Asian Pac. J. Health Sci., 2015; 2[4S]:55-59 e-ISSN: 2349-0659, p-ISSN: 2350-0964

A Nonsurgical root canal therapy treatment with apparent indications for root-end surgery

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ABSTRACT

The recent introduction of the surgical microscope to the practice of endodontics, especially for surgery, has allowed clearer visualization of the periapex during root-end resection and filling. However, despite this and other technologic advances, it has not been demonstrated that in the absence of thorough canal debridement the success rate of periapical surgery has improved over the 50% to 60% demonstrated in most long-term prognosis studies. Therefore it remains important to fully instrument and obturate the root canal system with conventional therapy before surgery is considered; this considerably improves the long-term prognosis. Various methods can be used in the nonsurgical management of periapical lesions: the conservative root canal treatment, decompression technique, active nonsurgical decompression technique, aspiration-irrigation technique, method using calcium hydroxide, Lesion Sterilization and Repair Therapy, and the Apexum procedure. Monitoring the healing of periapical lesions is essential through periodic follow-up examination.

Keywords: root, surgery, examination

Introduction

Bacterial infection of the dental pulp may lead to periapical lesions.[1] They are generally diagnosed either during routine dental radiographic examination or following acute pain in a tooth.[2] Most periapical lesions (>90%) can be classified as dental granuloma, radicular cysts or abscesses.[3,4] The incidence of cysts within periapical lesions varies between 6 and 55%.[5]The occurrence of periapical granuloma ranges between 9.3 and 87.1%, and of abscesses between 28.7 and 70.07%.[6] There is clinical evidence that as the periapical lesions increase in size, the proportion of the radicular cysts increases. However, some large lesions have been shown to be granuloma. [7] The definitive diagnosis of a cyst can be made only by a histological examination. However, a preliminary clinical diagnosis of a periapical cyst can be made based on the following: (a) The periapical lesion is involved with one or more non-vital teeth, (b) the lesion is greater than 200 mm 2 in size, (c) the lesion is seen radiographically as a circumscribed, well-defined radiolucent area bound by a thin radiopaque line, and (d) it produces a straw-colored fluid upon aspiration or as drainage through an accessed root canal system. [8]The ultimate goal of endodontic therapy should be to return the involved teeth to a state of health and function without surgical intervention.[9]All inflammatory periapical lesions should be initially treated with conservative nonsurgical procedures. [10] Surgical intervention is recommended only after nonsurgical techniques have failed.[11] Besides, surgery has many drawbacks, which limit its use in the management of periapical lesions.[12,13]Various studies have reported a success rate of up to 85% after endodontic treatment of teeth with periapical lesions.[14,15,16]A high percentage of 94.4% of complete and partial healing of periapical lesions following nonsurgical endodontic therapy has also been reported.[17]There are many traditional reasons to choose surgical over nonsurgical endodontics. The presence of a large (diameter > 20 mm or cross-sectional area > 200 mm^2) apical radiolucency is cited as a reason for recommending surgical removal of the lesion.[18] When a longstanding, infected, necrotic pulp has resulted in a large apical radiolucency, it may be said to be refractory to conventional treatment[18]

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because of the high probability of the lesion's being a cyst.[19] Another situation in which surgical RCT can be recommended is when the canal is supposedly "calcified" or obstructed and nonnegotiable. This is often assumed to be the case when the canal cannot be visualized radiographically, particularly if root-end surgery had previously been performed, Failure of a case that was treated with a metal obturating material is yet another scenario in which surgery is frequently indicated. In this report, a case was presented, demonstrating example of an approach to the treatment of these clinical situations without resorting to surgery.

Case report

A 30 year old patient complained of intermittent pain from his left maxillary lateral incisor. Periapical radiographs (Fig 1) showed a large radiolucency approximately 200 mm^2 in cross-section extending from the left mandibular canine to the left mandibular first premolar. Vitality testing with solid carbon dioxide (CO_2 ice) and an electric pulp tester elicited no response from the left mandibular canine, while all other teeth extending from the right mandibular second premolar to the left mandibular first molar responded normally. The left mandibular canine was also sensitive to percussion. No palpation sensitivity was noted in the area. A sinus tract was noted in the vestibule of the left mandibular canine. The lingual surface had a deep pit with associated caries. The patient recalled no history of trauma to this area. The most probable diagnosis was chronic apical periodontitis with a high likelihood of associated periapical radicular abscess.[19] Odontogenic tumors, non-odontogenic cysts, ameloblastoma, and metastatic lesions were considered unlikely; these conditions are generally associated with teeth with vital pulps and with other findings. [20]The treatment options to be considered were (1) RCT, (2) RCT in combination with root-end surgery and (3) extraction. Despite the slimness of the possibility that the lesion might be a tumor, it was deemed important to verify by biopsy that it was not a tumor. Therefore RCT was recommended (Fig 2). Cleaning and shaping were completed, and the canal was dried and dressed with calcium hydroxide Ca[OH]2 mixed with sterile anesthetic solution, then temporized with zinc oxide/eugenol (ZnO/eugenol). After 1 month the patient was asymptomatic and the sinus tract had closed. After 6 months healing was sufficient to rule out another diagnosis. The canal was obturated with gutta percha (GP) and Roth sealer through use of lateral condensation (Fig 3). Healing progressed at 1 month (Fig 4) and 6 months with apparent scar formation (Fig 5). The mandible showed normal bone trabeculation.

Fig 1:Preoperative procedure

Fig 2:Working length

Fig 3:Post obstruction

Fig 4:After 1 month

Fig 5:After 6 months

Method using calcium hydroxide

Calcium hydroxide is a widely used material in endodontic treatment because of its bactericidal effects [.21,22,23,24,25] It is thought to create favorable conditions for periapical repair and stimulate hard tissue formation.[26,27] Souza *et al*, suggested that the action of calcium hydroxide beyond the apex may be four-fold: (a) anti-inflammatory activity, (b) neutralization of acid products, (c) activation of the alkaline phosphatase, and (d) antibacterial action. [28] A success rate of 80.8 15 and 73.8% [29] has been reported with calcium hydroxide, when used for endodontic treatment of teeth with periapical lesions. It has been suggested that the presence of a cyst may impede or prevent root-end closure of an immature pulp less tooth even with the use of calcium hydroxide. [30] Contrary to this, HalíIkan and Tórkón have reported a case in which apical closure and periapical healing have occurred in a large cyst-like periapical lesion following non-surgical endodontic treatment with calcium hydroxide paste and a calcium hydroxide-containing, root-canal sealer.[36] Extrusion of calcium hydroxide beyond the apex was suggested as a factor for the lack of early healing of periapical lesions.[31] However, many investigators advocate that direct contact between calcium hydroxide and the periapical tissues is beneficial for the inductive action of the material. [27, 32] A high degree of success has been reported by using calcium hydroxide beyond the apex in cases with large periapical lesions. [15, 36, 28] It is barium sulphate that is added to the calcium hydroxide paste for radiopacity, which is not readily resorbed when the paste extrudes beyond the apex. However, it has been reported that even though complete resorption of the paste does not occur in some cases, the periapical radiolucency around the paste resolves. [15]Some studies have reported that long-term exposure of root dentin to intracanal calcium hydroxide leads to a decrease in the fracture resistance of teeth. [33,34] A method using calcium hydroxide, demineralized freeze-dried bone allograft, and Mineral Trioxide Aggregate (MTA) has been described by Chhabra *et al*., for apexification of an immature tooth associated with a large periapical lesion. Calcium hydroxide is used as an antibacterial agent for only 15 days, following which it is irrigated out of the canal using sodium hypochlorite. The demineralized, freeze-dried bone allograft is then packed in the periapical area to form an apical matrix, with the help of finger pluggers. The demineralized bone matrix also acts as an osteoconductive and possibly as an osteoinductive material. MTA is then compacted over the matrix, forming a 5 mm apical plug. [35]

Discussion

Apical periodontitis is due primarily to bacterial contamination of the root canal space [37]; therefore the aim should be to remove these bacteria. Recently it has been shown that if bacteria are reduced to undetectable levels by the bacteriologic methods in use today, a success rate of 95% can be achieved[38].This further emphasizes the importance of canal debridment. Surgery does not address the bacteria within the root canal space but rather attempts (with the aid of a root end filling material) to isolate canal bacteria from the apical tissues and allow periapical healing. The

reported success rate of 50% to 60% is indicative of this. 1 Even with the advances in surgical techniques seen over the past several years, the fundamental biologic reason for failure—i.e., infection of the root canal system is not addressed by this treatment option. Furthermore, there are numerous failures after initially successful surgery [39].This suggests that although a root-end filling seals the contaminated root canal space for several years, the leakage of bacterial contamination after initial success causes the apical tissues to break down. Therefore surgical root resection and root-end filling should be performed only after conventional treatment has been attempted or when the risk-benefit ratio of conventional treatment favors surgical treatment despite a lesser expectation of success. In addition, if the nonsurgical approach is unsuccessful, surgery usually can be performed. Case presented in this report is an example of a situation in which the practitioner may have deemed nonsurgical treatment to be impossible or to have little chance of success. However, the nonsurgical approach was accomplished and surgery was avoided.

Conclusion

Accordingly, when the apical pathosis is clearly endodontic, nonsurgical treatment may be attempted first. The technical advances of recent years, which have made the surgical approach so attractive, may overcome some of the obstacles to nonsurgical procedures. Prognosis studies continue to dictate that the nonsurgical approach should be attempted before surgery. Our cases illustrate this point.

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Source of Support: Nil
Conflict of Interest: None