Tissue and Cell xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Tissue and Cell

journal homepage: www.elsevier.com/locate/tice

Original submission

Aspiration and cytological evaluation of idiopathic bone cavities of the jaw

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ARTICLE INFO

Article history:
Received 27 September 2016
Received in revised form 8 March 2017
Accepted 13 March 2017
Available online xxx

Keywords:
Cytology
Biopsy
Bone cysts

ABSTRACT

The idiopathic bone cavity (IBC) is an intraosseous pseudocyst devoid of epithelial lining. Clinically, IBCs of the jaw are asymptomatic and normally found in routine radiographic exams. Although the literature regarding the content of IBCs is controversial, the final diagnosis is usually aided by the discovery of an empty cavity upon surgical exploration. The aim of this study was to perform cytological and histological analysis of IBC contents. Cytological analysis of nine cases of IBC was performed after puncture and processed by the cell block technique. Histological analysis was performed in six cases in which it was possible to collect enough material by curettage of bone walls. Remarkably, cell block analysis revealed the presence of fibrin, often arranged as a net; erythrocytes; and inflammatory cells, with a predominance of lymphocytes as well as some macrophages and neutrophils. Histological analysis showed the presence of scant connective tissue, bone trabeculae, hemorrhagic foci, and hemosiderin. Only two cases presented scattered multinucleated giant cells. Cytological evaluation of IBC content by the cell block technique might represent a useful diagnostic tool, especially in cases in which there is no available material for curettage in the cavity.

1. Introduction

According to the World Health Organization (WHO), the idiopathic bone cavity (IBC) is an intraosseous pseudocyst devoid of epithelial lining, which is either empty or filled with serous or sanguineous fluid (Jundt, 2005). Alternative nomenclatures for IBC include solitary bone cyst, traumatic bone cyst, hemorrhagic bone cyst, hemorrhagic cyst, unicameral bone cyst, and simple bone cyst (Hansen et al., 1974; Jundt, 2005; Nelson, 2010; Kumar et al., 2011).

IBCs of the jaws are predominantly diagnosed in the posterior body (Cortell-Ballester et al., 2009) and anterior symphysis of the mandible during the second and third decade of life (Jundt, 2005; Flores et al., 2017). These lesions are also common in extragnathic bones, especially in the proximal femur (Cha et al., 2014) and proximal humerus (Cha et al., 2013).

Although IBCs of the jaw are considered a rare entity in a recent retrospective study performed in Brazil, this lesion was the third most frequent entity of bone pathology diagnosed, behind only central ossifying fibroma and central lesion of giant cells (Flores et al., 2017)

Clinically, IBCs of the jaw are usually asymptomatic and are often accidentally detected by panoramic radiography (Harnet et al., 2008). Typically, the images show a radiolucent and unilocular homogeneous osteolytic area, with an absence or slight expansion of bone and cortical thinning. Superior margins extend between the roots of the teeth and are characteristically scalloped and corticated (Matsumura et al., 1998; Jundt, 2005; Martins-Filho et al., 2012). Although IBCs are benign conditions, they require differential diagnosis from other lesions of the jaw, such as cysts and tumors (Kim and Koh, 2013).

Definitive diagnosis of IBC is made by surgical exploration. The intraoperative finding of an empty or fluid filled space is supportive of this lesion. After curettage of the bony cavity, the material available for histology is usually negligible or nonexistent. However, when some tissue is present, histologic examination must

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http://dx.doi.org/10.1016/j.tice.2017.03.005
0040-8166/

be performed to exclude the possibility of an epithelial lining or tumor tissue (Hansen et al., 1974; Jundt, 2005; Cortell-Ballester et al., 2009; Kumar et al., 2011).

Many theories have been proposed to explain the etiopathogenesis of IBC, which reflect in the use of several different nomenclatures developed for this lesion over time (Hansen et al., 1974; Jundt, 2005; Nelson, 2010; Kumar et al., 2011). The most widely accepted hypothesis regarding the etiopathogenesis of IBC is based on the belief of non-successful intramedullary hemorrhage healing after trauma (Chigira et al., 1983; Matsumura et al., 1998; Suei et al., 2010).

The literature concerning IBC content is controversial and the most commonly reported findings include scant connective tissue, hemorrhagic foci, myofibromatous tissue, collagen deposits, fibrin, scattered giant cells, hemosiderin, new bone formation, osseous necrosis, cement-like tissue, serous fluid, gas, or a simple empty cavity (Chigira et al., 1983; Suei et al., 1998; Jundt, 2005; Suei et al., 2007; Kuhmichel and Bouloux, 2010; Suei et al., 2010; Martins-Filho et al., 2012). Because the histopathological characteristics of IBC are non-specific, the final diagnosis is aided by the discovery of a cavity with no or few sanguinolent materials upon surgical exploration (Matsumura et al., 1998; Jundt, 2005).

The diagnosis of lesions with fluid or semi-fluid contents, such as IBC, has been supported by the cell block technique, in which the content of the lesion is aspirated by a puncture and processed for microscopic analysis (Rivero et al., 2011; Khan et al., 2012; Oenning et al., 2012; Rivero et al., 2014). The cell block technique has proved to be efficient in the diagnosis of keratocystic odontogenic tumors (Rivero et al., 2014) and inflammatory cysts of the jaw (Oenning et al., 2012); however, regardless of these encouraging applications, there is no research available regarding the use of this technique for IBC diagnosis.

Hence, the purpose of this study is to describe the intralesional content of IBCs collected by both puncture (material processed by the cell block technique) and curettage, as well as to discuss if aspiration can be considered a useful tool for IBC presumptive diagnosis.

2. Material and methods

The sample included nine cases of IBC feasible for puncture, all from different patients, that were processed by the cell block technique. From these nine cases, only six were feasible for curettage and subjected to conventional histopathological analysis.

All of the patients voluntarily accepted participation in this study and signed an informed consent statement according to the Human Research Ethics Committee of the Federal University of Santa Catarina (nº. 145/2008).

Aspiration of the lesions was performed prior to any other surgical intervention. At the laboratory, the material was transferred from a syringe to a test tube and centrifuged at 2000 rpm for 20 min. The pellet was then transferred onto an absorbent paper and fixed in a 10% formaldehyde solution for 24 h and processed as previously described (Rivero et al., 2011).

All of the samples were analyzed with a light microscope (AxiostarPlus; Carl Zeiss, Oberkochen, Germany) by two different examiners according to the following criteria: presence of connective tissue; net arrangement of fibrin; and presence of eosinophilic amorphous material, erythrocytes, keratin, cholesterol crystals, epithelial, and inflammatory or multinucleated giant cells.

3. Results

The final sample of nine cases of IBC consisted of six female and three male patients ranging from 12 to 26 years of age (Table 1).

Table 1
Clinical characteristics of the patients.

Case	Age	Sex	Localization	Clinical diagnosis
1	16	Female	Mandible body	Cyst lesion
2*	14	Male	Mandible symphysis	IBC
3*	26	Female	Mandible body	KOT
4*	15	Female	Mandible body	KOT
5*	16	Female	Mandible body	KOT
6*	17	Male	Mandible body and ramus	Ameloblastoma
7	12	Female	Mandible symphysis	IBC
8	14	Male	Mandible symphysis	IBC
9*	23	Female	Mandible body	KOT

*Cases in which it was possible to perform histopathological analysis; IBC: idiopathic bone cavity; KOT: keratocystic odontogenic tumor.

None of the patients had a history of trauma at the point of the lesion, nor did they have any associated pathologies such as cysts, tumors, or dysplasia. All lesions were located in the mandible, mainly in the body portion and symphysis. A clinical diagnosis of IBC was considered in only three cases; in most cases, the clinical hypothesis was that of keratocystic odontogenic tumors (KCOT) (Table 1).

The cytological analysis of IBC samples processed by the cell block technique are summarized in Table 2 and remarkably revealed the presence of fibrin, which was often arranged as a net, a characteristic observed in eight of the nine cases (Fig. 1A and C); erythrocytes (Fig. 1B); and inflammatory cells (Fig. 1A–D).

Histopathological analysis was only carried out in six of the nine cases (represented by an asterisk in Table 1); in the other three cases, it was not possible to obtain any material from the IBC cavity upon surgical exploration. The most common histopathological finding was the presence of scant connective tissue (Fig. 2A), hemorrhagic and chronic inflammation (Fig. 2A and B), and immature bone (Fig. 2C). Only two cases presented sparse multinucleated giant cells (Fig. 2D).

All cases were treated by careful curettage of the bone walls and were followed up until evident bone healing.

4. Discussion

Since IBC has no specific histological characteristics and it is often not even possible to obtain sufficient material for histological analysis, its definitive diagnosis can be a challenge to dental surgeons. Hence, the use of complementary techniques, such as aspiration followed by cytological analysis, may represent an additional measurement for the diagnosis of this lesion.

From the nine cases that we processed by the cell block technique, only six contained sufficient material from curettage for histopathological analysis. Most of the cases had limited amounts of sanguinolent material; moreover, in three cases, it was not possible to obtain any material from curettage, presenting itself as empty cavities. In this way, aspiration of the lesion was shown to be more effective than curettage in collecting material from the cavities.

The cytological evaluation of IBCs processed by the cell block technique resulted in the finding of fibrin arranged as a net, which was noted in eight of the nine cases studied. Although it cannot be regarded as an exclusive characteristic of IBCs, the netlike arrangement of fibrin has not been reported for other lesions of the jaw processed by the cell block technique (Rivero et al., 2011; Oenning et al., 2012; Belatto et al., 2014; Rivero et al., 2014).

In this study, only three out of nine cases had a clinical diagnosis of IBC. This demonstrates that it is important to establish a differential diagnosis between IBC and other bone lesions of the jaw, especially considering that IBCs do not always appear in a classic pattern (Chell et al., 2015). As an example of that, IBCs can present as multilocular lesions in association with impacted teeth,

Please cite this article in press as: Rivero, E.R.C., et al., Aspiration and cytological evaluation of idiopathic bone cavities of the jaw. Tissue Cell (2017), http://dx.doi.org/10.1016/j.tice.2017.03.005