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CASE REPORT

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Recurrent odontogenic keratocyst and the use of Carnoy's solution: a case report

Ceratocisto Odontogênico recidivante e o emprego da solução de Carnoy: relato de caso

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ABSTRACT

Background: Odontogenic keratocyst is a challenging odontogenic lesion, originating from the epithelial remnants of the dental lamina, ranging from small cysts to extensive lesions with a high recurrence rate and morbidity for patients. The sometimes aggressive nature of these pathological entities explains the controversy among researchers regarding the best classification for these lesions, justifying the fact that these odontogenic cysts were once defined as benign odontogenic tumors for some years. However, there is consensus among scholars that it is a disease that requires careful follow-up of affected patients due to the high recurrence rates, especially in the first two decades after treatment completion. **Objectives:** The present study aims to elucidate the case of a patient with a mandibular odontogenic keratocyst who prematurely discontinued follow-ups and had a significant recurrence of the lesion after 7 years. **Description:** the second treatment was performed using Carnoy's solution. **Conclusion:** Carnoy's solution is an absolutely essential therapeutic resource in the treatment of odontogenic keratocysts, as its use significantly reduces the potential recurrence of the disease.

KEYWORDS

Decompression; Odontogenic cysts; Odontogenic keratocyst and mandible; Odontogenic tumor; Recurrences.

RESUMO

Contexto: Ceratocisto odontogênico é uma lesão odontogênica desafiadora, originada a partir dos restos epiteliais da lâmina dentária, que permeia desde pequenos cistos até extensas lesões com alta taxa de recorrência e morbidade para os pacientes. O caráter por vezes agressivo destas entidades patológicas, explica as controvérsias entre os pesquisadores com relação à qual seria a melhor classificação destas lesões, justificando o fato de que estes cistos odontogênicos já foram por alguns anos definidos como tumores odontogênicos benignos. Entretanto, é consensual entre os estudiosos que se trata de uma enfermidade que carece de criteriosa proservação dos pacientes acometidos dado as elevadas taxas de recidiva, especialmente nas duas primeiras décadas após o tratamento finalizado. **Objetivos:** O presente estudo objetiva elucidar o caso de um paciente portador de ceratocisto odontogênico mandibular que abandonou os acompanhamentos precocemente e teve importante recidiva da lesão após 7 anos. **Descrição:** Descrição: o segundo tratamento foi realizado empregando-se a solução de Carnoy. **Conclusão:** A solução de Carnoy mostrou ser um recurso essencial no tratamento do queratocisto odontogênico por ter reduzido significativamente o potencial de recorrência da doença.

PALAVRAS-CHAVE

Descompressão; Cístos odontogênicos; Ceratocisto odontogênico e mandíbula; Tumor odontogênico; Recidivas.

INTRODUCTION

The Odontogenic Keratocyst (OKC) is a relatively common benign cystic lesion of odontogenic origin with high recurrence rates, first described by Philipsen in 1956 [1,2]. OKC accounts for about 8 to 11% of all these cysts of the jaw bones, thus presenting a considerable incidence and being the third most prevalent in terms of these cystic lesions [2]. OKC has been the subject of much controversy and debate among experts regarding the best classification of this nosological entity. Proof of this is the change in its classification from 2005 to 2017, where the lesion was reclassified by the World Health Organization as a benign odontogenic neoplasm instead of an odontogenic cyst, as had been the case until then. However, in 2017, the lesion was reclassified again as an odontogenic cyst, and the orthokeratinized odontogenic cyst became an independent pathological entity, no longer considered a variant of the OKC, as its clinical and radiological characteristics are less aggressive compared to the OKC. The reclassification of the OKC occurred because specialists understand that its behavior, although occasionally locally aggressive, tends to respond favorably to the marsupialization process and is only slightly associated with genetic mutations, except when associated with Gorlin-Goltz syndrome [3-5].

Clinically, OKC affects the mandible in about 73% of cases, notably the posterior body and ascending ramus of the mandible, with the peculiar characteristic of developing in the anteroposterior direction and marrow space of the bone, as opposed to the buccolingual development. In general, OKCs have a wide variation in their epidemiological presentations, encompassing both sexes and a varied range of age groups. Moreover, the imaging of OKCs is quite diverse, including uni- and multilocular lesions, from small dimensions to very extensive lesions, usually with well-defined edges. Painful symptoms are rarely reported; however, they may be present in cases of more extensive lesions or associated infections, as well as paresthesia in the area affected by the OKC, since the expansion of the lesion can cause compression of the nerve associated with the injury [3,4,6].

The treatment applied to OKCs is also diverse and depends on each particular situation. Small lesions are directly enucleated and subjected to curettage or complementary peripheral adjuvant ostectomy. Lesions more than two centimeters in their largest diameter are usually marsupialized first, which favors metaplastic change in the cystic epithelium, with loss of keratin and epithelial thickening. Such tissue changes resulting from the marsupialization process significantly facilitate the subsequent removal of the cyst, which originally has a very friable cystic capsule that is prone to fragmentation. The fact is that these lesions are eminently recurrent, and because of this, the indication of Carnoy's solution use after enucleation and curettage or cystic osteotomy is currently a consensus issue among researchers [7-9]. However, the occasional difficulty of health services in having all the components of Carnoy's solution available may have contributed to its use being sometimes underestimated, which would imply an increase of approximately 17% in the disease's recurrence rates [10]. In light of the issues addressed previously, the present study aims to report the case of a patient with OKC and significant recurrence after 7 years from the initial treatment, discussing the importance of periodic follow-up and the use of Carnoy's solution as a tool of solid scientific evidence in favor of the therapeutic success of this cystic lesion and the substantial minimization of potential recurrences.

CASE REPORT DESCRIPTION

A 16-year-old male patient attended the Oral pathology clinic of a of the Dentistry course at the Federal University of Uberlândia,complaining of a slowly growing swelling in the left side of his face at mandibular region with occasional symptoms painful.The anamnesis revealed that the patient had no comorbidities, and the extraoral physical examination showed an increase in volume on the left side of the mandible, with a hardened consistency and slightly sensitive to palpation, causing mild facial asymmetry. The intraoral evaluation identified an oral mucosa of normal coloration in the swollen area (Figures 1, 2, 3, 4 and 5).

For a better diagnostic evaluation, a panoramic radiograph of the patient was performed, revealing an extensive well-defined osteolytic, radiolucent, and unilocular image, approximately 5 cm in its largest diameter, causing thinning of the mandibular base. The lesion involved the mandibular body region, extending to the mandibular ramus and involving tooth 38. For better imaging detail and therapeutic planning, a cone-

Figure 1 - Patient at first consultation, showing volumetric change in the left mandibular region.

Figure 2 - There is a volumetric increase in the left mandible.

Figure 3 - Oral mucosa in the posterior region of the mandible, on the left side, showing normal coloration and the presence of mild edema.

Figure 4 - View of the panoramic image from a cone-beam computed tomography, showing the extent of the osteolytic lesion in the body region of the left mandible, unilocular, extending from tooth 36 to the area of tooth 38, which is presented as displaced superiorly in the mandibular ramus region.

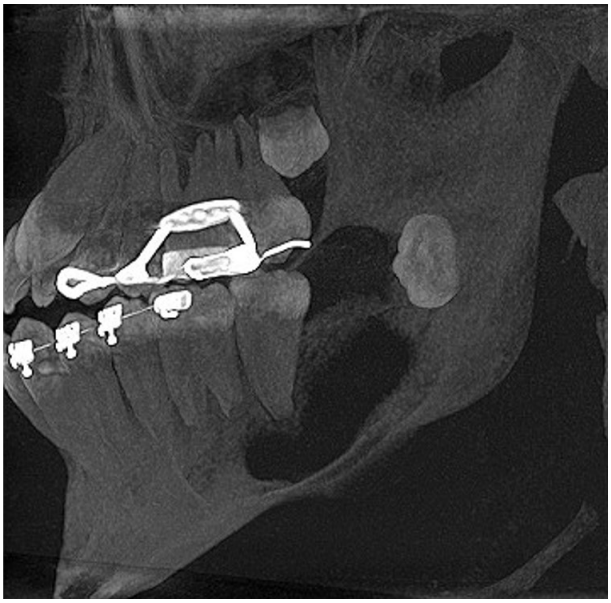

Figure 5 - Image obtained from a cone-beam CT scan, in a sagittal section, illustrating the lesion in it anteroposterior direction.

beam computed tomography was also performed, allowing the visualization of the lesion's expansion in both the buccal and lingual directions through multiplanar reconstructions in axial, coronal, and sagittal sections, as well as panoramic and 3D views (Figures 4, 5, 6 and 7).

Based on the clinical examination and complementary exams, such as the various sections of the cone-beam and helical CT scans, the diagnostic hypotheses considered in decreasing order of probability were Odontogenic Keratocyst, Dentigerous Cyst, Ameloblastic Fibroma, or Unicystic Ameloblastoma. Therefore, given the apparent absence of dental resorptions

of the involved elements and the considerable antero-posterior growth, the possibility of an Odontogenic Keratocyst was primarily suggested. Consequently, aspiration was performed in the area of the lesion, revealing a predominantly yellowish fluid content with whitish areas suggestive of keratin. At Therefore, an incisional biopsy was performed through curettage of the cystic capsule, and the histopathological examination result was consistent with an Odontogenic Keratocyst (Figures 8 and 9).

Given the extent of the lesion, at the same surgical time as the biopsy was performed, it was decided to proceed with the progressive decompression of the lesion through cystic marsupialization (Figures 10 and 11). The patient

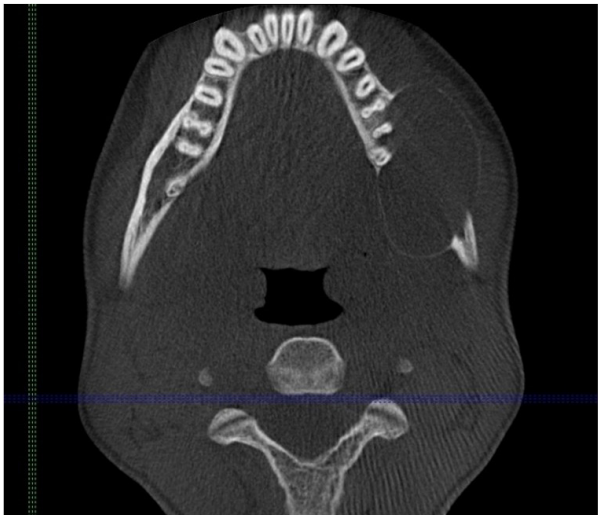

Figure 6 - Axial section of a helical CT scan showing a unilocular lesion, without septa or locules, with well-defined peripheral borders, affecting the left mandibular region, with ex- pansion of the lingual and buccal cortices. The lesion is observed in close contact with teeth 37 and 36.

Figure 7 - Coronal view, bone window, region of the mandibular first molars, showing a unilocular, radiolucent, homogeneous lesion, causing expansion of the buccal cortex of the mandible and displacement of the inferior alveolar neurovascular plexus to the basal region of the mandible, which is reduced in size.

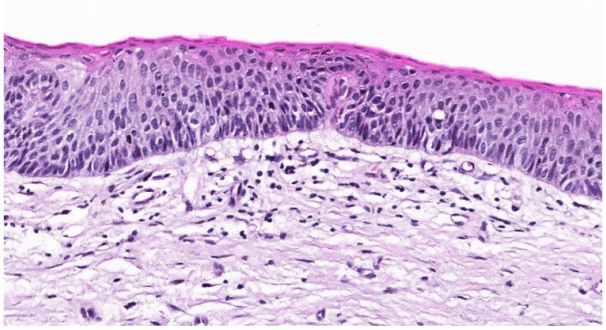

Figure 8 - Histopathological aspect of the lesion, demonstrating the parakeratinized stratified squamous lining epithelium characteristic of the OKC.

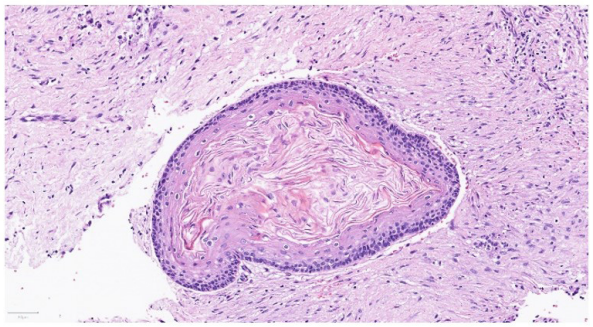

Figure 9 - Histopathological image illustrating areas suggestive of the presence of satellite cysts in the cystic capsule. (HE, 400X).

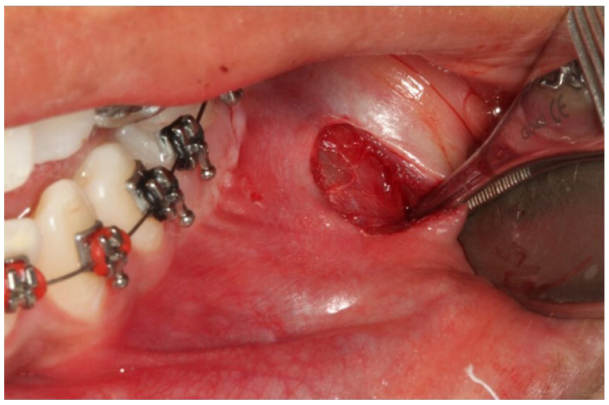

Figure 10 - Incisional biopsy obtained by inci- sion in the vestibular floor region near teeth 36 and 37, followed by mucoperiosteal flap elevation exposing the lateral surface of the body of the mandible.

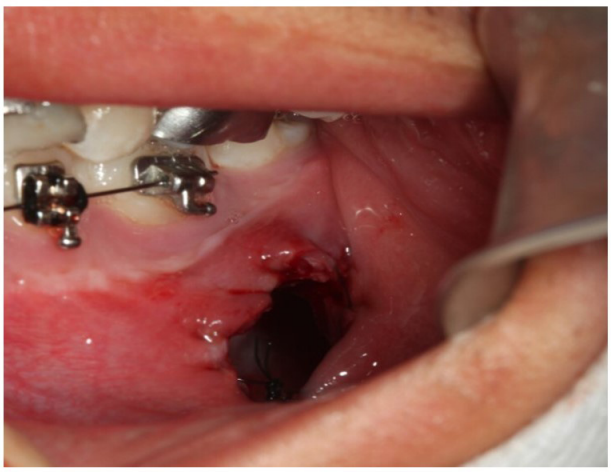

Figure 11 - Image demonstrating the area of marsupialization, with continuous suture to maintain the edges in position and ensure hemostasis.

was then instructed on the importance of proper daily hygiene of the cavity and the periodic monthly returns to the clinic for clinical and imaging follow-ups. During the follow-up visits, the patient showed some negligence with local care in the region of the lesion, and only after 1 year and 9 months from the decompressing procedure was it possible to perform the definitive enucleation of the lesion with additional curettage and extraction of tooth 38 (Figures 12 and 13).

Finally, the patient was reminded of the importance of periodic follow-up visits, through clinical examination and imaging of the lesion, which should be quarterly for the first two years due to its high potential for recurrence. Despite this, in the second year of follow-up, the patient and his family stopped attending the clinic and did not respond to attempts to reschedule appointments. Then, after 7 years from the cystic enucleation, the patient, now 23 years old, contacted the specialized service complaining of a new increase in volume in the left mandibular area, this time associated with fever and pain with the presence of pus. An antibiotic combination of Amoxicillin 500mg and Metronidazole 250mg for 7 days was then prescribed, and a new computed tomography exam was performed, which identified the existence of a large recurrent lesion, this time with a multiloculated appearance, approximately 8.5 cm in size, extending from the vicinity of the left mandibular notch to the apex of tooth 35 (Figures 15 to 17).

The patient underwent another aspiration and incisional biopsy, confirming the recurrence of a Keratocyst, and then a new marsupialization followed by monthly follow-up were scheduled (Figure 18). Eight months after marsupialization,

Figure 13 - Intraoperative view of the surgical wound suture during enucleation surgery.

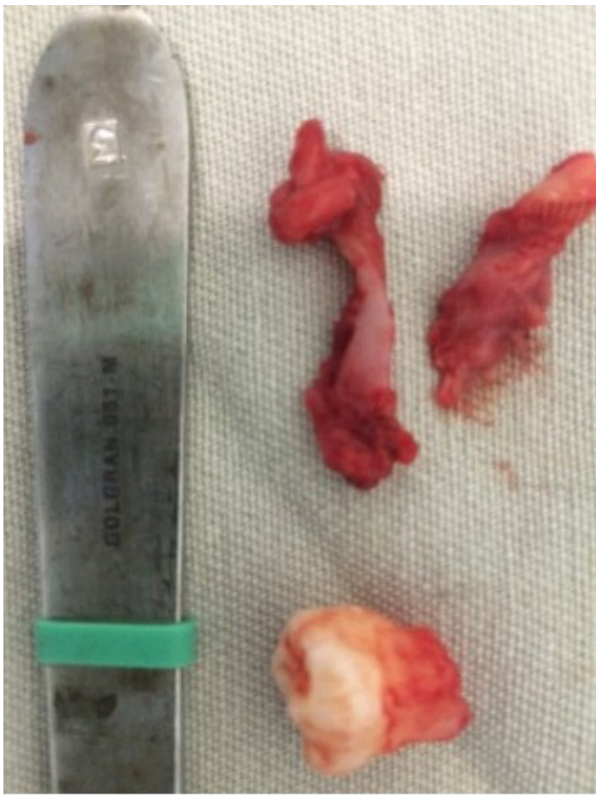

Figure 12 - After marsupialization, the surgery for enucleation of the lesion was performed, followed by curettage and extraction of tooth 38.

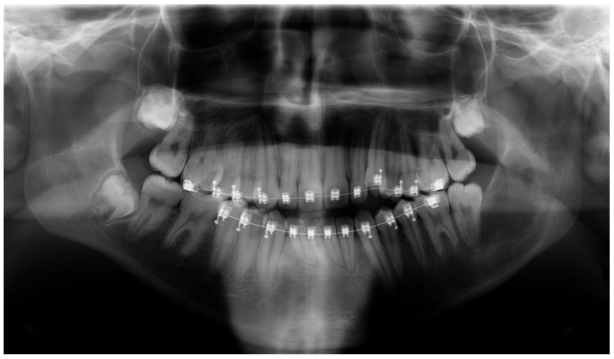

Figure 14 - Immediate postoperative panoramic radiograph.

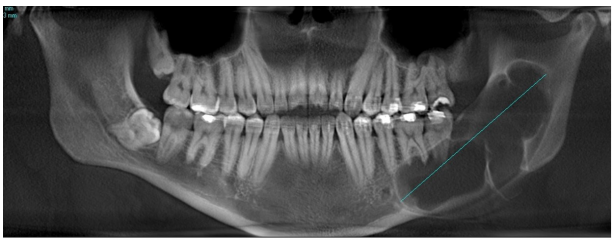

Figure 15 - Panoramic reconstruction obtained from cone-beam tomography illustrating the characteristics of the lesion's recurrence, noting radiographic changes such as: a shift from unilocular to multilocular lesion with lobulated peripheral borders, measuring up to 8.5 cm in its greatest extent.

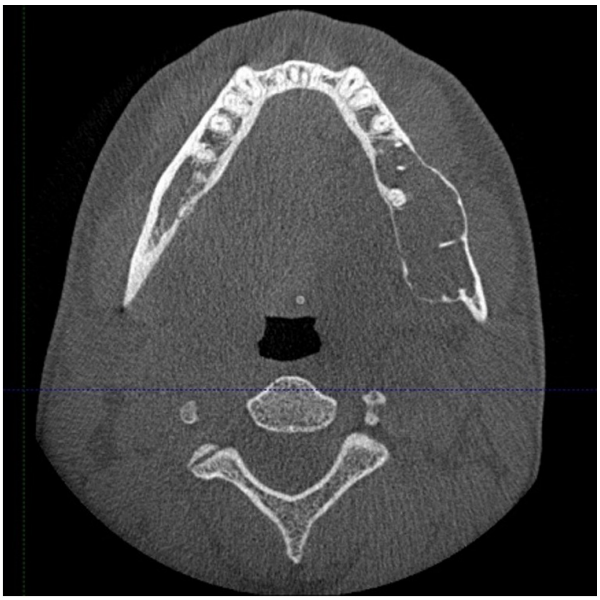

Figure 16 - Axial view of the helical tomography, bone window illustrating the expansion of bone cortices, anteroposterior extent, poorly defined borders, and primarily the peripheral lobu- lation and loculation within the lesion.

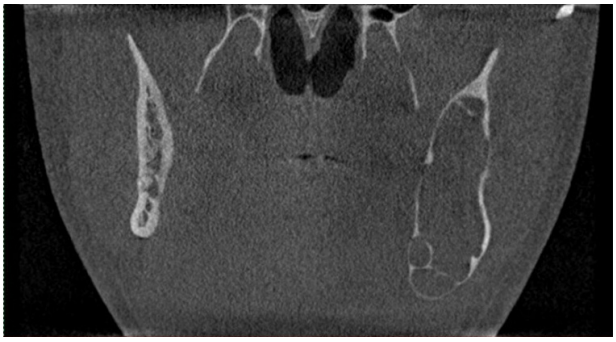

Figure 17 - Helical tomography in a coronal sec- tion, bone tissue window, shows lateromedial and superoinferior expansion as well as peripheral lobulation and loculation.

Figure 18 - Marsupialization.

and now with the patient's collaboration with the proposed treatment plan, as they were already in adulthood and attending appointments without family members, the lesion significantly reduced

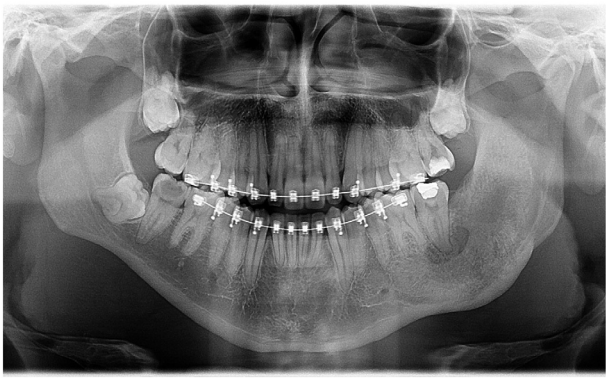

Figure 19 - Postoperative image of approximately 1 year.

in size, allowing for the planning of a new surgery. This time, the procedure involved cystic enucleation, curettage, and vigorous ostectomy in the surrounding lesion areas, complemented with the use of Carnoy's solution.

The patient has been under follow-up for a year now, aware of the need to attend periodic check-ups and without signs of new recurrence.

DISCUSSION

Odontogenic Keratocysts are developmental odontogenic cysts formed from the epithelial remnants of the dental lamina or from cells, which are usually found in the gingival tissue and alveolar bone. Among odontogenic cysts, they are relatively common lesions, and mutations in tumor suppressor genes, especially the PTCH1 gene, are present in a considerable percentage of cases. This is one of the factors that justify its controversial nature, sometimes presenting with typical cystic characteristics and sometimes with characteristics of a benign neoplasm. Its high recurrence rate, association with syndromic conditions (Gorlin-Goltz syndrome), and potential for significant antero-posterior growth also support the view of some scholars that the disease is closer to a benign neoplasm than to a cystic lesion [11]. However, in the 2017 World Health Organization classification of head and neck tumors, later ratified in the latest 2022 publication, the Odontogenic Keratocyst was again categorized among the developmental odontogenic cysts. In any case, the need for periodic and long-term follow-up, usually for more than 10 years, highlights the greater severity of this lesion compared to most other jaw cysts. Perhaps the only cyst with similar aggressiveness to this odontogenic cyst is the glandular odontogenic cyst [12,13].

A recurrence rate of 25-30% is reported in the literature for odontogenic keratocysts, indicating a high recurrence rate for a cystic lesion. Incomplete enucleations, usually hindered by a friable cystic capsule and the potential persistence of small satellite cysts, would explain these percentages. For this reason, the treatment of odontogenic keratocysts involves more aggressive therapies ranging from enucleations followed by curettage or osteotomies to surgical resections for larger and more aggressive lesions [13,14]. It's worth highlighting the literature foundation regarding the choice of performing the decompressive procedure of marsupialization for larger lesions. Therefore, these lesions not only respond positively to this decompressive procedure but also undergo metaplastic transformation of the epithelium, loss of keratin, and thickening of the cystic capsule, making the subsequent enucleation easier due to the dimensional regression of the lesion [15,16]. In the present case report, both at the initial diagnosis of the keratocyst and at the recurrence of the lesion, the patient underwent marsupialization which responded favorably, leading to a progressive decrease in the lesion's size, despite the patient's poor cooperation. The deficient hygiene of the lesion cavity resulting from marsupialization and the patient's failure to attend from the second year of follow-up post-enucleation, underscore how necessary it is for the team to have frank, enlightening, and sometimes repetitive dialogue with the adolescent patient and their family members about the seriousness of the lesion in question, its high potential for recurrence, and the undesirable consequences of a potential disappearance for the future prognosis of the disease. Especially considering individuals with lower educational levels and understanding, it falls upon the involved professionals to have the necessary sensitivity to perceive whether the communication was indeed effective and the information about the continuation of care was properly assimilated. The case in question seemingly reflects some failure in this professional-patient communication.

Despite the support for treatment through surgical resections of large keratocysts, the significant morbidity for patients undergoing this therapeutic modality has led many professionals to opt for enucleation followed by curettage or osteotomies [12]. And in order to make this more conservative treatment modality more efficient, the addition of Carnoy's solution has become an important resource in favor of a considerable decrease in the recurrence rates of the disease and exponential improvements in prognoses [17,18]. A mixture of 3ml of chloroform, 6ml of absolute ethanol, 1ml of acetic acid, and 1g of ferric chloride composes the so-called Carnoy's solution, which acts by promoting a chemical cauterization of the cystic lesion bed after its enucleation and curettage, by applying the medication to the bony defect of the lesion for about three minutes and subsequent irrigation with saline solution [18,19]. However, studies have shown that chloroform, a component of Carnoy's solution, is a potential carcinogen. In light of this, Carnoy's solution was modified by removing chloroform from its composition. Nevertheless, studies have indicated the low efficacy of the modified Carnoy's solution. A study conducted by Dashow et al. [20] compared the effects of Carnoy's solution versus modified Carnoy's solution and the recurrence of OKC when used as an adjunct treatment in the enucleation and simple curettage of OKC. The results showed that the recurrence rates were significantly higher in the group of patients who used the modified Carnoy's solution (35%) compared to the Carnoy's solution (10%). The literature has shown a new and effective adjunct treatment for the enucleation and curettage of OKC: the topical application of 5-fluorouracil. This agent is an antimetabolite frequently used to treat basal cell carcinoma (BCC). Since the PTCH gene is present in most cases of OKC, and neoplastic growth results from PTCH1 mutations that activate the Smoothened (SMO) and Sonic Hedgehog (SHH) pathways, it is believed that blocking SMO and SHH may be effective against the recurrence of OKC. 5-FU works by inhibiting the enzyme thymidylate synthase (TS), which influences DNA synthesis, leading to cell death. Therefore, 5-FU could be an alternative to the original Carnoy's solution and modified Carnoy's solution in the treatment of OKC [21].

Although surgical resection results in a lower recurrence rate of keratocysts (2%), therapeutic supplementation with the use of Carnoy's solution also allows for a relatively low recurrence (8%) combined with lower morbidity and higher quality of life for treated patients, provided that the solution's application time does not exceed five minutes, which could cause damage to adjacent nerve and vascular structures [19,22]. In the present case report, the initial treatment of the patient did not involve the use of Carnoy's solution due to a lack of supplies at

that time. Despite this, the patient's proper annual attendance at the reference service could have prevented the recurrent lesion from presenting with such exacerbated dimensions, which would facilitate new treatment. Fortunately, in treating the extensive recurrent lesion, the use of Carnoy's solution for three minutes was possible, and the patient continues without recurrences after the first-year post-enucleation and curettage with osteotomy, which necessitates that there be no absences from annual follow-ups for at least the next ten years.

CONCLUSION

The Odontogenic Keratocyst is a cyst that sometimes behaves in a challenging manner and may even resemble benign neoplasms. Given the high recurrence rate of the lesion and the long follow-up time required (over 10 years), it becomes mandatory to have clear and effective communication from professionals to patients and their families to ensure proper adherence to the follow-up over the years. Carnoy's solution is an absolutely essential therapeutic resource in the treatment of odontogenic keratocysts, as its use significantly reduces the potential recurrence of the disease.

Author's Contributions

JCGH: Writing – Original Draft Preparation, Writing – Review & Editing. KQS: Writing – Original Draft Preparation, Writing – Review & Editing. CAPP: Writing – Review & Editing. LBL: Review. LFBR: Writing – Review & Editing PRF: Writing – Review & Editing.

Conflict of Interest

The authors have no conflicts of interest to declare.

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Regulatory Statement

This study was conducted in accordance with all the provisions of the local human subjects oversight committee guidelines and policies: Free consent was signed by the patients.

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