

Masterclass in Clinical Practice

Dental Implants

with

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Apicectomy to repair
a bone defect in the
anterior maxilla as a
pre-implant procedure?
Description of a case
and overview of
apicectomy procedure.

This masterclass describes a known procedure (apicectomy), used in an “off-label” manner to restore a defect before proceeding with the removal of the tooth and the definitive treatment of a dental implant in same site.

Background

I often encounter the clinical scenario of having to remove an anterior maxillary tooth and replace it with a dental implant. This is usually in cases of a failed root canal therapy (RCT) with apical pathology, without the possibility of re-doing the RCT due to a post having been placed.

These cases can however involve extensive damage to the buccal bone as well as alveolar bone with the implication that removal of the tooth will leave a defect preventing primary stability of a dental implant (Figure 1)

Case presentation: Apical infection tooth 21 with large metal post.

The procedure is to perform an apicectomy to get bone repair, whereafter the tooth is removed and a dental implant is placed. This is done as the bone destruction is too extensive for dental implant placement after extraction (Fig. 1). It cannot be used if there is a vertical fracture so this should be ruled out.

In this case the bone destruction had damaged not only the buccal bone but the palatal bone as well and successful implant placement would have been doubtful with the little palatal bone as seen in Figure 1.

The healing phase after apicectomy will be dependent on the bone healing and may take 4-6 months or longer.

During this time, regular follow-up radiographs (every 2-3 months) should be taken to monitor bone fill. Radiographs will show the progressive bone fill (Fig. 2-5- coloured to show bone density better) as well as re-establishment of the periodontal ligament (PDL) space.

Seeing the PDL form is always a good sign, indicating that the apicectomy is working and should the PDL space suddenly widen again- it shows the procedure is failing and the tooth may have to be removed before more bone is lost.

Procedure Tip:

I use a 10% doxycycline to detoxify the root after the cavity preparation. The doxycycline is prepared with one 100mg capsule (powder is removed from capsule and the capsule discarded) per 1ml sterile water. This is applied for 3-4 minutes (removing



Figure 1: The tooth has a large metal pin and no bone on the buccal aspect, with extensive bone destruction on the palatal aspect of the root. Removal of the tooth may cause the thin palatal wall to collapse leaving insufficient bone for grafting and implant placement.

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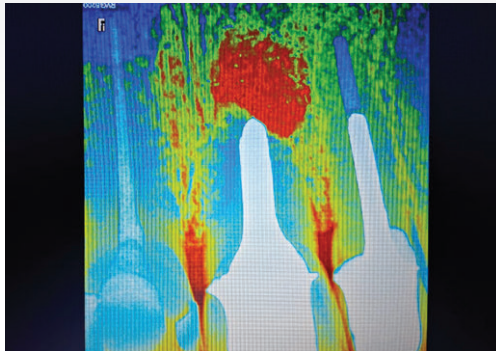


Figure 2: Day 1 of procedure, showing the cavity in red. The post was too hard to remove sufficiently for a 2-3mm retrograde filling and maximum 1mm was removed. MTA was placed as a retrograde filling.

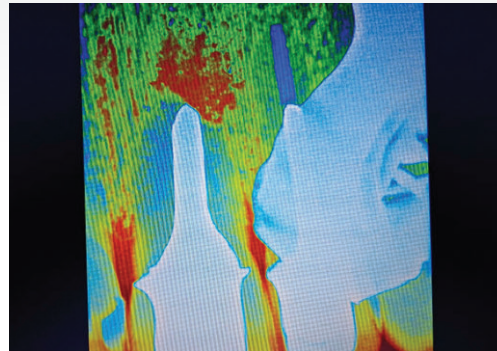


Figure 3: Bone healing at 3 months showing substantial shrinking of defect.

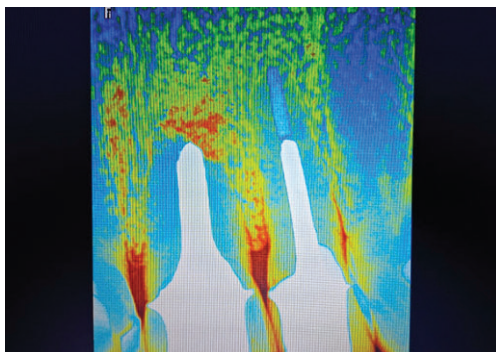


Figure 4: Bone healing at 9 months with defect almost completely healed.

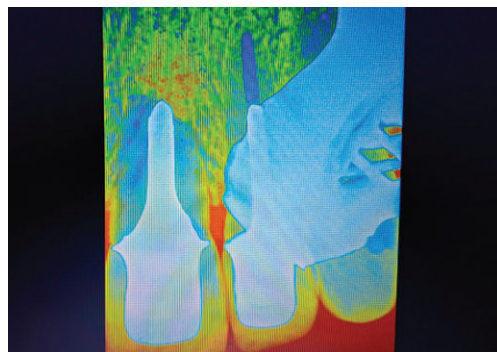


Figure 5: Bone healed completely at 12 months but at this stage the root fractured and bone loss was appearing again. Root was immediately removed and implant planned for 3-4 weeks later to avoid residual infection spreading to implant in immediate placement.

the liquid as soon as it appears if blood is mixing with the liquid) and afterwards rinsing with sterile saline to remove any remaining doxycycline.

At 10% doxycycline is extremely acidic (pH 1.8-2.2) and very bitter, so it should not be allowed to flow into mouth or towards throat as it will burn fragile mucosa. The root is dried with suction tip before applying the MTA retrograde filling.

At 12 months, the apicectomy of this case started failing. As the bone healing was satisfactory, the tooth was removed and the acute infection cleaned out. Immediate implant placement was not considered due to the risk of residual infection in the socket which can lead to implant failure.

CBCT confirmed that bone healing had occurred in original palatal defect (Fig. 6), allowing for implant placement 4 weeks later combined with GBR (Fig. 7).

The implant was placed with good primary stability and bone augmentation was done on the buccal aspect (Fig. 8).

Overview of apicectomy procedure on anterior maxillary teeth

Apicectomy (also called apical surgery, root-end resection, or peri-radicular surgery) is a microsurgical procedure that removes the tip (apex) of a tooth root, along with surrounding infected or inflamed tissue, and seals the root end with a retrograde filling. It is performed when conventional root canal therapy (RCT) or retreatment fails to resolve persistent apical pathology.

It is more successful on anterior maxillary teeth (upper central and lateral incisors, and canines). These single-rooted teeth have relatively straightforward anatomy and easy surgical access through the buccal vestibule.

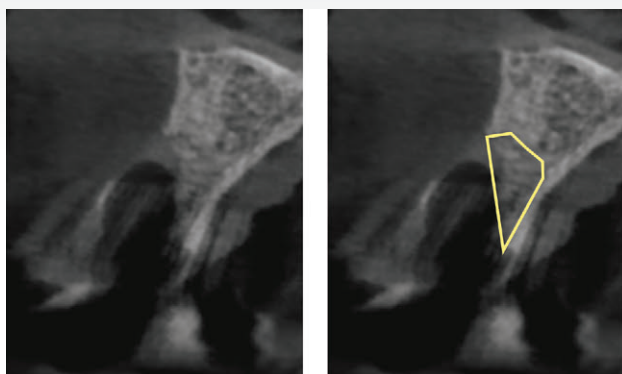


Figure 6: On the left is post extraction view and on the right new bone fill outlined in yellow. The new bone created a stable palatal bone volume for implant placement.

Indications

The procedure is indicated for:

- Persistent apical periodontitis, granuloma, or radicular cyst after adequate RCT/retreatment.
- Root canals that are obstructed (posts/cores that cannot be removed, calcifications within canals, or broken instruments).
- Root-filling material that was extruded through the apex causing ongoing symptoms or lesions.
- Anatomical aberrations such as apical deltas, lateral canals, or fractures limited to the tip of the root.
- Need to preserve the tooth when extraction + replacement (implant/bridge) is less desirable.
- As an intermediate solution to repair the bone defect apical/buccal before removing the tooth and placing a dental implant.

Contraindications

- Poor periodontal support or endo-perio lesions
- Vertical root fracture
- Systemic conditions that prevent surgery

Assessment of anterior maxillary teeth

- Roots are usually straight or mildly curved and lie close to the labial cortical plate, thereby creating easy access. This must however be confirmed on CBCT.
- The nasal floor can be a complication if perforated by infection or a short alveolar process with no space to work below nasal floor is present. CBCT assessment is needed for pre-operative assessment.
- As this is in the aesthetic zone, a full evaluation of the smile line, the gingival biotype and the width of attached gingiva is required as this will determine the flap design

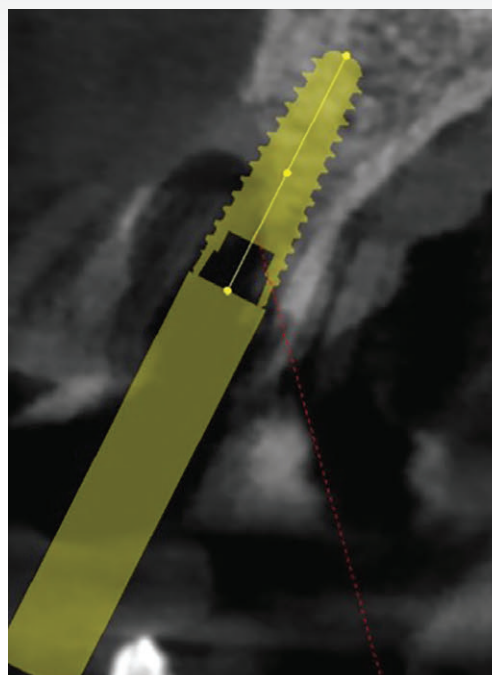


Figure 7: Implant planning showing enough bone palatal and apical with large jump-gap buccal for GBR with particulate bone.

to minimize recession or scarring. Care should be taken to ensure the flap design does not enter the periodontal sulcus as this will create an aesthetic defect. The horizontal incision should ideally be within attached gingiva.

Surgical procedure overview

Although endodontic microsurgery (operating microscope, ultrasonic instruments, biocompatible materials) is recommended, traditional techniques are an effective alternative if carried out with care, using an apical retrograde filling such as MTA.

Soft tissue:

Flap design in the aesthetic zone:

Incision in attached gingiva has no risk for post-operative recession. Should there be insufficient/no attached gingiva an intrasulcular incision should be used with vertical releasing incision(s) placed as far distal as possible for aesthetics- ideally distal of canines or 1st pre-molars if working on the incisors. Full-thickness mucoperiosteal flap is raised.

Bone surgery:

Often the apical pathology will have destroyed the buccal bone creating an opening and access to the apical part of root. If not, the bone overlying the apex is removed with a piezoelectric device or bur under saline irrigation to expose the root tip and lesion.

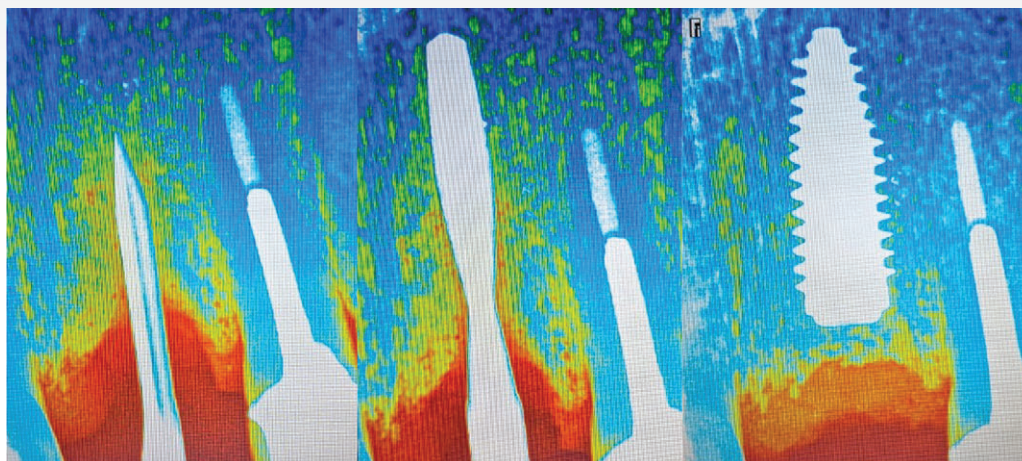


Figure 8: Placement of implant with GBR for buccal jump-gap, 4 weeks after removal of tooth.

Pathologic tissue is thoroughly removed with curettes and the specimen may be sent for histopathology if it can be removed largely intact or if a cyst is suspected.

Approximately 3 mm of the apex is resected perpendicular or at a slight bevel to the long axis of the root using a bur. This eliminates any potential apical delta and most accessory canals.

Preparation for retrograde filling can be done with ultrasonic tips or a specialized handpiece with a small head to gain access. Prepare an apical cavity at least 2-3mm along the canal (make sure the post allows for this). The canal is cleaned, dried, and sealed with a biocompatible material (commonly mineral trioxide aggregate (MTA) or similar new generation products). Before placing the retrograde filling, the root and cavity is treated with 10% doxycycline as described.

A postoperative radiograph is mandatory to confirm successful resection and filling, with absence of debris, before wound closure.

The flap is repositioned and sutured (absorbable sutures are preferred and 6/0 with 12-13 mm needle).

Postoperative Care

- Mild-to-moderate pain/swelling can be normal for 1–3 days (managed with NSAIDs and antibiotics if indicated).
- Avoid biting into food with anterior teeth for 2 weeks, careful plaque control by staying on the teeth with the brush to avoid the surgical site (especially if an intrasulcular incision was used) and ice packs if extensive surgery was done.

- Follow-up in 14 days and remove sutures if not resorbed.
- Bone healing is assessed at 3 - 12 months with radiographs.

Success Rates and Prognosis:

Anterior maxillary teeth have high success rates for apicectomy with 90%+ at one year. As this case presentation is more aimed at hopeless teeth, it may well be lower than in ideal cases when used as described.

Failure is usually due to incomplete seal of retrograde filling, undetected fractures or residual infection.

Conclusion

This case presentation is not an effort to imply that apicectomy does not have a place as a permanent solution to save a tooth where possible. This case highlights a procedure indicated for a hopeless tooth that needs to be replaced with a dental implant as described above and showing extensive bone loss.

Should the bone healing appear to be successful at 4-6 months, the tooth can be removed in a low trauma technique and the dental implant placed. In big apical lesions it may take up to 12 months for bone healing before removal of tooth should be done. CBCT done with small limited view may be needed to confirm bone fill in the defect.

This is a procedure which is helpful in patients with very high aesthetic expectations and where collapse of the bone and soft tissue is a high risk due to loss of bone walls as well as internal bone structure.