Case Report

Treatment of Large Radicular Cysts by Modified Marsupialization

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Abstract

We describe the enucleation of large radicular cysts to the maximum extent, and their treatment based on the concept of marsupialization and drainage after apicoectomy. Marsupialization requires a long period for healing, imposing a burden on the patient with regard to postoperative management. Considering this, together with the difficulty involved in the clinical diagnosis of radicular cysts, curettage of the cyst wall and drainage may be more effective for facilitating the healing process than use of marsupialization alone.

Introduction

Marsupialization is synonymous with Partsch's operation^[1]. In this procedure, the outer wall of a cyst is unroofed by a surgical incision to evacuate the contents, and a permanent opening is created by suturing the remaining part of the cyst membrane to the mucosal surface around the periphery of the opening. This procedure eliminates the intracystic pressure through exteriorization of the cyst, and thus promotes bone regeneration in the defective part through the body's natural healing mechanisms. This procedure preserves the lining mucosa to protect the exposed bone from infection from the mouth.

Marsupialization is particularly effective for very large cysts of which most parts are surgically inaccessible. It is also advantageous, considering the risk of inactivating the adjacent teeth by curettage of the cyst and the patient's natural fear of surgery. However, this method also has some drawbacks. First, since the cyst is kept open, the patient has to bear the burden of postoperative management including regular cleaning. Second, healing of the lesion is considerably slow after this treatment in comparison with other surgical treatments. Third, it is difficult to obtain a definite clinical diagnosis of radicular cyst even when a radiolucent lesion has been found by radiography.

In ten recent cases of large radicular cysts, we carried out enucleation to the greatest possible extent and gave treatment based on the concept of marsupialization after apicoectomy. Here we report several findings obtained in these cases.

Case Reports

<Case 1>

The patient was a 35-year-old man who visited our hospital for treatment of the upper left central incisor. At the first examination, swelling of the radicular region from the central incisor to the canine was found (Fig. 1). Radiography revealed a hen's egg-sized radiolucent lesion including the root apices of the lateral incisor and the canine, which had been treated by root canal filling (Fig. 2). The patient had visited a neighborhood dental clinic 3 months previously, because of spontaneous pain (+), swelling (+++), percussion pain ($\pm$), and tooth mobility (+).

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Fig. 1 Intraoral findings before the operation. There is swelling in the area corresponding to the roots of the upper left central incisor to the canine.

Fig. 2 A hen's egg-sized radiolucent lesion in the root apices of the upper left incisor and canine on preoperative radiography.

Fig. 3 A silicone tube was ligated to the incised gingiva at the center of the lesion following suture of the gingival flap.

Fig. 4 Histopathological findings of the resected tissue.

Left: A radicular cyst covered with non-keratinizing stratified squamous epithelium. There is slight to moderate inflammatory cell infiltration in the subepithelial connective tissue (x100).

Right: Granulation accompanied by capillary dilatation, proliferation and hemorrhage (x200).

Fig. 5 Left: A silicone tube removed after 1 week of retention. It was filled with much debris and blood clots.

Right: A radiogram showing a large radiolucent lesion covering the root apices of the central and lateral incisors and the canine.

Fig. 6 Left: A radiogram taken 6 months after the operation. The borders of the radiolucent area have become less clear than immediately after the operation.
Middle: Recall after 1 year. The radiolucent area is smaller, showing a healing tendency.
Right: Recall after 3 years. The radiolucent area have become more unclear, showing some sporadic black dots (arrow).

Fig. 7 There is a thumb-tip-sized radiolucent area in the root apex of the upper left lateral incisor, accompanied by external apical root resorption.

Fig. 8 Cholesterol crystals found in the enucleated radicular cyst (x100).

Fig. 9 Recall after 1 week.

Left: The suture and the tube have been removed.

Right: The external apical root resorption has been eliminated, followed by retrofilling with amalgam.

Fig. 10 Left: Recall after 3 months. Bone regeneration has occurred in the formerly radiolucent area.

Right: Recall after 1 year. Formation of new bone is prominent in areas surrounding the formerly radiolucent area, demonstrating a healing tendency.

These, he underwent pus drainage by incision and was given antibiotic medication. Thereafter, the patient received root canal treatment for the central incisor, but still had exudation from the root canal when he visited our hospital.

Under local anesthesia (5.4 ml of 2% Xylocaine), we performed root canal filling for the central incisor in advance, using a gutta-percha point and a root canal sealer (Canals™).

Then, a longitudinal incision was made in the gum distal to the upper left first premolar, and the gingival crest was incised from this area to the upper right canine. When the gingival flap was separated, the cyst wall was directly exposed. The cyst wall was hypertrophic and adhered partly to the mucosa of the base of the maxillary sinus. Therefore, the cyst was curetted to maximum possible extent.

During apicoectomy of the central and lateral incisors and the canine, colored dentin was found in some areas surrounding the gutta-percha in cross-sections of the roots of the central and lateral incisors. Retrofilling was therefore performed. We carried out cold burnish alone for the canine, since no colored dentin was found in the cross-section of its root. After suturing the gingival flap (Dexon™ 4-0), the gingiva was incised at the center of the cyst, and a silicone tube (internal diameter 4 mm, external diameter 6 mm) was ligated there (black silk 5-0) (Fig. 3). The patient was then given antibiotic and vitamin therapy. A diagnosis of radicular cyst was obtained from histopathological examination of the resected tissue. The inner surface of the wall was lined with rather uneven non-keratinizing stratified squamous epithelium. The subepithelial connective tissue exhibited granulation consisting of slight to moderate inflammatory cell infiltration, capillary dilatation and proliferation, and hemorrhage (Fig. 4). The suture and the tube were removed one week later (Fig. 5). Thereafter, the patient was followed up at 1, 2, 4, 6 and 9 months and 1, 2 and 3 years to observe the postoperative course. There was a tendency of the lesion for reduction during this period (Fig. 6).

<Case 2>

The patient was a 27-year-old woman who visited our hospital for treatment of the upper left lateral incisor. At the first examination, slight redness and fistulation were found in the area corresponding to the root apex of the lateral incisor. Radiography showed a thumb tip-sized radiolucent area including the root apex of the lateral incisor and external resorption on the mesial side of the root (Fig. 7).

Under local anesthesia (3.6 ml of 2% Xylocaine), enucleation and curettage of the cyst was carried out in combination with apicoectomy and retrofilling with amalgam. After suturing the gingival flap, a silicone tube was ligated to the fistula. The patient was then given postoperative antibiotic and vitamin therapy. Histopathological examination of the resected tissue yielded a diagnosis of radicular cyst. The inner surface of the cyst wall was lined with rather uneven non-keratinizing stratified squamous epithelium. There was also granulation consisting of moderate to severe inflammatory cell infiltration, capillary dilatation and proliferation, and hemorrhage in the subepithelial tissue. Cholesterol crystals (Fig. 8), calcification and foreign body giant cells characteristic of cystic lesions were also found. The suture and the tube were removed one week later (Fig. 9). The patient was followed up at 1, 3 and 6 months and 1 year after the operation to observe the postoperative course. The lesion showed a tendency for reduction during that period (Fig. 10).

Discussion

According to Neaverth *et al.* [1], marsupialization consists of unroofing the outer wall of a cyst by surgical incision and establishing a permanent opening by suturing the remaining cyst wall to the mucosal surface around the periphery of the opening. This procedure relieves the intracystic pressure and exteriorizes the cyst without enucleation, with the expectation that the defect will heal naturally.

It has been reported that, in root canal treatment of a tooth which has a periapical cyst, decompression or acute inflammation due to overinstrumentation sometimes leads to destruction of the cyst wall and inhibition of the excessive osmotic pressure which has caused the cystic cavity, thereby creating conditions in which the lesion can heal. Decompression and drainage of the cyst contents are important factors in the treatment of this condition. Marsupialization is a procedure that is grounded on these two basic principles. Although Neaverth *et al.*^[1] and Grandich^[2] have reported cases treated by this procedure, the period of marsupialization was long, arousing concern about postoperative management during that period. In the present series, we placed a tube in the wound for one week in an attempt to achieve drainage and decompression. As a result, the condition showed a tendency to heal without marked postoperative clinical symptoms. The tip of the tube was cut obliquely to prevent the cut surface from making close contact with the cyst wall and thus disturbing drainage. The tube we used had an internal diameter of 4.0 mm, whereas Neaverth *et al.*^[1] used one 1.5 mm in internal diameter and Freedland^[3] used one 4.7 mm in external diameter. Our tube was thick, and thus considered to be more effective for treatment of cysts (Table 1). However, when the tube was removed, it was already filled with blood clots and other tissues, and no longer functional. In view of this phenomenon, it is doubtful whether the tubes in the above studies served as had been expected, even though the researchers employed long-term marsupialization.

Table 1 Duration of marsupialization and tube size

	Cases	Period of application	Tube size in diameter(mm)
Freedland ³⁾	6	1wk~14m	4.7 *
Neaverth, ea tl. ¹⁾	4	5wk~1yr	1.5 **
authors	10	1wk	4.0 **

Single(*) and double(**) asterisks mean outside and inside diameter, respectively.

Marsupialization using a stainless steel tube inserted into the root canal has been reported^[4]. Since the tube is inserted making use of the root canal, this method is associated with less discomfort than other procedures in which a tube is inserted directly into the apical lesion. However, since there are laminations to the diameter of the tube according to the size of the root canal, this method seems to have a less marked marsupialization effect. In addition, cleaning of the tube with a special wire is obligatory for the patient in order to prevent blockage. Such long-term postoperative management is a nuisance to the patient, and it is also possible that any debris in the tube would be pushed into the space around the root apex during the cleaning process.

As mentioned previously, marsupialization, which is a procedure consisting of only decompression and drainage, is more advantageous in many respects than surgical procedures such as curettage. However, this procedure is indicated for radicular cysts only. It is difficult to obtain a clinical differential diagnosis when a large radiolucent structure has been found in a radiograph. Priebe *et al.*^[5] reported that only 12.7% and 58.7% of teaching staff in departments of oral surgery and dental radiography, respectively, diagnosed cysts or abscesses/granuloma accurately when they were given dental radiographs showing radicular lesions measuring about 1 cm in diameter.

They also stated that radiographs show only changes in the root apex and are not helpful for qualitative differentiation of pathological conditions. Braumann and Rossman^[6] also reported that 50% and 44% of endodontic and radiographic experts, respectively, diagnosed cysts accurately, and that the percentage of accurate diagnosis was 68.5% for cysts and radicular granuloma. Therefore it seems impossible to diagnose radicular cysts solely on the basis of radiolucency on radiographs. Since only radicular cysts are indicated for marsupialization, more accurate diagnostic measures are needed. The wound is usually kept open for a few days after surgical drainage has been carried out by inserting either gauze or ribbon made from rubber dam to obtain artificial drainage. However these procedures have several disadvantages: rubber dam ribbon is easily lost in a short period after insertion, and patients often complain of discomfort when the gauze drain is removed. There were no unfavourable postoperative symptoms in our ten cases in which marsupialization was used after apicocurettage and apicoectomy. It is therefore considered that marsupialization after apicocurettage and apicoectomy is a worthwhile procedure for cases in which the radiolucent area is larger than a thumb tip .

In cases of large radicular cyst, it is difficult to achieve recovery of the bone defect to a level completely equal to the surrounding tissue as seen in the radiograph. One interesting finding was the visualization of black dots at the site corresponding to the cyst in the radiograph of Case 1. Ehrmann reported similar findings in the monograph Endodontics edited by Ingle and Bakland^[7]. Since these cases showed a prominent healing tendency, the black dots are likely to have some relationship with new bone formation.

Conclusion

Marsupialization is a procedure for unroofing and decompressing cystic lesions to promote their spontaneous healing without removing the cyst wall. However, a long period is required for such healing, imposing a burden of postoperative management on the patient in. Considering this together with the difficulty of diagnosing radicular cysts clinically, curettage of the cyst wall and drainage may be more effective for facilitating the healing process.

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