

Surgical Approach to a Large Volume Cyst in the Mandibular Body: Case Report

Abordagem Cirúrgica em Cisto de Grande Volume em Corpo de Mandíbula: Relato de Caso

Laíza Krul^a; Guilherme Klein Parise^a; Patrícia Tolentino da Rosa de Souza^a; Alessandra Timponi Goes Cruz^a; Magda Eline Guerrart Portugal^a;

^aFaculdade Herrero. PR, Brasil.

*E-mail: mluizaprosdocimo@gmail.com

Abstract

Periapical cyst is considered one of the most common non-odontogenic cysts affecting oral and maxillofacial tissues. It is characterized by having a pathological cavity lined with epithelium, and is most often asymptomatic, originating from a tooth without vitality, derived from a long-term inflammatory process, and for this reason, it ends up being considered an imaging finding when diagnosed through imaging exams. The aim of this study is to report a clinical case of a root cyst in the mandibular body region, emphasizing the large volume and extent of the lesion presented, relating endodontic treatment with the use of biomaterial to fill the tooth, and the association of the surgical technique of cystic enucleation. A 63-year-old male patient presented with a periapical cyst located at the apex of tooth 34, a radiographic finding discovered through a complementary examination (panoramic radiography) requested during a routine consultation. Endodontic treatment was chosen for tooth 34, associated with surgical treatment of the cystic lesion in the mandible, using the enucleation technique. The surgical intervention associated with the endodontic treatment proved to be effective based on the imaging exams, where it was possible to see the beginning of bone neoformation and maintenance of the tooth without altering its masticatory function.

Keywords: Oral Surgery. Jaw Cysts. Radicular Cyst.

Resumo

O cisto periapical é considerado um dos cistos não odontogênicos mais comuns que afetam tecidos orais e maxilofaciais. É caracterizado por possuir uma cavidade patológica revestida por epitélio, sendo na maioria das vezes assintomático, oriundo de um elemento dentário sem vitalidade, derivado de um processo inflamatório de longa duração, e por essa razão, acaba sendo considerado um achado imaginológico quando diagnosticado por meio de exames de imagem. Este estudo tem por objetivo relatar um caso clínico de um cisto radicular na região de corpo de mandíbula, enfatizando o grande volume e extensão da lesão apresentada, relacionando o tratamento endodôntico com utilização de biomaterial, para obturação do dente, e associação da técnica cirúrgica de enucleação cística. Paciente do gênero masculino, 63 anos, apresentando um cisto periapical localizado no ápice do elemento dentário 34, sendo um achado radiográfico descoberto através de um exame complementar (radiografia panorâmica), solicitado em uma consulta de rotina. Optou-se pelo tratamento endodôntico do dente 34, associado ao tratamento cirúrgico da lesão cística em mandíbula, por meio da técnica de enucleação. A intervenção cirúrgica associada ao tratamento endodôntico mostrou-se eficaz com base nos exames de imagem, onde é possível visualizar o início da neoformação óssea e manutenção do dente sem alterar a sua função mastigatória.

Palavras-chave: Cirurgia Bucal. Cistos Maxilomandibulares. Cisto Periapical.

1 Introduction

Odontogenic cysts are pathological cavities coated by epithelium, which affect oral and maxillofacial tissues, which may arise due to inflammatory or developmental causes.¹⁻³ They are reported to have a higher prevalence between the fourth and sixth decades of life, presenting more commonly in men than in women, in a ratio of 1.6:1. They are found, in the vast majority, in the anterior region of the maxilla, followed by the region of lower molars.¹⁻³

Periapical cyst is one of the most common inflammatory odontogenic cysts¹, with a frequency of 15% to 32% among periapical lesions.³ Located at the dental apex, it appears through a long-lasting inflammatory process, associated with non-vital or endodontically treated teeth.¹⁻³ Because it has no symptoms, it is usually found as a radiographic finding.^{1,3}

Although the periapical cyst is not uncommon or aggressive, it is important to emphasize this lesion because, if not treated, it can cause more serious problems such as tooth loss or even pathological fracture of the jaw.²

Histopathologically, the periapical cyst is characterized as a pathological cavity, internally coated by epithelium, consisting externally of a fibrous tissue containing a fluid or semi-fluid material inside.^{1,4,5}

There are several forms of treatment for this type of lesion, such as endodontic treatment, marsupialization, enucleation and curettage, paraendodontic surgery/apicectomy, among others.^{4,6} Among these, first-choice surgical treatment is the enucleation technique, which consists of the total removal of the cystic capsule keeping the tooth involved without having to remove it.⁷ Therefore, the cystic lesion is removed by

means of enucleation, thus protecting the adjacent anatomical structures.^{6,7}

To report the clinical case of a root cyst in the jaw body region, emphasizing the large volume and extent of the lesion presented, related to the surgical technique of choice, associating to the endodontic treatment.

2 Case Report

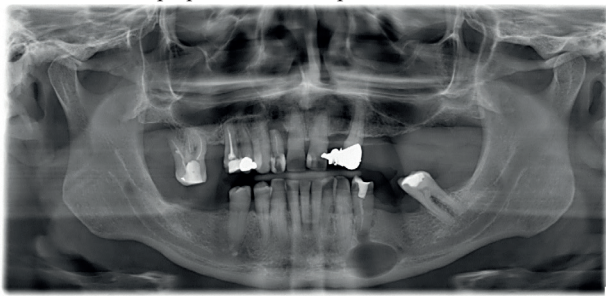
This case report was submitted to the evaluation of the Research Ethics Committee of Faculdade Herrero through the *Plataforma Brasil* (CAEE No. 61395622.1.0000.5688) and was approved by Opinion No. 5.595.115 according to regulated guidelines in research involving human beings (Resolution 466/2012) and ensuring the rights and duties that concern the scientific community and the subject of research.

Patient R.K., male, 63-year-old, leukoderma, attended the Faculdade Herrero Clinic for a routine evaluation in April 2021.

During the anamnesis, the patient reported being cardiopath, with 2 cardiac stents, and making continuous use of the following medications: Selozok of 50mg, Somalgin Cardio of 100mg, Clopidogrel of 75mg and Rosuvastatin of 10mg. The patient reported absence of allergies.

Panoramic radiography was requested (Figure: 1) for the overall evaluation of the oral cavity, the presence of a well-delimited single-root lesion with radiopaque halo at the apex of tooth 34 already treated endodontically, of approximately 1,1x2 cm in diameter, and asymptomatic.

Figure 1 - Initial panoramic radiography, presenting a radio lucid lesion with radiopaque halo at the apex of the tooth 34



Source : the authors.

The tests of sensitivity, percussion and palpation of the dental element in question showed negative results. There was also absence of mobility of the said tooth.

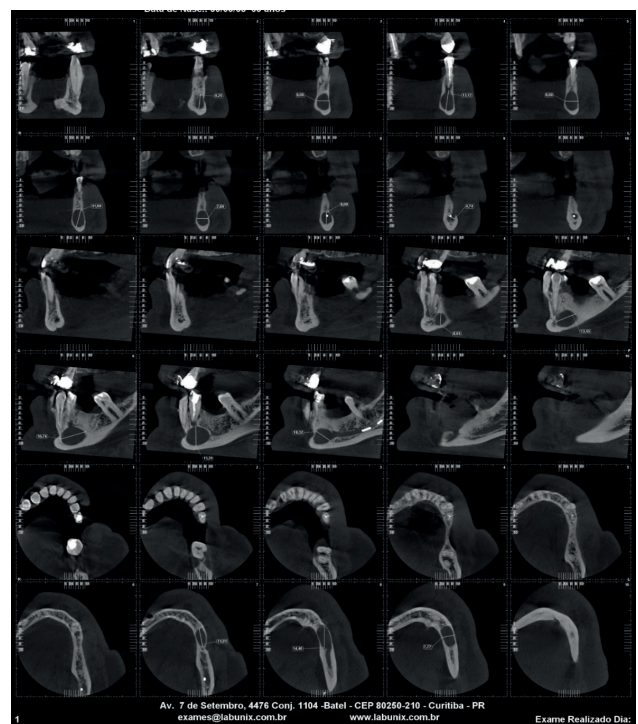
Computed tomography was requested for better evaluation in the month 05/2021 (Figure: 2 and 3), it can be observed that the lesion was in close contact with the apex of tooth 34 and inferior alveolar nerve, in addition to the presence of bone fenestration by the vestibular and lingual faces. As initial diagnostic hypotheses, the possibilities of keratocystic odontogenic tumor, unicystic ameloblastoma and periapical cyst were raised.

Figure 2 - Tomographic image in panoramic cut, 3D reconstruction and axial slice of the lesion



Source : the authors.

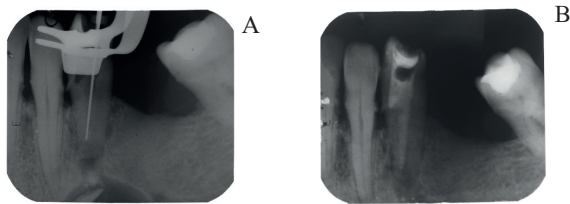
Figure 3 - Volumetric computed tomography of the cone beam of the jaw, presents hypodense lesion at the apex of the tooth 34, unilocular, well delimited, size 1.1cm and 2 in diameter



Source : the authors.

The patient was referred for endodontic retreatment of tooth 34 as an attempt to reduce the lesion, performed the chemical-mechanical preparation (PQM) with manual files in month 11/2021 (Figure: 4), sodium hypochlorite use 2.5% for irrigation (Asfer indústria química – São Caetano do Sul, SP, Brazil) and calcium hydroxide (Ultracal XS – ultradent – Indaiatuba, SP, Brazil) as intracanal medication, and glass ionomer cement (Maxon® – FGM – Joinville, SC, Brazil) as temporary restorative material. Intracanal medication was changed in the month 03/2022, using the same intracanal medication of choice and the temporary restorative material (Figures: 4 A and 4 B).

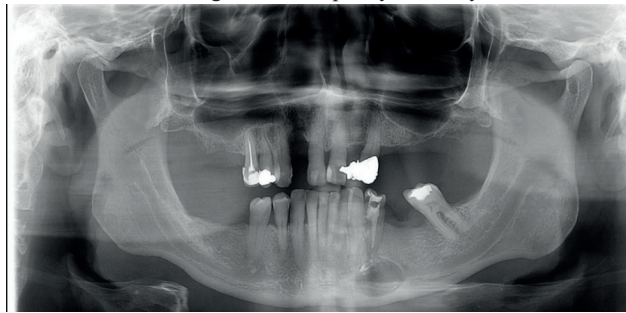
Figure 4A and 4B - Periapical radiography of the odontometry after removal of the root filling material and periapical radiography of the canal after PQM with calcium hydroxide placement of the intracanal medication



Source : the authors.

A new panoramic radiography was requested (Figure: 5) and a new tomography (Figure: 6 and 7) in month 02/22 for follow-up of the lesion after the beginning of the endodontic treatment, to observe whether the referred lesion progressed, regressed or stabilized.

Figure 5 - Panoramic Radiography after the start of the retreatment. There is greater radiopacity of the cystic lesion



Source : the authors.

Figure 6 - Tomographic image in panoramic cut, 3D reconstruction and axial slice of the lesion



Source : the authors.

Figure 7 - Volumetric computed tomography of the cone beam of the jaw. It is noted that it is less hypodense, and conferring bone neoformation

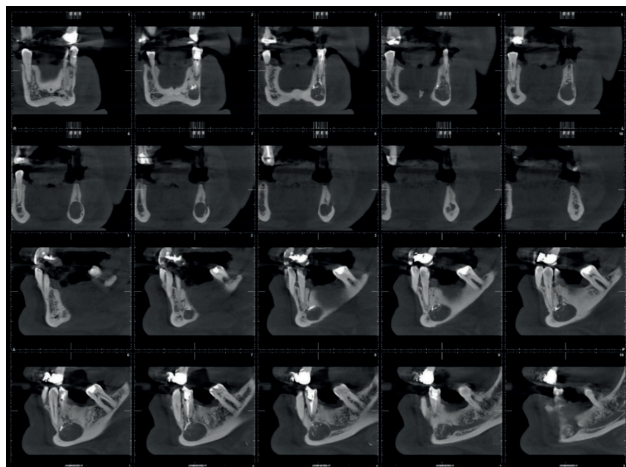
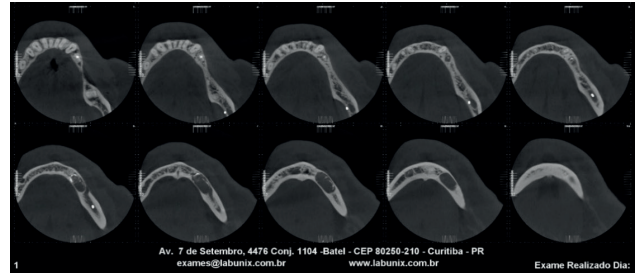


Figure 7 - Volumetric computed tomography of the cone beam of the jaw. It is noted that it is less hypodense, and conferring bone neoformation



Source : the authors.

The treatment of choice for the case was the technique of surgical enucleation, and due to the patient's health status, complete blood count and coagulogram were also requested, which presented results within normal values.

Because it is a cardiopath patient, preoperative drug therapy (antibiotic prophylaxis) of amoxicillin of 500mg - 4 capsules was prescribed, one hour before the procedure. The patient was asked to sign the Free and Informed Consent Form (TCLE) of the surgical procedure, pointing out all the risks and benefits of the intervention to be performed. After the patient's awareness and approval, the surgical procedure was initiated at the Faculdade Herrero outpatient clinic, following the surgical protocols of intraoral antiseptics with 0.12% chlorhexidine digluconate (Perioxidin® - Rio de Janeiro, RJ, Brazil), and extra-oral with topical iodopolyvidone at 10% (Riochemical® - Sao José do Rio Preto, SP, Brazil) (Figure 9).

Figure 8 - Preoperative clinical image

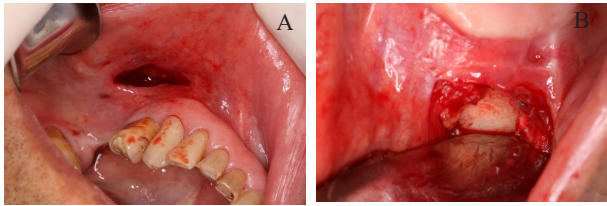


Source : the authors.

Topical anesthetic (Benzotop®- DFL – Rio de Janeiro, Brazil) was applied for better patient comfort, followed by long needle (Dencojet – DFL – Rio de Janeiro, Brazil), and short needle infiltrative anesthesia (Dencojet – DFL – Rio de Janeiro, Brazil), with 3 tubes of 1.8mL of 3% mepivacaine anesthetic solution with epinephrine vasoconstrictor 1:100.000 (Mepivalar® AD – DLA Pharma – Catanduva, SP, Brazil). With a scalpel handle and carbon steel blade number 15 (Maxicor® – Pinhais, Paraná), the rectilinear incision was performed, about 0.5 cm below the mucogingival line, extending from the tooth region 33 to 35. The total thickness

flap was taken off with the use of Molt curette n°9 (Golgran – São Caetano do Sul, SP, Brazil) exposing the anterior region of the jaw (Figures 9A and 9B).

Figures 9A and 9B - appearance of the incision and mucoperiosteal detachment and exposure of vestibular cortical in the region of teeth 33 to 35

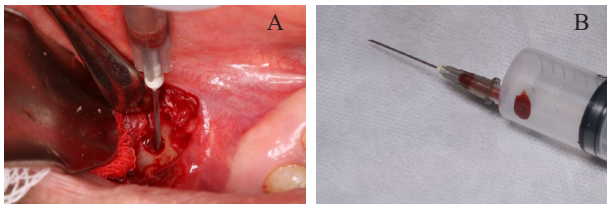


Source : the authors.

A bone window was made by the osteotomy technique with a surgical drill no. 701 (Prima Dental by Angelus Ind. Prod. – Londrina, PR, Brazil) in the high rotation pen, to expose the cystic capsule. The cystic capsule was in perfect condition.

For diagnostic proof, aspiration puncture was performed with a 20ml luer syringe with a 12x7mm needle (Descarpack – Ilhota, SC, Brazil), and a sero-sanguineous material was aspirated (Figures 10A and 10B).

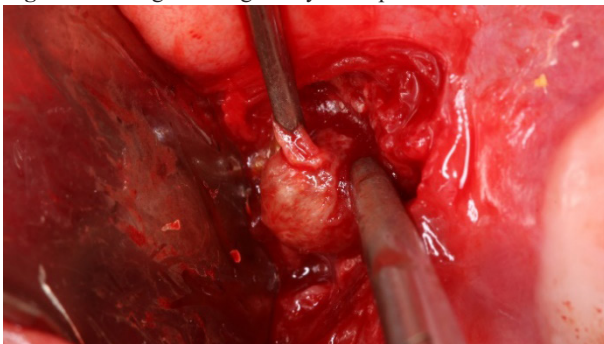
Figures 10 A and 10 B - aspect of the bone window and aspiration puncture with intra-cystic content (sero-sanguineous)



Source : the authors.

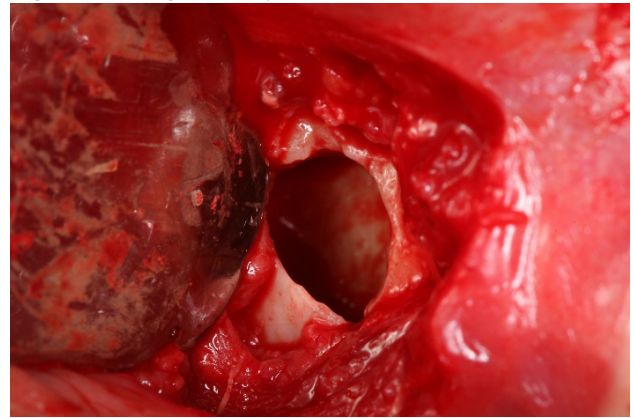
With the help of Lucas eight-sided curette (Golgran – São Caetano do Sul, SP, Brazil), cystic enucleation and irrigation were performed with 0.9% saline solution for cleaning the region, where finally, the region was cured stimulating bleeding to fill the cavity with blood, in order to obtain a future bone neoformation (Figure 11 and 12). The incised area was closed with continuous Reverding suture, using 3-0 silk thread (Shalon – São Luis de Montes belos, GO, Brazil) (Figure 14).

Figure 11 - Surgical image of cystic capsule enucleation



Source : the authors.

Figure 12 - Image of the cystic area



Source : the authors.

Figure 13 - Synthesis of surgery with continuous Reverding suture



Source : the authors.

After surgery, the patient received verbal and written postoperative guidelines and recommendations, in addition to post-surgical medication prescription: Dexamethasone of 4mg, every 08h for 05 days + Dipyron of 500mg, every 06h for 05 days.

The collected material was stored in a 10% formalin solution and forwarded for histopathological analysis by the Oral Pathology Service of the School of Dentistry of the Federal University of Rio de Janeiro - UFRJ, when a diagnosis of periapical cyst was obtained (Figure: 14).

Figure 14 - Report of histopathological examination



UNIVERSIDADE FEDERAL DO RIO DE JANEIRO - FACULDADE DE ODONTOLOGIA
DEPARTAMENTO DE PATOLOGIA E DIAGNÓSTICO ORAL

LABORATÓRIO DE PATOLOGIA ORAL FO/UFRJ

NOME: [REDACTED] REGISTRO: 22-2293AP
IDADE: [REDACTED] PROCEDÊNCIA: Curitiba-PR REG. ORIGEM:
PROFISSIONAL SOLICITANTE: Dra. Maria Luiza P. Moreira 37417 CRO-RJ

EXAME REALIZADO: Anatomia Patológica LOCAL: Periápice, dente 34
ENTRADA: 17/10/2022 SAÍDA: 26/10/2022 15:08:00

Macroscopia Seis fragmentos de tecido mole, recebidos em formol, de formato irregular, superfície irregular, consistência fibroelástica, coloração acastanhada, medindo 14 x 11 x 7 mm o maior.

Conclusão CISTO PERIAPICAL

Source : the authors.

A new image examination (computed tomography) was

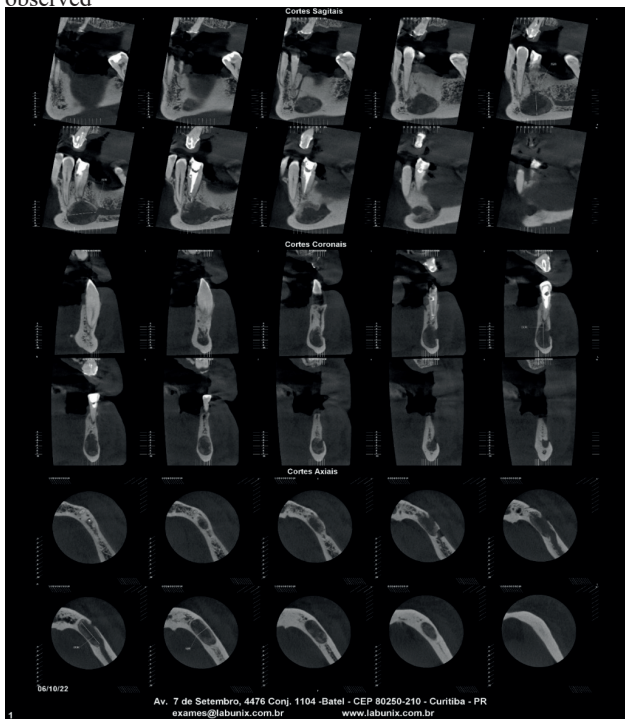
requested (Figures: 15 and 16) in month 10/22 for follow-up of the lesion after 04 months of the surgical intervention.

Figure 15 - Tomographic image in panoramic cut, 3D reconstruction and axial slice of the lesion



Source : the authors.

Figure 16 - Volumetric computed tomography of the cone beam of the jaw. Neoformation of bone cortical by the lingual face is observed



Source : the authors.

Also in the month 10/22, the application of Biodentin (Septodont – Pomerode, SC, Brazil) was performed inside the root canal of the tooth 34, with the purpose of sealing the root canal. Initially, topical anesthesia was administered (Benzotop®- DFL – Rio de Janeiro, Brazil), followed by infiltrative anesthesia using 1 tube of 1.8mL of 3% mepivacaine with epinephrine vasoconstrictor 1:100.000 (Mepivale® AD – DLA Pharma – Catanduva, SP, Brazil), short needle (Dencojet – DFL – Rio de Janeiro, Brazil), absolute isolation with Ostby arc (Prima Dental by Angelus Ind. Prod. – Londrina, PR, Brazil) and use of rubber dike (Madeitex – Santa Branca, SP, Brazil) with 206 clamp (Golgran – São Caetano do Sul, SP, Brazil), removal of the glass ionomer cement restorative material with a 1012 drill (KG Sorensen – Cotia, SP, Brazil) at high rotation, followed by removal of intracanal medication with file #15 2.5 (Dentsply Sirona Brazil – São Paulo, SP, Brazil) calibrated in working length (CT) associated with irrigation using sodium hypochlorite% (Asfer indústria

química – São Caetano do Sul , SP, Brazil).

After partially removing the medication, the surgical diameter file (DC) was used to remove the rest still with the aid of irrigation and positive aspiration, until the liquid changes color and begins to be clean. The final irrigation was performed using *easy clean* (Easy equipamentos odontológicos – Belo Horizonte, MG, Brazil) calibrated in -3 of the CT with pecking motions at low rotation, with 5ml of sodium hypochlorite 2.5% 3 cycles of 20s with agitation, always renewing the solution, 5ml of E.D.T.A. 17% (Biodinâmica Química e Farmacêutica – Ibioporã, PR, Brazil), 3 cycles of 20s with agitation, always renewing the solution and 5ml sodium hypochlorite 2.5% without agitation. The previous drying of the root canal was done by means of the aspiration cannulas (Ultradent – Indaiatuba, SP, Brazil) in the CT after the complete drying was performed with sterile paper cones in the DC diameter (Dentsply Sirona Brazil – São Paulo, SP, Brazil). Next, manipulation of biodentin was performed (Septodont – Pomerode, SC, Brazil) according to the manufacturer’s instructions, and the bioceramic cement was inserted into the canal mouth with the aid of a chisel.

The canal was filled from apical to cervical and a sterile cotton ball was placed in the mouth of the canal. The temporary sealing was performed with a temporary filling material (Villevie – Joinville, SC, Brazil) and glass ionomer cement (Maxion® – FGM – Joinville, SC, Brazil) (Figure: 17).

Figure 17 - Periapical radiography of the tooth 34 after filling with biodentin



Source : the authors.

The patient will continue to be followed monthly, in order to follow the bone neoformation and evaluation of possible recurrence. To date, the patient has a favorable prognosis (Figure: 18).

Figure 18 - Clinical aspect after three months of surgery



Source : the authors.

3 Discussion

Periapical cysts are inflammatory lesions that lead to bone resorption, forming a pathological cavity that can reach large dimensions.^{1-3,8} In its vast majority they are asymptomatic and slow-growing.^{1-3,8} This pathology is usually discovered occasionally by routine radiography or, when it reaches larger dimensions, by swelling of the involved bone and/or inadaptation and dental prostheses.^{1,8-10} Clinically, the presence of swelling and mild sensitivity, as well as mobility and displacement of adjacent teeth, can become symptomatic when infected or with large size, due to compression of nerve endings.^{2,3,8-10} In the present case report, the patient did not present either symptoms or swelling in the area of the lesion.

Radiographically, it is presented as a great periapical radiolucency involving the apex of one or more teeth, requiring a more accurate diagnosis, because it can be confused with other pathologies and for this there is a need to perform histopathological examination, giving the correct confirmation of the diagnosis.^{1,8-10}

Talpos-Niculescu et al.¹¹ report that the benefit of endodontic treatment in the reduction of periapical lesions is represented by the sanitation of the infected canal and the important reduction of bacteria inside the root canal. Sodium hypochlorite (NaOCl) as an irrigating solution in endodontics is an excellent antimicrobial agent, assisting in disinfection and cleaning of the endodontic space, having broad spectrum against bacteria, spores and viruses.¹¹⁻¹⁴ Endodontic therapy remains the first alternative in the treatment of periapical cystic lesions, because only the surgical approach without endodontic treatment is not effective, considering that the main factors responsible for the development of this lesion are derived from an infected root canal. There is no evidence that periapical cyst recurrence occurs when endodontic treatment is associated with cystic enucleation surgical technique.^{3,11-14}

In addition, the use of calcium hydroxide ($\text{Ca}(\text{OH})_2$) as intracanal medication between sessions increases the disinfection of the channel system by neutralizing the remaining microorganisms and inducing a favorable environment for periapical healing. Calcium hydroxide is effective against Gram negative species and inactivates the membrane transport mechanisms by performing its antibacterial functions, as it has the ability to induce the deposition of hard tissue, favoring the healing of the lesion and bone repair.^{3,11,13,14} In our clinical case, we used CaOH 2 as intracanal medication and it can be noted (Figure 3) that there was a bone repair. The extravasation of CaOH 2, collaborating with the reduction of bone fenestration and assisting in periapical bone repair.

In order for the action of root canal medication and the exchange of dressings with calcium hydroxide to be effective, in addition to a good biomechanical preparation, it is necessary a period, which can vary from two weeks to six months, to exchange medication or obturation of the conduit.^{11,14} In this case, the medication exchange occurred in an interval

between 3 and 4 months, giving a certain time for its action. Although the patient did not present edema or pain, the lesion drained via the canal spontaneously, as soon as the access cavity was created. The irrigation with sodium hypochlorite during endodontic treatment associated with aspiration inside the root canal increased the removal of exudate from the periapical region, released the pressure of the lesion, where with each exchange of intracanal medication the tooth was closed with medication of choice, namely, calcium hydroxide and temporary restoration. This result can be attributed to the antiseptic effect of chemical-mechanical debridement, complemented by prolonged use of Ca (OH)-based intracanal paste.^{2,14}

For the obturation we chose to use Biodentin. It is a calcium silicate-based material, which has great potential as an alternative to MTA, being a pure material, devoid of any metal, and easy to handle.¹⁵ For its high biocompatibility, regeneration capacity of hard tissues and improved mechanical properties, the applicability in regenerative endodontics is well presented by this material, having good bioactive effect and good periapical healing.¹⁵

Riachi and Tabarini¹⁶ in their study stated that surgical approaches to maxillomandibular cystic lesions may be marsupialization or enucleation. The treatment of choice will depend on the size, location of the lesion, the bone integrity of the cystic wall, its proximity to noble structures (vessels, nerves, among others) and the actual ability of the treatment to eliminate the periapical cyst.

Marsupialization is the decompression of a cyst, draining the internal fluid through a device that is sutured around the oral mucosa, reducing its size in the long term. This surgical intervention requires patient care to do the irrigation of the site, because it is a bone window exposed to the oral environment. Because it is an artifact, there is a disadvantage to perform maintenance, which can cause discomfort to the patient, and can also become a bacterial plaque sealing focus.^{6,7,17,18} This method, because it is more conservative, presents lower complications compared to enucleation with regard to the preservation of involved anatomical structures, inducing peripheral bone formation, reducing risks of mandibular fracture. The period of this technique can vary from 6 to 80 months, with an average time of 23.5 months and only 18.5% of the lesions disappear completely after marsupialization.^{5,6,18-20}

Enucleation is a more radical method, which consists of the total removal of the cystic capsule, which may compromise teeth and anatomical structures, as well as causing damage to nerves and vessels of the region.^{18,19} This surgical technique is performed in a single surgical time, the curing time is shorter compared to marsupialization, and yet, a graft is not required on site.^{5,20} Ratiu et al.¹⁷ claim that the formation of a blood clot within the bone defect, followed by the correct suture of the surgical wound and spontaneous healing of the bone tissue is widely accepted. The regeneration of the bone defect depends

on its size and shape, the anatomical location, the patient's age and other factors, such as the immune system, the blood supply of that region and the presence of a compact bone support to promote bone neoformation.^{6,7, 17,18} In the surgical technique of enucleation, the cystic lining is separated from the internal bone surface, removed from the cystic cavity and, filling with blood through curettage that will clot, inducing bone neoformation in the cystic cavity.^{7,17-19}

Many authors differ in their opinions on enucleation of large cysts. This is largely due to the fact that larger cystic cavities have no organization of a blood clot, and the formation of a new bone is questionable. A blood clot in a devitalized area is a great risk, as it can be easily infected and can lead to unwanted consequences of local inflammation.^{7,17-19}

Studies report that mandibular bone regeneration occurs without complications, even in large bone defects, without the need to use any graft material.^{19,20}

In the present case report, enucleation was performed, because its size is compatible with the surgical technique, besides involving only a single dental element. Another important factor for the choice of the technique is the difficult location, due to proximity to the mental nerve. When enucleation was performed, the patient would be submitted to only one surgical procedure and thus reduce the possibility of damage to this important structure. The patient underwent the surgical procedure without compromising any nervous structure.

4 Conclusion

The endodontic treatment aiming at the sanitation and elimination of any intracanal microbial agent responsible for periapical lesion, associated with surgical intervention using the enucleation technique, proved to be effective until now, proven by imaging tests, where it is possible to visualize the beginning of bone neoformation .

References

1. Santosh ABR. Odontogenic Cyst. *Dent Clin North Am J* 2019;64:105-19. doi: 10.1016/j.cden.2019.08.002
2. Johnson RN, Gannon OM, Savage NW, Batstone MD. Frequency of odontogenic cysts and tumors: a systematic review. *J Investig Clin Dent* 2014;5(1):9-14. doi: 10.1111/jicd.12044.
3. Junior CVA, Antunes HS, Carvalho JCA, Neto ND, Uzeda M. Os cistos radiculares podem curar após tratamento endodôntico? *Rev Bras Odontol* 2014;71(1):99-102. doi: 10.18363/rbo.v71i1.511
4. Dantas RMX, Dultra JA, Borges GL, Dultra FKA, Neri RFA. Enucleação de cisto radicular maxilar associado à apicectomia: relato de caso. *Rev Cir Traumatol Buco-Maxilo-Fac* 2014;14(3):21-26.
5. Bilodeau EA, Collins BM. Odontogenic Cysts and Neoplasms. *Surg Pathol Clin* 2017;10(1):177-222. doi: 10.1016/j.path.2016.10.006.
6. Pinto GNS, Figueira JA, Gonçalves ES, Sant'ana E, Tolentino ES. Marsupialização como tratamento definitivo de cistos odontogênicos: relato de dois casos. *Rev Fac Odontol* 2015;20(3):361-366. doi: 10.5335/rfo.v20i3.5209.
7. Rajae EG, Karima EH. Dentigerous cyst: enucleation or marsupialization? (a case report). *Pan Afr Med J* 2021;40(149):1-7. doi: 10.11604/pamj.2021.40.149.28645.
8. Patil VA, Desai MH, Patil VS, Kaveti HR, Ganji KK, Danappanavar PM. A novel approach for treatment of an unusual presentation of radicular cysts using autologous periosteum and platelet-rich fibrin in combination with demineralized freeze-dried bone allograft. *Case Rep Dent* 2013;2-5. doi: 10.1155/2013/893791.
9. Avelar RL, Antunes AA, Carvalho RW, Bezerra PG, Neto PJ, Andrade ES. Odontogenic cyst: a clinicopathological study of 507 cases. *J Oral Sci* 2009;51(4):581-586. doi: 10.2334/josnusd.51.581.
10. Corrêa, M; Elias, R; Cherubim, K; Ponzoni, D. Cisto Radicular Residual: Relato de Caso Clínico. *J Bras Clín Odontol Integ* 2002;6(32):133-35.
11. Talpos-Niculescu RM, Popa M, Rusu LC, Pricop MO, Nica LM, Talpos-Niculescu S. Conservative approach in the management of large periapical cyst-like lesions. A report of two cases. *J Med* 2021;57:1-12. doi: 10.3390/medicina57050497
12. Abuhaimed TS, Neel EA. Sodium hypochlorite irrigation and its effect on bond strength to dentin. *Biomed Res Int* 2017;2017:1-8. doi: 10.1155/2017/1930360.
13. Mondal IM, Coutinho J, Silva VC, Kill KB. Regressão não cirúrgica de grande lesão perirradicular. *Rev Cienc Esf Acad Saude* 2021;6(1):21-39.
14. Santos SM, Brito-Júnior M, Souza FK, Von Zastrow E, Cunha AO, Silveira FF, Nunes E, et al. Management of cyst-like periapical lesions by orthograde decompression and long-term calcium hydroxide/chlorhexidine intracanal dressing: a case series. *J Endod* 2016;42(7):1135-41. doi: 10.1016/j.joen.2016.04.021.
15. Sharma S, Sharma V, Passi D, Srivastava D, Grover S, Dutta RS, Large periapical or cystic lesions in association with roots having open apices managed nonsurgically using 1-step apexification based on platelet-rich fibrin matrix and biodentine apical barrier: a case series. *J Endod* 2018;44(1):79-185. doi: 10.1016/j.joen.2017.08.036
16. Riachi F, Tabarani C. Effective Management of large radicular cysts using surgical enucleation vs. marsupialization two cases report. *Oral Surg* 2010;1:44-51.
17. Ratiu CA, Ratiu IA, Cavalu S, Bosca AB, Ciavoi G. Successful management of spontaneous bone regeneration after jaws cystectomy using PRGF approach; case series. *Rom J Morphol Embryol* 2020;61(3):833-40. doi: 10.47162/RJME.61.3.21
18. Yeh TH, Chen YC, Lee YP, Chiang CP. Calcifying odontogenic cyst treated by marsupialization and subsequent total enucleation. *J Dent Sci* 2022;17(2):1076-8. doi: 10.1016/j.jds.2022.02.001
19. Ciulli E, Rocci M, Bollero R, et al. Maxillary cyst: description of a clinical case. *Oral Implantol* 2009;2(2):28-33.
20. Zibo HN, Miller E. Endoscopically assisted enucleation of a large mandibular periapical cyst. *Stomatologija* 2011;13(4):128-131.