Modern Endodontic Microsurgery Concepts

A Clinical Update

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KEYWORDS

• Microsurgery • Magnification • Surgical operating microscope • Isthmus
• Inspection • Apical surgery

KEY POINTS

- Microsurgical technique is a minimally invasive procedure that results in faster healing and a better patient response.
- Inspection is the key stage of microsurgery that is completely missing from the older surgical technique.
- Untreated isthmuses frequently cause treatments to fail; therefore, they must be identified, cleaned, shaped, and filled as carefully as the root canals.
- By following a strict microsurgical protocol and careful patient selection, almost all lesions of endodontic origin can be successfully treated.

ENDODONTIC MICROSURGERY: PROCEDURAL STEPS

Flap Design

Semilunar incision was the most commonly used incision design in older surgical procedures, especially in the maxillary anterior area. This incision is no longer used, as it does not allow for an adequate access to the surgical site and is related to prolonged inflammation and scar formation on healing of the wound.[1] Modern microsurgery is using the triangular flap with 1 vertical incision, the papilla base incision for preservation of the papillae and the Lüebke-Ochsenbein submarginal flap. The last one is the most commonly used esthetic flap design especially in the maxillary anterior area. It is performed within the zone of the attached gingiva and results in almost zero recession of the gum margins and the interdental papillae postoperatively.[2,3] Therefore, crown margin exposure and formation of "black triangles" in anterior teeth as well as food impaction in posterior teeth is prevented. In microsurgical technique, vertical incisions should be 1.5 to 2 times longer

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than in the traditional technique, so the flap is reflected far away from the light path of the microscope and adequate visibility of the surgical site is achieved.[4]

Osteotomy

In microsurgery, osteotomy becomes more and more conservative thanks to the enhanced magnification and illumination offered by the microscope. The diameter of the osteotomy is only 3 to 4 mm, just enough to allow for a 3-mm ultrasonic tip to vibrate freely within the bone cavity (**Figs. 1** and **5**).[5] To prepare a small-size osteotomy, the exact position of the root apex has to be identified. The clinician has to have in mind the following guidelines:

- Sometimes the cortical plate is perforated and the perforation can be identified with a microexplorer under the microscope. In that case, the osteotomy site is obvious. A microexplorer also can penetrate through a thin layer of cortical bone underneath which lies the lesion.
- If there is a sound cortical bone, the measurement of the tooth length by using digital radiograph or even better by using cone-beam computed tomography (CBCT) can give us a precise estimation of the root apex position.
- If there is a periapical lesion extending on both roots of a lower molar, then starting the osteotomy right at the center of the lesion will safely lead us to both mesial and distal root apex.
- If the osteotomy does not reveal the root apex at a depth of 2 to 3 mm, the placement of a radiopaque material on the cortical bone, for example, gutta percha, resilon, aluminum foil, and the acquisition of a periapical radiograph is a clinical technique for root apex identification.

A small-size osteotomy leads to reduced postoperative discomfort and faster healing. A clinical study on healing, as evidenced by radiographic changes, showed that there is a

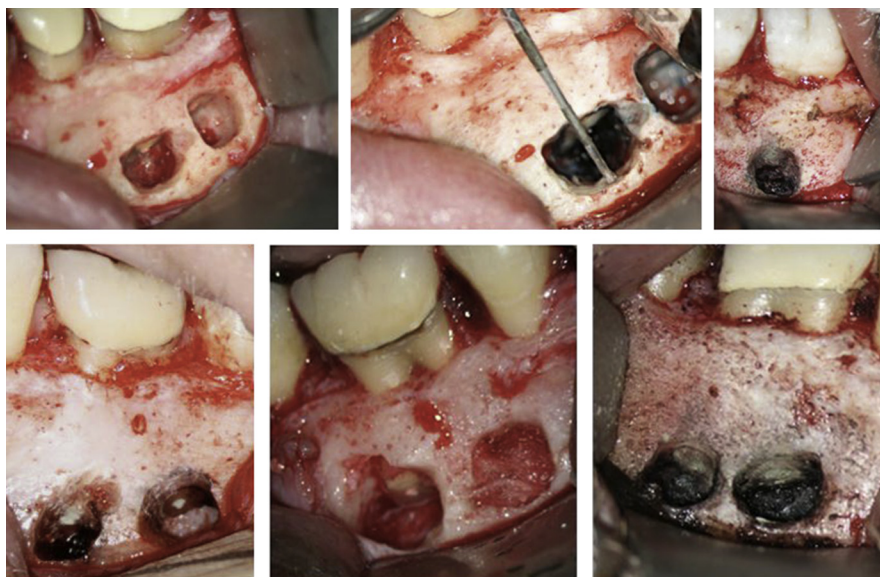

Fig. 1. Microsurgical technique on mandibular molars. The diameter of the osteotomy is only 3 to 4 mm, just enough to allow for a 3-mm ultrasonic tip to vibrate freely within the bone cavity. The root is resected at a 0° to 10° bevel.