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Clinical Case

Resective and Regenerative Surgical Treatment of a Dentigerous Cyst Associated with an Impacted Lower Canine with Transmigration: a Case Report

Tratamento Cirúrgico Ressectivo e Regenerativo de um Cisto Dentígero Associado a Canino Inferior Impactado com Transmigração: Relato de Caso

Tratamiento Quirúrgico Resectivo y Regenerativo de un Quiste Dentígero Asociado a un Canino Inferior Impactado con Transmigración: Reporte de Caso

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Abstract
To report the surgical management of a dentigerous cyst associated with a transmigrated mandibular canine using resective and regenerative techniques. A 28-year-old male presented with mandibular swelling, numbness, and pain. Imaging revealed a bone lesion associated with an impacted, transmigrated canine. Treatment included cyst decompression, enucleation, and guided bone regeneration (GBR) using biomaterials and a collagen membrane. Follow-up evaluations were conducted at 3, 6, and 12 months. Histopathology confirmed a dentigerous cyst. Post-operative healing was successful, with no recurrence, pain, or paresthesia. Radiographic evaluations showed significant bone repair and no signs of lesion recurrence. The combination of decompression, enucleation, and GBR effectively treated this rare case, minimizing bone defects and ensuring favorable outcomes. This approach is recommended for similar cases.
Descriptors: Dentigerous Cyst; Transmigrated Lower Canine; Guided Bone Regeneration (GBR); Resective and Regenerative Surgical Techniques.
Resumo
Relatar o manejo cirúrgico de um cisto dentígero associado a um canino mandibular transmigrado, utilizando técnicas ressectivas e regenerativas. Um paciente do sexo masculino, de 28 anos, apresentou-se com aumento de volume mandibular, dormência e dor. Os exames de imagem revelaram uma lesão óssea associada a um canino impactado e transmigrado. O tratamento incluiu descompressão do cisto, enucleação e regeneração óssea guiada (ROG) com uso de biomateriais e membrana de colágeno. Avaliações de acompanhamento foram realizadas aos 3, 6 e 12 meses. O exame histopatológico confirmou tratar-se de um cisto dentígero. A cicatrização pós-operatória foi bem-sucedida, sem recorrência, dor ou parestesia. As avaliações radiográficas mostraram reparo ósseo significativo e ausência de sinais de recidiva da lesão. A combinação de descompressão, enucleação e ROG tratou eficazmente este caso raro, minimizando defeitos ósseos e garantindo desfechos favoráveis. Esta abordagem é recomendada para casos semelhantes.
Descritores: Cisto Dentígero; Canino Inferior Transmigrado; Regeneração Óssea Guiada (ROG); Técnicas Cirúrgicas Ressectivas e Regenerativas.
Resumen
Informar el manejo quirúrgico de un quiste dentígero asociado a un canino mandibular transmigrado, utilizando técnicas resectivas y regenerativas. Un paciente masculino de 28 años se presentó con hinchazón mandibular, entumecimiento y dolor. Las imágenes revelaron una lesión ósea asociada a un canino impactado y transmigrado. El tratamiento incluyó la descompresión del quiste, enucleación y regeneración ósea guiada (ROG) con biomateriales y una membrana de colágeno. Se realizaron evaluaciones de seguimiento a los 3, 6 y 12 meses. La histopatología confirmó un quiste dentígero. La cicatrización postoperatoria fue exitosa, sin recurrencia, dolor ni parestesia. Las evaluaciones radiográficas mostraron una reparación ósea significativa y sin signos de recurrencia de la lesión. La combinación de descompresión, enucleación y ROG trató eficazmente este caso raro, minimizando defectos óseos y asegurando resultados favorables. Se recomienda este enfoque para casos similares.
Descriptores: Quiste Dentígero; Canino Inferior Transmigrado; Regeneración Ósea Guiada (ROG); Técnicas Quirúrgicas Resectivas y Regenerativas.

INTRODUCTION

The first report of tooth transmigration occurred in 1951[1], and as defined by Tarsitano et al.[2], tooth transmigration is characterized by a

phenomenon of displacement and migration of the unerupted tooth across the midline, being almost exclusively reported in mandibular permanent canines[1]. Although canine impaction is more prevalent in the maxilla (1.7%-4.7%) than in the mandible (0.008%-1.29%), transmigration is more common in the lower canine[1,3]. This anomaly is considered rare[4,5], with a reported prevalence of transmigration in permanent mandibular canines of 0.12%-0.98%[3].

Transmigrated canines are usually asymptomatic and incidental findings on imaging tests. However, due to the pressure it can generate on adjacent teeth, root resorption and tooth movement or even neuralgic symptoms can occur, in addition to the aesthetic complaint generated by the missing transmigrated tooth, which means that they are usually discovered by orthodontists[6,7], presenting clinical relevance and a challenge for these professionals.

The etiology still remains uncertain, as there are a limited number of studies on this aspect. In reviews on the subject, suggested causes have included abnormal displacement of the dental lamina during embryonic life, hereditary factors, malfunctioning of the endocrine glands, crowding in the mandibular dental arch, buccal inclination of the mandibular incisors, traumatic fracture of the mandible near the site of eruption of the mandibular canine and other local factors such as odontomas, cysts and shape anomalies of adjacent teeth[3,8].

Over the years, a number of therapeutic options have been reported in the literature for the treatment of this condition, which include: radiographic monitoring, surgical extraction, orthodontic traction or autotransplantation; and surgical extraction has proved to be the most prevalent of these approaches[3,8]. It is therefore a choice related to the particularity of each case and each surgeon, and may also be appropriate when associated with a cyst in need of marsupialization or enucleation. The formation of a dentigerous cyst is one of the most common complications of mandibular canine impaction, in addition to root resorption of the adjacent tooth and displacement of the lateral incisor[3].

Among the cysts associated with transmigration, we highlight the dentigerous cyst, which is an odontogenic cyst associated with the crown of a retained, impacted or unerupted tooth, whose pathogenesis has not yet been fully elucidated. It is believed that it develops from the accumulation of fluid between the reduced enamel epithelium and the crown of an impacted tooth, joining cyst and tooth through the amelocementary junction[9,10]. Generally, radiographically, it is seen as a unilocular radiolucent area associated with the crown of an impacted tooth, with slight variations depending on the extent or associated secondary infections[9].

This cyst can be associated with any included tooth, mostly in the permanent dentition. However, it is most prevalent in mandibular third molars, followed by canines and maxillary third molars. Dentigerous cysts associated with unerupted mandibular canines are less common[6]. Despite being associated with a wide age range, they are usually diagnosed between 10 and 30 years of age as incidental findings in periodic imaging or in exams to assess the lack of eruption of a tooth[9]. This is because, in most cases, it is asymptomatic with slow progression. Occasionally this cyst can grow to the point of causing cortical expansion. In this case, it may be accompanied by pain, facial asymmetry, paresthesia or even pathological fracture[9-13]. Thus, treatment can vary according to clinical characteristics. It is more common to opt for enucleation associated with tooth extraction, but in more extensive cysts, marsupialization can provide better results, as it promotes decompression of the cyst, reducing its size and enabling safer removal with a subsequent, less extensive surgical procedure[9,14].

Canines are important for aesthetics and functional occlusion, and disocclusion by canine guidance is one of the goals of orthodontic treatment in the permanent dentition. Thus, the transmigration of an included mandibular canine is a rare developmental disorder that represents a clinical concern and a challenge for orthodontists and surgeons. And the presence of an asymptomatic cystic lesion highlights the importance of imaging tests for diagnosing and planning the treatment of this pathological condition. Therefore, the aim of this study is to report a rare case of a dentigerous cyst in a mandibular canine with transmigration, demonstrating its clinical-imaging aspect and the combination of resective and regenerative surgical techniques for treating this alteration.

CASE REPORT

This manuscript is a descriptive qualitative case report, combined with a brief review of the literature, which provides relevant data on the characteristics, etiology and treatment of a dentigerous cyst associated with transmigration of an included canine in the mandible. The patient attended the Oral and Maxillofacial Surgery and Traumatology clinic at the “Júlio de Mesquita Filho” São Paulo State University of Araçatuba School of Dentistry (FOA-UNESP) and authorized the diagnosis and execution of the treatment, signing the informed consent form (ICF)[15].

A 28-year-old male patient with leukoderma came to the Oral and Maxillofacial Surgery and Traumatology clinic at FOA-UNESP, reporting that 20 days ago he had noticed swelling in the lower third of his face on the right side, associated with

intense pain and paresthesia in the area. During the consultation and anamnesis, the patient denied any systemic comorbidities, allergies, continuous medication, addictions or smoking. A detailed extraoral and intraoral clinical examination revealed a slight increase in volume at the bottom of the mandibular vestibule on the right, near the posterior teeth, similar in color to the mucosa and soft on palpation. Panoramic radiography (Figure 1A) showed a unilocular, circumscribed radiolucent bone lesion with well-defined boundaries and radiopaque margins, associated with the crown of the canine tooth (tooth 33) with Type 4 transmigration[16]. The lesion was located below the mental foramen and close to the apex of teeth 46, 45 and 44, and caused a slight change in the thickness of the lower cortical bone of the mandible. Due to its proximity to the inferior alveolar nerve and the mentonian foramen, a cone beam computed tomography (CBCT) scan of the mandible was requested for a better imaging assessment (Figures 1B to 1G). In the tomographic reconstruction in the coronal plane, it was possible to observe the displacement and compression of the inferior alveolar nerve towards the lingual region, justifying the probable cause of the paresthesia in the region (Figures 1B to 1E). The expansion of the vestibular cortex, as well as the thinning and rupture of the vestibular and lingual cortices can be identified in the coronal and axial reconstruction (Figures 1B,1C,1D,1F), suggesting bone resorption due to compression, a probable area of mandibular fragility and a risk of pathological fracture due to the extent of the lesion. The sagittal reconstruction shows the involvement of the dental crown of tooth 33 by the cystic lesion, joined at the amelocementary junction, with thinning of the lower cortical bone of the mandible and extending to the apex of the roots of tooth 45 and mesial root of tooth 46 (Figure 1G).

After detailed analysis of the imaging tests and correlation with the clinical findings, the diagnostic hypothesis of dentigerous cyst was established for this lesion. The initial course of action was incisional biopsy to define the diagnosis and cystic decompression to minimize the possibility of pathological fracture and irreversible damage to anatomical structures, which could cause permanent paresthesia.

In order to perform the incisional biopsy and adapt the decompression device, the operative field was antiseptically cleaned and the mentonian nerve was regionally anesthetized, complemented by infiltrative terminal anesthesia deep in the mandibular vestibule, using 2% mepivacaine hydrochloride solution with 1:100,000 adrenaline. Subsequently, an ellipse incision was made near the apex of tooth 46, locating the area of bone fenestration in the vestibular region, allowing the collection of material for the biopsy and access to the interior of the cystic cavity (Figure 2A and 2B). After collecting the material, the specimens were sent to the histopathology laboratory at the FOA-UNESP, and an adapted latex device was introduced into the cystic cavity and fixed using simple stitches with 5-0 nylon thread (Figure 2C), promoting decompression. At the end of the procedure, the patient was prescribed antibiotic therapy (amoxicillin 500mg) every 8 hours for 7 days and analgesics (dipyrone 500mg) every 4 hours if there was pain.

The patient remained with the decompression device for 4 months, irrigated twice a day with 0.9% saline solution, and reported no paresthesia or pain in the immediate postoperative period. After the decompression period and confirmation of the diagnosis of dentigerous cyst (Figure 2D), cystic enucleation and extraction of the transmigrated canine were indicated.

In a second surgical phase, the operative field was antiseptically cleaned and regional anesthesia of the inferior alveolar nerve and mentonian nerve on the right side was performed, as well as infiltrative anesthesia in the mandibular vestibule, using a 2% mepivacaine hydrochloride solution with 1:100,000 adrenaline. Next, the cystic decompression device was removed (Figures 3A and 3B) and a low biangular incision was made, using a nº15 scalpel blade, the mentonian nerve was carefully dissected (Figure 3C), allowing the flap to be folded back and the cystic cavity and the transmigrated impacted tooth to be visualized. Using levers and a discreet osteotomy, the transmigrated canine was removed, the cystic capsule was completely enucleated (Figure 3D) and the entire cavity was irrigated with Gentamicin 80mg/ml diluted in 500ml of 0.9% saline solution. After observing the dimensions of the bone defect and thinking about minimizing the risk of flap dehiscence, a guided bone regeneration (GBR) procedure was performed. In this regenerative procedure, in which a bone substitute based on biphasic calcium phosphate (Nanosynt®) and bovine collagen membrane (Lumina Coat®) were used, a framework was formed for bone neoformation, without interference from soft tissue proliferation (Figure 3E and 3F). The flap was then repositioned and sutured with simple interrupted stitches using 5-0 nylon thread (Figure 3G). The patient was instructed on post-operative care and was prescribed antibiotic therapy (amoxicillin 500mg) every 8 hours for 7 days, anti-inflammatories (ibuprofen 600mg) every 8 hours for 3 days and analgesics (dipyrone 500mg) every 4 hours if there was pain. Seven days after the operation, the sutures were in place and had a good scar appearance, with no signs of infection or dehiscence (Figure 3H), and were removed.

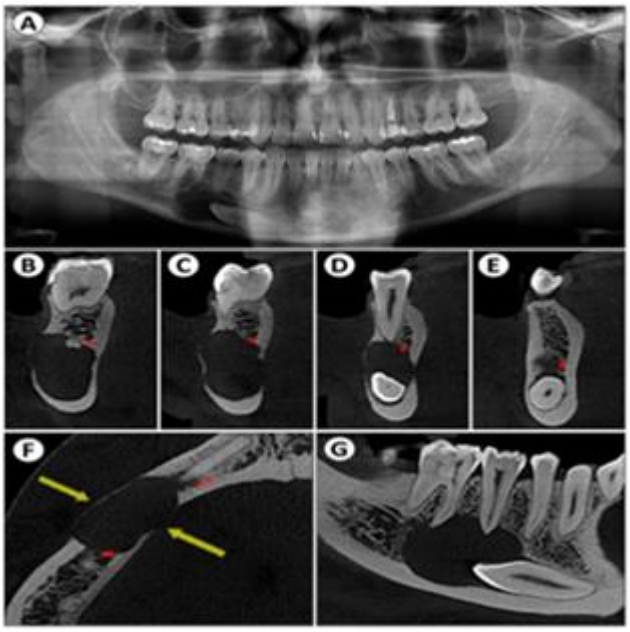

Figure 1. A - Preoperative imaging exam. Panoramic radiograph. **B, C, D and E -** Cone beam computed tomography, coronal plane. **F -** Cone beam computed tomography, axial plane. **G -** Cone beam computed tomography, sagittal plane. **Symbols:** red, inferior alveolar nerve; yellow arrow, vestibular cortical expansion and lingual cortical disruption.

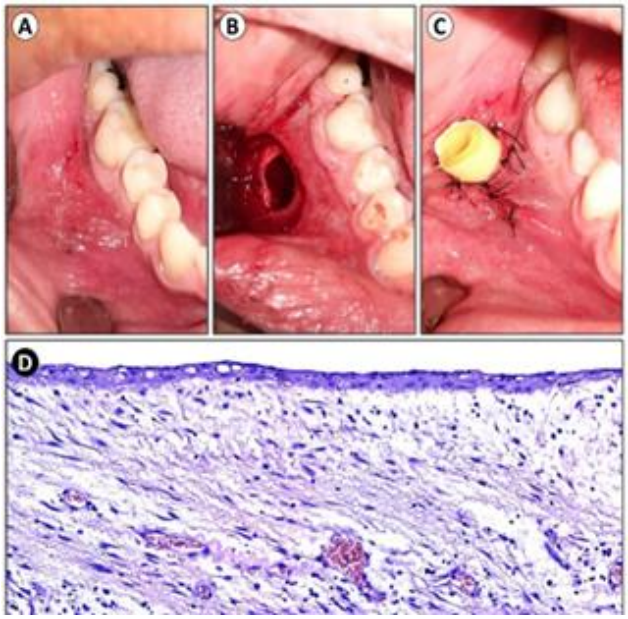

Figure 2. Cystic decompression and histopathological analysis. **A -** Initial clinical appearance. B - Ellipse incision and visualization of the bone fenestration. **C -** Adaptation of the cyst decompression device. **D -** Photomicrograph of histopathological analysis of dentigerous cyst x200 magnification.

In a two-week postoperative outpatient follow-up, the panoramic radiograph (Figure 4A) showed complete cystic enucleation and exodontia of the included canine, as well as correct deposition of the grafted material. The patient returned 6 months after surgery, and the panoramic radiograph (Figure 4B) showed incorporation of the grafted material and a radiopaque area in the region of the surgical site, suggesting new bone formation in the area. Since then, the patient has been followed for a year without any recurrence of the lesion, pain or paresthesia.

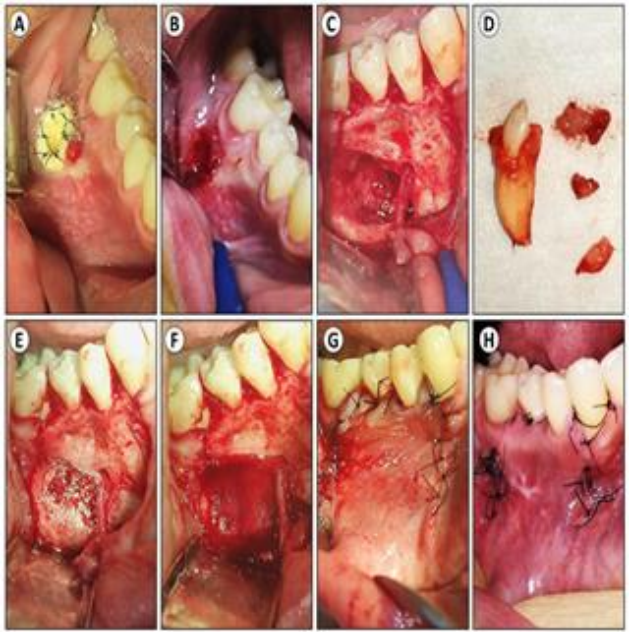

Figure 3. Surgical procedure for exodontia of impacted canine with transmigration, cystic enucleation and guided bone regeneration. **A -** Cystic decompression device in position. **B -** Removal of the cystic decompression. **C -** Flap flap. **D -** Exodontia of the included canine with transmigration and cystic enucleation. **E -** Filling of the bone defect with biphasic calcium phosphate (Nanosynt®). **F -** Fitting of the bovine collagen membrane (Lumina Coat®). **G -**Repositioning of the flap with 5-0 nylon thread. **H -** Post-operative aspect at 7 days.

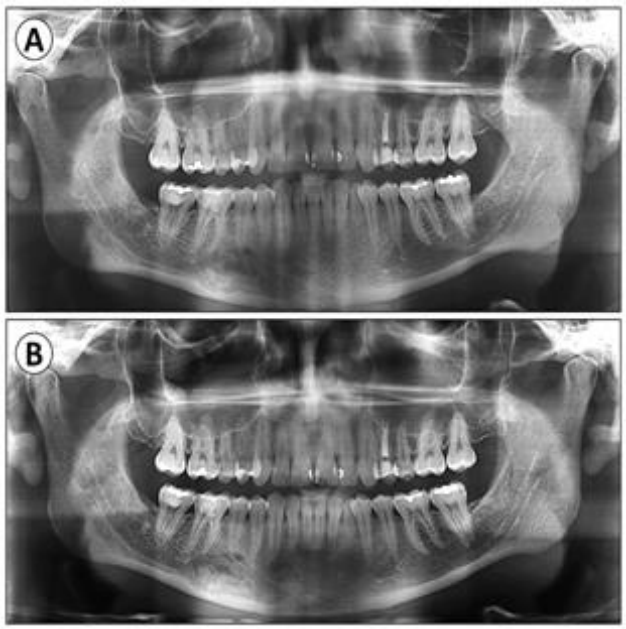

Figure 4. Radiographic follow-up. **A -** Postoperative panoramic radiograph at 14 days. **B -** Postoperative panoramic radiograph at 6 months.

DISCUSSION

Dental transmigration is a rare event and its etiology is not yet fully understood. The rarity of the reported case of transmigration of an impacted lower canine in a male patient is demonstrated in the literature, where the prevalence of impaction and transmigration of the lower canine is 0.008%-1.29% and 0.12% to 0.98%, respectively. A slight predominance in women (55.4%) has been reported[3]. In the present clinical case, retention of

the deciduous canine was observed, which is attributed as one of the causal factors of dental transmigration. Anterior tooth crowding and absences and prolonged tooth retention should be investigated, as they may be related to dental pathologies. This justifies the high percentage of diagnoses made by orthodontists, since these patients tend to seek out this specialty more in order to understand the changes they see in their mouths when compared to patients with normal occlusion[3]. However, in the vast majority of cases, the diagnosis is late, when the dental element has usually already completed the process of rhizogenesis. In the case reported here, the patient was 28 years old and there was evidence of a transmigrated mandibular canine that was already fully formed and in an unfavorable position, so orthodontic treatment would not be a viable form of treatment. We therefore encourage radiographic assessment during the mixed dentition in order to obtain a more accurate diagnosis[17].

In an attempt to improve communication between dental surgeons and create a means of classifying the transmigration of mandibular canines, Mupparapu[16] observed five distinct patterns, which he classified as Type 1, Type 2, Type 3, Type 4 and Type 5. This classification takes into account the inclination of the long axis of the canine, the relationship of the canine to the midline, other adjacent anterior teeth and the contralateral canine. In the systematic review carried out by Sathyanarayana et al.[3], when evaluating studies that used this classification of transmigration[16], it was found that Type 4 (zero-13.3%) and Type 5 (zero-12.5%) were the least common. In the case in question, the classification is Type 4, in which the impacted canine was observed in a horizontal position, close to the lower edge of the mandible, below the premolars on the contralateral side. In addition, the presence of an associated cystic lesion led us to opt for decompression, followed by excision of the lesion and tooth extraction. When evaluating the treatment of 119 impacted canines with transmigration, Sathyanarayana et al.[3] found that the canine was extracted in 46.7% of cases, and the authors assumed that the position of the impacted canine was unfavorable in most cases (71.4%), as in the case reported here.

The etiological factors most commonly related to mandibular canine transmigration are dental crowding (6.7%-74.5%), followed by retention of the deciduous canine (4.8%-61.3%) and the presence of an odontoma or cyst (8.5%-29.41%)[3]. In the clinical case reported, the patient had a cystic lesion associated with the canine tooth with transmigration, with the diagnosis of dentigerous cyst. The treatment of dentigerous cysts varies according to the size of the lesion, the age of the patient and the relationship with adjacent anatomical structures. The most commonly used therapeutic modalities include marsupialization, decompression and enucleation[17]. Marsupialization is indicated for large cysts or those in close proximity to important anatomical structures, allowing for gradual reduction of the cyst and minimizing the risk of damage[14]. Enucleation is preferable for smaller cysts, allowing the lesion to be completely removed in a single procedure[18]. The choice of technique should consider factors such as the potential for bone regeneration, the preservation of adjacent teeth and minimizing complications. Thus, CBCT scanning in this case allowed a better assessment of the relationship between the included tooth-lesion and the adjacent anatomical structures for proper surgical planning and has been considered important for diagnosis[3].

In the case of the patient being treated, we initially opted for marsupialization of the dentigerous cyst associated with the included canine, with the aim of reducing the size of the lesion and relieving intracystic pressure. After four months, the cyst was enucleated together with the extraction of the canine tooth. This sequential approach allowed for a controlled reduction of the lesion, facilitating definitive surgical removal and reducing the risk of complications, such as damage to nearby anatomical structures. The literature supports this strategy, especially in cases of extensive cysts or those located in critical áreas[14].

Guided bone regeneration (GBR) is a surgical technique widely used to treat significant bone defects, including those resulting from the removal of large odontogenic cysts, such as dentigerous cysts. GBR uses membranes to cover and protect the bone defect, preventing the invasion of non-osteogenic tissues and promoting bone neoformation. This approach is especially indicated in cases where bone loss compromises the structural and functional integrity of the affected region, facilitating the patient's rehabilitation and recovery[19,20]. In the clinical case presented, the application of GBR at the same surgical time as enucleation and exodontia was a decision based on the need to promote bone regeneration in the area of the resulting defect. The literature indicates that the use of membranes in GBR prevents the invasion of non-osteogenic tissues, favoring the formation of new bone tissue and restoring local anatomy. In addition, the use of GBR after enucleation of cysts can shorten the time of osteogenesis and increase the amount of bone neoformation[21], and these events are highly desirable in order to avoid pathological fractures. Thus, this approach is effective in the rehabilitation of significant bone defects, contributing to the functional and aesthetic recovery of the affected region[22].

In short, early diagnosis provides better possibilities for dental and anatomical preservation. In the mixed dentition, this allows for orthodontic treatment and dental preservation. In addition, the importance of preparing the dental surgeon to recognize and treat pathological lesions affecting the face is highlighted. Careful surgical planning before any intervention is essential. Currently, new surgical techniques enable satisfactory and increasingly safe results for the patient, such as the case of cystic decompression associated with GBR, which has numerous advantages and good cost-benefit when well indicated.

Finally, more studies on the pathophysiology of tooth transmigration are needed to better understand the pathology, as well as the possibility of preventing it, given the aesthetic and consequently psychological damage to the patient.

CONCLUSION

It was concluded that the use of CBCT in the diagnosis of the rare case of a dentigerous cyst in an included lower canine with transmigration was essential for the treatment definition. The combination of surgical techniques of decompression, enucleation, exodontia and guided bone regeneration allowed for adequate healing of the soft tissues and favorable bone repair, which remained stable over time.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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