

Endodontic and Periodontal treatment of complete buccal root and apex exposition: a challenging case report with 17 months follow-up

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Running Title: Complete buccal root exposition: a case report

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A one-sentence summary describing the key finding: Even with a poor prognosis and outside the alveolar plates, a correct diagnosis and treatment plan, patient cooperation, and technique mastery can save the tooth and enhance esthetic, achieving a complete root coverage and a successful outcome.

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AUTHOR CONTRIBUTIONS

Conceptualization: SK, ATD, LZO, VN, GVOF

Formal Analysis: VN, LZO, SK

Investigation: SK, ATD, GVOF

Methodology: SK, ATD

Project Administration: SK, ATD

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ABSTRACT

Introduction: This case report demonstrated a challenging clinical case addressed within a multidisciplinary approach to achieve its maintenance, even though had a poor prognosis. It was associated with the endodontic treatment with mucogingival techniques, including periodontal microsurgery and connective tissue graft.

Case presentation: A patient presented a deep gingival recession with the apex-exposed non-vital tooth with interproximal bone loss (RT2) and without mobility. The treatment involved an initial endodontic approach and periodontal therapy (scaling and root planing), microsurgical techniques with coronally advanced flap (CAF), root preparation with PrefGel® (24% EDTA), enamel matrix derivatives (Emdogain®), and connective tissue graft. As a clinical result, it was verified an increase

of keratinized tissue width and gingival thickness, and root coverage, reaching good esthetics and a stable result after 17 months.

Conclusion: The correct diagnosis and technique selection may affect directly the outcome, especially in challenging cases. Even though there was a poor prognosis, an adequate treatment plan, patient cooperation, and technique mastery help to achieve a high level of root coverage, esthetic recovering, and successful outcome.

Keywords: Tooth apex; Gingival recession; Root resorption; Nonvital tooth; Esthetics.

BACKGROUND

The orthodontic treatment is one of the etiological factors for gingival recession (GR) occurrence, which may impair the oral hygiene and result in bone loss. It can occur in case of extreme arch expansions¹, in an attempt at a conservative treatment with no extractions, moving the tooth outside the alveolar housing², mainly on mandibular incisor proclination. Moreover, a higher incidence of facial bony dehiscence and GR is found for thin periodontal phenotype³, affecting between 20% and 25% of patients, between 2 to 5 years after orthodontic treatment⁴.

Thereby, as result of orthodontic management, GR may be associated with apical periodontitis, jeopardizing either the vitality of the tooth as the buccal bone wall. In this case, the primary goal must be to treat the apical occurrence, either nonsurgical endodontic treatment or through a periradicular surgery, both with high possibilities to resolve the local problem and restore the function of the tooth⁵. Secundarily, the aim is to perform the esthetic evaluation and proceed with the periodontal reconstruction.

Therefore, the present case report describes the management of a lower incisor tooth with a poor prognosis, deep GR, and complete exposition of buccal tooth's face up to the apex, further interproximal clinical attachment loss, after orthodontic treatment.

CLINICAL PRESENTATION

Diagnosis

A 27-year-old male, healthy, presented to the private dental office (Rio de Janeiro, Brazil) in May 2019 with a complaint of a lower root exposure. Upon intraoral examination, it was noticed recession at tooth #23 (lower left lateral incisor), which had 11mm of buccal recession and 4.5mm of width, and was classified as recession type 2 (RT2)⁶, with apex-exposure (Fig. 1), necrosis, and no mobility. The adjacent gingival thickness (GT) was less than 1mm, measured using a file, and there was the absence of local keratinized tissue width (KTW). The initial CBCT showed tooth #23 was positioned outside the alveolar process with an endodontic lesion (Fig. 2). The patient was firstly referenced to endodontic treatment. After three months, the goal of the surgical treatment plan was attempting to reestablish the periodontal protection apparatus (gingiva) within at least two periodontal surgeries, once to rebuild the facial alveolar process is extremely challenge, in order to stablish the local tissue and preserve the tooth.

Case Management

After the endodontic treatment (Fig. 3A), the patient underwent scaling and root planning, followed by oral hygiene instructions (Fig. 3B-D). All sites presented probing depth (PD) < 4 mm, bleeding on probing (BOP) <10%, and full mouth O'Leary plaque index $\leq 20\%$ ⁷; moreover, the values for the distance from cement-enamel junction (CEJ) to crestal bone, gingival margin to crestal bone, CEJ to gingival margin, gingival thickness, and bone thickness were obtained at baseline and after 17 months, after the second surgery (Table 1). The treatment plan was to perform two surgical procedures, to gain GT and KTW, reaching a high level of root coverage (RC). The patient received prophylactic antibiotic treatment, 2g of Amoxicillin, and 8mg of dexamethasone, 1 hour before the procedure.

Local anesthesia was performed (2% lidocaine, 1:100,000 epinephrine). The elected technique⁹ initiated with an incision with 15c blade, slightly more coronal to the CEJ at distal, while a second incision, divergent to the first one, was made 2mm apical, at mesial (Fig. 4A). Afterward, with

a microsurgical blade¹, a split-thickness flap was initiated (Fig. 4B), extending beyond the mucogingival junction (Fig. 4C).

In addition, for root surface biomodification, 24% EDTA[¶] was applied for 2 minutes (Fig. 5), followed by enamel matrix proteins[#] application. After recession measurement, an 11mm subepithelial connective tissue graft (SCTG) was harvested from the palate at 1mm thickness with the use of a double blade scalpel handle¹⁰ (Fig. 6A). The SCTG was prepared, removing the epithelial layer (Fig. 6B-C). Sequentially, the suture was performed in two stages, approximation (5/0 suture^{**} was used to place the edge of the flap at the base of the papilla) and coaptation (7/0 interrupted sutures^{††}, without passing through the graft and also between the flap and the graft) (Fig. 7). The patient received a course of treatment with Amoxicillin 500mg TDS for 7 days and Dexamethasone 4mg BDS for 3 days, to begin on the following day (24 h after the procedure), and Dipyrone 1g QDS for 5 days, orally administrated. Sutures (7/0) were removed after 5 days post-operative (p.o.) and 5/0 sutures at 14 days. Follow-up was done after 60 days p.o. (Fig. 8).

For the second surgery, six months after the first procedure, the same preoperative and anesthesia protocol was followed. To obtain access to the root surface, 90° incisions at the base of the mesial papilla between lower canines were performed (Fig. 9A). A partial-thickness flap was raised extending beyond the mucogingival junction, and root surfaced biomodification was achieved with 24% EDTA for 2 minutes (Fig. 9B), followed by enamel matrix proteins. Sequentially, a partial incision was performed. Then, a 30mm SCTG was harvested from the palate at 1mm thickness. To keep the graft in place, interrupted sutures between the graft and the papilla were performed with a 6/0 suture^{‡‡}. The CAF was positioned with sling sutures (5/0 suture) (Fig. 10), followed by a horizontal interrupted suture to the periosteum surface performed with a 5/0 suture to gain vestibular depth, to reduce flap mobility and vertical displacement (Fig. 11). Sutures were removed at 14 days p.o. The patient was instructed to follow the same drug protocol as previously described.

¹ SB003 - MJK, Marseille, France

[¶] Straumann® PrefGel® (24% EDTA) (Straumann Group)

[#] Straumann® Emdogain® (Straumann Group), Basel, Switzerland

^{**} Resotex - Resorba, Bayern, Germany

^{††} Resolon - Resorba, Bayern, Germany

^{‡‡} Glycolon - Resorba, Bayern, Germany

CLINICAL OUTCOMES

The patient was evaluated 6 months of the first surgery with a tomograph exam (Fig. 12); he was recalled after 60 days of the second surgical procedure for review and also after 17 months (Fig. 13) with a new CBCT image (Fig. 14). Notable gingival recession reduction with high level of RC was achieved along with a significant increase of KTW and GT. The PD was 3mm for tooth #23 at the buccal face. A stable outcome was seen in the follow-up appointments, highlighting after 17 months. The values obtained for all periodontal structure around the tooth and immediate adjacent teeth were noted at the table 1. However, there is no bone formed in the buccal face, which was showed by the CBCT performed. The patient is highly satisfied with the treatment outcome.

DISCUSSION

There are many root coverage techniques described in the literature⁸. The precise diagnosis and selection of appropriate procedure according to the anatomical characteristics along with meticulous abilities is of extreme importance for a favorable and desirable outcome. It is wise to make a thorough assessment of variables that might interfere with the prognosis.

Primarily, even though exist many types of posology to prescribe medications, this case report applied 8mg of dexamethasone one hour before the procedure, following the prescription of Kahn et al. (2016)⁹, which can be considered a dose somewhat elevated. Already for the antibiotics used in prophylaxis before dental procedure, the literature has considered that more than 80% of are considered unnecessary¹⁰, and due to be a healthy patient, although there was no impairment, the prophylactic antibiotic with 2g of Amoxicillin may be not necessary in this clinical case.

In this case report, there was a multidisciplinary approach to try achieving the clinical success. Then, after the endodontic treatment, it was selected for the first surgical step the technique of periodontal plastic microsurgery according to Campos *et al.* (2006)¹¹, which provided an interesting initial gain. Therefore, a second mucogingival technique, modified Bruno's technique, was required to elevate high level of root coverage, with an increased keratinized tissue band and, most importantly, to save a tooth which was considered, initially, lost. Conversely, mainly focusing the second technique proposed, there was an impairment observed in the papillae which could be avoided

if applied a more conservative approach, such as in the tunnel technique, that keeps the papillae on the place.

Moreover, other techniques have been studied and discussed in the literature, in order to reduce the local trauma and obtain a better esthetic result. One of them is the laterally closed tunnel¹², which was specifically designed for deep isolated mandibular recessions, with a valuable approach for the treatment of deep isolated mandibular RT2 gingival recession. Another approach, although not common and involving a multidisciplinary therapy, involves the surgically facilitated orthodontic treatment (SFOT) which can be applied for periodontally accelerated osteogenic orthodontics (PAOO)¹³. It allows a safer orthodontic treatment in periodontium with thin phenotypes, modifying through surgical augmentation the thin bone morphotype and/or gingiva in a thick periodontal environment. This technique permits orthodontic treatment without iatrogenic adverse effects.

Finally, it is important to highlight that there was no occlusal trauma when observed the guides of mandibular movement, which did not compromise neither the healing phase nor long-term maintenance phase.

CONCLUSION

Within the limitations of this case report, it was possible verify that the correct diagnosis and the development of an adequate multidisciplinary treatment plan, even though exist a poor prognosis, it can permit to preserve a tooth orally. After 17 months of the last surgical procedure, it was possible to perceive that, even with no buccal plate reconstruction and presence, the local soft tissue was reestablish with a high level of root coverage.

SUMMARY

Why is this case new information?	It is a challenging clinical case with a poor prognosis that needed a multidisciplinary approach and application of different techniques.
What are the keys to successful management of this case?	The correct diagnosis treatment plan, and adequate technique choice for the flap and connective tissue graft harvesting.
What are the primary limitations to success in this case?	Presence of interproximal bone loss, the position of the tooth outside the alveolar housing, lack of keratinized tissue, apex exposure with a periapical lesion.

CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest, associated with this study.

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FIGURE LEGENDS



(before) Fig. 1. (A) initial preoperative clinical labial view of the mandibular left lateral incisor. (B) close view of tooth #23 showing the apex exposition. (C and D) initial periapical x-ray.

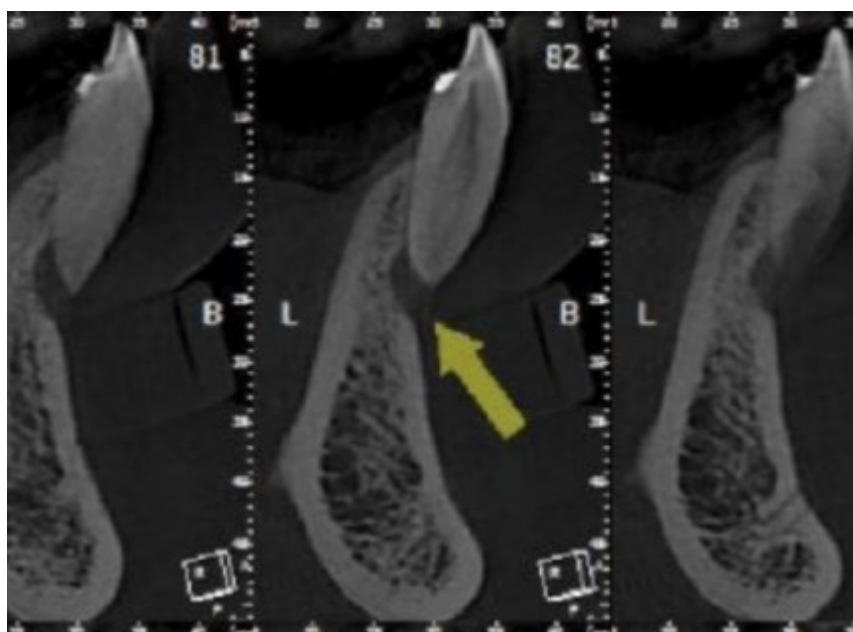


Fig. 2. sagittal view of cone beam computed tomography (CBCT) image showing initial condition and localization of the root, outside the alveolar bone (arrow).

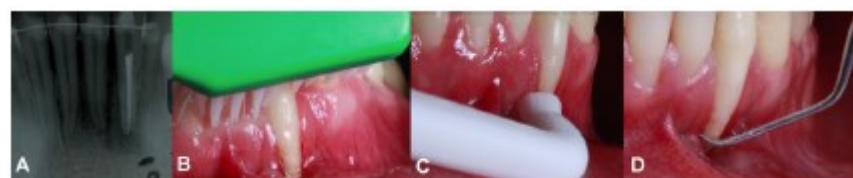


Fig. 3. (A) tooth after endodontic treatment. (B and C) oral hygiene. (D) scaling and root planing.

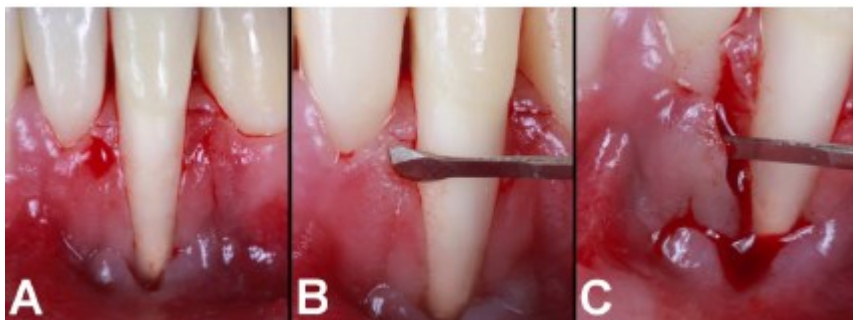


Fig. 4. (A) initial incisions at the papilla with 15c blade. (B and C) intrasulcular incision and detachment of the flap.



Fig. 5. treatment of the root with 24% EDTA and enamel matrix derivative.



Fig. 6. (A) free SCTG harvested from the right palate in the area between premolars. (B) de-epithelization extraorally with the use of a 15c blade. (C) view of the SCTG after prepared.

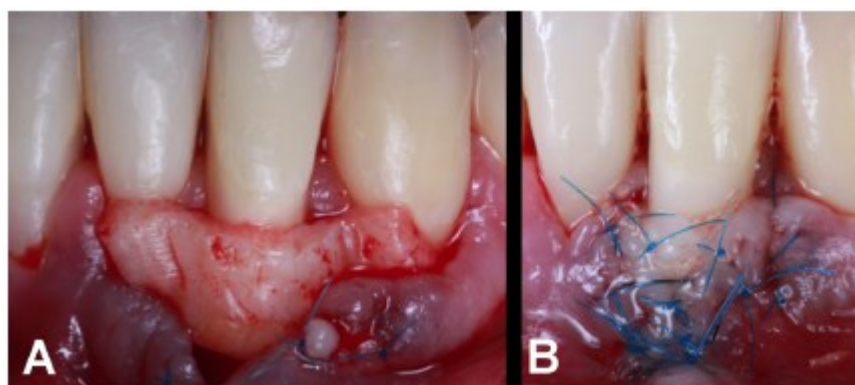


Fig. 7. (A) SCTG inserted under the flap. (B) suture to keep the SCTG stable.

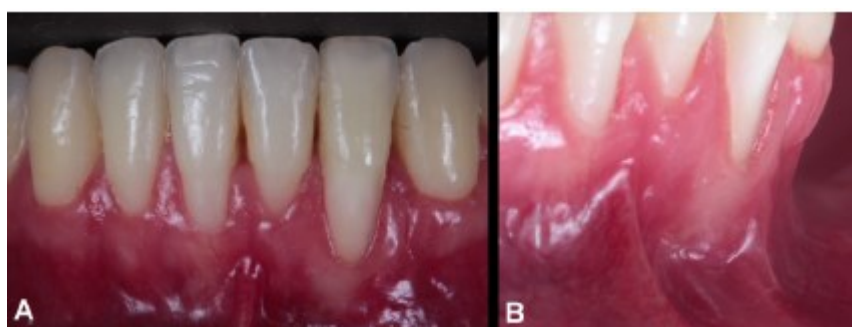


Fig. 8. result after 60 days from the first surgery. (A) frontal view. (B) lateral view.



Fig. 9. (A) second surgical step with flap designed between mesial of both canines (B) root preparation with 24% EDTA and enamel matrix derivative.



Fig. 10. suture performed to reposition the flap.

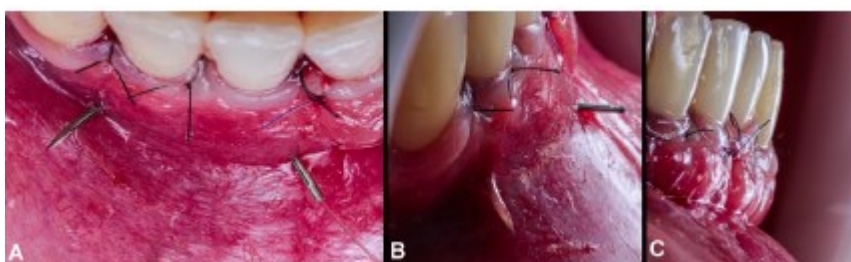


Fig. 11. periosteal suture in order to avoid displacement and mobility.



Fig. 12. CBCT after 6 months of the first periodontal surgical procedure.



(after) Fig. 13. frontal view after 17 months demonstrating the stabilization of the soft tissue.



Fig. 14. Final CBCT, after 17 months of the second periodontal surgical procedure.

Table 1. Initial and final values for buccal site from tooth #20 up to #26.

TOOTH	CEJ - CRESTAL BONE (mm)	GINGIVAL MARGIN - CRESTAL BONE (mm)	CEJ - GINGIVAL MARGIN (mm)	GINGIVAL THICKNESS (2mm BELOW THE GINGIVAL MARGIN)	BONE THICKNESS (2mm BELOW THE CRESTAL BONE)
24 (i)	9.1	7.7	1.4	1.5	0.3
23 (i)	15.6	0.4	15.2	N/A	N/A
22 (i)	5,0	4.7	0.3	1.2	0.3
24 (f)	9.0	7.1	0	0.95	0.29
23 (f)	15.5	11.8	1.18	1.0	N/A
22 (f)	3.95	3.95	0	0.95	0.28

N/A = not available; i = initial values; f = final values (after 17 months from the second surgery).