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Research article

Functional Crown Lengthening with Osteotomy in Anterior Teeth as a Prevention Against Restoration Failure: A Case Report

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Abstract.

Background: Teeth with inadequate clinical crowns lead to failure in restorative treatment. This condition complicates the tooth isolation in root canal treatment and results in minimal retention. Functional crown lengthening is the most common surgical procedure performed to increase the length of the clinical crown.

Case Report: This case report discusses the functional crown lengthening along with osteotomy on the anterior teeth of a 25-five-year-old male patient with a chief complaint of loose crown denture on the upper left lateral incisor accompanied with soreness after root canal treatment. Area #22 was seen as a gingival excess with a clinical crown remaining <2 mm on intraoral examination and showed non-hermetic obturation on radiographic examination.

Conclusion: The effectiveness of the treatment was proven by the nonrecurrence of gingival excess as seen from a one-month follow-up after functional crown lengthening.

Keywords: functional crown lengthening, osteotomy, gingival excess

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1. Introduction

Periodontal treatment and restorative dentistry are inseparable in achieving the best aesthetic and functional results in patients. Several conditions such as caries, tooth malposition, fracture, eruption disharmony, exostosis, and genetic variation may cause the shortened clinical crown to a cervico-incisal distance less than 2 mm and make it challenging to obtain restoration retention [1]. Teeth with root canal retreatment indications generally have secondary caries and fractures. The root canal retreatment critical success factors include isolation, cleaning up the root canal from the previous root canal filling material, and final restoration [2]. Final restoration after root canal retreatment must restore masticatory and aesthetic functions other than maintaining and protect the remaining tooth structure [3]. One of the challenges of acquiring outstanding restoration

results is increasing the clinical crown length deficiency to establish dentogingival complex stability to earn a fine restorative margin closure and an aesthetically pleasing final restoration [4]. Common treatment modalities to increase the clinical crown include gingivectomy and apically repositioned flaps with or without osteotomy [5]. The crown lengthening procedure was carried out by considering the biological aspects, that is, the distance between the alveolar crest and the free gingival margin, and the anatomical aspects of the teeth, which included the crown-root length and shape, as well as the ratio of the roots [6].

This report describes the functional crown lengthening with osteotomy of the upper left lateral incisor in a 25-year-old male patient before root canal retreatment followed by fiber-post restorative treatment and porcelain crown.

2. Case Report

A 25-year-old male patient was referred to the Periodontics Clinic of Rumah Sakit Gigi dan Mulut, Universitas Gadjah Mada Prof. Soedomo, Yogyakarta, Indonesia, for further treatment due to the inadequate clinical crown length of the upper left lateral incisor, which will be complicated in isolating the teeth using a rubber dam for root canal retreatment. Patient was a college student, a non-smoker, and had no medical history contributing to this case. Extra-oral examination showed no significant findings, with normal lip line and minimal gingival appearance when smiling. Intra-oral examination revealed that the remaining clinical crown height in the palatal aspect on area #22 was less than 2 mm (Fig. 1A and Fig. 1B). According to the dental history, patient had a root canal treatment followed by inserting a jacket crown on the upper left lateral incisor about one year ago. The patient indicated relatively good oral hygiene (Silness and Loe), with a gingival excess and 3 mm of bone-sounding on the palatal aspect. Periapical radiographic examination of the upper left lateral incisor displayed non-hermetic root canal obturation with adequate root length without horizontal alveolar bone damage (Fig. 2). Based on a thorough examination, the diagnosis of this case was confirmed as mucogingival deformities related to gingival excess. There are no diagnostic challenges, such as access to testing, financial, and cultural, in determining the diagnosis.

After guiding a dental health education (DHE) followed by scaling and root planing at the first visit, a functional crown lengthening treatment plan was formulated, taking into the biological and anatomical aspects of the teeth to gain the ideal biological width. The functional crown lengthening procedure was performed to increase the supragingival tooth structure to allow an optimal relationship between the restoration

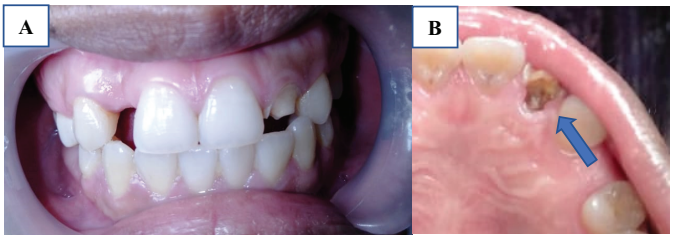

Figure 1: A. Intra-oral clinical appearance from labial view, B. Intra-oral clinical appearance from occlusal view, (blue arrow pointed to the palatal side of area #22).

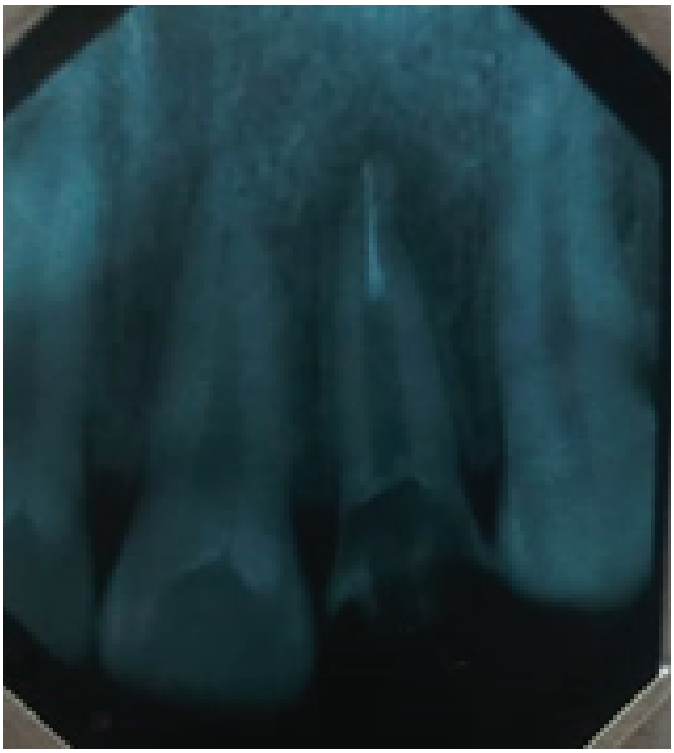

Figure 2: Periapical radiograph area #22 at baseline.

and the periodontal tissues. After discussing the clinical examination results, treatment plan, and risks associated with the surgical procedure, the patient gave verbal and written consent as evidenced by signing informed consent.

Functional crown lengthening procedure

Local infiltration anesthesia (Articaine hydrochloride 4% and Epinephrine in a ratio of 1:100,000) were administrated in labial and palatal sides. Osteotomy needs to be reconsidered by measuring bone sounding using a periodontal probe before the procedure. The pocket was marked with a pocket marker to form a bleeding point, then incised using a scalpel with a blade number 15 c on the palatal side of the upper left lateral incisor following the bleeding point. The external bevel incision starts apically in a coronal direction at an angle of approximately 45 degrees to the tooth surface (Fig.

3). About 1 mm of osteotomy on the palatal side was performed using a round diamond bur, irrigated with adequate saline solution to avoid bone necrosis (Figure 4).

Figure 3: External bevel incision was made on the palatal side #22 using blade number 15 c following *bleeding point*.

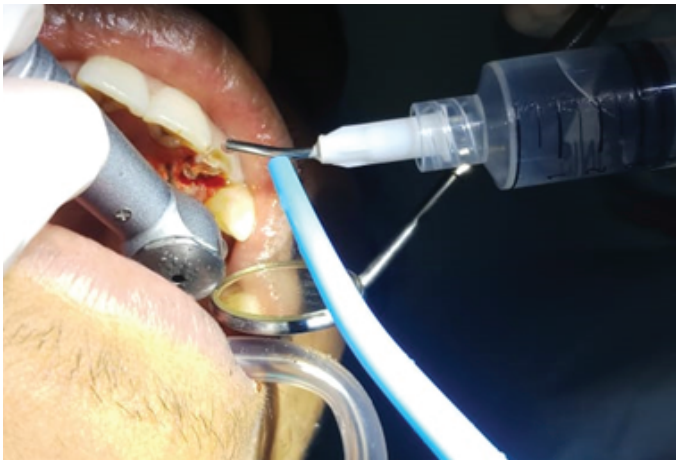

Figure 4: Osteotomy was made using a round diamond bur.

After contouring the gingiva, bleeding was controlled by pressing sterile gauze for 3-5 minutes. The entire surgical area was irrigated with saline solution, followed by applying a resorbable periodontal dressing (Resopac) (Figure 5). The patient has prescribed an antibiotic (Amoxicillin 500 mg) every 8 hours for five days, the analgesic (Mefenamic acid 500 mg) orally if necessary, and the antimicrobial mouthwash Chlorhexidine 0.12% twice a day for two weeks starting after the periodontal dressing was absorbed to take care personal oral hygiene status.

Patients were evaluated at one week and two weeks postoperatively to be irrigated with saline solution and given the motivation to maintain oral hygiene. There were no

Figure 5: Periodontal dressing (Resopac) was applied.

postoperative complications, such as bleeding and swelling, in one week and two weeks of examination. The patient was very cooperative in implementing his dental home care dental as seen from the low plaque control record score at each visit. (Figure 6A). On a one-month follow-up, there was no recurrence of gingival excess. An increase of about 2 mm was seen in the supragingival structure on area #22 without any sign of inflammation. The patient was then ready to begin restorative treatment (Figure 6B).

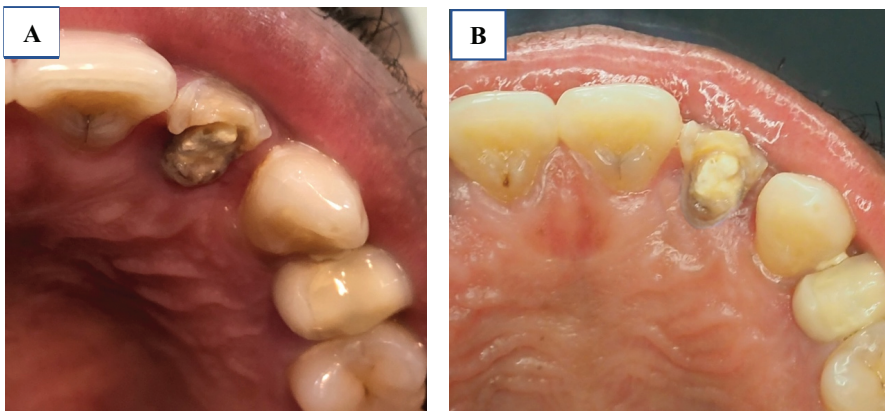

Figure 6: A. Clinical view area #22 two weeks after A crown lengthening, B. Clinical view area #22 one month after crown lengthening.

After being shown the condition before and after the procedure, the patient feels that his teeth look more shaped, no longer covered by gums, and he hopes that his current form teeth will facilitate further treatment.

3. Discussion

The accomplishment of functional crown lengthening treatment is one-factor determining root canal retreatment and restorative treatment on teeth with inadequate clinical crowns. Functional crown lengthening procedure may resolve the short clinical crown problem to maintain the ideal biological width, providing an acceptable dental isolation procedure in root canal retreatment and building supragingival structures to produce a ferrule effect which increases restoration resistance [7].

Biological width was defined as the physiological distance between the base of the gingival sulcus and the alveolar crest, with an average physiological dimension of 2.04 mm [8]. Biological width changes may prompt inflammatory response due to the restoration edges being too close to the alveolar crest, which increases periodontal pocket depth and destruction of the alveolar bone [9]. Isolation of the working area is essential in root canal retreatment to obtain a dry and clean working area. Some literature has also been written about the necessity of using a rubber dam to support root canal treatment. However, the inadequate structure of the clinical crown is often an obstacle in installing a rubber dam clam [10].

In the present case, functional crown lengthening was deemed necessary because the measurement of tooth structure found that the base of the palatal cavity was 2 mm below the gingiva. According to the basic principles in restoration in post-endodontic teeth, it is important to acquire at least a 2 mm ferrule effect to withstand the leverage and lateral pressure of the restoration [11]. Therefore, the distance between gingival margin and base of cavity added with the prerequisite ferrule effect is become 4 mm. The results of bone-sounding measurements by a periodontal probe before the procedure is 3 mm, so a 1 mm osteotomy was necessary [12].

The success of functional crown lengthening treatment was indicated by the absence of complaints related to inflammation or tooth sensitivity from the patient and neither recurrence of gingival excess at one-month postoperative evaluation.

4. Conclusion

Functional crown lengthening is one of the minimally invasive surgical procedures that could prevent a failure in restorative treatment while maintaining a healthy periodontal structure. An interdisciplinary approach and action plan considerating the biological and anatomical aspects of the teeth will determine the success of the treatment.

Evaluation of the patient is mandatory to ensure satisfactory results both functionally and aesthetically.

We can learn from this case that proper crown lengthening can facilitate perfect endodontic retreatment and achieve a ferrule effect for excellent prosthesis retention.

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