Review Article

Endodontic Management of a Periapical Cyst- A Review

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Abstract:
The development and progression of endodontically induced periapical lesions is clearly associated with the presence of microorganisms in the root canal system. There are surgical and nonsurgical methods to treat such cases. Ideally, a nonsurgical method should initially be done especially in cases where lesions are in close proximity to important anatomical landmarks. The success of the nonsurgical endodontic treatment method is based on appropriate cleaning, shaping, asepsis and filling of the root canal. Studies have reported a success rate of up to 85% after endodontic treatment of teeth with periapical lesions. Various methods can be used in the nonsurgical treatment: 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.

Key words: Cyst, decompression, healing, LSTR therapy, healing, periapical lesion, granuloma

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INTRODUCTION

Most periradicular lesions (90%) can be classified as dental granuloma, radicular cyst, or abscess.(1) There are two distinct categories of radicular cysts namely, those containing cavities completely

enclosed by epithelial lining; True cysts and those containing epithelial-lined cavities that are open to the root canals.[2,3] The later was originally described as a 'Bay cyst',[3] and has been newly designated as a 'periapical pocket cyst'.[(2)]

It is generally accepted that periradicular lesions cannot be differentially diagnosed as either radicular cysts or apical granulomas based on radiographic evidence alone. The definitive diagnosis of the type of periapical lesion can only be made by a histological examination. However, a preliminary clinical diagnosis of a periapical cyst can be made based on the following: (i) The periapical lesion involves one or more teeth with necrotic pulps (ii) The lesion is greater than 200 mm^2 in size (iii) A straw-coloured fluid is produced upon aspiration or on drainage through an access (iv) The fluid contains cholesterol crystals. [(4)] There has also been a prolonged debate about the management of large cystic lesions, with some maintaining that true cysts can only be successfully treated by surgical means.[(5,6)] Since the goal of endodontic treatment is elimination of bacterial challenge and creating an environment conducive to the placement of a root canal filling, endodontists believe that a large majority of cysts will heal after nonsurgical root canal treatment.[(7-9)] Treatment options to manage large periapical lesions range from non-surgical root canal treatment and/or apical surgery to extraction. Current philosophy in the treatment of teeth with large periapical lesions includes the initial use of non-surgical root canal treatment.[(10)] When this treatment is not successful in resolving the periradicular pathosis, surgical intervention can be considered. Besides, surgery has many drawbacks, which limit its use in the management of periapical lesion.[(11)] A high percentage of 94.4 of complete and partial healing of peripaical lesions following nonsurgical therapy have also been reported.[(12)]

Do cysts really heal….?

There has been prolonged debate about the management of large cystic lesions. The view held by many oral pathologists is that the epithelial

lining of the cyst must be completely removed by surgical means. However, when large cysts are treated in this manner there is the risk of devitalizing many teeth and following resolution of the lesion there is often a residual defect left in the alveolus.[13] A more conservative approach suggested by most endodontists is that many cysts can be treated successfully by non-surgical means.[14] Success rates of up to 85% have been reported after endodontic treatment of teeth with periapical lesions.[15] As it has been claimed that more than 40% of periapical lesions are radicular cysts, many of these lesions must be responding to root canal treatment.[16,17] Once the causative factors are eliminated the granuloma heals spontaneously so no need of over instrumentation. Because there is prevalence of two distinct classes of radicular cysts and the low incidence of true cysts (< 10%) amongst periapical lesions.The tissue dynamic of a true cyst is selfsustaining however, as the lesion is no longer dependent on the presence or absence of irritants in the root canal. Therefore, true cysts, particularly the large ones, are less likely to be resolved by conventional root canal therapy. This has been clearly shown in a longitudinal follow-up of a case.[6]

Treatment

Cystic lining degeneration with minimal over-instrumentation. Bhaskar (1972)[17] suggested that if instruments are extended 1 mm beyond the apical foramen, the inflammatory reaction that develops destroys the cyst lining and converts the lesion into a granuloma. Once the causative factors are eliminated the granuloma heals spontaneously. Bender[18] added that penetration of the apical area to the centre of the radiolucency may help in resolution by establishing drainage and relieving pressure. Although this proves to be an effective method Shah[19] suggests the possibility that added trauma of the minimal over-instrumentation may enhance epithelial proliferation and cystic expansion, not resolution and stressed on the need of follow up for a period of two years.[20] Seltzer[20]suggested that over-instrumentation allowed drainage of the cystic fluid, which then allowed degeneration of the epithelial cells by strangulation because fibroblastic and collagen proliferation squeezed the capillary supply to the cystic lining. The over-instrumentation technique

was based on the assumption that the periapical lesion could be a cyst.

Osseoinduction with Calcium hydroxide

Calcium hydroxide is a widely used material in endodontic treatment because of its bactericidal effects. It is thought to create favorable conditions for periapical repair and stimulate hard tissue formation.[21]Packing the canal system with calcium hydroxide or the placement of calcium hydroxide into the periapical cyst is considered an alternative to over-instrumentation.[22,23] Placement of the root canal paste beyond the apex is not indicated according to contemporary endodontic principles. However, it may be accidentally extruded during filling procedures. The exact mechanism of action of calcium hydroxide is still speculative. Ghose et al[24] has advocated that direct contact between the calcium hydroxide and the periapical tissue was necessarily beneficial for osseoinductive reasons. It is suggested that if the calcium hydroxide is confined to the root canal, it is possible that the inflammation created by the diffusion of the calcium hydroxide through the apical foramen may be sufficient to cause break-up of the cystic epithelial lining, thereby allowing a connective tissue invagination into the lesion with ultimate healing.[23] Moreover, Souza et al. (1989) suggested that the action of calcium hydroxide beyond the apex may be fourfold: (i) anti-inflammatory activity (ii) neutralization of acid products (iii) activation of the alkaline phosphatase (iv) antibacterial action. Some studies have reported that long-term exposure of root dentin to intracanal calcium hydroxide leads to a decrease in fracture resistance of teeth.[25]

Decompression: Aspiration & Irrigation

The terms decompression and marsupialization are often used interchangeably. Decompression is the surgical exposure of a cyst wall and insertion of a tube or other type of drain to decompress the lesion during healing. Decompression is a more conservative treatment option that allows the progressive reduction in lesion size and may eliminate the necessity of surgical enucleation. Decompression is intended to

disrupt the integrity of the lesion wall, reduce the internal osmotic pressure, and permit osseous regeneration. [26]

The drain could either be “I” shaped pieces of rubber dam, polyethylene tube along with a stent, hollow tubes, polyvinyl tubing, suction catheter or radiopaque latex tubing. There is no standard protocol as to the length of time necessary to leave the drain. It may be different for different kinds, sizes or locations of lesions. It can vary between two days to five years. [27] The decompression technique is contraindicated in cases of large dental granulomas or any solid cellular lesion, as there is absence of a fluid-filled cavity to decompress. [28]

Aspiration and irrigation technique

Hoen et al, suggested aspiration of the cystic fluid from the periapical lesion using a buccal palatal approach, but this leads to the creation of buccal and palatal wounds that may cause discomfort to the patient.[29]To overcome this, a simple technique of aspiration through the root canal has been described. In this technique, aspiration of the cystic fluid is done through the root canal by passing the aspirating needle through the apical foramen. However, it is advisable not to use either aspiration-irrigation or aspiration through the root canal techniques where adjacent tissue spaces or sinus cavities are involved, when there is no fluid aspiration from the lesion, or in infected periapical lesions. [30]

Apexum procedure

The new Apexum procedure represents a shift from the current endodontic paradigm. Foremost, it does not limit the endodontic intervention only to removing the cause (bacteria) and then allowing the host to heal at its own pace, and furthermore, the device enters the periapical lesion far beyond the apical foramen, a process expected by many operators to result in a flare-up or severe symptoms.[31,32] The Apexum procedure uses two sequential rotary devices, the Apexum NiTi Ablator and Apexum PGA Ablator designed to extend beyond the apex and mince the periapical tissues on rotation in a low-speed handpiece,

followed by washing out the minced tissue.[33] Further studies regarding this procedure are in progress.

Lesion Sterilization and Repair Therapy:

In recent years, the Cariology Research Unit of the Niigata University has developed the concept of 'Lesion sterilization and tissue repair LSTR therapy [10] that employs the use of a combination of antibacterial drugs for disinfection of oral infectious lesions, including dentinal, pulpal and periradicular lesions. Repair of damaged tissues can be expected if lesions are disinfected.[34] A combination of antibiotics would also decrease the likelihood of the development of resistant bacterial strains. The combination that appears to be most promising consists of metronidazole, ciprofloxacin, and minocycline.[35,36] Sato et al[37]investigated this drug combination in vitro and found it to be very effective in the sterilization of carious lesions, necrotic pulps, and infected root dentin of deciduous teeth. The commercially available drugs are powdered and mixed in a ratio of 1:3:3(3Mix) and mixed either with macrogol-propylene glycol (3 Mix-MP) or a canal sealer (3 Mix-sealer).[34] A 1:1:1 ratio of the drug combination has also been used.[38] Although the volume of the drugs applied in this therapy is small, care should be taken to check if the patients are sensitive to chemicals or antibiotics.[39] A disadvantage of the triple antibiotic paste is tooth discoloration induced byminocycline. Cefaclor and fosfomycin are proposed as possible alternatives for minocycline, in terms of their antibiotic effectiveness, but further clinical studies are needed to demonstrate their efficacy in the root canal.[40]

Healing mechanism

The exact mechanism by which periapical cysts heal is not clearly understood. According to Simon[3] and Nair et al[2] as the lumen of a 'bay' or 'pocket' cyst is open to the root canal it is likely to heal after conventional root canal treatment due to the removal of intracanal irritants. In contrast, the tissue dynamics of a true cyst are self sustaining by virtue of its independence of the presence or absence of irritants in the root canal. True cysts, particularly large ones, containing cholesterol

crystals are less likely to be resolved by conventional root canal treatment.[6] Because it is clinically and radiographically impossible to differentiate a bay cyst from a true cyst, as it is likewise between a cyst and granuloma, judicious treatment planning should favor a conservative approach to treatment; this approach is supported by many authors.[16,17] It is claimed that nonsurgical management should in the same way lead to the local or generalized destruction of the epithelial lining of true cysts.

Conclusion

Non surgical management of periapical lesions has shown a high success rate. A nonsurgical approach should always be adopted before restoring to surgery. The decompression and aspiration-irrigation techniques can be used when there is drainage of cystic fluid from the canals. These techniques act by decreasing the hydrostatic pressure within the periapical lesions. When there is no drainage of fluid from the canals, calcium hydroxide or the triple antibiotic paste can prove beneficial.

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