

# Endodontic Microsurgery of Left Maxillary Central Incisor in Patient with Thin Gingival Biotype

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## Abstract

According to a classification of endodontic microsurgical cases, this case is an ideal candidate for microsurgery, the lesion size is relatively small and without periodontal involvement. However, surgical assessment of this case indicated presence of aesthetic challenges. The patient has medium line, thin gingival biotype, crestal position of labial frenal attachment, and the two upper centrals are covered with porcelain veneers. Another challenge was that the patient was anxious about the surgical treatment. The purpose of this case report is to show that endodontic microsurgical cases could have non-endodontic challenges that should be considered during all the case management steps, surgical assessment, information given to the patient, surgical techniques, and follow-up protocol.

**Keywords:** Endodontic Microsurgery; Surgical Endodontic Retreatment; White and Pink Aesthetic; MTA Retrograde Filling.

## Introduction

Endodontic surgery is a treatment option to save teeth with recurrent or persistent periapical disease [1]. The development of microsurgical fundamentals has revolutionized the apical surgical technique and has resulted in higher rates of success of the modern technique in comparison with the traditional technique [2-4]. Although the main purpose of apical microsurgery is to prevent bacterial reinfection from the root canal system and/or to remove extraradicular pathogens [5-7], other objectives should be also considered. A second important goal in modern dentistry is achieving good "white and pink" aesthetics, especially in visible regions [8]. Aesthetic outcome in endodontic microsurgery is adversely affected by the incidence of post-surgical gingival recession and scar formation, specially in aesthetic zone [9]. Treatment plan of endodontic microsurgical cases should be constructed in a way that minimize the incidence of post-surgical gingival recession and scar formation [9]. In this perspective, the purpose of this case report is to present the management of a patient with dental anxiety who has surgical and anatomical challenges (crestal position of labial frenal attachment [10,11], and thin gingival biotype [12]).

## Case Report

### Reason of Referral

A 43-year-old female patient was referred to endodontic clinic by her General Dental Practitioner (GDP) for apical surgery of the upper left central incisor (UL1). The GDP reported that the patient was presented with an abscess related to this tooth, which had primary and secondary root canal treatment.

### History of Presenting Complaint

- The patient has a history of dental trauma "from about 20 years ago" led to the fracture of the maxillary central incisors.
- Root canal treatment was immediately done to the fractured teeth (UR1 and UL1) (primary RCT).
- Since that time no trauma-related symptoms appeared. However, from two years ago the patient suffered from severe pain radiating to the left ear which was followed by swelling in the area of upper anterior teeth.
- The patient had an antibiotic course and nonsurgical root canal retreatment to UL1.

- At the time of history taking, the patient's chief complaint was recurrent episodes of pain, swelling, abscess and sinus formation related to UL1.

### Medical History

Fit and healthy

### Dental History

Regular dental attendee

The GDP mentioned that the patient was anxious about the surgical option.

### Social History

Non-smoker

### Clinical Examination

#### Extraoral Examination

No abnormality detected

#### Intra-oral Examination (figure1)



**Figure 1:** Intraoral photographs (Periodontic)

**General status:*****Soft tissues***

- Normal colour
- Normal texture

***Periodontal examination***

- Soft and hard deposits as well as bleeding were evident on probing
- Plaque retentive factors (marginal defects)
- BPE

2	2	1
3	2	2

**Occlusal Analysis:**

Class II incisal relation

***Anterior Guidance***

- Protrusion: incisal guidance with posterior disocclusion
- Lateral excursion: bilateral group function with no contact or interferences in non-working sides

**Clinical examination for UL1**

Small fluctuant soft tissue swelling at the level of mucogingival junction and labially to UL1 associated with presence of small scare (sinus)

- Porcelain veneers of UR1 and UL1
- Palatal access filling
- No periodontal pocket

**Radiographic Examination*****Preoperative intraoral periapical radiograph (Figure 2)***

- The missing coronal tooth structure of UL1 represents about one-quarter of the crown including the mesio-incisal angle.
- The root canal filling is dense. The filling was about 1.5 mm short from the radiographic apex, however, the apical 1/3 of the root was less radio-opaque than the rest of the root of UL1.
- Circular apical radiolucent area of 5 mm in diameter was centred over the root apex of UL1.



**Figure 2:** Preoperative radiograph 1 UL4

**Special Tests** (Table 1)**Table 1:** Pulp sensibility test of UR2 and UL2.

<b>Pulp sensibility test</b>	<b>UR2</b>	<b>UL2</b>
<b>Electric Pulp Test</b>	+ve (reading 22)	+ve (reading 22)
<b>Cold Test</b>	-ve	-ve

**Diagnosis**

*UL1:* Previously endodontically treated; Chronic periapical abscess

Plaque-induced gingivitis

**Treatment Options**

- UL1
  - No treatment
  - Non-Surgical root canal (re-) retreatment
  - Surgical root canal retreatment
  - Extraction:
    - a) Leave space
    - b) Replacement with fixed or removable prosthesis
    - c) Implant

**Treatment Plan**

After discussion with the patient, the following treatment plan was finalised:

- OHI
- Surgical root canal retreatment of UL

**Presurgical Explanations and Consent Form Signature**

- Information about the apical microsurgery was given to the patient, including risks (e.g. the proximity of UL2 root apex to the defect site) and benefits (treatment of the periapical disease and preservation of the tooth).
- Informed consent was obtained.

**Surgical Assessment**

- The crown root ratio from the radiograph is (1:1.5)
- The minimum width of the keratinised gingiva is 5 mm at UL2.
- Gingival labial fraenum attachment.

The distance between the veneer cervical margin and the depth of the gingival sulcus is 1 mm.

- Probing depth at the surgical side (UR1, UL1, and UL2) ranges between 1 and 2 mm.
- The gingival biotype was confirmed to be thin biotype using probe transparency test.
- The upper anterior region has gingival frame harmony.
- Medium (average) upper smile line (according to the posed smile in **Figure 3**).



**Figure 3:** Smile view photograph.



**Figure 4:** The flap design.

### Treatment Details

The patient reported that she had a breakfast, and she took analgesic tablets (Paracetamol) before the surgery time.

### Local Anaesthesia:

A topical local anaesthetic was applied at the injection sites. Three cartridges of 2.2 ml 2% lidocaine with 1:80,000 epinephrine (Xylocaine®) were injected to anaesthetise the surgery field (anterior superior alveolar nerve and nasopalatine nerve). Two cartridges used for labial infiltrations and one for palatal infiltration.

### Soft Tissue Management:

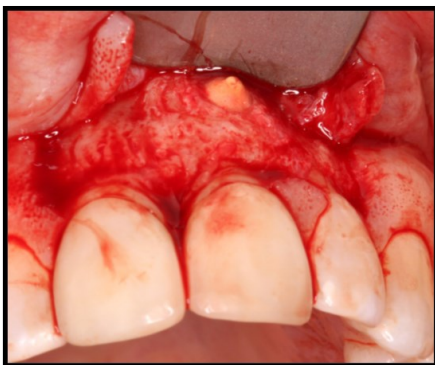
**Flap design:** After 15 minutes from administration of the local anaesthetic, a rectangular design was made of two vertical releasing incisions and horizontal incision (a combination of papillary based and sulcular incisions) (**Figure 4**) using microblade SM64 (Swann-Morton, Sheffield, UK).

**Flap elevation:** Periosteal elevators were used to raise the flap. The flap was carefully retracted with Austin retractor; constant bone contact was kept along the surgical procedure (**Figure 5**). The flap was kept moist during the operation.

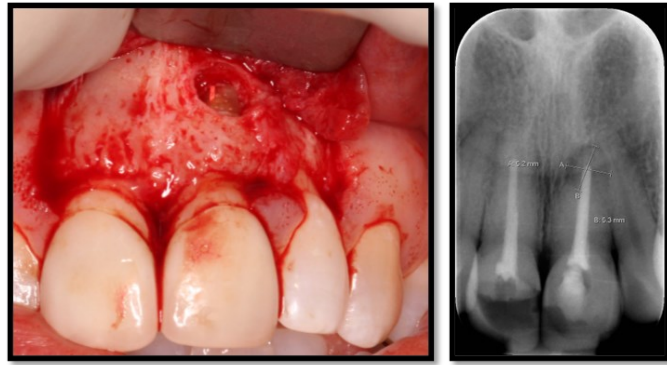
### Hard Tissue Management:

The osteotomy was not needed because of the size of the bony crypt that was created by the resorptive lesion. The lesion was spherical shape localised at the root apex of UL1. Sac-like lesion of about 6 mm in diameter filled with yellow material of paste-like consistency (pus) surrounded by a thick layer of fragile less organised soft tissue (granulation tissue) (**Figure 5**).

Under high magnification with Dental Operating Microscope (DOM), the lesion was removed entirely (enucleated) using spoon curette and sent as a biopsy to the histopathology laboratory for histological examination. Further curettage and debridement were carried out at the defect site. Partial resorption of the root apex and protrusion of the canal filling were obvious (**Figure 6**).



**Figure 5:** Flap elevation and exposing of the bony defect.



**Figure 6:** A: the bony defect after enucleation; B: radiographic estimation of the lesion size diameter (5.3 mm)

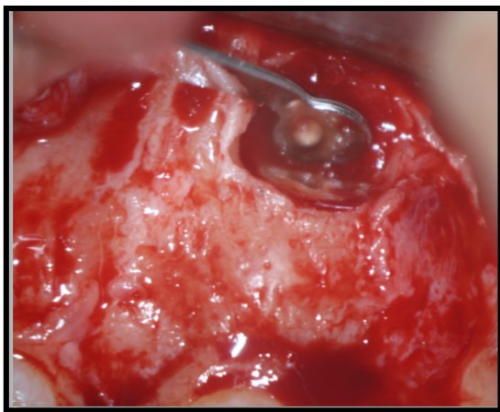


*Root end resection and retrograde preparation:* Williams periodontal probe was used to measure 3 mm of the root end to be resected (sent to the histopathology laboratory). DOM was used during the surgical stages that should be done under high magnification. Root end resection was carried out using 45° angle surgical handpiece and tapered diamond bur.

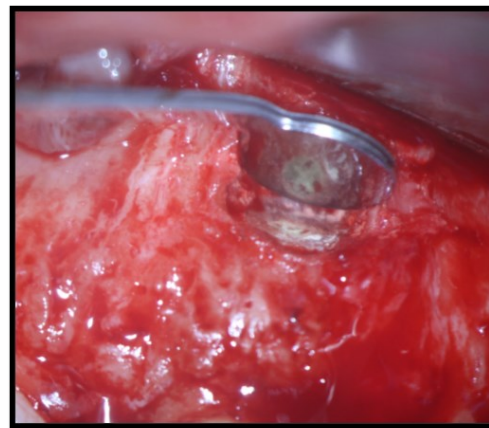
The resected root surface was inspected to rule out the presence of vertical root fracture. The retrograde preparation was made using KiS-2D tip, which produced a preparation of 3 mm depth and 0.7 mm diameter width (**Figure 7**). Copious amount of coolant (Normal saline) was used during the resection and the retrograde preparation to reduce the frictional heat associated with the use of diamond bur and ultrasonic tip.

The residual Gutta percha was vertically condensed away from the preparation walls using micro-bluggers (**Figure 7**). Bleeding control from the bony crypt was achieved by compression with cotton pellet soaked in local anaesthetic containing vasoconstrictor. The retrograde canal preparation was dried with pre-bent paperpoints.

ProRoot MTA (white) was mixed according to the manufacturer's instructions and placed as a thick paste into slots of Lee block to be carried by an instrument (micro-plugger) and then condensed within the retrograde preparation (**Figure 8**).



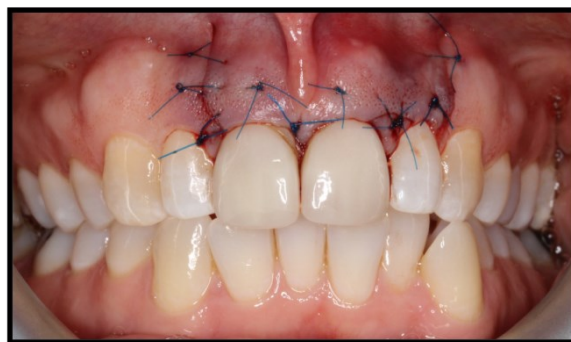
**Figure 7:** Root-end resection and retrograde preparation.



**Figure 8:** MTA retrograde filling.

#### **Flap repositioning and suturing:**

Irrigation of the reflected flap with normal saline was performed before re-approximation of the wound edges. Gentle pressure was applied for about 5 minutes. Castroviejo needle holder and scissors were used to place eight interrupted sutures using monofilament polypropylene (Prolene) 5-0 and 6-0 sutures (reverse cutting needle); another two stitches were sutured around UR1 and UL1 to control the flap position (**Figure 9**). Compression the repositioned flap with saline-moistened gauze for few minutes (about 5 min).



**Figure 9:** Flap closure and suturing.

#### **Postsurgical Radiograph:**

The post-surgical radiograph is showing satisfactory technical outcome with well-condensed 3 mm retrograde apical plug of MTA (**Figure 10**).



**Figure 10:** Postoperative radiograph of UL4

**Postsurgical Instructions:**

The patient was advised to follow the following instructions:

- Control postsurgical pain by administration of Ibuprofen 400 mg tablets
- Minimising the swelling by application of ice bags during the first 4-6 hours after the surgery.
- Soft diet.
- Maintenance of oral hygiene (careful use of mouth wash and teeth brush).

**Postsurgical Reviews**

*Suture removal:* **(Figure 11)**

- The patient reported mild discomfort and swelling during the first day after the surgery.
- No ecchymosis
- Good signs of soft tissue healing
- The recession was mainly at the interdental papilla between UR1 and UL1.

*One-month review:* **(Figure 12)**

Signs of soft tissue healing with primary intention at the incision sites however, about 0.5-1 mm recession was observed at the midline interdental papilla and the mesial of UR1.

OHI was re-emphasized.



**Figure 11:** Photograph after suture removal.



**Figure 12:** Photograph on one-month review.

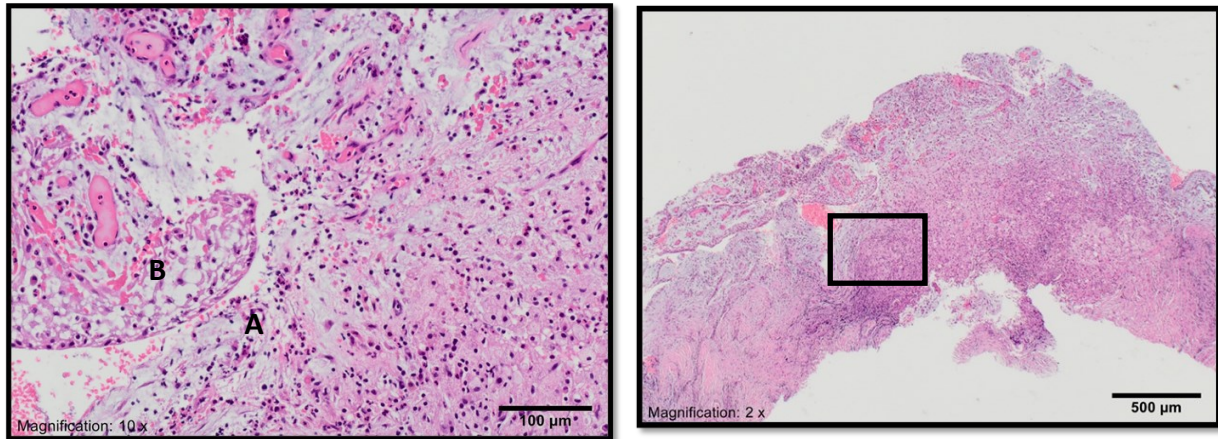
**Histopathology:**

The report from the histopathology laboratory indicated that the lesion was a granuloma.

The main features of the histological section are: **(Figure 13)**

Foamy macrophages, Lymphocytes, plasma cells, and neutrophils were identified. This cellular infiltration **(Figure 13, A)** of immune cells indicated that the lesion is chronic with acute exacerbation.

Strands of oedematous non-keratinised stratified squamous epithelium were partially lining the lesion **(Figure 13, B)**.



**Figure 13:** Microphotograph of the histological section of the lesion.

**Discussion and Conclusion**

According to the classification of microsurgery cases by Kim & Kratchman (2006) [13], this case can be classified as class B (relatively small lesion; without periodontal involvement). The teeth that fall under this category were described as “ideal candidates for microsurgery”. However, this patient was anxious about the surgical treatment. It has been recommended that anxious dental patients should be provided with update information about the possible sensation that may occur in different stages of dental treatment [14]. They should also be informed about how they can cope with these sensations [14]. An application of topical anaesthetic at the site of anaesthetic injection was carried out in an attempt to control the anticipatory anxiety [15]. Moreover, the patient took analgesic tablets before the surgery time (pre-emptive analgesia).

The radiographic appearance and position of the two lateral incisors indicated pulp sensibility testing for these teeth. That mainly was to exclude their negative sensibility before the surgery.

A second important goal in modern dentistry is achieving good “white and pink” aesthetics, especially in visible sides [8]. The flap design, in this case, was controlled by the position of the labial frenal attachment which has been linked to the incidence of gingival recession [10,11]. The patient has thin gingival biotype. The coronal soft tissue in this biotype does not display regrowth to its original level [12]. The cervical margins of porcelain veneers are expected to be partially exposed with healing, especially in a case of high or medium lip line.

The use of DOM during apical surgery has been recommended in the guideline of Royal Collage of Surgeons of England (RCS England 2012). The impact of DOM on the outcome of apical surgery had not been demonstrated until Setzer *et al.* (2012) [16], and Tsesis *et al.* (2013) [17] reported a positive effect of DOM on outcomes of apical surgery.

Sectioning of the dental papilla is associated with compromised healing in its shape and height [18], the papilla between the two central incisors was included in the flap because of the gingival position of the labial frenal attachment. Velvart *et al.* (2003) [19] used vertical mattress sutures to stabilize the elevated papilla in their study, a marked reduction in height of the papilla was observed in one month and three months postsurgical reviews whereas, immobilized papilla associated with papilla based incision showed recession-free healing.

The suprapariosteal blood vessels are running parallel to the long axis of the teeth within the mucosa [20]. Therefore, vertical releasing incisions were cut parallel to the course of the suprapariosteal blood vessels, to reduce the number of disrupted blood vessels [21]. The vertical releasing incisions were also extended apically to permit tensionless flap retraction [21].



The flap was kept moist during the surgery to prevent the dehydration and the shrinkage [22]. Kim *et al.* (2001) [23] suggested that at least 3 mm of the root-end should be resected to reduce of the apical ramifications and the lateral canals by 98% and 93% respectively. The RCS (England) recommend 3 mm deep retrograde preparation to be prepared with ultrasonic tip [24]. Using of high ultrasonic power during retrograde preparation should be avoided because it has been linked with the formation of micro-cracks [25].

To promote the wound healing, several recommendations based on scientific evidence were followed. Careful repositioning of the flap edges was performed in an attempt to induce wound healing with primary intension [26]. The repositioned flap was stabilised in place to improve the primary healing using sutures [27]. It has been found that the use of monofilament sutures is associated with the less inflammatory reaction when compared with multifilament sutures, this was explained by reduced bacterial ingress with monofilament [28].

Compression of the repositioned flap with gauze moistened with saline solution was followed to create a thin layer of fibrin between the bone and the flap tissue, which is expected to promote the formation of fibrous tissue and collagen adhesion [22]. The use of # 6/0 suture is recommended in papillae to diminish the risk of necrosis [21]. The number of sutures was relatively increased to reduce the tension [29]. However, Peters & Wesselink (1997) [26] recommended the use of few number of sutures to reduce the foreign body reaction which may affect the healing.

Postsurgical swelling could be minimized with the application of ice pack during the first 4 to 6 hours after surgery [30]. Rinsing with chlorhexidine mouthwash improve plaque control during the period when teeth brushing is inadequate [31]. Suture removal is recommended to be not before four days because collagen fibers that are only formed after three days these fibers are responsible for the tensile strength of the wound [32].

An accurate histopathological diagnosis is possible if the lesion was serially sectioned and examined. Nair *et al.* (1996) [33] serially sectioned 256 periapical specimens and analyzed these sections; the results indicated that 50% granuloma, 35% abscess, and 15% cysts. The lesion size has been found to affect the healing regardless the histopathology results [34]. The success rate of cases with small lesions and without periodontal involvement was found to be 96% [34]. Moreover, in the same study the lesion size between 6 and 10 mm takes about 7.25 months to heal. The results of a recent meta-analysis that included eighteen studies indicated that the pooled success rate of the apical surgery after one year is 89 % [17]. The use of MTA as a retrograde filling was found to be associated with better outcome [17].

There are contradictory reports regarding the long-term success of the apical surgery. From the results of 16 studies, Torabinejad *et al.* (2009) [35] found that the success rate at 2-4 years was 77.8%. However, the success dropped to 71.8% after 4-6 years. Whereas, the results from a clinical study by Rubinstein & Kim (1999) [34] showed that the success rate after one year (91.5%) remained constant when the same cases evaluated after additional 5-7 years. Torabinejad *et al.* (2009) [35] systematic review did not differentiate between traditional and modern surgery.

Endodontic microsurgical cases could have non-endodontic challenges that should be considered during all the case management steps, surgical assessment, information given to the patient, surgical technique, and follow up protocol.

### Conflict of Interest

The author declares no conflict of interest.

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