Efficient and ergonomic apical resection using the Kaiserswerth algorithm

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Fig. 1

Fig. 1_The MAP system.

_Introduction

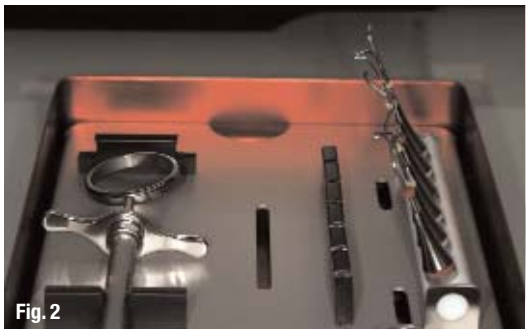
Thanks to minimally invasive techniques, such as ultrasonic surgery and the availability of reliable restorative materials, the surgical revision and rehabilitation of endodontically treated teeth have a significantly better prognosis than only ten years ago. Apical resection is a challenging surgical procedure—not least because of the limited accessibility of the surgical field. Instrumentation of an apical resection case therefore requires a surgical technique that is as simple as it is safe and ergonomic.

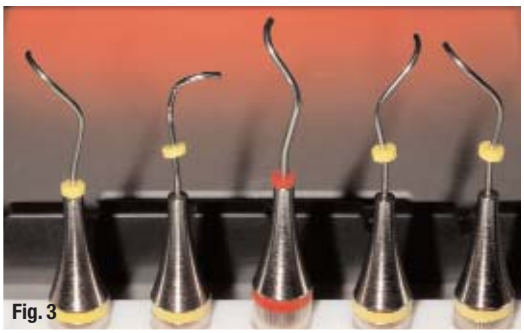
This report presents two clinical cases that illustrate a system for applying retrograde endodontic filling materials that has proven a consistently viable option in our clinical practice.

_Case I

The first case is that of a 34-year-old male patient who presented at our clinic for the first time. The orthopantomogram (OPG) yielded an accidental finding of apical translucencies at teeth # 14, 36

Fig. 2_Autoclavable box with syringe, mixing cup and tips.
Fig. 3_Tips with different angulations.
Fig. 4_OPG showing active infection at sites 16, 36, and 46
Fig. 5_Surgical site after removing a bone block and performing apical resections on tooth #36.
Fig. 6_Bone block, stored in Ringer's solution.


Fig. 2


Fig. 3

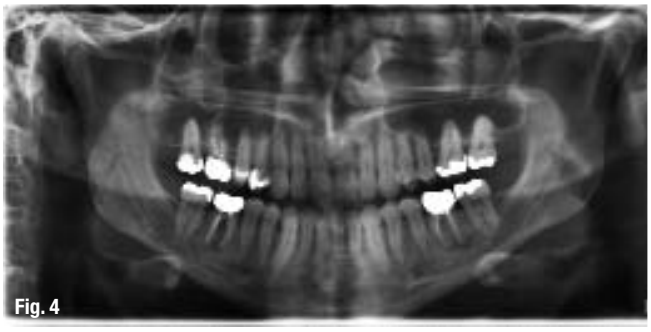

Fig. 4


Fig. 5


Fig. 6

and 46, which had been insufficiently treated endodontically. Clinically, these translucencies were asymptomatic and diagnosed as instances of chronic apical periodontitis or apical osteitis (Fig. 1).

Together with the patient, we planned for an apical resection of tooth #36 in conjunction with a retrograde root-canal filling with subsequent removal of the non-salvageable teeth #16 and 46.

Following extensive consultation and patient education, surgery was performed under local infiltration anaesthesia. With our protocol, block anaesthesia is unnecessary in 98% of all surgical interventions in the mandible, and dispensing with it minimises the risk of iatrogenic nerve damage.

An incision was performed in the marginal gingiva, with a mesiodistal relief incision, followed by preparation of a full flap for adequate access to the surgical site. Using the Piezotome II (Acteon), a buccal bone window of adequate depth was prepared to gain access to the apical region at tooth #36 in order to perform the apical resection. It is helpful for the preparation to provide for undercuts in order to facilitate subsequent removal of the bone block. As no rotary instruments were used and because ultrasonic surgical instruments have a vaso-constrictor effect, the surgical field remained impressively free of bleeding and afforded a clear view of the site. The bone block was stored in Ringer's solution to facilitate subsequent repositioning (Fig. 2). The root apices were then exposed and ultrasonically removed (Fig. 4).

After apical resection, our protocol called for thorough removal of all soft tissue using instruments, followed by complete decontamination of the cyst lumen using a diode laser. Care had to be taken to ensure that the laser tip did not make direct contact with the bone.

Retrograde preparation of the root canals was also performed ultrasonically, which only takes a few seconds when using the Piezotome II.

Following chlorhexidine digluconate and sodium-hypochlorite rinses, the retro-prepared root canals were dried with paper points. In our clinic, we have had excellent success with the MAP (Micro-Apical Placement) retro system (PDSA), which has been on the market for many years (Fig. 5). The system comes in a sterilisable metal container. The triple-angled endo tips greatly simplify the uptake and application of the material, with the syringe facilitating "injection" (retrograde obturation) of the root canal to a depth of several millimetres (Fig. 6). This well-targeted application of the restorative material keeps the surgical field clear (Fig. 7).

On application of ProRoot MTA (DENTSPLY Maillefer), the material was allowed to set, the cross-section surface of the resected area was smoothed and polished, the resection lumen was filled with a quick-hardening bone cement (VitalOs, PDSA), and the bone block was returned to its place (Fig. 8). The post-operative radiograph shows the site following apical resection and retrograde root filling (Fig. 9).

The patient was prescribed Amoxicillin 750 mg and Ibuprofen 600 mg post-operatively, as well as Arnica C30 to prevent swelling. Post-operative healing was uncomplicated, and the sutures were removed after eight days. Swelling was minimal, and the patient reported virtually no post-operative pain.

_Case II

The second case is that of a 65-year-old female patient who presented with an apical resection on tooth #14 that had been performed in alio loco five years before. The patient presented at our clinic because the site had become reinfected.

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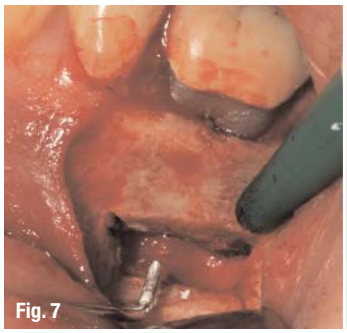

Fig. 7


Fig. 8


Fig. 9

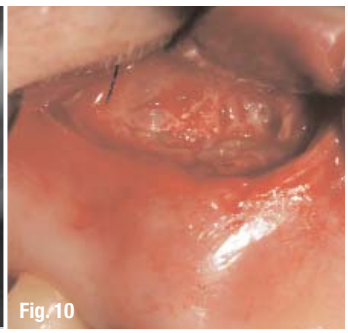

Fig. 10

Fig. 7_Applying MTA using the MAP system.
Fig. 8_The bone block is repositioned and secured with bone cement (VitalOs).
Fig. 9_Postoperative OPG detail following apical resection of tooth #36.
Fig. 10_Surgical site 14 following the semilunar incision.

She reported pain at tooth #14 on occlusal contact and percussion. A local digital radiograph clearly showed the area of apical resection, the two root-canal fillings and a cystic peri-apical radiolucency (Fig. 10). Since this was a surgical re-entry case, the same incision technique was used as chosen by the primary treatment provider, i.e. a crescent-shaped incision as described by Pichler (Fig. 11). The procedure was otherwise the same as in case I. Following retrograde ultrasonic preparation (Fig. 12), ProRoot MTA was mixed to a working consistency and applied using the MAP system (Figs. 13 & 14). This clean and efficient application mode and controlled handling shortened the surgical procedure and reduced post-operative complaints (Fig. 15). The post-operative radiograph shows an efficient retrograde filling of both root canals following revision of tooth #14. Owing to a projection artefact, the restorative appears beside the canals, when it is in fact located clinically exactly within.

_Conclusion

Apical resection is a routine procedure in our clinic. Thanks to the use of ultrasonic surgery, the surgical laser, and the MAP system, this procedure is reliable, predictable and simple, and we have preserved the natural teeth of many patients. Being an oral implantologist myself, I do not perceive anything contradictory in looking at these treatment methods; rather, apical resection is a complementary treatment mode and an attempt to preserve teeth over the longer term that would otherwise be considered lost._

The list of references is available from the author on request.

Fig. 11_Retrograde ultrasonic preparation (Piezotome II, Acteon)
Fig. 12_Mixed Pro-Root MTA prior to application.
Fig. 13_Applying the MTA using the MAP system.
Fig. 14_Resected and retro-filled tooth #14.
Fig. 15_Baseline status of tooth #14 following apical resection alio loco and reinfection.
Fig. 16_Revision treatment outcome for tooth #14.

_contact

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Fig. 11


Fig. 12


Fig. 13

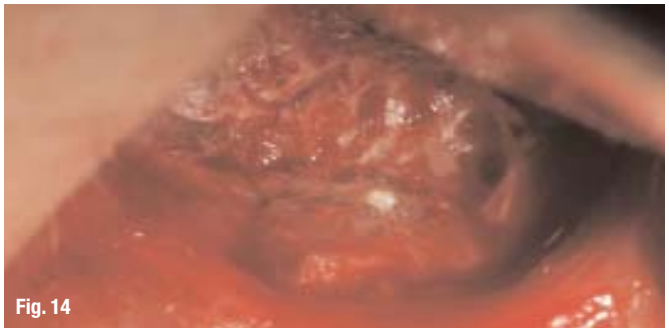

Fig. 14


Fig. 15


Fig. 16

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