made with a semilunar incision. The option for this type of incision was determined by the absence of a large, radiographically visible bone defect (Figure 2) and also for esthetic reasons. This type of incision does not carry the risk of post-operative gingival recession.

After raising the surgical flap, it was possible to note the integrity of the cortical bone. The osteotomy was performed with surgical piezoelectric ultrasound and CVDentus® W1-0 insert for more precise of the micro-motion. The amplitude of the micro-movements is better. It induces a faster increase in morphogenetic bone proteins and modulates the inflammatory reaction, in addition to stimulating healing.

The quality of the root remainder filling was evaluated by introducing a micromirror into the apical bone recess and reviewing the root remainder filling, considered satisfactory as it uniformly filled the root canals (Figure 8c). This was the criterion used for not performing retro-preparation and retrofitting of the root canals, since this region of the canal had been adequately cleaned, shaped and filled.

The sutures were made with the aid of the operating microscope. Two simple stitches with Vicryl 9-0 thread were made to stabilize the flap, and another continuous stitch with Vicryl 9-0 thread to coat the edges (Figure 9).

Clinical control was performed after seven, 30 and 90 days. There was remission of all the clinical signs and symptoms of endodontic infection.

The fractured instrument was removed together with the apical root third in the apicoectomy (Figure 8d). The apical root cut was performed at an angle of 90° to the long axis of the root, to expose the smallest quantity of dentinal tubules and preserve the most root extension, favoring microbiological control and function of the dental remainder.

The biological benefits of piezoelectric surgery particularly involve the maintenance of cellular viability in the operated region, so that the first post-operative stages of the bone repair process are better. It induces a faster increase in morphogenetic bone proteins and modulates the inflammatory reaction, in addition to stimulating healing.

References
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Managing maxillary molars - case study

How meticulous root-canal therapy lays the foundation for successful long-term retention and restorative care - Dr Mark Dreyer

Maxillary first molars are complex root canal system morphology. The mesio-buccal roots are characterised by an irregular ovoid morphology, resulting in an isthmus or fin of pulpal tissue extending in the palatal direction off of the principal mesio-buccal canal. This case report presents steps taken to address this anatomy to maximise the disinfection and debridement of the root canal system. Failure to address this anatomic complexity may lead to persistence or recurrence of endodontic disease.

**Endodontic evaluation**

A 58-year-old female patient presented for endodontic evaluation and therapy in the upper left quadrant. Mild pain was reported by the patient for several days prior to the appointment. Medical history was non-contributory and dental history was remarkable for multiple existing large amalgam restorations (Figures 1, 2, 3). Clinical examination and diagnostic evaluation were performed for all posterior teeth on the right side, including cold testing, percussion, pulpal bleeding, periodontal probing and bite challenge. Findings led to a pre-operative diagnosis of irreversibly pulpotis/maxillary right first molar with normal peri-radicular.

After anesthesia, and isolation with the rubber dam, entry was made into a calcified pulp chamber. Use of the dental operating microscope greatly enhances lighting and visibility allowing for careful and deliberate clearing of reparative dentin, pulp stones, and other potential impediments to canal orifices. It is important to stress resisting the urge to take files into the canals prior to developing proper access form. In such cases, ledging and blockages can easily occur, needlessly compromising and complicating treatment. The palatal pulp tissue was calcified and extirpated in toto, as seen in Figure 4.

**Ultrasonic tips**

In this case, ultrasonic tips were used to plane the pulpal floor and increase visibility. These instruments are available from many manufacturers in a variety of sizes and shapes designed to address specific case needs. In this case, the orifice of the MB2 canal was located toward the palatal orifice in an unusual presentation (Figures 5, 6). This stresses the importance of continuing to examine the pulpal floor with the microscope throughout the procedure, as irrigants and instrumentation constantly alter the presentation of subtle cues and clues to orifice location.

Once orifice location is completed, canal negotiation and instrumentation is carried to completion. Warm vertical compaction of gutta percha and ZOE sealer is used in this case, demonstrating the treated canal morphology (Figures 7, 8, 9). The MB2 canal was addressed as a completely separate canal. One study examined more than 1,700 teeth, which included more than 1,000 first molars. The presence of the MB2 canal was demonstrated in 93 per cent of these teeth (Stropko, JOE June 1999).

These findings are not surprising given the morphology of the mesio-buccal root in maxillary molars. To better acquaint oneself with this anatomy, examine extracted teeth or see Brown and Herbransson’s Tooth Atlas, a rich source of 3D imagery. The final radiographs demonstrate placement of an orifice barrier, subsequent to temporisation and referral back to the restorative dentist. Image (not included) shows the easily identifiable bonded high contrast composite used for this purpose.

**A complex system**

This case presented an opportunity to demonstrate the complex canal system anatomy present in maxillary molars. Use of the dental-operating microscope throughout a carefully executed coronal and radicular access procedure maximises the ability to disinfect and debride these teeth.

Ultrasonic instrumentation allows for the judicious removal of dentin required to prevent iatrogenic mishaps and unnecessary weakening of the tooth. When patients present with endodontic disease, meticulous root-canal therapy lays the foundation for successful long-term retention and restorative care.