Evaluation of Fixed Prosthodontic Appliances after Five Years of Use Using Orthopantomographic Screening in Relation to Material

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Summary

The aim of this study was to screen patients with fixed prosthodontic appliances, in the mouth for a period of 5 years or more, for root caries and pocket formation, deeper than 3 mm. The aim was also to determine the difference between frequency of pathologic findings for different materials of fixed prosthodontic appliances (FPA), or between abutments and natural teeth. A total of 260 patients (55% women and 45% men) aged from 25 to 70 years, who had a fixed prosthodontic appliance for a period of 5 years or more in their mouth and who were fully satisfied, participated in the study. A total of 260 orthopantomographs were analysed with 2265 teeth, 864 were abutments of the bridges, 407 crowns and the rest natural teeth. Radiographs were analysed for root caries and pocket formation. The results reveal relatively high incidence of pathologic findings (caries, periodontal pockets > 3 mm) in patients with FPDs older than 5 years. Periodontal pockets were more frequent than cervical caries. The highest frequency of pathologic findings was registered for abutments with metal acrylic crowns, and the lowest frequency of pathologic findings was registered for abutments with metal-ceramic crowns ($p<0.05$). There were no significant differences between abutments with metal-ceramic crowns and non-abutment teeth ($p>0.05$). There were no significant differences in caries incidence between the examined teeth ($p>0.05$). Non-abutment teeth and abutments of metal-ceramic crowns had significantly lower frequency of pockets deeper than 3 mm than abutments of metal acrylic and full metallic crowns ($p<0.05$).

Key words: *fixed prosthodontic partial denture, over 5 years old, orthopantomograph.*

Acta Stomat Croat
2002; 249-252

ORIGINAL SCIENTIFIC PAPER
Received: January 15, 2002

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Introduction

Orthopantomography is a widely accepted radiographic technique which produces a single image of the facial structures including both maxillary and mandibular jaws with TM joints. It is widely used for screening patients before any prosthodontic treatment as it may reveal roots, cysts, foreign bodies and even neoplasms in completely edentulous jaws with no clinical signs (1-3). It helps in evaluation of resorptive changes of the jaws (4, 5) and is very important in implantology (6).

However, if some teeth are present in the patient's jaws it may offer even more useful information. Although panoramic radiograph is affected by both magnification errors and displacement, it has been proved that linear dimensions of the structures on the radiogram are similar to the actual dimensions of the filmed structures, as long as the distances measured do not traverse the midline (7).

The radiation dose is significantly lower for orthopantomographic radiographs in comparison with the dose needed for oral status using retroalveolor radiographs (8).

Numerous studies worldwide have evaluated clinically and/or radiographically fixed partial dentures older than 5 years (9-21) and the results vary considerably, dependent on caries incidence, periodontal pocket formation, alveolar bone recession etc.

Aim of the study

The aim of the study was to screen patients with fixed prosthodontic appliances, in the mouth for a period of 5 years or more, for root caries and pocket formation and alveolar ridge resorption, which comprised all teeth present in mouth. The aim was also to find out if there is any difference between different materials of fixed prosthodontic appliances (FPA), or between abutments and natural teeth.

Patients and methods

A total of 260 patients (55% women and 45% men) aged from 25 to 70 years, who had a fixed prosthodontic appliance for a period of 5 years or more in their mouths, participated in the study. They came to their dentist for some other reason, not because they wanted a replacement of their bridges or crowns. They had no problem with their fixed prosthodontic appliance and stated they had no complaints and were fully satisfied. All of the patients were radiographically controlled (orthopantomographic radiograph) for other reasons, and not due to the problems with their fixed appliances.

A total of 260 orthopantomographs were analysed with 2265 teeth, 864 were abutments of the bridges, 407 crowns and the rest natural teeth. Radiographs were analysed for root caries and pocket formation. Pockets on non-abutment teeth were measured in cases if the upper border of the alveolar crest was more than 3 mm below the cemeto-enamel junction. If alveolar bone was more than 3 mm below the crown's margin, however coupled with vertical bone resorption, it was considered a pocket formation on abutment teeth. Measurements were performed by a precise calliper (MEBA, Zagreb, Croatia) with precision of 0.1 mm.

Although there was no significant difference between the three dentists who analysed 20 orthopantomographs and who examined 20 patients (Kappa = 0.89), it was decided that only one dentist should examine all the orthopantomograms and all the patients. The dentist recorded the data on the material of the crowns and bridges (full metal, metal + acrylic veneer, metal ceramic).

The statistical analysis comprised descriptive statistic methods and χ^2 test.

Results and discussion

Percentages of the radiologically examined teeth are presented in Figure 1.

The distribution of different material used for FPA is shown in Figure 2.

There were no statistically significant differences in frequency of FPA or materials used between men and women (χ^2 = 1.2 d.f. = 3; p=0.201 N.S.) (p>0.05).

Findings of root caries, pockets deeper than 3 mm, caries + pockets deeper than 3 mm for all the exam-

ined teeth (abutments with metal acrylic veneer material, abutments with full metallic FPA, abutments with metal-ceramic material and natural non-abutment teeth) on the orthopantomographic radiograms are shown in Figure 3.

Pathologic findings for all the examined teeth on the orthopantomographic radiogram are shown in Figure 4.

The significance of the differences in pocket formation between abutments with metal acrylic veneer material, abutments with full metallic FPA, abutments with metal-ceramic material and natural non-abutment teeth is shown in Table 1. There was statistically significant higher incidence in pocket formation in abutments with metal acrylic veneer material and abutments with full metallic FPA in comparison to abutments with metal-ceramic material and natural non-abutment teeth. There was no significant difference in pocket frequency between abutments with metal-ceramic material and natural non-abutment teeth (χ^2 = 0.338; d.f. = 1; p=0.561 N.S.) (p>0.05).

There was no significant difference in root caries frequency between abutments with metal acrylic veneer material, abutments with full metallic FPA, abutments with metal-ceramic material and natural non-abutment teeth (χ^2 = 1.84; d.f. = 3; p=0.103 N.S.) (p>0.05).

The worst findings, both for caries and pockets deeper than 3 mm were recorded in metal + acrylic veneer crowns in comparison to other FPAs or non-abutments, which is statistically significant (Figure 4, Table 2).

The radiographic analysis of this study on the status of abutment teeth, their parodontium and surrounding alveolar tissue, indicates the relatively high frequency of pathologic findings for abutments of FPAs.

The lowest percentage (9%) of caries was recorded for abutments with metal-ceramic crowns. The lower percentage of caries on metal-ceramic abutments in comparison to other FPA materials could be ascribed to the fact that the higher extent of tooth preparation for the metal-ceramic crown may eliminate eventual initial caries lesions. Another possibility is that, due to the fact that the cost of metal-ceramic FPDs is not covered by our national insurance system, patients take more care and maintain better oral hygiene. Some studies have also proved that dental plaque does not adhere firmly to glazed ceramics as to other materials in prosthodontics, especially in the early stage (22).

A relatively high percentage of pathologic findings (caries, pockets > 3 mm) was diagnosed for abutments of all kinds of FPAs, as well as for non-abutment teeth. The highest percentage of pathologic findings was found for abutments with metal acrylic crowns (p<0.05). The reasons for the high percentage of pathologic findings in this study could be multifactorial. Namely, in this study analysis of orthopantomographic radiographs was performed, which did not include assessment of oral hygiene. Other studies in this country revealed that oral hygiene (23-27) was inadequate, which may be one of the most important factors for such findings.

Abutments with metal ceramic RPDs had the lowest percentage of pathological findings, and frequency of 42% of pockets deeper than 3 mm is much worse than the reports of other studies with 12% pockets deeper than 4 mm after 10 years of use (14). Apart from inadequate oral hygiene, the reason for the high frequency of periodontal pockets in this study cuold be ascribed to the fact that FPAs include teeth with periodontal diseases prior to preparation.

The frequency of caries was lower than the frequency of periodontal pockets, although it is a relatively high frequency in comparison with the findings of some other authors (14) who did not register caries at all in 10 year old FDPs, or in comparison with Carlson and Yontchev (18) or Rashid et al. (9), who stated that caries was a rare feature. On the other hand, Libby et al. found that cervical caries is the most frequent reason for failure of fixed prosthodontic partial denture (16).

The results of this study revealed a higher incidence of periodontal pockets than cervical caries.

The results revealed in this study are better than the results in some other populations. The highest recorded caries incidence (9%-metal acrylic crown abutments) is still lower than 65% incidence of caries on abutments of FPAs in after-war Sarajevo, recorded by Redžepagić (12).

The results of this study are much better than the results collected in geriatric populations older than

65 years, regardless of whether they lived with their family or in a geriatric institution (21, 28-30).

Due to the relatively high incidence of pathologic findings, for both abutment and non-abutment teeth, it is possible to conclude that recall examinations are needed, at least once or twice a year, and education of patients on correct oral hygiene.

Conclusions

1. The results reveal a relatively high incidence of pathologic findings (caries, periodontal pockets > 3 mm) in patients with FPD s older than 5 years. Periodontal pockets are more frequent than cervical caries.
2. The highest frequency of pathologic findings was registered for abutments with metal acrylic crowns and the lowest was registered for abutments of metal-ceramic crowns ($p<0.05$). There were no significant differences between abutments with metal-ceramic crowns and non-abutment teeth ($p>0.05$).