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CASE REPORT

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Imaging aspects of dentigerous cyst through magnetic resonance imaging and ultrasound

Aspectos imaginológicos do cisto dentígero por meio de ressonância magnética e ultrassonografia

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ABSTRACT

Magnetic resonance imaging (MRI) is a type of imaging examination considered as gold standard in the analysis of the internal structure and content of intra-osseous lesions. Because of the inherent characteristics of acquisition, MRI allows determining the nature and differential diagnosis among alterations that have aspects similar to those of other imaging modalities, such as radiographs and computed tomography (CT). Moreover, MRI main advantage is to be a non-invasive method, because it does not use ionizing radiation. Both ultrasound (US) and MRI provides images without showing deleterious effects to living organisms, enabling the differentiation between solid and cystic lesions, but US lacks to provide comprehensive anatomical detail and information about the chemical composition of the lesions as MRI, which would be crucial in determining the lesion diagnosis. This paper reports the clinical case of a child exhibiting dentigerous cyst along the whole extension of the right maxillary sinus with extensive tooth displacement, aiming to emphasize the use of both MRI and US in the diagnosis of dentomaxillofacial lesions.

KEYWORDS

Magnetic resonance imaging; Ultrasonography; Dentigerous cyst.

RESUMO

A Ressonância Magnética (RM) é uma modalidade de exame por imagem considerada padrão ouro na análise da estrutura e do conteúdo interno das lesões intraósseas, possibilitando, por suas características inerentes de aquisição, determinar a natureza e o diagnóstico diferencial entre alterações que possuam aspectos similares em outras modalidades de imagem, como por exemplo em radiografias e tomografia computadorizada (TC), além de possuir a grande vantagem de não ser um método invasivo, uma vez que não utiliza radiações ionizantes. A Ultrassonografia (US), assim como a RM, fornece imagens sem apresentar efeitos deletérios aos organismos vivos, possibilitando a diferenciação entre lesões sólidas e císticas, porém, não possui a capacidade da RM em fornecer um detalhamento anatômico apurado, e nem informações sobre a composição química das lesões, o que seria fundamental na determinação do diagnóstico das mesmas. O presente trabalho expõe o caso clínico de uma criança, que apresentou um cisto dentígero em toda extensão do seio maxilar direito com amplo deslocamento dentário, em que se objetivou enfatizar o uso da RM e US no diagnóstico de lesões dentomaxilofaciais.

PALAVRAS-CHAVE

Imagem por ressonância magnética ; Ultrassonografia; Cisto dentígero.

INTRODUCTION

Both maxilla and mandible are usual anatomical sites for developing the so-called odontogenic lesions. Because of the large variability of odontogenic lesion manifestations the diagnosis is extremely complex [1,2]. Conventional radiographs and computed tomography (CT) has an important role in detecting, treating and following-up these lesions, but the routinely use of ionizing radiation emitting devices has been associated to deleterious effects in living organisms [3].

Magnetic resonance (MR) provides an excellent soft tissue contrast and high sensitivity to detect alterations (i.e., swelling and inflammatory process), and is a very effective imaging examination to visualize pathologic processes in both maxilla and mandible, such as: intra-osseous pathologies, periapical lesions, inflammatory periodontal disease, and loss of vascularization of teeth after traumas [3,4].

Because of the soft tissue contrast, MR is useful to diagnosis soft tissue cysts. Some authors have previously reported MR utility, including the improved contrast dynamics for the differential diagnosis of odontogenic cysts and tumors. Panoramic radiograph and computed tomography (CT) can be employed to detect bone structures. However, the efficacy of these imaging methods in evaluating odontogenic cysts and tumors is lower than that of MR. Indeed, both panoramic radiograph and CT examines the bone involved in the lesion, while MR enables significantly valuing of its content [5].

On the other hand, MR of buccomaxillofacial complex is technically challenging because maxillary and mandibular bone structures provide inherent and specific imaging aspects depending on not only the lesion content, but also on the parameters used to obtain the images, which result in images characterized by hypo or hyper signal of the lesion, allowing the comparative evaluation and characterization of the components of a given pathology [5,6].

MR images do not employ ionizing radiation and do provide excellent soft tissue contrast, which is important to study the differences between normal and abnormal tissues [7,8]. In this context, ultrasound (US) is also a non-invasive examination important to evaluate the solid components of maxillary and mandibular cystic lesions [9].

Recent studies have emphasized the potential US applications for evaluation of periodontium and study of temporomandibular joint (TMJ). Notwithstanding, few studies reported the role of US examination in diagnosing maxillary and mandibular bone lesions, describing the imaging aspects of the lesions, especially for Color Doppler Ultrasound [10,11]. It is worth noting that although US images is largely employed in medicine, this imaging examination use is very restricted to evaluate soft tissues in Dentistry [11].

US may aid in the differential diagnosis between cysts and granulomas, reveling the content nature of determined bone lesion. US is based on the evaluation of echoes reverberated from the interface between two different tissues having different acoustic properties. The hypoechoic area exhibits low intensity echo; the anechoic area has no reverberation, that is, any area filled by fluids; the hyperechoic area shows high intensity echo. Moreover, Doppler US provides information on the presence, direction and speed of the blood flow inside the lesion. US main disadvantage is that it can be only used if a bone defect is on the lesion, so that the ultrasound waves can pass. To date, few studies are available to validate US use in diagnosing odontogenic lesions [12].

The aim of this present study was to emphasize MR and US use in diagnosing dentomaxillofacial lesions by describing a clinical case of dentigerous cyst in which these imaging examinations were employed as complementary examinations

CASE REPORT

A male patient aged 10 years was referred to take a panoramic radiograph (Figure 1) to evaluate the presence of swelling and pain in the right maxillary area. Panoramic radiographic revealed the presence of a radiolucent, circumscribed, unilocular lesion along the whole right maxillary sinus involving the right maxillary second pre-molar (#15) which was not erupted and displaced towards the ipsilateral maxillary tuberosity, also promoting the displacement of tooth germs of right permanent canine (#13), first pre-molar (#14), and second molar (#17) and the bulging of the limits of the right nasal fossa.

RM and US examinations were carried out as auxiliary tools for planning the surgical excision of all lesions. MR device Sigma 1.5 Tesla (General Electric, Milwaukee, USA), equipped with skull coil provided images at different anatomical cuts (axial, coronal and sagittal), weighted at T1 and T2 – showing a lesion with precise limits along the whole right maxillary sinus, with expansion of the cortical bone (Figures 2 - 4). The weighted images at T1 evidenced the internal content of the lesion showing intermediate signal, while those weighted at T2 exhibited a hyper signal content of liquid nature (cystic content) enabling the differential diagnosis of solid tumor lesion (i.e., conventional solid ameloblastoma, adenomatoid odontogenic tumor). Also, both the bulging and thinning of cortical bone of the lesion was observed (Figures 2 - 4).

US images revealed the expansive formation of insufflating character, anechoic, of regular contours and well-defined limits, with internal echoes, characterizing the presence of possible cholesterol crystals, measuring approximately 4.5 x 2.99 cm (volume: 19.2 cm^3), determining significant compression/ uncertainty of the lateral and inferior walls of the adjacent maxillary sinus and reduction of the size of the adjacent nasal fossa without signals of cortical bone rupture (Figure 5, 6).

Both MR and US did not exhibit signs of vascularization inside or surrounding the examined tissue.

The anatomopathological examination reported histological cuts of fragments of cystic capsule partially covered by stratified squamous epithelial tissue with little cell layers. The cystic capsule was constituted by either loose or dense conjunctive tissue presenting lymphoplasmacytic inflammatory process. Hemorrhagic areas and fragments of bone tissue were also reported. The final diagnosis was of dentigerous cyst.

Figure 1 - Panoramic radiograph

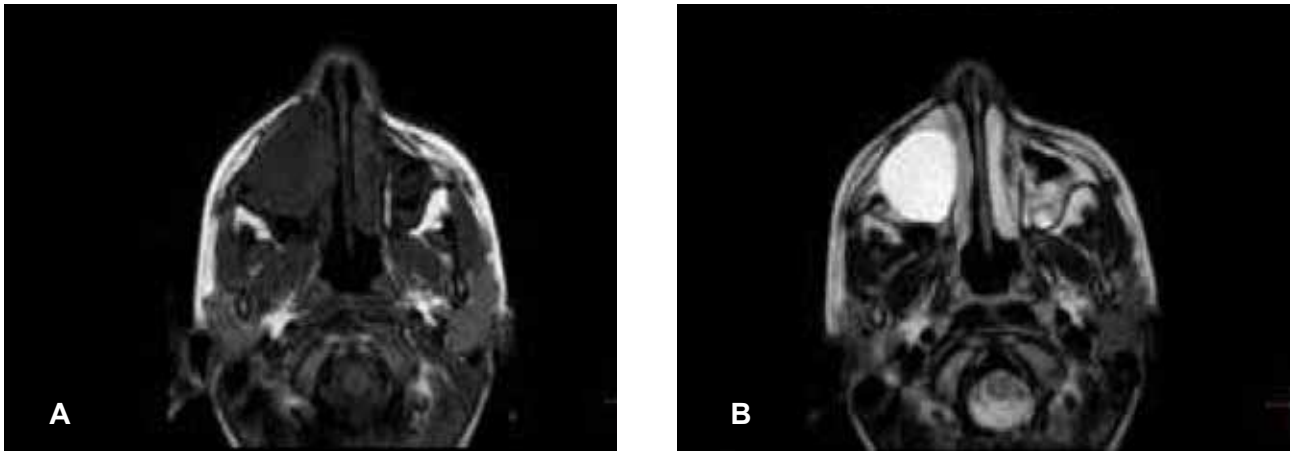

Figure 2 - MR axial images (A) T1; (B) T2;. Note the presence of intermediate-signal mass occupying the whole right maxillary sinus extension compromising its mesial wall consequently occupying the ipsilateral nasal cavity. Observe the lesion signal increasing on the umage welghted at T2, suggesting the aqueous (cystic) content.

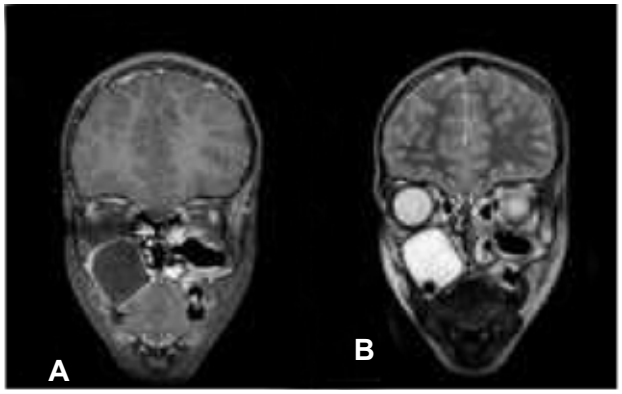

Figure 3 - MR coronal images: (A) T1; (B) T2. Note the mass with same characteristics as those described in figure 2, of expansive and invasive aspect and precise limits.

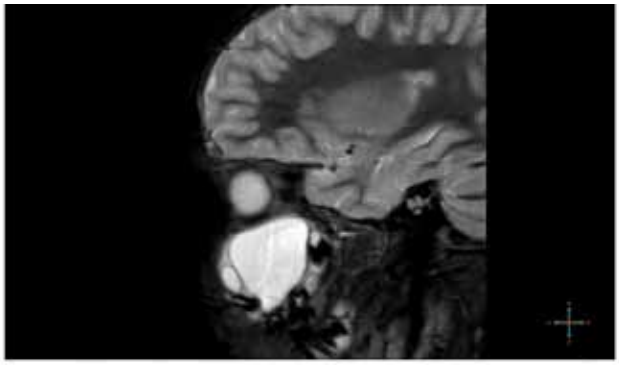

Figure 4 - SAGITAL IMAGE: evidencing the lesson dimension at anterior-posterior and superior-inferior directions.

Figure 5 - US Doppler images evidencing the anechoic content of the lesion within the right maxillary sinus and the presence of images characterized by sparse echogenic internal content (cholesterol crystals) (arrows).

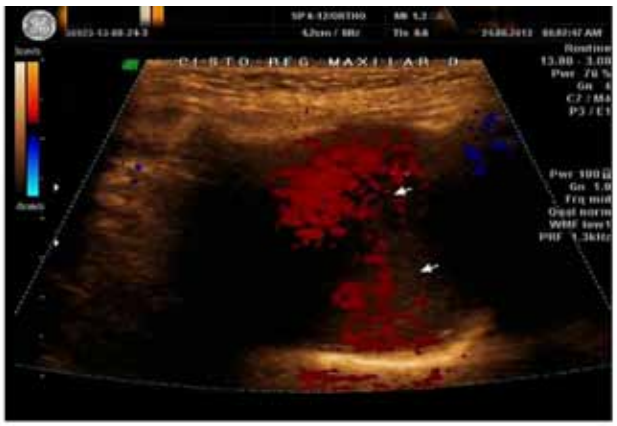

Figure 6 - US Doppler images (Color and Power) evidencing no internal vascularization.

DISCUSSION

MR is the gold standard to analyze the structure and internal content of intra-osseous lesions. MR has been used in differential diagnosis of odontogenic cysts and tumors [13] .

The dentigerous cyst exhibited homogenous intermediate signal in images weighted at T1 and hypersignal in images weighted at T2, indicating its internal liquid content [14]. Therefore, this allowed differentiating the dentigerous cyst from solid tumor lesion (i.e., ameloblastoma), but not from unicystic ameloblastoma; on the other hand, the nature and liquid content provided by the MR images would be useful for the differential diagnosis of many lesions characterized by solid content, evidencing the role of this imaging examination [15].

The capsule and limiting tissues of lesions such as dentigerous cyst and cystic calcifying odontogenic tumor are generally thin, while in other lesions (i.e., adenomatoid odontogenic tumor) the capsule is normally thick [3,14,15]. In this present case, MR exhibited a thin hypodense image of the lesion limits, compatible with the fibrous features of cystic lesions, thus justifying the possible hypothesis of cystic over tumor lesions. However, it is worth emphasizing that follicular ameloblastoma many times include content of internal cystic lesions, often of multiple aspects, which was not observed in the present report because the lesion was unilocular [4,16].

The cavitary aspect of large dimensions may be present in cystic and tumors lesions (i.e., unicystic ameloblastoma). Unicystic ameloblastoma consists of a thin capsule followed by thick or solid portions, including ameloblastic epithelial cell islands [15,16]. In ameloblastoma cases associated with cystic lesions, the cyst exhibits a thin wall connecting with the solid part of the ameloblastoma. These differential features can be detected by MR, emphasizing its useful role in the differential diagnosis of these lesions. MR images well matched the macroscopic findings and histopathological examination showing the presence of a large cystic cavity and conjunctive tissue wall which frequently presents thin layer of stratified squamous epithelium [5,17].

In dentigerous cyst cases exhibiting relationship with tooth, MR is useful to distinguish this pathology from other lesions, even if the diagnosis is difficulty in conventional radiographs and computed tomography [17]. This present study reported a dentigerous cyst case. Notwithstanding, further studies analyzing MR images of such lesions are necessary to clarify the diagnosis resources of various types of odontogenic tumors by MR.

Dib et al. [18] reported positive results of US use in differential diagnosis of mandibular bone lesions. These authors evaluated the ultrasonographic aspects of 72 mandibular lesions and proposed US use as complementary imaging examination in the diagnosis of intra-osseous lesions of the jaws [18]. The clinical studies have demonstrated that US is a promising technique of diagnosis with potential to be used in evaluating periradicular lesions. In this case report, US images were compatible with the internal content of lesions with cystic features. Moreover, Doppler provides information on the absence of blood flow both inside and surrounding the examined tissue [8,19].

Dib et al. [18] conducted a study aiming to observe through US the internal content of 72 intra-osseous lesions of the jaws prior to the surgical treatment. By comparing the histopathological and US results, the authors concluded that US imaging is a useful complementary tool for investigating bone alterations of the jaws because it makes easy the differentiation of the internal content, but US image does not establish a definitive diagnosis [5,19,20]. Additionally, the color feature of Doppler US may provide information on the blood flow presence both inside and surrounding the examined tissue. It is worth emphasizing that the presence of intact and thick buccal bone cortical, infected cysts, and solid areas inside cystic lesions may lead to wrong interpretation of US images [21].

FINAL CONSIDERATIONS

Due to the management and imaging feature of dentigerous cyst in this present case report, it can be observed that MR is a useful imaging tool for the differential diagnosis of dentigerous cyst from other lesions of solid aspect which may exhibit characteristics similar to those of dentigerous cyst on conventional examinations such as panoramic radiographs. US may provide additional information on the content of intra-osseous lesions, i.e., the presence or absence of internal blood flow by Doppler US.

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