

# Screening of Fixed Prosthodontic Dentures after Five Years of Use in Relation to Material and Construction

I. Baučić<sup>1</sup>, M. Baučić<sup>2</sup>, J. Stipetić<sup>1</sup>, D. Komar<sup>1</sup>, K. Mehulić<sup>1</sup>, D. Božić<sup>1</sup>,  
B. Klaić<sup>3</sup> and A. Čelebić<sup>1</sup>

<sup>1</sup> School of Dental Medicine, University of Zagreb, Zagreb, Croatia

<sup>2</sup> Department of Dental Prosthodontics, University Hospital »Dubrava«, Zagreb, Croatia

<sup>3</sup> Dental Polyclinic »Perkovičeva«, Zagreb, Croatia

## ABSTRACT

*The aim of this study was to screen patients with fixed prosthodontic appliances that were in oral cavity for a period of 5 years or more and to assess clinically and radiologically root caries, gingival recession, pocket formation, alveolar ridge resorption, as well as gingival (GI) and plaque index (PI). The aim also was to find out the differences between materials and constructions, between abutment and non-abutment teeth, and to find out the need for replacement. A total of 260 patients and their orthopantomograms were examined, with a total of 2,265 teeth, 610 being bridge abutments and 246 being crowns. The most frequent were metal+ acrylic veneer crowns or bridges. Root caries was found under the abutments in 10–20%; however abutments with ceramic crowns had the lowest percentage of caries ( $p < 0.01$ ). Alveolar ridge resorption, pocket formation deeper than 3 mm and gingival recession of various degree was found in 50% of the cases, again with the lowest percentage of ceramic-fused-to-metal appliances ( $p < 0.01$ ). Pocket depth was registered in significantly higher percentage in metal-acrylic veneer appliances compared to natural teeth ( $p < 0.01$ ), while there was no significant difference between metal-ceramic appliances and natural teeth ( $p > 0.05$ ). Although the worst findings were recorded for metal+acrylic veneer crowns for PI, no significant difference existed between crowns of different material or non-abutment teeth ( $p > 0.05$ ). There was statistically significant difference between abutments with metal + acrylic veneer crowns, full metal crowns, metal ceramic crowns and non-abutments for GI scores. Higher percentage of scores 0 and 1 was recorded for metal ceramic crowns and non-abutments and significantly higher percentage of scores 2 and 3 was recorded for metal + acrylic veneer crowns and full metallic crowns. Almost 50% of metal-ceramic abutments had no pathologic findings. Almost 30% of the patients needed replacement, or even some abutments to be extracted and therefore a new prosthodontic appliance.*

## Introduction

Orthopantomography is a widely used technique for screening a patient before any prosthodontic treatment. It may reveal foreign bodies, residual roots, cysts, and even neoplasms in completely edentulous jaws with no clinical signs<sup>1-3</sup>. It helps in evaluation of resorptive changes of the jaws<sup>4,5</sup> and is very important in implantology<sup>6</sup>. Orthopantomographic radiograph is the most important as may reveal some changes on abutment teeth of fixed partial dentures (FPD) and non-abutment teeth during the follow-up studies..

Orthopantomographic radiograph produces a single image of the facial structures including both maxillary and mandibular jaws with TM joints. It is known that panoramic radiograph is affected by both, magnification errors and displacement, but 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<sup>7,8</sup>.

The radiation dose is significantly lower for orthopantomographic radiograph in comparison with the dose needed for oral status using retroalveolar radiographs<sup>9</sup>.

Numerous studies evaluated clinically and/or radiologically fixed partial dentures<sup>10-20</sup> and the results vary considerably dependent on caries incidence, periodontal pocket formation, alveolar bone recession etc.

The aim of this study was to screen clinically and radiologically (orthopantomograms) patients with FPD that were in mouth for a period of 5 years or more to reveal the frequency of root caries, pocket formation, alveolar ridge resorption and gingival and plaque index (GI and PI). The aim was also to find out the differ-

ence between different materials and different fixed partial denture construction (FPA), the difference between abutment and natural teeth and finally to find out the percentage of need for replacement.

## Patients and Methods

A total of 260 patients (55% women and 45% men) from 25 to 70 years, who had a fixed prosthodontic appliance (FPD) for a period of 5 years or more (5-12 years) in their mouth participated in the study.

They came to the 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 they stated they had no complaints and are fully satisfied. All of the patients had to be radiographically controlled (panoramic radiograph) for any other reason except for the problems with their FPDs.

The patients were also examined clinically and the dentist recorded data about material of the crowns and bridges (full-metal, metal + acrylic veneer, metal ceramic), root caries, gingival recession (from the cemento-enamel junction to gingival margin using the graduated periodontal probe in mm), pocket depth (graduated periodontal probe), as well as plaque (PI) and gingival index (GI)<sup>21,22</sup>.

From panoramic radiograph horizontal alveolar resorption around abutment and non-abutment teeth was evaluated. However, horizontal alveolar ridge resorption was measured in those cases when the upper border of alveolar crest was more than 3 mm below cemento-enamel junction. If alveolar bone was more than 3 mm below the cemento-enamel margin, however coupled with vertical bone resorption, it was considered a pocket formation. Measurements were performed by a precise caliper (MEBA, Zagreb, Croatia) with a precision of 0.1 mm.

There was no significant difference among the three dentists who analyzed 20 orthopantomographs and who examined 20 patients (Kappa = 0.89), but it was decided that only one dentist should examine all the orthopantomographs and all the patients. The same dentist also made clinical examination.

The statistical analysis comprised descriptive statistic methods and  $\chi^2$  test.

## Results and Discussion

The examined teeth comprised 44% natural teeth, 38% of bridge abutments and 18% of crown abutments. There were 32% full metal crowns, 43% metal-acrylic veneer crowns and 25% metal-ceramic crowns.

No statistically significant differences were found in frequency of FPD or materials used between men and women ( $\chi^2 = 1.2$ ;  $df = 3$ ;  $p = 0.201$  ns) ( $p > 0.05$ ) and therefore the statistical analysis included the whole sample.

Findings of root caries, pockets deeper than 3 mm, caries + pockets deeper than

3 mm, horizontal alveolar resorption and gingival recession for all examined teeth (metal-acrylic veneer abutments, full metal-crown abutments metal-ceramic abutments and natural non-abutment teeth) are shown in Figure 1.

The significance of the differences for root caries between abutments with metal+acrylic veneer material, abutments with full metallic FPDs, abutments with metal-ceramic FPDs and natural non-abutment teeth is shown in Table 1. There was significantly higher incidence of root caries on abutments with metal+acrylic veneer material in comparison to the abutments with metal-ceramic material, full-metal crowns and natural non-abutment teeth ( $p < 0.05$ ).

The significance of the differences for 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 significantly higher incidence of pocket formation in abutments with metal+acrylic veneer mate-

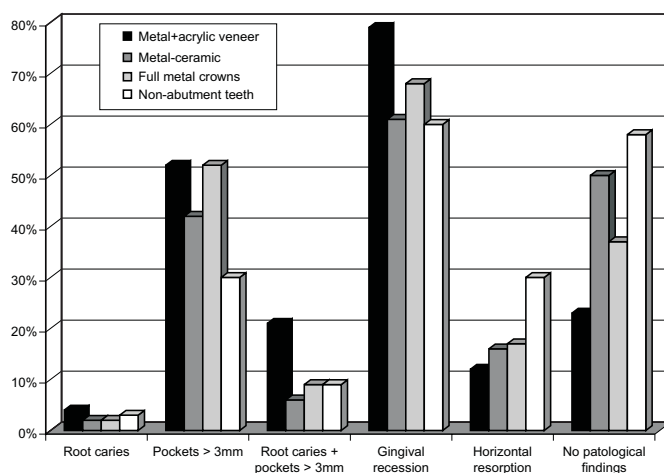


Fig 1. Frequency of root caries, pockets deeper than 3 mm, caries + pockets deeper than 3 mm, gingival recession and horizontal alveolar recession in different FPD abutments and non-abutment teeth.

**TABLE 1**  
SIGNIFICANCE OF THE DIFFERENCES BETWEEN FINDINGS ON ABUTMENTS WITH METAL +ACRYLIC VENEERS, FULL METALLIC, METAL-CERAMIC CROWNS AND NON-ABUTMENT TEETH

| Findings                       | $\chi^2$ | df | p       |
|--------------------------------|----------|----|---------|
| Root caries                    | 14.0     | 5  | 0.030*  |
| Periodontal pockets > 3 mm     | 13.7     | 5  | 0.038*  |
| Gingival recession             | 11.6     | 5  | 0.045*  |
| Horizontal alveolar resorption | 14.8     | 5  | 0.018*  |
| All pathological findings      | 15.6     | 5  | 0.010** |

\*p<0.05; \*\*p<0.01

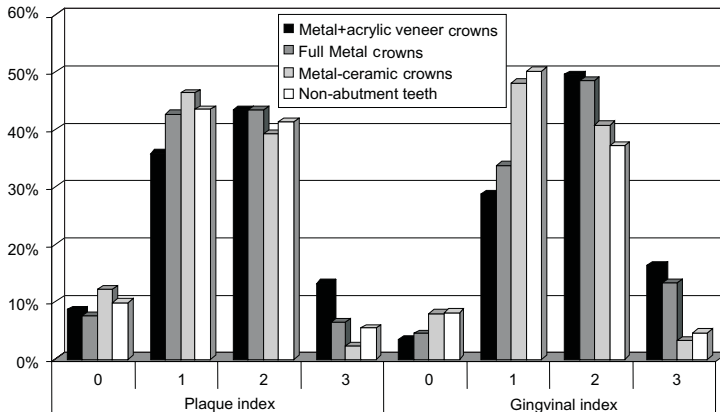


Fig 2. Frequency of plaque and gingival index metal + acrylic veneer abutments, full metal abutments, metal – ceramic abutments and non-abutment teeth.

rial and abutments with full metallic FPA in comparison to abutments with metal-ceramic material and natural non-abutment teeth (p<0.05).

The significance of the differences for horizontal alveolar bone resorption between abutments with metal+acrylic veneer material, abutments with full metallic FPA, abutments with metal-ceramic material and natural non-abutment teeth is also shown in the Table 1. There was a significant difference (p<0.05) for the incidence of horizontal alveolar resorption, non-abutment teeth having the highest percentage of horizontal resorption. However, this finding was due to the higher incidence of gingival pockets on abutment teeth. Besides, pocket pathology is

clinically more serious than horizontal resorption, which is even a normal physiologic appearance due to aging.

The significance of the differences for gingival recession 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 significantly higher incidence of gingival recession on abutments with metal+acrylic veneer material in comparison with abutments with other types of prosthodontic restoration or non-abutments (p<0.05).

The radiographic and clinical analysis revealed high frequency of pathologic

findings (root caries + pocket formation) on abutments of FPAs (Figure 1).

Frequency of plaque and gingival index on metal + acrylic veneer abutments, full metal abutments, metal – ceramic abutments and non-abutment teeth is shown in Figure 2.

There was no significant differences between abutments with metal + acrylic veneers, full metal crowns, metal ceramic crowns and non-abutments for PI scores ( $\chi^2= 4.5$ , ns), although the worst findings were recorded for metal + acrylic veneer crowns. However, there was statistically significant difference between abutments with metal + acrylic veneer crowns, full metal crowns, metal ceramic crowns and non-abutments for GI scores ( $\chi^2= 8.9$ ,  $p<0.05$ ). Higher percentage of scores 0 and 1 was recorded for metal ceramic crowns and non-abutments and significantly higher percentage of scores 2 and 3 was recorded for metal + acrylic veneer crowns and full metallic crowns.

The highest percentage of root carious lesions was recorded in metal + acrylic veneer crowns and the lowest percentage (9%) of carious lesions was recorded on abutments with metal-ceramic crowns. This could be attributed to the fact that higher extent of tooth preparation for metal-ceramic crown may eliminate eventual initial lesions. However, more acceptable interpretation would be the assumption that patients who decide to pay for the cost of metal-ceramic crowns

(it is not covered by Croatian basic insurance system) take better care for their teeth and maintain oral hygiene regularly.

Oral hygiene was generally poor, as could be seen from PI scores. The worst result is recorded on metal + acrylic veneer crowns, together with the highest incidence of gingival recession, root carious lesions and pocket formation. High incidence of periodontal pockets, especially on acrylic-veneer metal abutments could not be attributed only to the inadequate oral hygiene<sup>18,20-35</sup>, but also to irritation of gingival tissue due to the contact with alloy (and/or acrylic facets), as many FPD were made of Ag-Pd alloy (which is covered by insurance in our country, and gold alloys are not). Significantly higher incidence of GI scores, as recorded in this study may contribute to this assumption.

The results on the incidence of pathologic findings obtained in this study are better than some other studies including patients with FPDs<sup>16</sup>, or the studies on geriatric population<sup>36</sup>, or patients with FPDs combined with removable partial dentures<sup>24,25,32</sup>.

However, a specialist of prosthodontics should not be satisfied with such findings and therefore regular recall examinations should be performed after the fixed or combined fixed-removable prosthetic therapy with thorough instructions on how to maintain proper oral hygiene.

## REFERENCES

1. KOGON, S., R. BOHAJ, R. STEPHENS., Oral Surg. Oral Med. Oral Patol. Oral Radiol. 80 (1995) 365.
2. SPYROPOULOS, N. D., A. J. PATSAKAS, A. P. ANGELOPOULOS., Oral Surg., 52 (1981) 455.
3. SWENSON, H. H., J. R. HUDSON., J. Prosth. Dent., 18 (1967) 304.
4. ORTHMAN, L. F., J. Prosth. Dent., 22 (1989) 449.
5. SOIKKONEN, K., A. AINAMO, Q. XIE, J. Oral. Rehabil., 23 (1966) 70.
6. UPDEGRAVE, W. J., Oral Surg. Oral Med. Oral Patol. Oral Radiol., 22 (1966) 49.
7. ČATIĆ, A., A. ČELEBIĆ, M. VALENTIĆ-PERUZOVIĆ, A. ČATOVIĆ, T. KUNA., Coll. Antropol., 22 Suppl. (1998) 139.
8. ČATIĆ, A., A. ČELEBIĆ, M. VALENTIĆ-PERUZOVIĆ, A. ČATOVIĆ, V. JEROLIMOV, I. MURETIĆ., Oral Surg. Oral Med. Oral Patol. Oral Radiol. Endod., 86 (1998) 242.
9. SWENSON, B., B. SODERFELDT, H. G. GRONDAHL. Dentomaxillofac. Radiol., 25 (1996) 151.
10. LOVGREN, R., B. ANDERSSON, G. E.

- CARLSSON, P. ODMAN., J. Prosthet. Dent., 84 (2000) 514. — 11. SERDAR COTERT, H., B. OZTURK., J. Oral Rehabil., 24 (1997) 697. — 12. RASHID, S. A., A. M. AL-WAHADNI, D. L. HUSSEY, J. Oral Rehabil., 26 (1999) 912. — 13. ROSEN, H., J. Prosthet. Dent., 80 (1998) 511. — 14. NAPANKANGAS, R., M. A. SALONEN, A. M. RAUSTIA, J. Oral Rehabil., 24 (1997) 713. — 15. SUNDH, B., P. ODMAN., Int. J. Prosthodont., 10 (1997) 513. — 16. REDŽEPAGIĆ, S., Med. Arh., 49 (1995) 95. — 17. LIBBY, G., M. R. ARCURI, W. E. LAVELLE, L. HEBL., J. Prosthet. Dent., 78 (1997) 127. — 18. BUDTZ-JORGENSEN, E., J. Dent., 24 (1996) 237. — 19. CARLSON, B. R., E. YONTCHEV, J. Oral Rehabil., 23 (1996) 163. — 20. MOJON, P., A. RENTSCH, E. BUDTZ-JORGENSEN., Int. J. Prosthodont., 8 (1995) 564. — 21. SILNESS, J., H. LÖE., Acta Odontol. Scand., 22 (1964) 121. — 22. LÖE, H., J. SILNESS., Acta Odontol. Scand. 21 (1963) 533. — 23. STIPETIĆ, J., A. ČELEBIĆ, I. BAUČIĆ, B. LAZIĆ, D. KOMAR, V. BRATOLIĆ, A. ČATIĆ, S. ŠTEFANČIĆ., Coll. Antropol., 25 (2001) 311. — 24. KNEZOVIĆ ZLATARIĆ, D., A. ČELEBIĆ., Int. J. Prosthodont., 14 (2001) 423. — 25. KNEZOVIĆ ZLATARIĆ, D., A. ČELEBIĆ, M. VALENTIĆ-PERUZOVIĆ., J. Periodontol., 73 (2002) 137. — 26. STIPETIĆ, J., A. ČELEBIĆ, V. JEROLIMOV, I. VINTER, S. KRALJEVIĆ, Z. RAJIĆ., Coll. Antropol., 24 Suppl. (2000), 25. — 27. STIPETIĆ, J., A. ČELEBIĆ, A. ČATOVIĆ, T. IVANIŠ, Journal of Dental Research., 79 (2000) (Special Issue) 263 — 28. STIPETIĆ, J., T. IVANIŠ, A. ČELEBIĆ, A. ČATOVIĆ, T. KUNA, Acta Stomatol. Croat. 33 (1999) 55. — 29. STIPETIĆ, J., T. IVANIŠ, A. ČELEBIĆ, A. ČATOVIĆ, T. KUNA, S. ŠEGOVIĆ, Acta Stomatol. Croat. 33 (1999) 199. — 30. STIPETIĆ, J., A. ČELEBIĆ, A. ČATOVIĆ, B. LAZIĆ, J. PANDURIĆ, Acta Stomatol. Croat., 33 (1999) 349. — 31. STIPETIĆ, J., A. ČELEBIĆ, A. ČATOVIĆ., Coll. Antropol., 22 Suppl. (1998) 31. — 32. KNEZOVIĆ-ZLATARIĆ, D., A. ČELEBIĆ, M. VALENTIĆ-PERUZOVIĆ, R. ČELIĆ, I. FILIPOVIĆ-ZORE, M. BAUČIĆ., Coll. Antropol., 24 (2000) 485. — 33. ČELEBIĆ, A., M. VALENTIĆ-PERUZOVIĆ, H. BRKIĆ, G. PRPIĆ-MEHIČIĆ, Coll. Antropol., 18 (1994) 87. — 34. ČELEBIĆ, A., M. VALENTIĆ-PERUZOVIĆ, G. PRPIĆ, J. STIPETIĆ, Acta Stom. Croat., 27 (1993) 17. — 35. STIPETIĆ, J., A. ČELEBIĆ, G. PRPIĆ-MEHIČIĆ., Acta Stom. Croat., 26 (1992) 55. — 36. ČATOVIĆ, A., B. LAZIĆ, I. BAUČIĆ, D. KOMAR, D. VOJVODIĆ, M. VALENTIĆ-PERUZOVIĆ, A. ČELEBIĆ, J. Dent. Res., 6 (1997) 118.

## I. Baučić

*Department of Prosthodontics, School of Dental Medicine, University of Zagreb, Gundulićeva 5, 10000 Zagreb, Croatia*

## STANJE FIKSNO-PROTETSKIH RADOVA NAKON VIŠE OD 5 GODINA UPORABE OVISNO O MATERIJALU I VRSTI KRUNICA

### SAŽETAK

Cilj rada bio je pregledati i otkriti eventualna patološka stanja fiksnih protetskih radova ili susjednih tkiva u pacijenta čiji su radovi bili stariji od pet godina. Evaluirani su postoci karijesa na korijenovima zuba, postoci gingivne recesije, nastajanje džepova ili horizontalne resorpcije alveolarne kosti uz zube, kako bi se utvrdilo postoje li razlike između različitih materijala i konstrukcija, razlike između zuba nosača mosta ili krunice i ostalih zuba nenosača protetske konstrukcije, te kako bi se ustanovila eventualna potreba za zamjenom fiksno-protetskog rada. Pregledano je ukupno 260 ortopantomograma, tj. 2.265 zuba, od čega su 610 zuba bili nosači mosta, a 246 nosači krunica. Najčešće upotrebljavani materijal kod mostova (ili krunica) bio je metalna legura s akrilatnim fasetama. Karijes korijena ustanovljen je ispod zuba nosača u 10–20% slučajeva; nosači krunica od keramike imali su najmanji postotak karijesa ( $p < 0,01$ ). Resorpcija kosti na zubima nosačima, formacija džepova dubljih od 3 mm i recesija gingive različitog stupnja ustanovljena je u 50% slučajeva, s najmanjim postotkom kod

keramičkih radova ( $p < 0,01$ ). Džepovi su bili značajno dublji kod radova napravljenih od dentalne legure s akrilatnim fasetama u usporedbi sa zubima nenosačima ( $p < 0,01$ ), a nije bilo značajne razlike između keramičkih radova i zuba nenosača ( $p > 0,05$ ). Premda su registrirane najviše vrijednosti plak indeksa kod fasetiranih radova, nije bilo značajne razlike između njih i potpunih metalnih i metalno-keramičkih radova ili zuba nenosača ( $p > 0,05$ ). Značajna razlika registrirana je za GI indeks s značajno većim postotkom rezultata 0 i 1 kod metal-keramičkih radova i nenosača, a značajno većim postotkom rezultata 2 i 3 kod fasetiranih i potpunih metalnih radova. Gotovo 50% keramičkih radova nije imalo nikakvih patoloških nalaza. Gotovo 30% pacijenata trebalo je izradu novog fiksno-protetskog rada, liječenje nosača, čak i ekstrakciju pojedinih zuba nosača prije izrade novog protetskog nadomjeska.