Margin fit of metal crowns and bridge retainers

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The margin fit of metal crowns and bridge retainers was examined radiographically in individuals who were registered to receive treatment at the School of Dentistry, University of Bergen. One sample consisted of 184 individuals registered in 1967–68 and another one of 232 individuals registered in 1982–83. In all, 2057 proximal surfaces could be examined. The margin fit was scored as excess, deficit, or satisfactory. In the 1967–68 single-crown sample margin excess was recorded for 66%, margin deficit for 8%, and satisfactory fit for 26%, on the average. In the 1982–83 single-crown sample margin excess was recorded for 36%, margin deficit for 5%, and satisfactory fit for 59%. In the 1967–68 sample bridge retainer margins on the average scored 60% excess, 10% deficit, and 30% satisfactory fit. In the 1982–83 bridge retainer sample margin excess amounted to 33%, margin deficit to 4%, and satisfactory fit to 63%. The possible reasons for the differences between the two samples are discussed.
□ *Clinical assessments; prosthetics*

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Restoration margins have been reported to promote accumulation of plaque and cause gingival reactions when placed subgingivally (1–5). By histological methods it has been found that the severity of the gingival and periodontal reactions may increase if subgingival restoration margins have defects (1, 2). Björn et al. (6) reported that alveolar bone loss may be associated with overhanging artificial crown margins. Supragingival overhanging gold alloy restoration margins have been reported to accumulate more plaque than control teeth without restorations (7).

In the present investigation the occurrence of metal crown margins with excess, deficit, and satisfactory fit was examined on the basis of radiographs of two samples of individuals registered for dental treatment in the dental school at the University of Bergen, in 1967–68 and in 1982–83.

Materials and methods

Samples

The investigation aimed at examining all patients who had crowns or bridges at the time they were registered for treatment at the dental school. For a minor portion (approximately 5%) of the patient records, radiograms were not available.

In the 1967–68 sample 184 individuals had crowns or bridges, whereas the corresponding number in 1982–83 was 232. The mean age of the 1967–68 individuals was 46.4 years and that of the 1982–83 sample 54.8 years. The female to male ratio was equal for the two samples (6:4).

Radiograms

The 1967–68 radiograms had been taken with a bisecting-angle technique, whereas the radiograms from 1982–83 had been taken by use of a film holder described by Eggen (8). All radiograms had been taken at the Department of Oral Radiology. Some of the radiograms were unreadable for the purpose of the investigation owing to inadequate projection. From the 1967–68 sample 17% of the original number of surfaces and from the 1982–83 sample 10.6% of the surfaces were unreadable owing to inadequate projection. The percentages of excluded surfaces were approximately the same for all tooth types, with a somewhat greater number of unreadable radiograms for anterior teeth than for

Table 1. Mean age and standard deviations and number of individuals, radiograms, and proximal surfaces

	Age, years (mean ± SD)	Individuals, *n*	Radiograms, *n*	Surfaces, *n*
1967–1968	46.4 ± 13.6	184 (118F, 66M)	223	764
1982–1983	54.8 ± 15.7	232 (146F, 86M)	547	1293

premolars and molars in both samples. In total, 764 proximal surfaces based on 223 radiograms from the 1967–68 period and 1293 proximal surfaces based on 547 radiograms from the 1982–83 period could be examined (Table 1). The radiograms were mounted in diaslides, 5 cm × 5 cm, and projected with the optical axis of the projector at a right angle to a screen with a 10-fold linear magnification. The radiograms were examined by one of the authors (F. Gustavsen).

Margin fit was scored as excess, deficit, or satisfactory.

Criteria for scoring

The restorations were scored as excess or deficit when the cervical margin area showed definite deviation from the expected contour of the proximal surface. When in doubt, the 'satisfactory' score was used.

Examiner variability

Examiner variability was calculated by reexamining a 10% random sample of each of the two series. The percent reproducibility (the number of surfaces scored consistently divided by the total sum of scored surfaces times one hundred) was 88% for both samples.

Results

In 1967–68 approximately 6% of the patients registered for treatment in the school had crowns or bridges. The corresponding figure for 1982–83 was 15%. The number of proximal surfaces with crown or bridge retainer margins per individual was on the average 5 for the 1967–68 sample and 6.1 for the 1982–83 sample. Whereas 54% of the examined teeth in 1967–68 had single crowns, the corresponding figure for 1982–83 was 60%.

Single-crown margins (Fig. 1)

For the 1967–68 sample margin excess amounted to about 66%, deficit was recorded in about 8%, and satsifactory fit was found in about 26% of the proximal surfaces. No distinct differences between the various tooth types occurred.

Distinctly lower percentages of margin excess and margin deficit were found among the 1982–83 patients—on the average, about 36% and 5%, respectively. Satisfactory fit, on the other hand, occurred more frequently and was recorded in about 59% of the proximal surfaces. The fit varied somewhat between crowns made on different tooth types. Anterior teeth had the highest proportion of surfaces with satisfactory fit, molars were intermediate, and premolars had the lowest proportion.

Bridge retainer margins (Fig. 2).

In the 1967–68 sample bridge retainer margins on the average showed about 60% excess, 10% deficit, and 30% satisfactory fit. Relatively large differences were encountered between tooth types, especially with regard to margin excess and satisfactory fit. Crowns on the anterior teeth showed the lowest frequency of margin excess, whereas those on the molars demonstrated the highest frequency. Margin excess and deficit figures on the average were markedly lower for the 1982–83 individuals, whereas satisfactory fit was correspondingly higher. The actual percentages were about 33, 4, and 63. Again, differences occurred, depending on

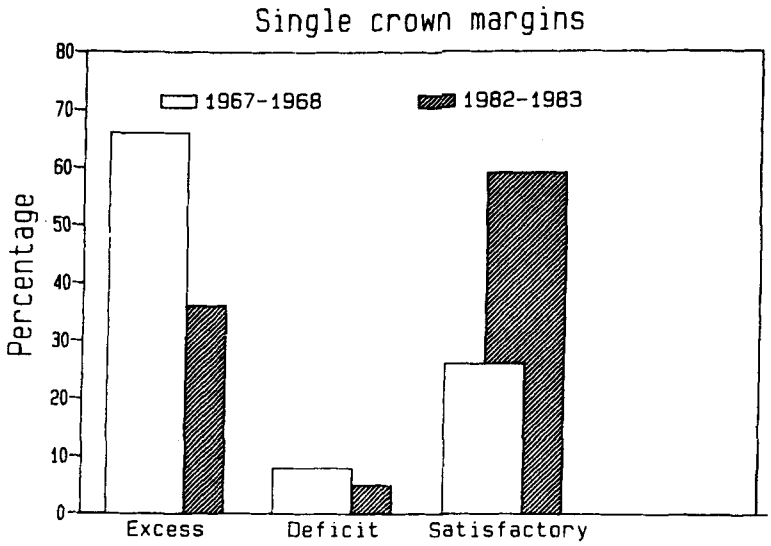

Fig. 1. Percentage distribution of margin fit scores for single crowns.

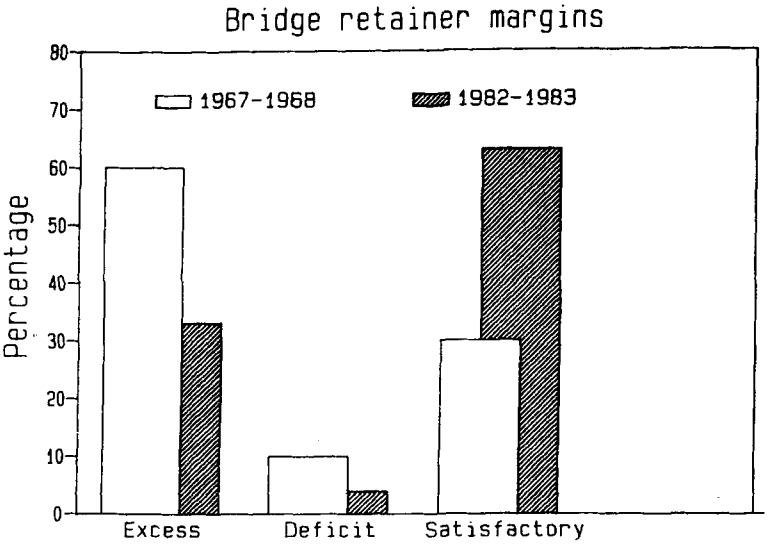

Fig. 2. Percentage distribution of margin fit scores for bridge retainers.

the localization in the tooth arch. Crowns on molars and premolars showed higher percentages of excess than those on the anterior teeth. The differences were, however, less pronounced than for the 1967–68 sample.

Discussion

A higher rate of unreadable surfaces on the radiograms owing to inadequate projection for the purpose of the investigation was found in 1967–68 than in 1982–83. The change in technique from the bisecting-angle technique to the method described by Eggen (8) may partly account for the difference.

A substantially larger proportion of the individuals who came to the dental school for treatment in 1982–83 than those who came 15 years ago already had crowns or bridges. This may in part be explained by the 8-year higher mean age of the 1982–83

individuals. The more than doubling of the proportion with fixed prosthodontic work, however, also suggests an increase in the rate of such treatment in general practice. Together with an increase in the proportion of individuals with fixed prosthodontic work the amount per individual had increased by 22%. A somewhat larger proportion of single crowns relative to bridge abutments was also found in the 1982–83 sample.

The most frequently recorded defect of margins, also in other investigations, has been excess (6, 9). The percentages of excess for the 1967–68 sample in the present study are, however, somewhat lower than those reported by Björn et al. (6). A more favorable situation was recorded in the 1982–83 sample, which displayed a doubling of the proportion of margins with satisfactory fit. Whereas the proportions of satisfactory fit in anterior teeth were higher than in premolars and molars in both the 1967–68 and the 1982–83 samples, the most conspicuous difference between the two samples was found for molar margins in bridge abutments.

There seems to be no doubt that the individuals who registered for treatment in the dental school in 1982–83 had a better quality of the margin fit of their crowns and bridge retainers than they had 15 years ago. This is an encouraging finding, especially if the results are a manifestation of an improved quality of crown and bridge work in general practice over the years. This change could be attributed to the technological improvements, to better performances of the clinical and technical routines, or a combination of such factors. It is probably also due to the adoption of modern approaches to prevention of dental diseases accompanied by an increased understanding of the technical demands necessary to facilitate an appropriate hygiene for abutment teeth.

References

1. Waerhaug J. Tissue reactions around artificial crowns. J. Periodontol 1953;24:172–85.
2. Karlsen K. Gingival reactions to dental restorations. Acta Odontol Scand 1970;28:895–904.
3. Silness J. Periodontal conditions in patients treated with dental bridges. J Periodontal Res 1970;5:60–8.
4. Silness J. Periodontal conditions in patients treated with dental bridges. II. The influence of full and partial crowns on plaque accumulation, development of gingivitis and pocket formation. J Periodontal Res 1970;5:219–24.
5. Silness J. Periodontal conditions in patients treated with dental bridges. III. The relationship between the location of the crown margin and the periodontal condition. J Periodontal Res 1970;5:225–9.
6. Björn A-L, Björn H, Grkovic B. Marginal fit of restorations and its relation to periodontal bone level. II. Crowns. Odontol Rev. 1970;21:337–46.
7. Renggli HH. Reaktion der Gingiva auf überhängende Füllungsränder. Dtsch Zahnärztl Z 1972;27:322–7.
8. Eggen S. Standariserad intraoral röntgenteknik. Sver Tannläk-Forb T 1969;17:867–72.
9. Wolf JE, Hakala PE, Kolehmainen L, Järvinen V. A follow-up study of porcelain and acrylic jacket crowns. Proc Finn Dent Soc 1978;74;54–8.

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