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Indexed in:
- IME
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Received: October 24, 2014
Accepted (or accepted for publication): February 17, 2015.

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Ilustre Colegio Oficial de Odontólogos y Estomatólogos de la Iª Región

Case report

Periapical Microsurgery: An alternative in the treatment of persistent apical periodontitis: 2 case reports

Published in spanish Científica Dental Vol. 12. Nº 1. 2015
www.cientificadental.es

ABSTRACT

Endodontic microsurgery is an alternative in the treatment of periradicular lesions of endodontic origin which do not respond to conventional treatment. The use of surgical microscopy, surgical ultrasonic tips and new sealing materials, such as MTA, have improved the long-term prognosis of these treatments. Two clinical cases where surgery was the treatment of choice for persistent periapical lesions are described. The first was treatment of an injury due to foreign matter in the apical third of the mesiobuccal root. The second was due to a persistent extensive periapical lesion after conventional retreatment.

KEYWORDS

Periapical surgery; MTA; Operating microscope; Periapical periodontitis.

BACKGROUND

Endodontic microsurgery is the branch of dentistry dedicated to the diagnosis and treatment of lesions of endodontic origin that do not respond to conventional endodontic therapy[1]. Faced with a periradicular lesion of endodontic origin, the use of a proper non-surgical technique with adequate cleaning, 3-dimensional conformation and sealing of canals achieves a success rate of 85%[2-4]. Among the causes of the persistence of these lesions are: Presence of intracanal biofilm, extraradicular Actinomyces infections, presence of cholesterol crystals and foreign body reactions[5]. In these cases, a therapeutic alternative may be endodontic microsurgery[6-9].

The main purpose of endodontic surgery is to prevent the invasion of bacteria and their bioproducts from the canal system to the periradicular tissues in teeth with periodontitis of endodontic origin[10-13]. Over time, endodontic surgery has had varying success rates and much lower than those of today. Ignorance of the root microanatomy, the use of rotating tungsten carbide burs for retropreparation and the use of silver amalgam as a filling material meant the prognosis was uncertain in most cases[14]. At present, the technological advances and knowledge of the microanatomy canal system have improved the long-term prognosis, achieving success rates close to 90%[15-17]. The use of Cone Beam Computed Tomography (CBCT) has improved the diagnosis, location and extent of periradicular lesions[18-19]. The use of the surgical microscope (Figure 1) has led to a substantial improvement in vision, by magnifying a work area as small as the root apex, and with the new lighting systems with xenon light or LED, which provide an intensity far superior to conventional halogen lighting. The better control of bleeding in the area of the bone crypt, thanks to proper anaesthetic technique and the use of local binding agents, improved management and vision of the operative field. The use of ultrasonic small size diamond tips and a specific design for various work areas (Figure 2) has facilitated the preparation of the cavity. The small size provides: a greater vision of the work area, due to not inserting

Figure 2. Surgical ultrasonic diamond tips reinforced with zirconium.

Figure 1. A surgical microscope provides better lighting and magnification in the work area.

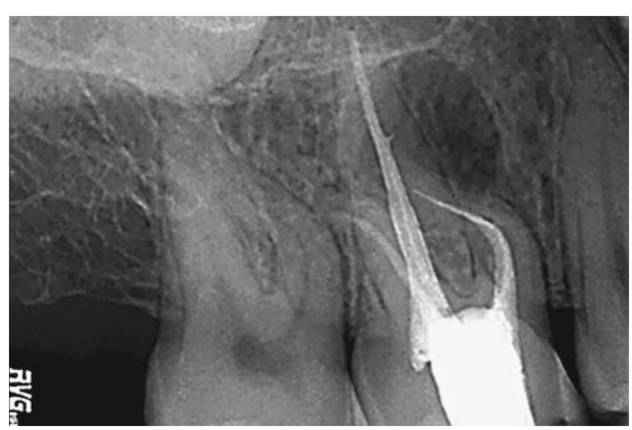

Figure 3. Radiograph of 16 showing the presence of a piece of material in the apical third of the mesial root.

the head of the handpiece, smaller osteotomies, apical bevels reduced by up to 10° and less aggressive and more accurate preparations[20].

Finally, the use of more biocompatible materials to provide better sealing, such as the mineral trioxide aggregate (ProRoot MTA, Maillefer, Ballaigues, Switzerland) and ethoxy benzoic acid reinforced cement (SuperEBA, Harry J. Bosworth, Skokie, IL, USA) have helped improve long-term prognosis of these cases[21-24].

CASE REPORT 1

Female patient, aged 28 years, referred to the consultation for reporting pain in the occlusion and swelling in the upper right vestibular region. The patient reported she had undergone a root canal treatment on tooth 16 two years earlier and was injured by a broken instrument. She had remained asymptomatic until recently. A clinical examination revealed inflammation in the vestibular area corresponding to 16 and tenderness after palpation and percussion of the tooth. The radiological examination revealed a root canal treatment in 16 with adequate condensation and extension of the sealing material, except in the mesiobuccal root, where a possible piece of material occupying the apical third (Figure 3) was detected. A radiolucent lesion associated with the apex of that root was also noted.

Since the fractured instrument piece was about 7mm in length and located beyond the angle of curvature of the mesial root, the possibility of success for a repeat treatment was considered low. The possibility of performing microsurgery to remove the lesion, removing the instrument piece and improving the sealing was proposed to the patient.

Infiltrative anaesthesia was performed with articaine with 1:100,000 epinephrine (Ultracain, NORMON, Madrid, Spain) to achieve adequate haemostasis of the operating areas to allow for proper vision. The use of the microscope during infiltration of the anaesthesia helped to avoid puncturing small blood vessels. A microfoil scalpel incision (Micro Blades, Hu Friedy, Zweigniederlassung, Germany) was performed to increase accuracy and minimise damage to the soft tissue. An incision was performed at 90° and not bevelled to promote proper repositioning of the flap; thus preventing scarring due to sliding. The

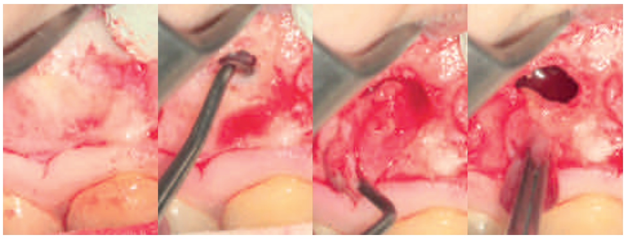

Figure 4. Removal of granulation tissue, curettage of the lesion and removal with the aid of toothed forceps.

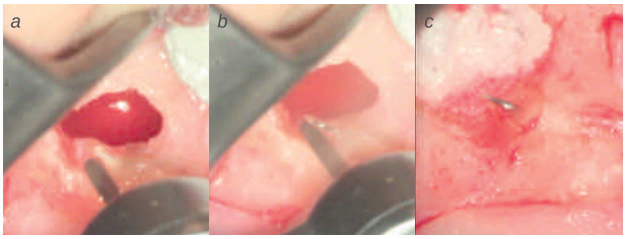

Figure 5. Elimination of 3mm of the root apex with surgical handpiece and abundant irrigation (a and b), exposing the fragment of foreign matter (c).

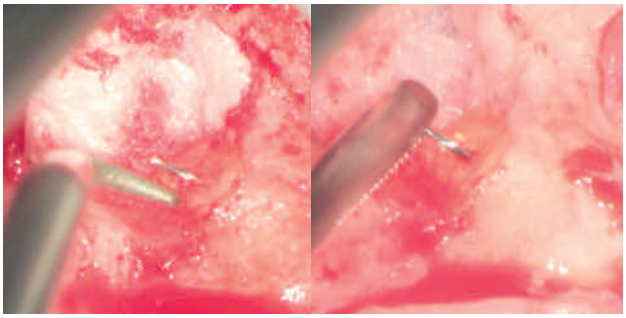

Figure 6. Ultrasonic surgical tip to dislodge fragment (a) before being removed with the straight forceps (b).

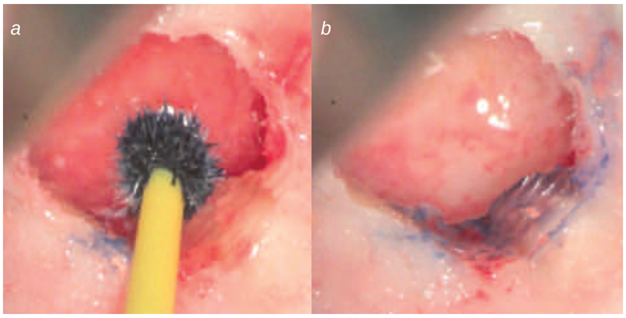

Figure 7. Staining of sectioned apical area with methylene blue (a) and detail of root section to see limits and possible untreated canals (b).

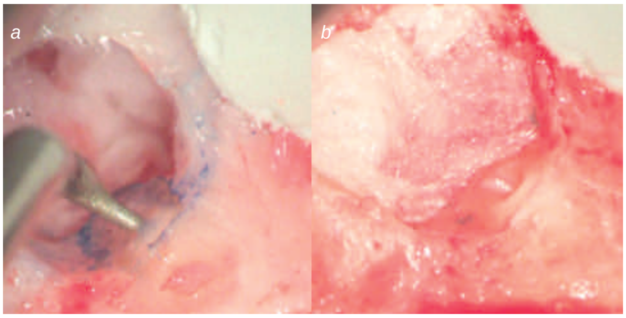

Figure 8. Preparation of retro cavity with ultrasound and abundant cooling (a). Close-up of retro cavity prepared and dry (b).

vestibular osteotomy was performed with a round surgical bur and a handpiece, copiously irrigated with saline. Part of the vestibular cortical bone had been lost due to the extent of the injury. After curettage of the tissue to remove granulation and the aid of toothed forceps, the instrument was removed in one piece from the lesion (Figure 4).

Next, 3mm of the apex root was removed, exposing the fragment of the file. This required a surgical NSK handpiece at a 45° angle (Ti Max A 450L, NSK, Shimohinata, Kanuma, Japan) and a surgical length tungsten carbide bur (Figure 5) was used. When the file fragment was exposed it was loosened by ultrasonic vibration with the surgical tip to disengage it from the root canal. Once it began to move, it was extracted with the help of a straight pair of forceps (Figure 6). After removing the file fragment, the apical area was dyed with methylene blue to better appreciate the periodontal limit, possible cracks and unsealed canals

Figure 9. Syringe MAP System for transporting MTA to the retropreparation.

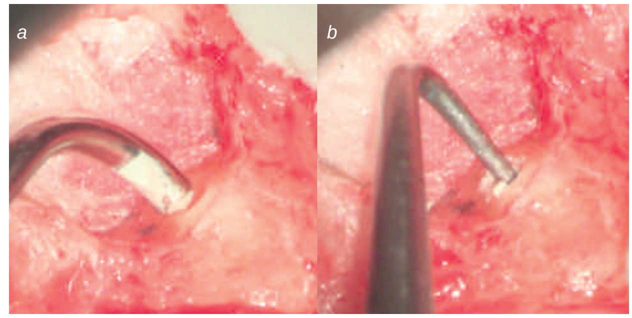

Figure 10. Close-up of MTA transport to the retrocavity with the MAP System syringe (a). Microrammer used to reduce the sealing material (b).

Figure 11. Radiograph postoperatory to evaluate greater sealability.

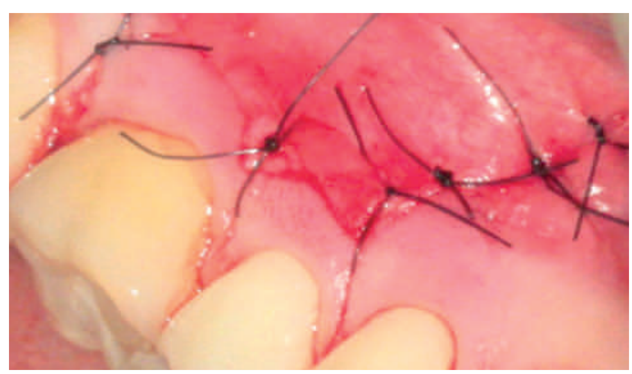

Figure 12. Surgical suture monofilament 5/00.

Figure 13. Follow-up radiographs at 6 months (a) and 9 months (b) where development of bone and complete regeneration of the injury can be seen.

(Figure 7). Then, the cavity was prepared to a depth of 3mm with an Ultrasonic Surgical diamond tip (ProUltra Ultrasonis tips, Maillefer, Ballaigues, Switzerland), by removing traces of potentially contaminated gutta percha. Ultrasound treatment was performed with ample cooling to prevent heating of the root and the appearance of cracks. The cavity was reviewed with micromirrors and dried using low pressure air with the Stropko air syringe (SybronEndo, Orange, CA, USA) (Figure 8).

Mineral trioxide aggregate ProRoot MTA (Maillefer, Ballaigues, Switzerland) was used as a sealing material, and transported with a MAP System syringe (Maillefer, Ballaigues, Switzerland), which had different angled terminals of different diameters and curvatures, suitable for the different areas of the arch (Figure 9). The sealing material was reduced with a microrammer and applied with a microspatula (Figure 10). After the sealing was finished and checked for possible remains of filling material which were removed from the bone crypt. A postoperative radi-

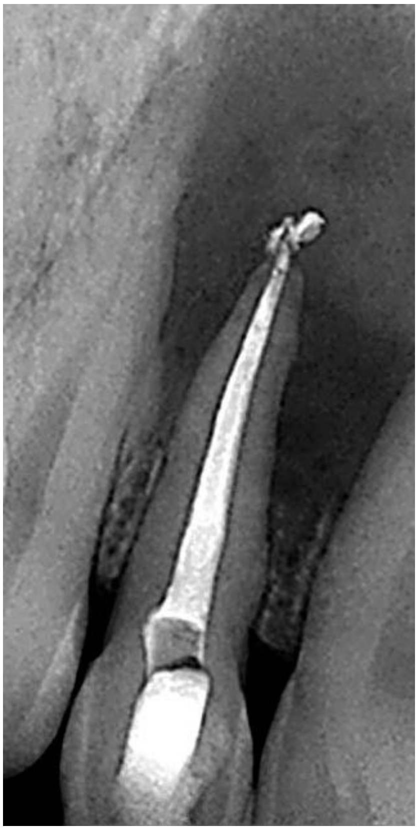

Figure 14. Root canal treatment of 12 with periradicular lesion reaching 11 and 13.

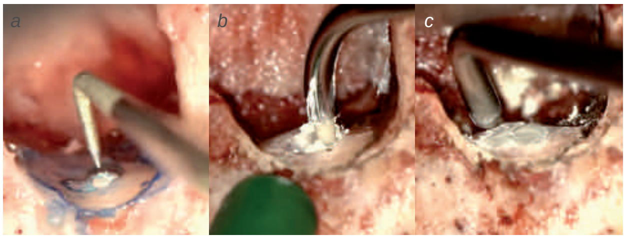

Figure 15. Close-up of the cavity preparation to retro with ultrasound tips (a) sealing with MTA (b) and condensation of the sealing material (c).

Figure 16. Postoperative radiograph to assess the quality of the seal and to serve as a reference to assess the evolution of bone growth during follow-ups.

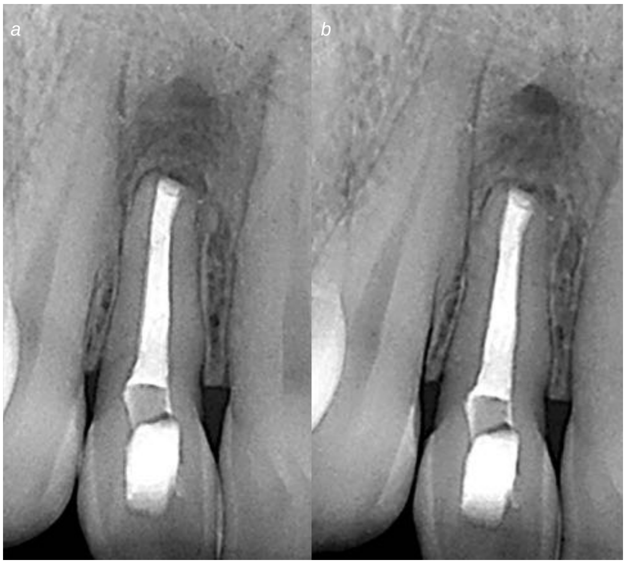

Figure 17. Follow-up radiographs at 6 months (a) and 9 months (b). Almost complete regeneration of the bone defect can be seen.

ograph was taken to verify the adaptation of the sealing and to serve as reference in subsequent tests (Figure 11). The areas was curetted to stimulate bleeding and a clot established in the bone defect. No bone graft or resorbable membrane material was added as the vestibular cortical defect was reduced. A simple suture was performed with 5 zero monofilament suture points (Normon, Madrid, Spain) (Figure 12).

The patient was prescribed Amoxicillin 500mg, Ibuprofen 600mg and 0.2% chlorhexidine mouthwash for a week. The suture was removed after 48 hours. Radiographic controls at 6 months and 9 months were performed to check for the complete regeneration of the bone defect (Figure 13).

CASE REPORT 2

Female patient, 24 years, referred by her dentist to assess the periradicular injury on the 12 associated with an old canal treatment. The patient told us that the first root canal treatment was 3 years earlier and since then she had experienced periodic episodes of inflammation and pain. About 3 months previously, a retreatment was performed on the same tooth but the symptoms did not cease. Thus, the possibility of microsurgery was suggested. The clinical examination revealed a gum inflammation at the vestibular level 11, 12 and 13 and tenderness in that area. Probing the gingival sulcus 12 was negative and no mobility was appreciated. In the radiological examination a root canal in 12 was apparently of the correct extension and condensation, and an extensive radiolucent lesion around the apexes 11, 12 and 13 (Figure 14) was observed.

Pulp vitality tests were performed and it was observed that 11 and 13 had positive pulp vitality, so it was decided not to perform any treatment on these parts. The treatment suggested was periapical microsurgery on 12. All microsurgery phases were the same as described in clinical case 1 (Figure 15). Before the suture, a postoperative radiograph was performed to verify the quality of the sealing and the absence of foreign material in the crypt (Figure 16). The patient had clinical and radiographic follow-ups at 6 and 9 months (Figure 17). The patient was asymptomatic and the bone regeneration of the lesion was seen radiographically. A small radiolucent afterimage either showed that the injury had not completely healed or that there was non-pathological scar tissue present.

CONCLUSIONS

Periapical microsurgery may be an alternative predictable treatment in cases of persistent apical periodontitis.

The presence of insurmountable obstacles, such as fractured pieces of instruments, stepping, calcification, cast and core preventing access to the apical third are sometimes contraindicated for a retreatment. In these cases, periapical microsurgery may be a first therapeutic alternative.

The use of the operating microscope, ultrasonic terminals with diamond tips and new biocompatible retro sealing materials of greater sealability are some of the advances that have modified the surgical technique.

Careful treatment of the soft tissues, reducing the size of the osteotomy and precise suturing of the flap reduces inflammation and postoperative pain; thus possibly categorising this technique as minimally invasive.

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