

Decision Analysis on Management of Periapical Cyst

Research Article

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Abstract

Periapical lesions develop as sequelae to pulpal diseases. They occur often with acute pulpal pain and are diagnosed by radiographic examination. These untreated or infected pulpal infections lead to other periapical lesions like periapical granuloma, cyst, abscesses etc. the incidence of periapical cyst is about 6 to 55% among periapical lesions. The periapical cyst is the common to three fourth of all the cysts in the jaws. These are generally asymptomatic and are diagnosed during routine radiographic investigations. Removal of the necrotic pulp, inflamed tissue and proper sealing of the root canal will allow the tooth to heal under uninfected conditions. The aim of this paper is to give a summary of various methods of management of periapical cyst both by non-surgical and surgical approach.

Keywords: Periapical; Surgical; Non surgical; Decompression; Apexum.

Introduction

The infection of dental pulp occurs as a result of Infections of the dental pulp occur as consequence of dental caries, operative dental procedures and trauma and involve a mixed, mostly Gram-negative, anaerobic bacterial flora [1, 2]. These infections often cause total pulpal necrosis and it stimulate an immune response in the periapical region, which is commonly referred to as a periapical lesion. The periapical lesions can be classified mostly as granuloma, radicular cyst or abscess [3, 4]. Radicular cysts or apical granuloma cannot be differentiated based on the radiographic evidence alone [5, 6]. Various studies have shown that with a radiographic lesion size of 200 mm² or larger, the incidence of cysts is equal to or greater than 92% [7]. If the lesion is away from the apex and with an intact epithelial lining (apical true cyst), it may have developed into a self-perpetuating entity that may not heal when treated non-surgically [8]. On other occasions, a large periapical lesion may have a direct communication with the root canal system (apical pocket cyst or bay cyst) and respond favour-

ably to non-surgical treatment [9, 10]. Few clinical studies have shown that even simple non surgical treatment with proper infection control will promote the healing of large periapical lesions [11, 12]. In the past even smaller periapical cyst are treated with surgery but in the recent years due to greater awareness of the complexities of root canal systems has led to various newer techniques, materials and instruments. Therefore, fewer patients need periapical surgery. An awareness on morphology of root canal and a careful interpretation of preoperative radiographs are necessary for adequate access and infection control in endodontic therapy. Mandibular incisors are often anatomically complex, with 45% displaying second canals, such teeth with anatomical complexes may fail to respond to treatment if important anatomy is missed [13].

We have numerous highly cited publications on well designed clinical trials and lab studies [14-30]. This paper suggests that non surgical and surgical removal of periapical cyst of pulpal origin is not mandatory, and that, irrespective of the size of the lesion,

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every effort should be made to treat such lesions by conservative as well as by surgical means.

Decision Tree for the Management of Periapical Cyst

The decision tree for the management of periapical cyst were given in figure 1 and figure 2.

The decision on management of periapical cyst can be of two types;

1. Non-surgical management
2. Surgical management

Non Surgical Management

Many radicular cysts are symptomless and are discovered when regular periapical radiographs are taken of teeth with non vital pulps. Over the years, these cyst may regress, remain static or grow in size. The treatment of the cysts can be either nonsurgical management or surgical management being either enucleation or marsupialization. Nevertheless, no matter what choice it might be, the treatment option should be kept as conservative as possible [31]. The basic premise of any non surgical endodontic treatment is to have a conventional orthograde approach.

The ultimate goal of endodontic therapy should be to return the involved teeth to a state of health and periapical lesions should

be initially treated with conservative nonsurgical procedures [33]. Surgical intervention is recommended only after nonsurgical techniques have failed. Besides, surgery has many drawbacks, which limit its use in the management of periapical lesions [34]. Various studies have reported a success rate of up to 85% after endodontic treatment of teeth with periapical lesions [10, 35]. There is also a report where non surgical endodontic therapy has shown 94.4% of complete and partial healing of periapical lesions.

The periapical cyst management can be categorised based on the size of lesion according to CBCT periapical index (PAI index).

Management of Cyst according to PAI Index Score

If the PAI index score of the cyst falls under 0 to 3 it can be treated by non surgical method. patient is having pain root canal treatment is initiated. If exudate is present, the drainage of exudate is done and cleaning and shaping of the canal to be done. Intracanal medicaments are to be kept after cleaning and shaping procedures. If the symptoms persist the surgical management is carried out or if the tooth is asymptomatic obturation is done and follow up is done. If the PAI index score is 4 and with swelling and sinus tract opening root canal procedure should be done with the previously mentioned criteria. Incision and drainage of the swelling without sinus opening should be done. The methods of non surgical treatment are:

Aspiration Irrigation Technique

In this aspiration irrigation technique, an 18-gauge needle attached

Figure 1. Decision tree for periapical cyst – non surgical management.

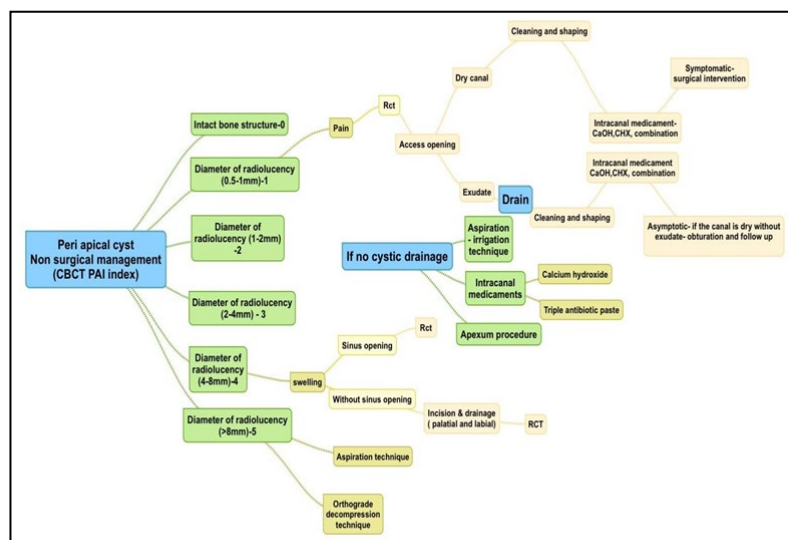
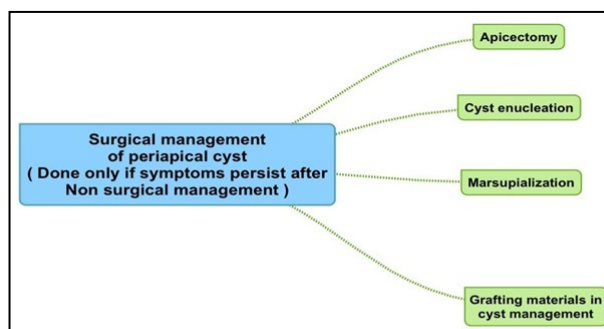


Figure 2. Decision tree – surgical management.



to a 20 ml syringe is used to penetrate the buccal mucosa and aspirate the cystic fluid. Other syringe filled with saline is then used to rinse the bony lesion. The new needle is then inserted through the buccal wound and passed out through the palatal tissue creating a pathway for the escape of the irrigant [36]. Accumulation of cystic fluid within a confined bony cavity leads to increased hydrostatic pressure, which causes additional osteoclastic activity and growth of the cyst [37]. This aspiration leads to decreased hydrostatic pressure, which slows the osteoclastic activity and enlargement of the defect. The gentle irrigation cleanses the bony defect and initiates bleeding and subsequent clot formation, which could be the start of the healing mechanism. The disadvantage of this technique is the creation of buccal and palatal wounds that may cause discomfort to the patient [38].

Intra canal Medicament

Intra canal medicament play a vital role in healing of periapical cyst because of their bactericidal effects. Most commonly used intracanal medicaments are calcium hydroxide, triple antibiotic paste. Calcium hydroxide is an antibacterial agent and used 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 as an osteoinductive material. MTA is then compacted over the matrix, forming a 5 mm apical plug [39].

If lesions are disinfected properly, repair of damaged tissues can be expected. Metronidazole is the first choice because it has a wide antibacterial spectrum against anaerobes. However, some bacteria are resistant to metronidazole, and hence, ciprofloxacin and minocycline are added to the mix. The combination of drugs has been shown to penetrate efficiently through dentine from the prepared root canals especially from the ultrasonically irrigated root canals [40]. The commercially available drugs are powdered and mixed in a ratio of 1:3:3 (3 Mix) and mixed either with macrogol-propylene glycol (3 Mix-MP) or a canal sealer (3 Mix-sealer). A 1:1:1 ratio of the drug combination has also been used [41]. Although the volume of the drugs applied is small in this therapy, care should be taken to check if the patients are sensitive to chemicals or antibiotics. A disadvantage of the triple antibiotic paste is discoloration of tooth induced by minocycline. 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 [42].

Apexum Procedure

Apexum method is based on a device that removes the chronically inflamed periapical tissues through a root canal access by a procedure that is minimally invasive compared with open-flap apical surgery. There is possibility of providing some of the benefits of apical surgery by the new technology (Apexum Ablator; Apexum Ltd, Or- Yehuda, Israel) without the drawbacks of the conventional surgical procedure. This advancement may allow for the application of such a protocol in many cases in which healing time is a critical factor.

This procedure uses two sequential rotary devices, the Apexum-

NiTi Ablator and Apexum PGA Ablator (Apexum Ltd, Or Yehuda, Israel), 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 [43]. A clinical trial reported that there is significantly faster periapical healing in the Apexum-treated group (95%) than in the conventional root canal treatment group (39%) at six months, with significantly less postoperative discomfort or pain. However, whether the procedure was able to remove all the periapical inflammatory tissue was beyond the scope of the study conducted, further studies regarding this procedure are in progress.

Decompression Technique

The decompression technique involves placement of a drain into the lesion, regular irrigation, periodic length adjustment, and maintenance of the drain, for various periods of time. The drain could either be 'T' shaped pieces of rubber dam, polyethylene tube along with a stent, hollow tubes, a polyvinyl tubing, suction catheter or a radiopaque latex tubing [44]. The advantages of this decompression technique are; it is a simple procedure, it minimizes the risk of damaging adjacent vital structures, and is easily tolerated by the patient. However, there are several disadvantages being noted; patient compliance is very essential, inflammation of the alveolar mucosa, persistence of the surgical defect at site, development of an acute or chronic infection, displacement or submergence of the drainage tube [45].

Surgical Management

The surgical management of periapical cyst would be a choice only if the symptoms doesn't subside even after all the non surgical treatment fails. This surgical management can be done only with cyst enucleation and marsupialization or apicectomy and surgery with grafting materials for better healing of cyst.

Cyst Enucleation and Marsupialization

The treatment objective is restoring the morphology and function of the affected region. There are two basic surgical procedures, namely marsupialization (decompression) and enucleation. Marsupialization, is a simple procedure, consists of surgically producing a - window in the cystic wall to relieve intra-cystic tension and after this, the cystic cavity slowly decreases in size. The cavity is then lightly packed with paraffin gauze until the line of junction between the cystic lining and the oral mucosa has healed. Three to six months later, enucleation should be performed [46].

Enucleation with primary closure is the treatment of choice [47]. It is a one-stage surgical treatment followed by periodic radiographic evaluation at regular intervals to observe the progress of bone regeneration of the defect. The routine surgical treatments for radicular cyst include total enucleation of small lesions, marsupialization for decompression of larger cysts or a combination of these techniques. Surgical intervention is necessary, that the clinician must decide whether to raise a flap and completely enucleate the lesion or to try "decompression" first. If the marsupialization with decompression is attempted first, the size of the lesion will be reduced, which will make it less difficult to remove, with less risk of damage to the associated teeth and vital structures.

Apicectomy

In most of the large cystic lesions, the marsupialization and enucleation is sufficient after endodontic treatment. Apicectomy is needed only in case of swelling. After complete enucleation of the cyst the apical 2-3mm is cut off and retrograde filling is done with biocompatible materials like glass ionomer, biodentine, MTA etc. After apicectomy and retrograde filling, the placement of graft can be decided based on the defect.

Grafting Materials in Management of Cyst

Bone Graft: The bone regeneration following periapical surgery can be facilitated by placing bone graft into the periapical defect. Different types of bone grafts are available for dental surgical procedure. These include autografts, allografts, xenografts, and alloplasts. The ideal bone replacement material should be clinically and biologically inert, noncarcinogenic, easily maneuverable to suit the osseous defect, and should be dimensionally stable. It should serve as a scaffold for bone formation and slowly resorb to permit replacement by new bone [48]. Based on the defect and bone loss in the affected region the bone grafts, PRF etc can be used. Endodontic regenerative procedures frequently include the use of barrier membranes and bone grafting materials to encourage the growth of key surrounding tissues [49].

Blood: A blood clot is composed of insoluble fibrin and many growth factors/cytokines such as platelet-derived growth factor (PDGF), TGF- β , vascular endothelial growth factor (VEGF), endothelial growth factor, insulin-like growth factor (IGF), and basic fibroblast growth factor (FGF).

Platelet Rich Plasma (PRP) first generation platelet concentrate was proposed as a method of introducing concentrated growth factors PDGF, TGF β , and IGF 1 to the surgical site, enriching the natural blood clot in order to promote wound healing and stimulate bone regeneration. The PRP is an autologous volume of plasma with 4-5 fold increase in platelet concentration, is a proven source of growth factors like PDGF, TGF, IGF, VEGF, EGF, Platelet derived angiogenesis factor and Platelet factor IV. PRP has been used for tissue regeneration in combination with autogenous bone grafts in maxillofacial surgery.

Conclusion

Management of periapical cyst depends on the size of the lesion and presence of exudate and swelling. Depending on these the cyst treatment can be carried out whether to go for non-surgical or surgical management. Periapical cysts are mostly tried to manage in conservative method, non-surgical. Only in large infected cystic lesion cases the surgical management is to be considered. Various techniques mentioned in this paper can be used for the management of cyst.

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