedures, daily oral hygiene behavior), the number of missing teeth, the functional occlusion, the socio-economic status, and the causes of failure of FPR.

MATERIAL AND METHOD

An extensive literature search on articles with similar evaluation criteria was made of the causes of failure of FPR. It identified nine possible causes of failure. In the present study, in 2009-2010, five dentists in three randomly selected dental offices in Cluj-Napoca, Romania performed this retrospective survey.

All the examiners were calibrated to assess the previously identified nine failure causes and to calculate the Plaque Index (after O'Leary). At the end of calibration, the inter-examiner kappa was >80% for all items.

The study included the 45 patients who asked for dental treatment because of a tooth-supported FPR failure and who had this FPR made in the previous eight years. An informed consent of each patient were obtained. The study included all the patients from the dental offices selected for the study, for which the dentists decided there was indeed a need of replacement of the tooth-supported FPR. All the patients agreed to take part in the survey.

The questionnaire was validated through a pilot-study with 2 dentists and 20 patients.

The Plaque Index of the patients concerned was recorded by the dentists, on the survey form, according to the O'Leary method (percentage of surfaces with plaque deposits), after the patient was asked to chew a plaque-disclosing tablet for 3 minutes and then to rinse.

The survey form had six items filled in by the patient, regarding socio-demographic data (open questions) and the following closed questions (multiple choice questions with more than one answer possible): symptoms regarding the FPR abutments and surrounding gingival tissue, oral hygiene information received after the initial treatment, oral hygiene knowledge regarding FPR cleaning, daily individual hygiene habits and recall visits attended (frequency and reasons).

The dentists were also asked to fill in an item regarding the type of FPR failure (of the nine causes, more than one answer being possible) and the

treatment they choose to perform. A complete dental chart was recorded, on which the dentists noted for the FPR abutments the dental caries according to the International Caries Detection and Assessment System II 2005 at cavitary level (scores 3 to 6). The dentists recorded the periodontal pockets depth in 6 points (mesio-buccal, buccal, disto-buccal, disto-lingual, lingual, and mesio-lingual).

Statistical analysis was performed using the SPSS (version 13.0) statistical package and the Microsoft Office Excel 2007.

Descriptive and multivariate regression analysis was employed.

The logistic regression model was used to assess the relationship between failure causes, number of missing teeth, the presence of interference and premature contacts, oral hygiene behavior, knowledge about oral hygiene and attitude towards this and towards the dental visits.

RESULTS

An extensive search of the Medline-Pubmed medical database identified seven articles with similar evaluation criteria, of which we took the results

published by Goodacre et al.⁷ in 2007, as a reference for the failure causes (Table 1).

Table 1 Results reported in articles on FPR failure with similar including criteria

Cause	No of abutment teeth in the study/ no of affected abutment teeth	Mean incidence
Dental and root caries	3360/602 abutment teeth 1354/113 FPR	18% of the abutment teeth 8% of the FPR
Endodontic treatment needed	2514 / 276 abutment teeth 1358/ 88 FPR	11% of the abutment teeth 7% of the FPR
Decementing	1906/ 137 FPR	7% of the FPR
Aesthetic failure	1024 / 58 FPR	6%
Periodontal failure of the abutments	1440 / 62 FPR	4%
Fracture of abutments	1602 / 44 FPR	3%
Fracture of the bridge	1192 / 24 FPR	2%
Fracture of ceramic layer of metal-ceramic FPR	768 /17 FPR	2%

The sex distribution of the studied group was uniform and the socio-economic status (monthly income and education) was similar to that of the general population of Romania, according to the data provided by the Romanian National Institute of Statistics - Household Income and Expenditure - Q1

2010Error! Reference source not found. - fig. 1 and 2. The main causes of failure identified in the present study were over 6 mm pockets associated with at least I/II degree mobility at a-butments in 12 subjects (26.67%), dental caries at 8 patients (17.77%) and aes-thetic failure for 11 patients (24.44%)–fig.3.

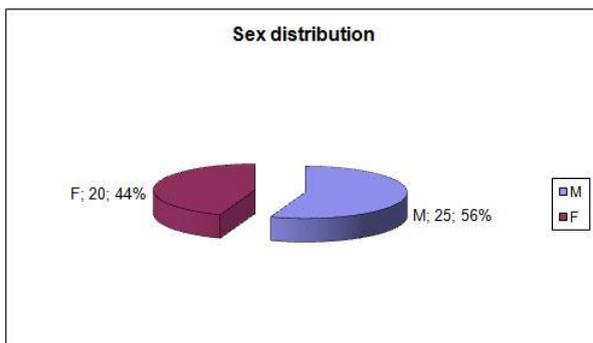


Fig.1 - Sex distribution of the studied group

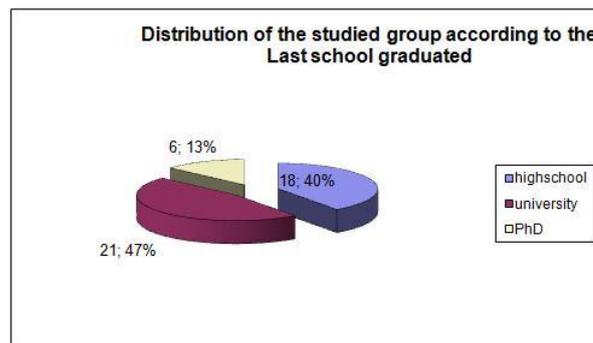


Fig.2 - Distribution of the studied group according to the last school graduated

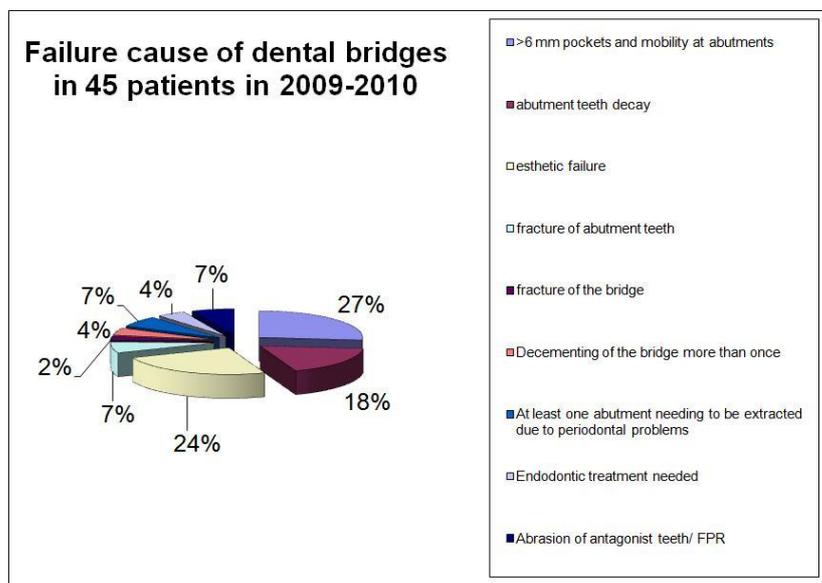


Fig.3 - Main failure cause of dental bridges at the time of their removal

The main failure causes shown in fig. 3 were mostly often associated with defficiencies in design and execution of the FPR for 7 patients (15.55%) and with parafunctional occlusal issues associated with FPR in 8 patients (17,77%). The mean ICDAS values

recored were 6.57 / 5.13 (SD= ±3.82 / 2.16) with an average D3MF-S index of 36.7 (D=11.48, M=12.52, F=12.70).

33 de subjects (73.33%) said they have not received any individual dental hygiene information regarding interdental cleaning aids (IDCAs) for the

maintenance of their FPR after their initial treatment.

10 patients (22.22%) reported they brush their teeth once a day. 9 patients (20%) declared that even if they were informed regarding the necessity of daily use of auxiliary oral hygiene methods and IDCAs, they performed just the toothbrushing 2-3 times a day. Only 11 patients (24.44%) used daily at least one of the IDCAs, which explains the distribution of the plaque index - fig. 4. Less than 10% (just 4 patients) had a check-up once a year whereas the rest of them asked for an appointment only because of pain or aesthetic problems from their FPR.

The multivariate multilevel logistic regression model used to assess the relationship between failure causes, average income, knowledge and daily habits of oral hygiene and attitude to-

wards the dental visits showed a statistically significant influence of the above mentioned explanatory factors on the failure causes related to dental and root caries (predicting the localization of caries on proximal surfaces and their depth) and on the number of missing teeth, the depth of periodontal pockets at the abutment teeth ($p < 0.05$).

The variable "Functional Occlusion" is a factorization characteristics, resulting in 2 subgroups according to values YES/NO. In the two subgroups the study of univariate association between "Lifespan of FPR" and "frequency of use of IDCAs", "Lifespan of FPR" and "material of FPR" according to the cumulative role of "frequency of using IDCAs" and "material of FPR", by bivariate regression, did not show a statistically significant influence in the studied group ($p > 0.05$).

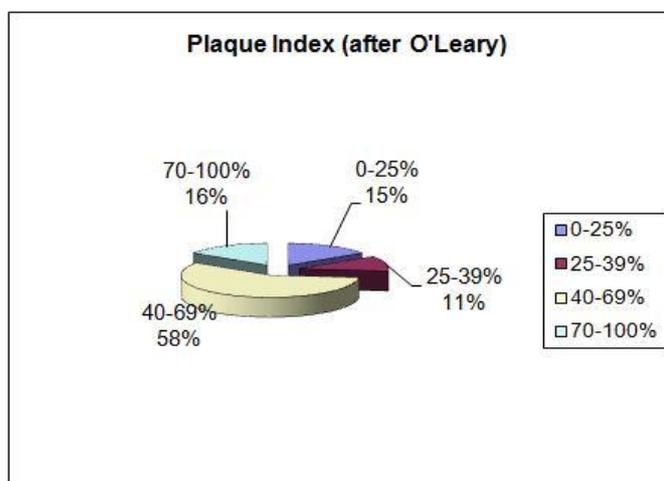


Fig.4 -Plaque index at the studied group

DISCUSSIONS

We consider that the FPR longevity because is very difficult to assess since there are lots of confusing factors which are inter-related.

From the extensive search we did in the medical literature, to our knowledge, this is the first publication regarding the relationship between oral hy-

giene behavior and the causes of failure of FPR. On an intuitive level, poor oral hygiene and the lack of interdental cleaning aids were expected to be associated with failure due to caries, periodontitis, deficiencies of design and execution of FPR, the associated parafunctions or their complications, but the

association needs further investigations, especially for clinical cases with a functional occlusion.

In order to verify this association we consider necessary a study should further investigate this possible influence on a larger number of patients and on a wider geographical area.

A possible source of bias in the present study is that it is a retrospective evaluation, based also on anamnestic data, but we consider that due to the large time-span between the initial treatment and the moment of failure of the FPR, planning a prospective study would be unrealistic since the number of patients lost to follow-up would be extremely high especially due to the particular conditions of dental treatment in Romania (the fact that the patients need to pay themselves the costs of dental treatments) which probably counts for the reduced frequency of asking for regular dental care.

We consider it would be interesting to assess the influence of root and interproximal caries on the endodontic problems and need for endodontic treatment (including for cases when the endodontic treatment can be performed without the removal of FPR).

During the clinical exam, we noticed deficiencies of design and execution of FPR that created retentive areas that made more difficult the cleaning.

Among possible confusing factors that we consider to be very difficult to assess and which are a major source of error are the following two: first there is almost impossible to evaluate at the

time of the FPR removal if there were initially any dental caries in the abutments and especially if they were correctly treated before the prosthetic treatment. Another problem is the effect of prosthetic preparation on the vitality of pulp tissues (in the present study we tried to identify by anamnesis, using standard questions, relevant symptoms for hiperemia and for partial pulpitis immediately after the application of FPR), but we consider that due to the very long time between the initial treatment and the moment of failure, there is a large source of error in collecting these information.

Tighter correlations between oral hygiene and associated failure causes (deficiencies of design and execution associated with parafunctions and periodontal pockets of 4-6 mm associated with root caries at abutments) compared to those between oral hygiene and singular failure causes suggests that a bad oral hygiene may determine the necessity of sooner replacement of FPR, but a carefully planned study should do further investigations. We consider such a study could be planned starting from the same criteria used for assessing the odontal restorations longevity. It would be interesting to assess the relation between FPR longevity, failure causes and favorisant or determinant risk factors used in this study. The survival analysis with Cox or Kaplan-Meier models may bring along proofs for such a relationship, if this study could be performed on a larger group of patients.

CONCLUSIONS

Occlusal equilibration is a major step because besides motivating patients for a regular daily oral hygiene, could significantly increase the longevity of FPR. More dental hygiene in-

formation should be given after prosthetic treatment and patients should be motivated to attend recalls on a regular basis for professional teeth-cleaning. Interdental cleaning aids should be ex-

plained and the patients have to be motivated to use them at least once a day and the using technique should be individualized. We consider patients should be motivated towards the importance of self-care and also of early self-diagnosis should be adjusted to the socio-economic level and the education of the patients. Explaining to the pa-

tient the role he can play himself into the long-term success of a prosthetic treatment which most often represents a particular financial effort, could motivate the patients towards a more important care and preoccupation towards oro-dental health and onto more careful daily individual oral hygiene, including the use of IDCAs.

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