# Management of radicular cyst: endodontic retreatment associated to marsupialization and enucleation

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## ABSTRACT

In cases of extensive lesions, treatment of radicular cysts includes an association of endodontic conservative approach with surgical intervention. This case report aims to describe the diagnosis, treatment and proservation of a large radicular cyst, in the anterior maxilla. The patient came to the Dental Clinic of the State University of Maringá, asymptomatic, with facial asymmetry and swelling in the investigated region. Radiographically, there was a well-defined radiolucent image surrounding the apexes of the teeth #21, #22, #23 and #24. After obtaining a diagnosis by clinical, radiographic and tomographic examinations, the treatment plan consisted primarily of endodontic retreatment of tooth 21, in a single session, using mechanized systems (Mtwo) and irrigation with 2% chlorhexidine gel with saline solution. After, marsupialization surgical procedure was performed to reduce the intracystic pressure and, therefore, the size of the lesion. Proservation after 30, 60 and 210 days indicated a reduction of the cyst, the patient was asymptomatic and there were no signs of recurrence. After eight months, enucleation was performed followed by bovine bone graft. We conclude that endodontic retreatment, marsupialization and enucleation have proven effective methods in the removal of radicular cyst, promoting bone repair.

**Keywords:** Radicular cyst. Marsupialization. Enucleation. Endodontics.

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## Introduction

According to the World Health Organization (WHO), a radicular cyst is classified as an inflammatory and non-neoplasic lesion.[1] The radicular cyst is an inflammatory lesion, which stems from the proliferation of epithelial rests of Malassez of inflamed periradicular tissues. Its etiopathogenesis is the infection of the root canal, leading to pulp necrosis and consequently the infection of the periapical region, which receives inflammatory stimuli that result in proliferation of epithelial cells.[2,3] A wide variety of cysts and tumors can occur in the maxillofacial region, and the identification can be difficult. Radicular cysts are characterized by a fibrous connective tissue capsule lined with epithelium and present a lumen containing liquid and cellular debris.[4]

For many years, it has been estimated that the distribution of cysts among periapical lesions was about 40% to 50%.[5] Subsequent studies that analyzed complete lesions using serial sections revealed that, in fact, much less injuries were actually cystic than previously thought. From 15% of injuries considered cystic, a little more than half are true radicular cysts.[3,6,7]

Most radicular cysts develop slowly. Patients do not have painful symptoms, unless an acute inflammatory exacerbation is present, and the lesions are often only detected during routine radiographic examination. If the cyst grows large, symptoms such as swelling, light sensitivity, dental mobility and displacement can be observed. The affected tooth does not respond to thermal and electrical tests.[8] Cystic lesions are treated in two ways: endodontic (conservative) and surgical treatments, and this last is divided into enucleation, marsupialization and decompression.[9]

Given the above, the objective of this study was to report a clinical case of apical radicular cyst in the anterior maxillary region, in which the endodontic retreatment, followed by marsupialization, were the treatments selected, considering the extent of the lesion.

## Case report

Female patient, 43 years old, black, came to the Dental Clinic of the State University of Maringá (UEM), complaining of swelling on the left side of the face, in the region of tooth #21. Data from anamnesis, physical and radiographic examinations were collected. The patient was in good general health. During anamnesis, the patient reported undergoing an endodontic surgery over 10 years ago. Extraoral physical examination evidenced a swelling on the face, in the region of tooth #21. In the intraoral examination, there was discoloration of tooth #21 and increased volume of the vestibular region, of resilient consistency, smooth surface, with normal color of the mucosa. The teeth were asymptomatic, that is, no pain to percussion or palpation. Upon pulp sensitivity test, negative response was detected in tooth #21 and positive response in the teeth #22, #23 and #24.

Radiographically, there was a large radiolucent lesion with well-defined edges (Fig 1A and 1B), extending from tooth #21 to tooth #24. A computed tomography (CT) revealed a cyst formation, with regular contours and disruption of the vestibular cortical bone (Fig 1C). Tooth #21 had undergone unsatisfactory previous endodontic treatment and the analysis of the apical third indicated a previous apicoectomy. The clinical, radiographic and tomographic findings suggested the diagnosis of radicular cyst. In this way, we opted for endodontic retreatment of tooth #21 and surgery by means of marsupialization, due to the extent of the lesion.

The patient was referred to the residency in Endodontics for endodontic retreatment of tooth #21. After the coronal opening, for the removal of the filling material, we used Mtwo® retreatment files (15.05, 25.05) in the specific motor (VDW, Munich, Germany) and instrumented with Mtwo® files (30.05, 35.04, 40.04, 45.04, 50.04) associated with 2% Chlorhexidine gel with sterile saline. When performing apical patency, there was drainage of exudate characteristic of cystic fluid. After completing instrumentation, the canal was irrigated with 17% EDTA under passive ultrasonic agitation, followed by sterile saline. The root canal was dried with absorbent paper cones. In a single session, the canal was filled with gutta-percha cone and Sealapex cement (Kerr Sybron, Orange, USA) using the lateral condensation technique. The patient remained asymptomatic after endodontic retreatment.

Because of the large extent of the lesion, initially, the marsupialization of the lesion was made in order

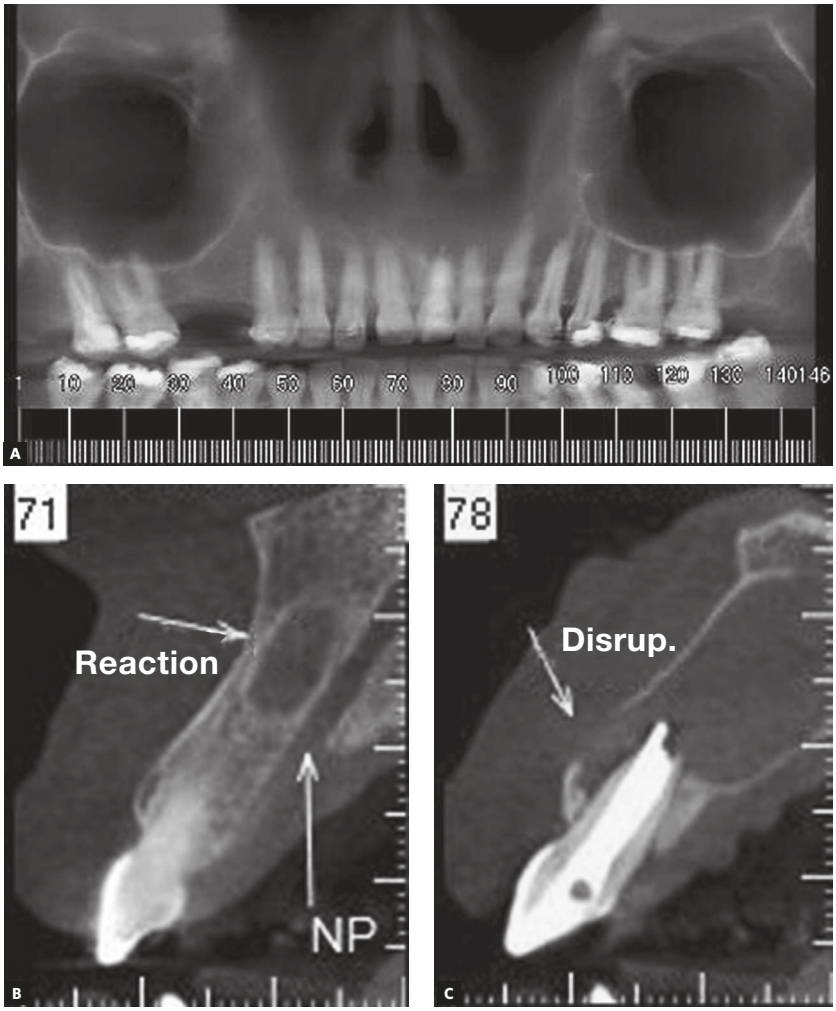


**Figure 1.** Initial radiograph showing the extent of the lesion (**A**). Computed tomography: lesion in close contact with the apex (**B**); and disruption of the vestibular cortical bone (**C**).

to reduce the intracystic pressure, in the expectation to stop the cystic growth and, in a second stage, to perform complete enucleation of the lesion. The surgical technique was performed as follows: intraoral antisepsis with 0.12% chlorhexidine digluconate solution, extraoral antisepsis with topical 10% povidone iodine (PVP), followed by infiltrative anesthesia with 2% mepivacaine with epinephrine 1: 100,000. Then, a circular incision of approximately one centimeter in diameter was made using a #15 scalpel blade on the buccal mucosa and the lesion (Fig 2A and 2B).

After the procedure, borders of the lesion were sutured with the buccal mucosa with mononylon 5-0 (Fig 2C), and kept dressing with gauze occluding the surgical cavity (Fig 2D).

The patient was instructed on daily hygiene through proper brushing and irrigation of the cavity with isotonic saline.

After 30, 60 and 210 days of clinical and radiographic follow-up, there was a reduction in periapical radiolucency (Fig 3), but requiring a second surgical procedure for the complete removal of the lesion. It was also programmed, in conjunction with enucleation, devitalized bovine bone graft (Bio-Oss®), to assist in the process of bone repair. Figure 4 illustrates the dimensions of the remaining bone defect.

After eight months, a second surgery was performed for enucleation of the lesion. The surgical procedure was based on the same protocol of intra- and extraoral antisepsis previously described,

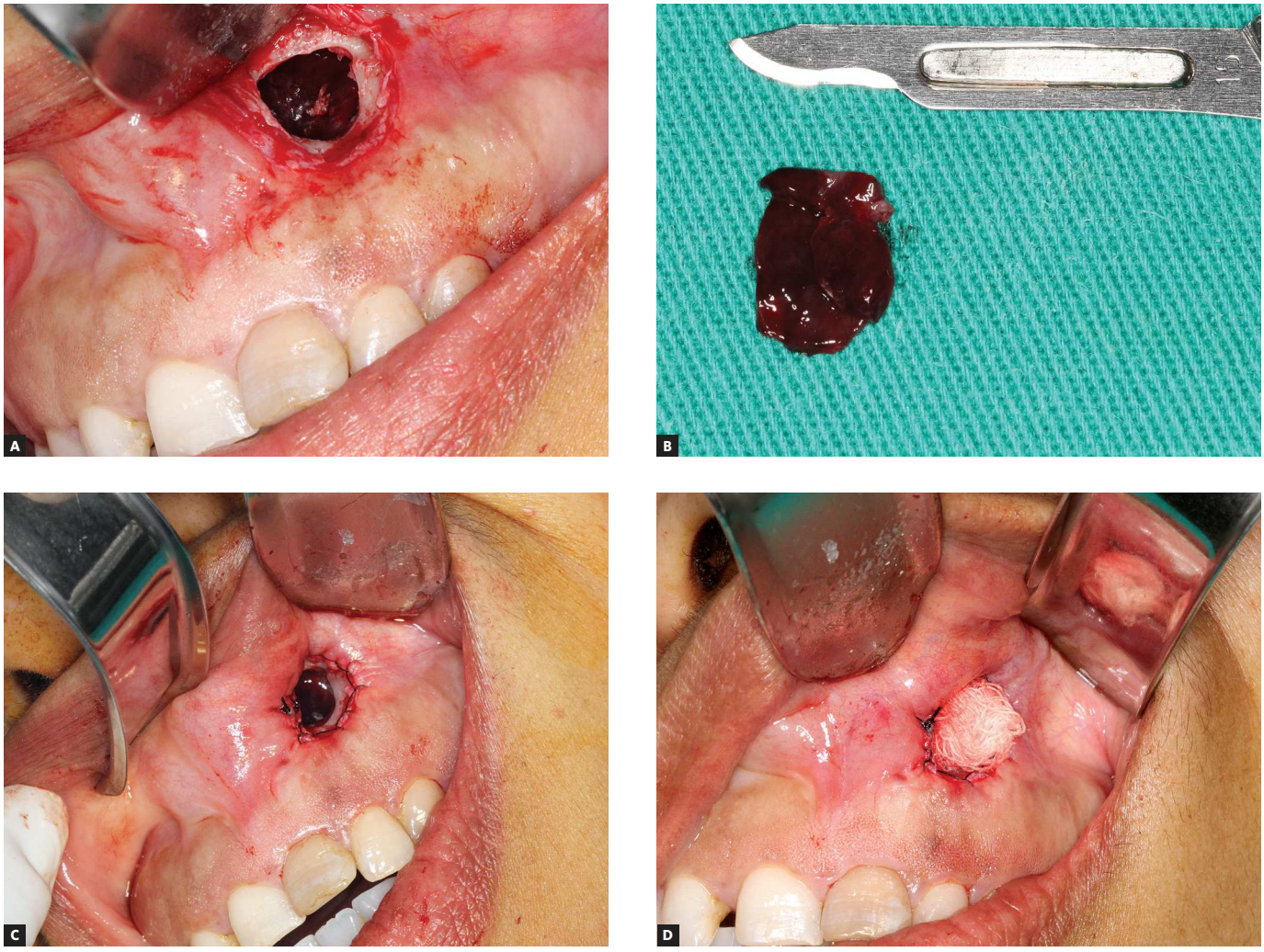


**Figure 2. A**) Circular incision on the buccal mucosa and the lesion. **B**) Surgical specimen. **C**) Suture of lesion borders with the buccal mucosa. **D**) Gauze occluding surgical cavity.

followed by infiltrative anesthesia with 2% mepivacaine with epinephrine 1:100.000. Then, a mucoperiosteal flap of total thickness of Novak-Peter (trapezoidal) was made involving the teeth #21, #22, #23 and #24, using a #15 scalpel blade and periosteal dissector, exposing the bone defect with the remaining lesion (Fig 3A). Next, the surgical cavity was prepared using diamond burr mounted on a straight handpiece at low speed; the enucleation of the lesion was performed with surgical curette and apicoplasty of tooth #21 (Fig 3B and 3C). Then, 0.5g Bio-Oss®, 1-2 mm granulation (large), were placed into the surgical cavity, and coated with resorbable bovine membrane (GenDerm®). Finally, we performed fistulectomy of chronic fistula generated by the first procedure and sutured with resorbable 4-0 vicryl (Fig 3D and 3F).

Postoperative medication prescribed consisted of 500 mg amoxicillin every 8 hours for 7 days, 600 mg ibuprofen every 8 hours for 3 days and 500 mg dipyrone every 6 hours for 2 days, in addition to mouthwash with 0.12% chlorhexidine gluconate every 12 hours for 7 days. The patient returned to the dental clinic periodically until a new tomography after 70 days, which evidenced a satisfactory adaptation of the bone graft to the fullest extent of the defect created previously by cystic lesion (Fig 4). The patient was instructed about proservation of the teeth #21, #22 and #23.

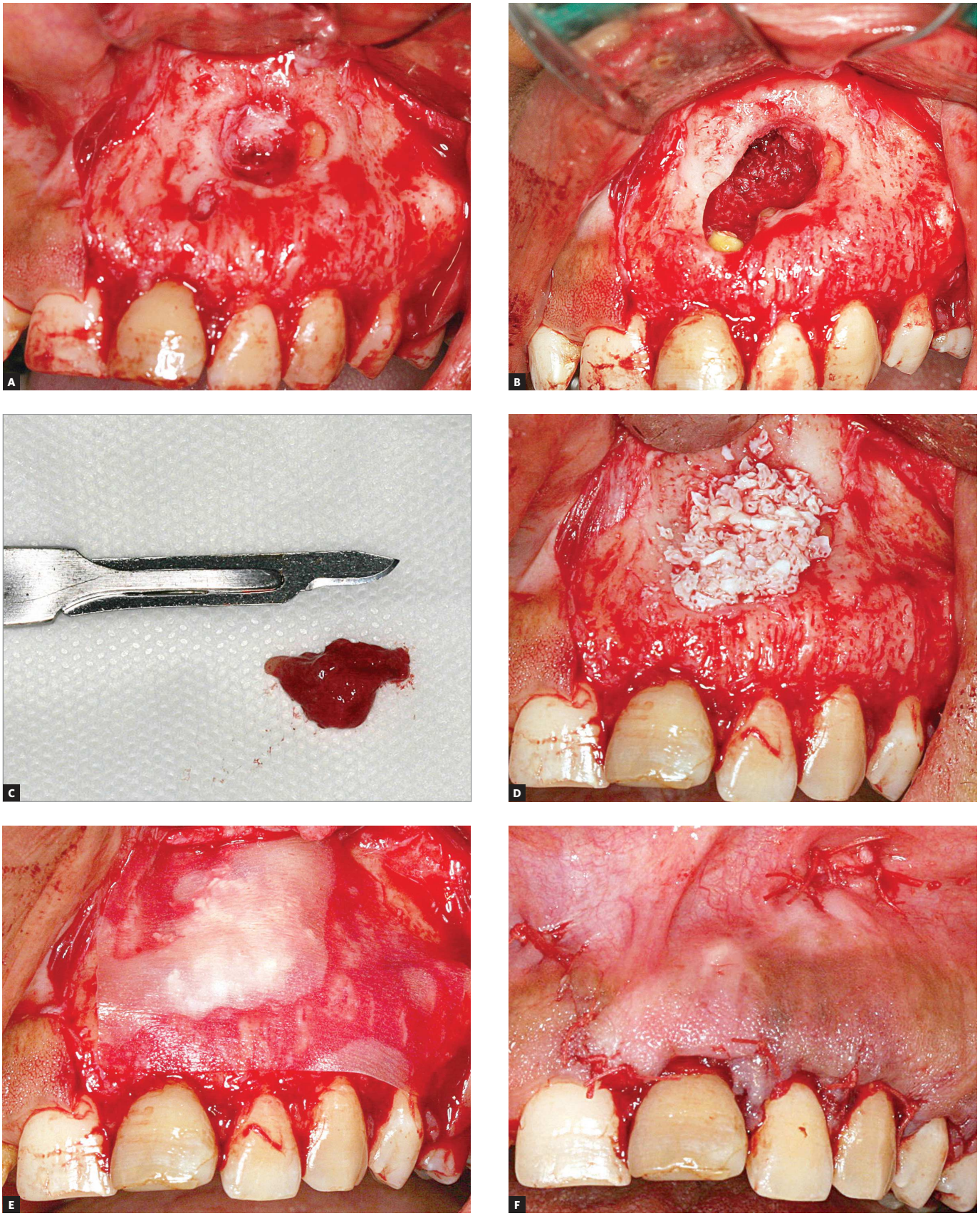


**Figure 3. A**) Exposure of the bone defect and remaining apical lesion. **B**) Surgical cavity after enucleation of the cystic lesion, apicoplasty of tooth 21 and preparation to receive the bone graft. **C**) Cystic lesion after enucleation. **D**) Devitalized bovine bone graft inserted into the bone defect. **E**) Resorbable bovine membrane positioned. **F**) Sutures of the flap; and fistulectomy made.

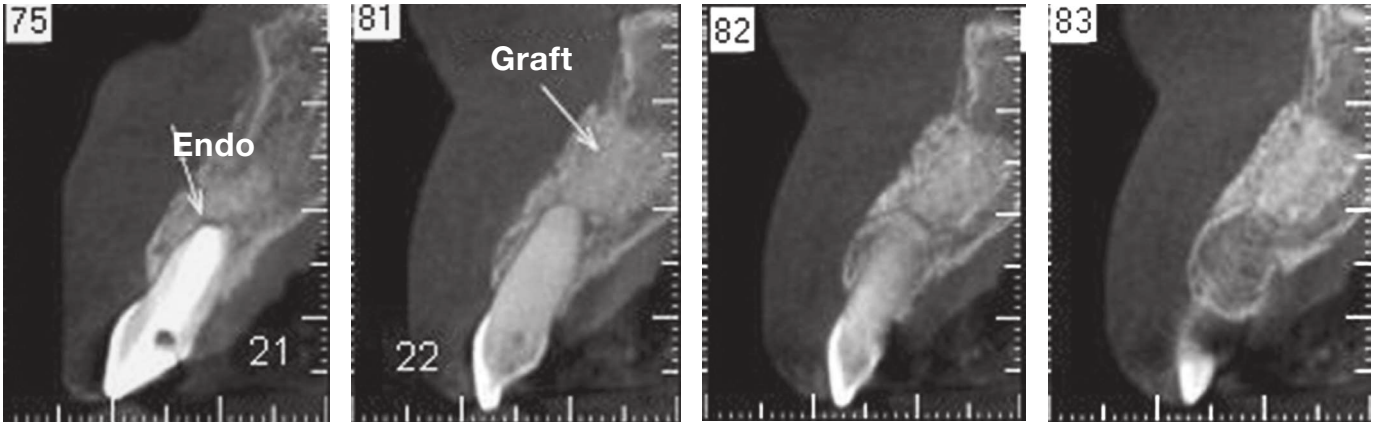


**Figure 4.** Apicoplasty and bone graft adaptation on the bone defect.

## Discussion

Radicular cysts arise from epithelial rests of Malassez in the periodontal ligament, and proliferate as a result of periapical inflammation caused by an infection in the root canal system.[2] They are particularly frequent in the anterior maxillary region,[10] as also observed in this case. Recently, it was demonstrated that cone-beam computed tomography[11] was able to diagnose granulomas and radicular cysts.

The expansion of cortical bone, root resorption of the affected tooth and displacement of adjacent teeth are common characteristics of radicular cysts. In this case, there was perforation of the cortical bone, and showed the relationship with the tooth apex.[21] The teeth adjacent to the lesion remained vital (#22, #23 and #24), however when the cyst increases in size, adjacent teeth may become non-vital.[8,12]

Two types of inflammatory radicular cysts have been histologically described.[3,6] Bay-cyst has its cavity in close contact with the dental apex, while the true cyst is completely enclosed by lining epithelium.[3,6] All periapical inflammatory lesions should initially be treated with conservative procedures.[10] In general, treatment of radicular cyst is based on a non-surgical treatment by endodontic treatment.[13] However, when extensive lesions are present or cases of true cysts, most often, endodontic treatment alone is not effective, and becomes necessary to associate it with decompression or marsupialization, or even enucleation.[9]

The management of large cystic lesions has been the subject of debate.[14] In this case, it was recommended endodontic retreatment of tooth #21 because of the unsatisfactory filling material, mainly in the apical third of the root canal and the poor quality of the coronal restoration. It is known that persistent infection and coronary microleakage result in the presence of bacterial endotoxins and inflammatory cytokines, which are factors responsible for the inflammation of periapical region.[15,16] The use of intracanal medication between sessions in cases of endodontic treatment in teeth with chronic periapical lesions is important to reduce bacteria inside the dentinal tubules and branches;[17] but many recent studies show similar results regarding the repair rate when the therapy is accomplished in a single session.[18] Based on this systematic review, the endodontic treatment of this case was made in a single session associated with 2% chlorhexidine gel that provides a broad spectrum of action, with effective results against the microbiota in cases of endodontic retreatment.[19] After retreatment, we observed the filling of sealer into branches of the apical third and a more homogeneous filling without voids when compared to the initial condition.

The endodontic therapy is usually limited to resolution of small cystic lesions or as a tool for partial regression of lesions for subsequent surgical treatment. Combined with conservative treatment, we decided for marsupialization due to the extent of the lesion. This step aims to reduce intracystic pressure for subsequent enucleation, which will make it less difficult to remove with less risk of damage to teeth and adjacent vital structures.[20-22] Once the periapical inflammation is reduced, there will also be a reduction of inflammatory mediators, pro-inflammatory cytokines, growth factors, and epithelial cells lining the cysts undergo apoptosis.[8]

The mechanisms of expansion and shrinkage of the cyst have been widely discussed. The expansion of cysts may be related to the activity of bone resorption mediators, such as interleukins (IL-1, IL-6), tumor necrosis factor, prostaglandins and metalloproteinases,[23] which are released by innate and adaptive immune cells, fibroblasts and apical periodontitis lesions. Kubota et al[24] suggested that interleukin (IL 1-alpha) may be partially regulated by intracystic pressure. The roles of IL-1 alpha include the induction of osteoclast formation and stimulation of production of prostaglandin and collagenase.[25] Thus, it is likely that the reduction of intracystic pressure is a key factor, pointing out the importance of marsupialization for shrinkage of the cystic cavity, facilitating a subsequent enucleation.

Some case reports show the complete repair of cystic lesions after decompression without subsequent enucleation.[26,27] Marsupialization has some advantages: a) can minimize the cyst size;[26,27] b) can minimize the risk of damage to tissues and important anatomical structures, including the inferior alveolar nerve and sinuses, and even a pathological fracture of the mandible;[28,29,31,32] c) can minimize damage to bone tissue and stimulate osteogenesis;[28-30] d) it is a cost-effective technique for the treatment of cystic lesions.[31] Nevertheless, there are also some disadvantages of treatment, such as: a) there is a long repair period and patient discomfort is evident in the early stages of marsupialization,[31-33] requiring cooperation from patients, who play an important role in the success of this treatment plan; b) in some cases, it requires a second surgical procedure to remove residual pathological tissue.[30,31]

Despite the reduction in cyst size, the repair of the periapical area was not fully completed due to the large area of destruction. Therefore, it was necessary to perform a second surgical procedure for enucleation of the lesion associated with bone graft. Currently, the patient is asymptomatic and remains in follow-up of the teeth #21, #22 and #23.

## Conclusion

Endodontic retreatment, marsupialization and cystic enucleation associated with bone graft shown to be effective methods for radicular cyst reduction, facilitating complete removal of the cystic lesion through a second surgery procedure, promoting bone repair.

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