Improving Oral Health–Related Quality of Life by Converting Fractured Abutment Teeth in Double Crown–Retained Removable Prostheses into Root-Anchored Ball Attachments

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Purpose: To investigate changes in oral health prior to and after conversion of fractured abutment teeth in double crown–retained removable dental protheses (DC-RDPs) into root-anchored ball attachments.

Materials and Methods: Twenty patients were supplied with one root-anchored ball attachment after abutment tooth fracture. The Oral Health Impact Profile (OHIP-49) was completed by the patients prior to and after treatment to assess changes in perceived oral health. Results: Changes in OHIP were statistically and clinically significant (28.90 points prior to treatment and 13.80 points after treatment), especially in cases with a minor number of remaining double crowns. Conclusion: The conversion of fractured abutment teeth in DC-RDPs into root-anchored ball attachments can be an effective strategy for improving perceived oral health. Int J Prosthodont 2019;32:389–392. doi: 10.11607/ijp.6211

An established therapy for patients with few residual teeth is to provide a removable dental prosthesis retained by double crowns (DC-RDP). The survival rates of abutment teeth range from 60.6% to 95.3% after 4 to 10 years.1 Failure is mostly attributed to periodontal diseases, carious lesions, and fractures (Fig 1). Treatment indications for fractured teeth include extraction of the fractured tooth followed by denture rebasing or renewal; inclusion of the fractured tooth within a new denture; or conversion to a root-anchored abutment, which requires minor denture modifications.

Assuming that predominantly elderly patients wear DC-RDPs, the first two strategies are challenging and affect patient adherence and satisfaction, as adaptation to the new prosthesis/base is necessary. Nonetheless, prompt treatment is needed, as the loss of a double crown has a relevant impact on chewing abilities and consequently on perceived oral health. Therefore, the conversion of fractured teeth into root-anchored attachments might be a promising prosthetic strategy. The treatment effects should be evaluated using dental patient–reported outcomes (dPRO) to determine whether patients benefit from treatment.2

Thus, the purpose of the present study was to evaluate the changes in oral health–related quality of life (OHRQoL) prior to treatment and after conversion of fractured abutment teeth into root-anchored ball attachments.
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Alpha1 (excellent), Alpha2 (good), Beta (sufficient), Charlie (insufficient), or Delta (poor). Patient satisfaction and denture retention were also observed, ranked as Alpha, Beta, or Delta.

Wilcoxon signed-rank test, \( t \) test, and bivariate correlations were calculated, assuming a level of significance set to .050 (SPSS 24, IBM).

RESULTS

Twenty patients (mean age 73.0 ± 8.6 years, range 53 to 85 years, 45.0% women) received a root-anchored ball attachment. Prior to treatment, 10.0% of the patients rated their oral health as excellent or good, and this percentage increased to 35.0% at follow-up (Table 1). The mean total sum score for the OHIP was 28.90 points prior to treatment and decreased to 13.80 points at follow-up (\( P = .001 \)), indicating improved OHRQoL. Denture retention was evaluated as Alpha by 100.0% of the patients. Complaints were also rated as Alpha by 100% of the patients (85.0% Alpha1 and 15.0% Alpha2). Patient satisfaction was

### MATERIALS AND METHODS

Between August 2016 and October 2018, patients with a single fractured abutment tooth in DC-RDPs were consecutively recruited and supplied with a root-anchored ball attachment (Pro Snap, Cendres+Métaux). Abutment teeth with successful endodontic treatment and a biologic width of ≥ 2 mm were included. Exclusion criteria were xerostomia, temporomandibular disorders, and/or pregnancy. The study was approved by the local ethics committee (no. 135-17).

Post space (ER System, Komet Dental) and abutment teeth were prepared (Fig 2a), and impressions were taken utilizing the existing denture (Figs 2b and 2c). The root-anchored ball attachment was self-adhesively cemented (Figs 2d and 2e), and the housing was intraorally luted into the secondary crown (Figs 2f through 2i). Prior to treatment and at follow-up (at least 8 days after insertion), patients completed the Oral Health Impact Profile (OHIP-49), which surveys perceived oral health conditions, as well as general and oral health. During follow-up, complaints were examined and ranked as Alpha (excellent), Alpha2 (good), Beta (sufficient), Charlie (insufficient), or Delta (poor). Patient satisfaction and denture retention were also observed, ranked as Alpha, Beta, or Delta.

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### RESULTS

Twenty patients (mean age 73.0 ± 8.6 years, range 53 to 85 years, 45.0% women) received a root-anchored ball attachment. Prior to treatment, 10.0% of the patients rated their oral health as excellent or good, and this percentage increased to 35.0% at follow-up (Table 1). The mean total sum score for the OHIP was 28.90 points prior to treatment and decreased to 13.80 points at follow-up (\( P = .001 \)), indicating improved OHRQoL. Denture retention was evaluated as Alpha by 100.0% of the patients. Complaints were also rated as Alpha by 100% of the patients (85.0% Alpha1 and 15.0% Alpha2). Patient satisfaction was
rated as Alpha by 95% of the patients and as Beta by 5.0%. For the correlation between the number of remaining double crowns and differences in OHIP sum scores before and after treatment, the Pearson coefficient was –0.355 (Fig 3). This value was not statistically significant (P = .125).

Fig 2  (a) Post space, an anti-rotation lock, and a tangential finish line were prepared. (b) A burn-out acrylic post (CAST, Komet Dental) was used for impression with polyether (Impregum, 3M). (c) Afterwards, a pick-up impression was taken with alginate (Blueprint Xcrete, Dentsply Sirona). (d, e) The labside-fabricated root-anchored ball attachment was cemented with self-adhesive resin cement (RelyX Unicem, 3M). (g) After airborne particle abrasion and application of alloy primer (Monobond Plus, Ivoclar Vivadent) to the secondary crown, (f) the housing was prepared with (h, i) a primer containing methacryloyloxydecyl dihydrogen phosphate (Monobond Plus) adhesive for luting (Quick up, VOCO).
**DISCUSSION**

The results of this investigation indicate positive treatment effects of root-anchored ball attachments on dPRO, as the decrease in OHIP sum scores was statistically and clinically significant (≥ 6 units). This improvement seemed to be dependent on the number of remaining double crowns.

These results corroborate previous studies that described a relevant improvement in OHRQoL after implant placement under existing RDPs. However, this conversion technique entails lower costs for the patient.

A limitation of the present study is the small sample size, as there is only a small field of indication. Additionally, due to the acute treatment needs of the patients, only one pretreatment dPRO assessment was completed. A multicentric approach including two pre- and posttreatment assessments would corroborate these results and support that OHRQoL was stable before and after treatment.

To the authors’ knowledge, no survival analyses of root-anchored ball attachments are available. The improvements in OHRQoL, as well as patient satisfaction with denture retention, support the conversion of fractured abutment teeth into root-anchored ball attachments as a potent prosthetic strategy in DC-RDPs with failures.

**CONCLUSIONS**

Within the limitations of the present study, the conversion of fractured abutment teeth in DC-RDPs into root-anchored ball attachments can be an effective method for improving OHRQoL, especially in patients with a minor number of remaining double crowns.

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**REFERENCES**