Textbook of Oral and Maxillofacial Surgery

Gustav O Kruger

(The C V Mosby Company, St Louis, Toronto, London, 1979)

Fifth Edition

Chapter 12

Chronic periapical infections

James A O'Brien

When trauma or carries causes a tooth to die, the pulp cavity and canals become repositories for necrotic pulp tissue. This degenerating tissue (with or without bacteria) produces periapical irritation through the apical foramina. The body attempts to combat this irritation by an inflammatory response. If a virile organism is responsible for the infection, the process is likely to be acute. On the other hand, if the organism is not virile or if the irritation is produced by toxins of the necrotic pulp, the process is likely to be chronic.

Types of Chronic Periapical Infection

Chronic alveolar abscess

An abscess, by definition, is a localized collection of pus in a cavity formed by the disintegration of tissues. The chronic alveolar abscess may be the aftermath of an acute periapical infection, or it may be produced by a chronic periapical infection. In either case periapical bone is destroyed by a localized osteomyelitis, and the resultant cavity is filled with pus. The inflammatory process walls off the area. If the chronic irritation continues, the abscess will expand until it drains itself by perforating the gingiva ("gumboil" or the skin.

If the source of the irritant is removed, either by extraction of the tooth or by means of a root canal filling, the abscess cavity will drain itself and be replaced by granulation tissue, which then will form new bone.

Granuloma

A granuloma is, literally, a tumor made up of granulation tissue. However, the term dental granuloma is used to designate the situation in the periapical region in which an abscess or a localized area of osteolysis is replaced by granulation tissue.

The chronic irritation from the dental pulp results in destruction of periapical bone. The body's attempt to repair the defect consists of an ingrowth of capillaries and immature connective tissue that, were it not for the continued irritation from the dental pulp, would rebuild the bone tissue. However, the continued irritation causes a mixture of this reparative tissue with the inflammatory exudate, and this makes up the dental granuloma.

Microscopically, the granuloma is made up of organizing connective tissue with numerous capillaries, with a fibrous capsule that has collagenous fibers running parallel to the periphery, and with evident inflammatory exudate (principally lymphocytes and plasma cells). The radiograph usually demonstrates a discrete, rounded lesion, which is difficult, if not impossible, to differentiate from a cyst.

A granuloma may contain epithelial cell rests of Malassez. These cell rests have the potential to form a cyst if the granuloma remains in the bone, even if the tooth is removed.

Periapical cyst

A cyst is defined as a sac that contains a liquid or semisolid. The periapical cyst is an epithelium-lined sac containing liquid or semisolid inflammatory exudate and necrotic products. The periapical cyst is considered to originate from the dental granuloma. The epithelial cell rests of Malassez entrapped in the granuloma are stimulated to proliferate. A central area of breakdown forms, and the proliferating epithelium becomes an encapsulating membrane. Cellular disintegration within the cyst causes diffusion of additional fluid into the cystic cavity and resultant pressure. This increased pressure causes the peripheral bone to resorb and the cyst to enlarge. An inconstant radiographic finding is a radiopaque line around the cyst cavity. The mechanism of cyst growth or the reason one cyst becomes larger than another is still not clearly understood. As a rule, the periapical cysts, which are always considered to be infected, do not grow as large as the follicular cysts, which are not infected unless contamination occurs.

A periapical lesion may be large without showing radiographic evidence of bone destruction. This is because osteolytic lesions in cancellous bone cannot be detected radiographically; it is only when a portion of cortical bone is destroyed that the radiograph demonstrates it.

Treatment

Chronic periapical pathological conditions, such as chronic alveolar abscess, granuloma, or periapical cyst, may undergo acute exacerbations. Treatment of the acute phase, particularly when severe, is described in Chapter 11. However, treatment of localized exacerbation requires the following additional considerations.

1. If the tooth is a useless one, removing it is the simplest and best treatment, subject to other factors considered in Chapter 11.

2. If the tooth is a useful one, conservation should be the prime goal. Therefore the treatment should consist of opening the pulp chamber and removing a major part of the contents of the canals to obtain drainage. If drainage by this route is inadequate, an incision for drainage may be necessary. Antibiotic therapy is discussed in Chapter 9.

When the exacerbation has subsided, root canal treatment should be carried out. Most endodontists report a success rate of 90% or better without recourse to surgery. Investigators have demonstrated that approximately 43% of periapical lesions are cysts. It seems evident then that most small cysts will heal without surgical enucleation if the root canal filling is

adequate. However, surgical intervention in the periapical area is a relatively simple procedure, and there are several indications for it:

1. In a case that cannot be followed postoperatively for whatever reason. Surgical curettement of the periapical area assures a result that is no longer endangered by debris from the endodontic procedure or by epithelial elements.

2. In a case in which there is a suspicion of an unfilled accessory canal orifice or a severely curved root end. Apicoectomy will remove the unfilled portion of the canal.

3. In procedural accidents, removal of broken root canal instruments or filling material may require periapical surgery.

4. Necessity for retrograde filling of a canal. Extremely large ("blunderbass") canals cannot be filled adequately by insertion of pints or pastes or both; they must be obliterated by amalgam at the apex. Retrograde fillings are also useful to close a canal in a tooth that cannot be treated in the usual manner because of a porcelain jacket or some other obstacle (for example, limitation of mandibular movement, preventing access through the crown of the tooth).

5. Persistent postoperative discomfort after root canal filling. Periapical curettage and apicoectomy will frequently eliminate the symptoms.

Technique of apicoectomy

1. Make a radiograph after the root canal filling has been completed to determine the level at which the root should be amputated. This level should be such as to remove any unfilled portion of root canal, and it should also facilitate access to the periapical cyst or granuloma to ensure its complete removal.

2. Design the mucoperiosteal flap with three considerations in mind: (a) Be sure blood supply and tissue mass are adequate to avoid necrosis and poor healing. Incisions sharply made perpendicular to bone are important. (b) Make the flap large enough to provide good access. (c) Make the flap extend well beyond the bony defect so that the soft tissue will be supported by bone when it is replaced.

3. After the mucoperiosteal flap has been raised, make an opening into the periapical bony defect using a surgical bur or chisel if the granuloma or cyst has not already perforated the labial plate of bone. Extend the opening in the labial plate with bur, chisel, or rongeurs to obtain good access to the limits of the defect.

Then, with a fissured cylindrical bur, amputate the root at the level determined with the aid of the radiograph. The cyst or granuloma should be enucleated, preferably in toto, by means of small curets.

4. Control hemorrhage within the defect by crushing bleeding points in bone, by pressure, or by cotton pledgets dipped in epinephrine (Adrenalin).

5. Suture the mucoperiosteal flap with a small cutting needle and No 4-0 silk or catgut.

6. After closing, maintain firm pressure over the area for 10 minutes to avoid formation of a hematoma.

7. Obtain an immediate postoperative radiograph to check the level of root amputation and for future comparison.

Retrograde filling

Retrofilling is sometimes a very useful procedure when complete filling of a canal is impossible by coronal approach or when symptoms persist following filling of the canal. Several points are important to success:

1. Bevel the root surface in the apicoectomy so you have very good visualization of the apical foramina.

2. In the "cavity preparation" for the retrograde filling, undercut only toward the lingual side of the canal. On that side you will have enough dentine apical to the undercut; on the labial side, attempting to undercut just chips out the wall (because of the bevel of the apicoectomy).

3. A small suction tip is essential. Of great help has been the use of a 16-gauge needle that fits on the end of a standard suction tip. With several of these needles at hand, your assistant can use the regular tip to pick up larger debris (including amalgam fragments) and quickly place or remove the needle tip as needed.

4. Zinc-free amalgam is the most commonly used retrofilling material. Gutta percha also has been used with success.

Other aspects of periapical radiolucencies

In this discussion the term, cyst, will be used to include granulomas as well.

It is a cardinal point that a periapical cyst is not the cause of radiolucency if the tooth is vital. If the tooth is vital, the periapical radiolucency has some other basis, and the fact that the root of the tooth lies within the apparent cyst is no indication for extracting it or for root canal therapy. Also, lack of vital response, without symptoms and without radiographic changes, is not an indication for extraction or root canal therapy.

If the tooth is extracted, the small periapical cyst usually can be enucleated through the socket. A small curet is inserted with the sharp edge against bone and the convex surface against cyst membrane. By careful dissection the cyst can be separated from the bone and lifted out in toto. If it fails to come out intact, the wall of the defect must be curetted carefully to remove all remnants of the cyst.

For larger cyst the technique consists of raising a mucoperiosteal flap similar to the apicoectomy flap, removing the overlying bone by means of bur, chisels, or rongeurs, and

enucleating the cyst by means of curets. Again, "shelling-out" a cyst is best accomplished by using the back side of the curet. That is, the concave side of the curet is toward bone and the convex side is against the cyst. In this way, the cyst is removed without tearing the cyst wall, and therefore the chance of leaving epithelial cells that might reproduce the cyst is lessened. After the cyst has been removed, the mucoperiosteal flap is replaced and sutured and pressure is maintained on the area for 10 minutes.

If a large periapical cyst is accessible and does not involve vital teeth or the maxillary sinus, it is usually best treated by enucleation. Primary closure of a large defect, however, can result in the accumulation of a pocket of necrotic material if the large, unsupported blood clot breaks down. Therefore if the defect is more than 15 mm in diameter, it is good practice to pack the void with petrolatum gauze (1/4 or 1/2 inch) or Adaptic strip, bringing the end out through the line of closure. This packing prevents the accumulation of a pool of blood in the defect. The packing is removed after approximately 5 days.

When a large periapical cyst involves the roots of adjacent vital teeth or approximates the antral wall, treatment consists of exteriorizing the cyst, thus removing the central pressure that causes the expansion of the cyst. With this central pressure removed, the periphery will slowly fill in, gradually decreasing the size of the defect. This process can be allowed to continue until the defect is obliterated, but this may take many months. The period of treatment can be shortened by enucleating the cyst after it has been reduced to a size that does not threaten the adjacent teeth and the antrum.

Two basic methods of exteriorizing cyst are available:

1. The entire cyst can be unroofed. The epithelized cystic membrane lining the cavity is then sutured to the mucosa immediately adjacent to it around the periphery. In effect the cyst wall is made a part of the oral mucosa. This is the Partsch procedure of marsupialization.

2. The other method of exteriorizing is based on the same principle but differs in practice. Instead of removing the entire roof of the cystic cavity, a window is cut into the cavity. The fluid contents of the cyst are removed by aspiration. No attempt is made to remove the cyst wall. The cavity is then packed with iodoform gauze. The end of the gauze is brought out through the window in the mucoperiosteum. The iodoform gauze is removed after 5 days. Then an obturator is constructed to fit the window. The patient is instructed to remove the obturator daily and to irrigate the defect. Frequently, the obturator can be constructed so that irrigation can be carried out with it in place. As the defect fills in, it is necessary to reduce the size of the obturator periodically. A piece of rubber or plastic catheter or tubing makes a useful obturator; the external end is simply ligated to an adjacent tooth with wire.

Treatment of chronic periodontal infection

Chronic periodontal infection, or chronic periodontitis, can be a debilitating condition. In the past it was common to simply extract the teeth in such cases. But in modern practice, treatment of the disease is directed toward salvaging the teeth in most cases. Since this is not a textbook of periodontics, suffice it to say that care of the periodontium by dentist, hygienist, and patient can often restore a severely diseased mouth to health.

When a tooth is to be removed from an area of periodontal infection, however, it is wise to take certain precautions. A small curet should be passed firmly down the root surfaces of the involved tooth before extraction to detach the tooth; the adjacent gingiva can be torn severely if the tooth is not separated from it. Be careful to avoid leaving crushed calculus in the wound. The surrounding alveolar bone is conserved as much as possible so that an alveolar ridge can be formed by the healing process. Isolated bony projections can be removed to form an even ridge, but conservatism should be paramount. If a question of judgment arises regarding alveoloplasty, the area can be allowed to heal without further surgery for 3 weeks. Then the need for alveoloplasty, if present, will become more apparent, and it can be done at that time. A localized periodontal lesion may have formed secondarily to a periapical lesion. If the cause of the periapical lesion is corrected by root canal therapy, the secondary periodontal lesion should clear.

Removal of broken needles

In spite of all precautions a needle may break and disappear in the oral tissues. The removal of a broken needle may be a difficult procedure and should not be attempted unless the operator is thoroughly familiar with the technique and anatomy involved.

Location of the needle by means of radiographs made from several different angles is an important aid, particularly after insertion of another needle, which can be detached from the syringe and left in the tissues for purposes of orientation. The technique in locating the needle varies with the anatomical site, but the following principle holds true for all techniques: do not search in the direction that the needle was inserted but, rather, in a direction perpendicular to the direction of insertion. For example, if the needle was broken while blocking the mandibular nerve through an insertion near the pterygomandibular raphe, the incision for searching is not made at the site of insertion of the needle, but a vertical incision is made just medial to the anterior border of the ramus, and then the dissection is carried medially and posteriorly; that is, the needle is approached from a direction perpendicular to it. If the anesthesia technique consisted of insertion immediately adjacent to the ramus rather than at the pterygomandibular raphe, the incision for searching should be made near the raphe and the dissection then carried laterally. When the blade of the scalpel or blunt dissector comes in contact with the needle, it can be readily felt. The tissues are retracted to this depth, and when the needle comes into view, it can be grasped with a hemostat and removed. It is important in this procedure that good assistance be available so that it is unnecessary for the operator to look away from the operative site (for example, to pick up an instrument) once dissection has started.

The removal of a broken needle is not an acute surgical emergency. However, it is advisable to remove it as soon as possible to relieve the patient's anxiety. Actually, broken needles have been left in place permanently without complication, so that failure to retrieve one is not a catastrophe.

The removal of other foreign bodies from oral tissues presents problems in localization. If teeth are present in the area, localization is simply a matter of obtaining radiographs on which one can measure the distance from tooth to foreign body. In addition to the panograph and the ordinary lateral radiograph, a vertically directed view, such as an occlusal film, is often helpful.

Where no other landmarks are available for reference, a threaded suture needle can be placed through the mucosa in the approximate area. After the radiographs have been taken, the needle is pulled on through the tissues and the suture loosely tied to show the former position of the needle.

Once the foreign body has been localized on radiographs, its removal is performed exactly the same as removal of a root tip.

A question of whether foreign bodies should be removed sometimes arises. If the patient is completely asymptomatic and no radiographic evidence of tissue reaction is found in the area, small fragments of amalgam and other metallic foreign bodies may be ignored. However, if pain or any other symptom appears that might be produced by the foreign body, removal is advised. In general, it is also good practice to remove any foreign body if a denture is to be placed over the area.