A New Coping for Overdentures. Part 1: A Pilot Study of the Marginal Precision

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The aim of this study was to investigate the marginal precision of new chairside copings prepared on 20 extracted teeth. The marginal fit was examined microscopically through 360-degree external observations. Subsequently, 10 new copings were adapted in vivo on 10 teeth that were planned for extraction. After extraction, the marginal fit was evaluated using the same protocol. The mean values of the marginal gap for the 2 groups (20 and 10 copings) were 24.1 and 32.6 μm, respectively. The marginal precision of the new copings was within the clinically accepted limits.
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The growing elderly population has increased the demand for prostheses covering residual roots. A new chairside coping has been proposed to reduce the number of overdenture therapy sessions. Because marginal precision ensures the long-term success of fixed prosthodontics,[1] this study aimed to analyze the fit obtained by these new copings.

Materials and Methods

Twenty new chairside copings (One-Step-Post, Simex) (Fig 1) were adapted by 2 operators on 20 extracted teeth (8 maxillary central incisors, 7 maxillary canines, and 5 mandibular canines), which were prepared following a protocol described in a previous study (Fig 2).[2] Ten of the posts were adapted using a direct technique (Fig 3) and 10 with an indirect technique (Fig 4). Each specimen, with its cemented coping (Panavia, Kuraray), was inserted centrally and perpendicularly in a gypsum block (Dental Hydrocal, Kerr). The margins of the copings protruded 3 mm from the block. The teeth were transferred to a device for marginal gap analysis, as described in a previous study.[3] The acceptable mean value for marginal gap size was set at 70 μm. The same examiner performed all of the measurements. The fit was evaluated at 90 external points per coping. Using a 50× microscope (TYP-355110, Wild) connected to a digital camera (PowerShot S40, Canon), 15 digital photographs, each spanning 24 degrees of the circumference, were taken of each coping and stored in a computer. On each photograph, 6 equally spaced points (1 every 4 degrees), were selected on the abutment margin, along with 6 corresponding points on the coping margin. The computer measured the gap between each pair of points using the appropriate software (IM-50, Leica Microsystems). The measured misfit was called the marginal gap.[4]

In the second part of the study, 10 One-Step Posts (Simex) were prepared and cemented (Panavia, Kuraray) in a single session by a third operator on 10 teeth (1 maxillary first premolar, 3 maxillary canines, 2 maxillary central incisors, 2 mandibular first premolars, 2 mandibular canines) that had to be extracted for periodontal reasons. The pulp was removed for vital teeth, but no root canal treatment was performed. Five copings were prepared using the direct technique and 5 using the indirect method. The teeth were immediately extracted, with extra care taken to not damage the margins of the copings. A second examiner analyzed the marginal precision following the aforementioned protocol. The data were analyzed using the Student *t* test.

Results

The mean value of the fit of the 20 copings prepared on extracted teeth was 24.1 μm (range: 10.2 to 84.3 μm). The most precise specimen had an average fit of 18.4 μm, while the least precise had an average fit of 35.3 μm.

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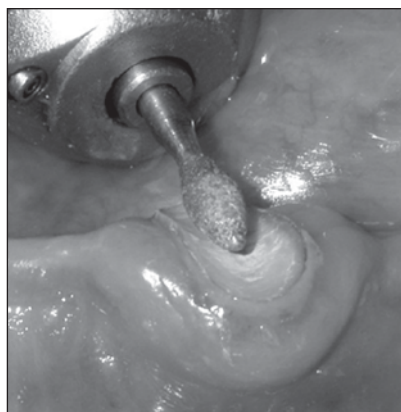
Fig 1 *(left)* The new chairside copings: 12-mm-long posts (75% gold) with a 2.25-mm-diameter ball attachment (75% gold) soldered to a 12-mm-diameter, 0.12- or 0.10-mm-thick foil (99.9% gold).

Fig 2 *(right)* The surface of the root was prepared using a diamond bur (Komet Brasseler) to obtain a concave surface. The root canal was then shaped with Largo burs (nos. 2 and 3, Maillefer) to accommodate the post.
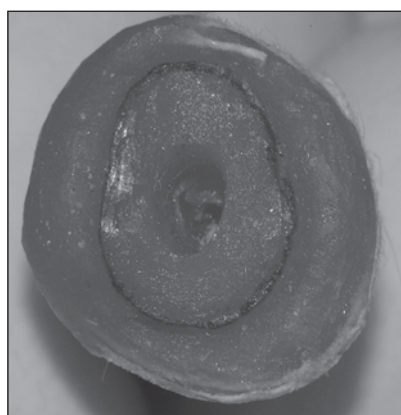
Fig 3 *(left)* The direct technique. The gold foil was adapted directly on the root surface using a ball filler. During adaptation, the coping was extracted from the root to cut away the excess foil. When satisfactory precision was obtained, the margins were burnished and finished with rubber burs (Shofu).

Fig 4 *(right)* The indirect technique. The gold foil of the coping was used as an individual impression tray. A resin cast of the platform of the root was obtained from the impression. The gold foil was then adapted on the resin cast using a ball filler, and the excess foil was cut away with scissors. The adapted post was then transferred to the root, burnished, and polished.

The mean value of the fit of the 10 copings prepared in vivo and evaluated after tooth extraction was 32.6 µm (range: 7.2 to 148.3 µm). The most precise specimen had an average fit of 22.2 µm, while the least precise had an average fit of 50.2 µm.

No significant differences were noted between the precision obtained with the direct and indirect techniques in either the 20-specimen group ($P = .003$) or 10-specimen group ($P = .0042$).

Discussion

The number of measurements for fit evaluation was in accordance with the results of a previous study.[3] The acceptable fit was set at 70 µm, a value commonly reported in the literature. The maximum clinically acceptable gap size was reported to be 120 µm.[5] Technical difficulties might have produced inaccuracy in the fit evaluation. Variations in the angles of the preparations might have caused alignment errors between the plane of the marginal preparation and the focal plane of the microscope, thus creating projection errors. At times, any excess cement might have covered the margins of the gold foils and/or the preparations, thus inducing mistakes during measurement. Furthermore, the 10 copings prepared in vivo were adapted on teeth with Class II and III mobility, making it difficult to apply the

right amount of pressure during adaptation, finishing, and cementation. In fact, 4 of 10 samples showed peaks in gap measurement larger than 100 µm. This may also have been the result of damage that occurred during the extraction procedures.

Conclusion

Within the limitations of this investigation, the authors conclude that the marginal fit of the copings prepared on extracted teeth and those prepared in vivo and evaluated after extraction showed mean gap values that were within clinically acceptable limits.

References

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