Management of the Simple Bone Cyst

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LEARNING OBJECTIVES:

After reading this article, the individual will learn:

- the diagnosis and treatment of the simple bone cyst, and
- potential pitfalls associated with the surgical treatment of the simple bone cyst.

ABOUT THE AUTHORS

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INTRODUCTION

Since it was first described by Lucas and Blum\(^1\) in 1929, the simple bone cyst (SBC) has attracted a great deal of interest. SBC is a misnomer because it is a pseudocyst; however, its pathogenesis is not clearly understood.\(^1-3\) SBCs have been reported in the literature under a variety of other names: hemorrhagic bone cyst, extravasation cyst, progressive bone cavity, traumatic bone cyst, and unicameral bone cyst.\(^4-5\) The variety of names applied to this lesion attests to the lack of understanding of its true etiology and pathogenesis.

The term simple bone cyst is the most widely used today.\(^3-6\) This lesion is mainly seen in young patients, frequently during the second decade of life, and the sex distribution is reported to be equal.\(^7\) The majority of SBCs are located in the body of the mandible between the canine and the third molar. The second most common site is the mandibular symphysis. Fewer cases are reported in the maxilla.\(^6-8\) Clinically, the lesion is generally asymptomatic and is often incidentally discovered during routine radiological examination. Pain is infrequent and presents in 10% to 30% of patients. Expansion of the cortical plates of the jaw is rare, and teeth adjacent to the lesion are usually vital without mobility, displacement, or root resorption. On radiological examination, SBCs usually appear unilocular and radiolucent with an irregular but well-defined (or partially well-defined) outline, with or without a sclerotic lining at the periphery of the lesion. Characteristic of the simple bone cyst is a “scalloping effect” when the radiolucency extends between the roots of the teeth and interproximal bone.\(^3-8\)

Definitive diagnosis of SBC is achieved at surgery when an empty bone cavity without an epithelial lining is observed, with very little except normal bone and occasional fibrous tissue curetted from the cavity wall. Sometimes the cavity contains a straw-colored fluid or blood. There is never any evidence of a cyst-like epithelial lining. The lesion may, however, exhibit areas of vascularity, fibrin deposition, and occasional giant cells adjacent to the bone surface.\(^3-8\)

Recommended treatment for SBCs is surgical exploration followed by curettage of an area of the bone to induce hemorrhage. The surgical exploration serves as both a diagnostic procedure and as definitive therapy by producing bleeding into the cavity. Hemorrhage in the cavity forms a clot, which is eventually replaced by bone.\(^1-8\) Although treatment is a relatively simple procedure, if not carefully performed it may lead to complications such as perforation of tooth roots, penetration of the maxillary sinus, nerve damage, and devitalization of teeth.

CASE REPORT

A 13-year-old boy was referred by his orthodontist for evaluation of a radiolucent lesion seen on a panoramic radiograph. A unilocular, radiolucent, irregular but defined...
area without a sclerotic lining, with scalloping extending between the roots of the second and third molars and interproximal septae, was apparent (Figure 1). There was no root resorption, and the teeth were not mobile. The patient was free of any symptoms. There was no expansion of cortical bone either buccally or lingually. No palpable lymph nodes were detected. The medical history was not contributory, and the patient could not recall a history of trauma. The differential diagnosis included odontogenic cysts (ie, odontogenic keratocyst), odontogenic tumors (ie, unicystic ameloblastoma), vascular lesions (ie, aneurysmal bone cyst), and oral cysts (ie, SBC).

After negative aspiration using a 14-gauge needle, under local anesthesia a triangular mucoperiosteal flap from the first molar to the ramus was reflected. Using a small, round surgical bur and electric drill, cortical bone was removed between the first and second molars, and the cavity was entered with an explorer through the small bur hole. An empty cavity was encountered that was devoid of tissue or fluid, and there was no lining of tissue on the walls. The hole was enlarged to allow insertion of a small curette. Following a careful curettage of the inner part of the buccal cortex in a vertical manner, small bone chips were scraped and submitted for microscopic examination. The operative findings were suggestive of SBC; therefore, no further treatment was performed apart from scraping. Thus, the buccal cortex was curetted from the inside just above the inferior alveolar nerve and only in a vertical direction between the teeth, in one area only, for the purpose of inducing hemorrhage. The wound was not irrigated, and after the cavity filled with blood the flap was sutured using 2 3/0 silk sutures. The postoperative recovery was uneventful. Histological examination revealed normal-appearing bone spicules with vascular fibro-connective tissue. The diagnosis was consistent with that of an SBC. Three years later, panoramic radiograph revealed resolution of the radiolucent area and bone fill. The teeth that were within the lesion were vital (Figure 2).

**DISCUSSION**

The SBC is uncommon and comprises approximately 1% of all cyst-like lesions of the jaws. The lesion is usually solitary, radiolucent, demarcated, and nonexpansile. Margins may be scalloped and between vital teeth, and root resorption is rare. A surgical approach to the lesion reveals an empty cavity. The pathogenesis of the SBC still remains a matter of conjecture, and several theories have been suggested. Trauma is the most frequently discussed etiologic factor in the formation of a SBC. The presence of a history of trauma is extremely variable in the reported series of cases (from 17% to 70%), and some researchers believe that there must also be a predisposing idiosyncratic
factor in the pathogenesis of SBC, such as abnormality of vessel walls or abnormal blood coagulation.\(^6\)\(^-\)\(^8\) Some believe that trauma leads to intraosseous hematoma formation; the blood clot liquefies and adjacent bone is destroyed by enzymatic activity, resulting in the development of a SBC.\(^6\)\(^-\)\(^8\)

As stated, a previous injury to the affected part of the jaw can be in the patient history, and this injury may have occurred several years before discovery of the lesion. The time interval between the trauma and the discovery of a SBC varies. When discovered early, the lesion usually contains blood or serosanguineous fluid. The fluid aspirated from the cyst cavity usually has electrolyte and protein concentrations similar to that of serum. It is suggested that the fluid is extravasated blood.\(^9\) The amount of fluid diminishes with the age of the lesion, and the lesion eventually becomes empty. In the case presented, the cystic lesion was devoid of fluid.\(^6\)\(^-\)\(^8\)

Treatment of the SBC is to establish bleeding into the cavity.\(^7\) Intralesional hemorrhage due to either intentional curettage or during the exploratory procedure may induce a reparative process. This is a simple procedure, but it is important to perform the procedure correctly. If attention is not directed to the following points, complications may arise: (1) Aspiration with a 14-gauge needle must be accomplished (to rule out a vascular lesion). In some cases the wall of bone may be thick, requiring flap reflection and drilling. (2) A flap large enough to cover the exploration site must be reflected (the incision lines should be on solid bone). (3) Cortical bone must be removed superficially in an area overlying the radiolucency, but between the roots of the teeth. (4) In the mandible, the bur hole must lie above the inferior alveolar nerve (IAN). (5) A small hole is drilled and perforated first with an explorer (with care taken so the site does not overlie the tooth root), just large enough to aspirate with a needle. (6) In the maxilla, care is taken to drill below the maxillary sinus, and not to unnecessarily perforate the maxillary sinus. (7) After aspiration, the hole can be enlarged, but in a direction that will not expose the teeth roots or, when in the mandible, jeopardize the IAN. (8) After accessing the lesion, curettage must be done carefully in an area above the IAN (in the mandible) and away from the tooth apices to prevent devitalization of teeth. In the case presented, this meant scraping only in a vertical direction between the first and second molar roots, scraping the inner part of the cortex that was superior to the IAN, and only in an upward direction. No scraping is done under the roots, so as to avoid devitalization. (9) Irrigation is not performed, as this may dissolve the clot and prevent resolution of the lesion. (10) It must be ascertained that the defect fills with blood before closure. Organization of the clot results in complete bony repair.\(^7\)

Using this protocol, the authors have not encountered any complications or nonresolving cases in more than 15 patients with SBCs treated during the past 20 years. One case that resolved without treatment was also observed; however, in the absence of treatment enlargement of the lesion over time is a more common occurrence. The authors have observed no recurrences in cases where treatment has been performed. However, Suei, et al\(^10\) found a 26% recurrence rate. Andric, et al\(^11\) suggested a link between several types of viruses and cysts of the jaws; however, this link has not been substantiated.

**CONCLUSION**

The simple (traumatic) bone cyst (SBC) is an uncommon nonepithelial-lined cavity of the jaws, mainly found in young patients, most frequently during the first or second decade of life. Most SBCs are found in the mandibular body. Clinically, the lesion is asymptomatic in most cases, without swelling, and is often incidentally discovered on radiological examination; it is observed as a radiolucent area often with a scalloped appearance between the teeth. Since material for histological examination is essentially nonexistent, definite diagnosis of SBC is generally achieved at the time of surgery when confronted with an empty bone cavity. Treatment, although a relatively simple procedure, may result in complications if not properly performed.

This article has presented a typical case of SBC involving the posterior body of the mandible, and has presented treatment and recommended management principles important for preventing complications.
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REFERENCES


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1. A simple bone cyst ____.
   a. has an epithelial lining
   b. is filled with keratin
   c. often presents with pain
   d. is usually empty

2. A simple bone cyst ____.
   a. is asymptomatic
   b. is painful
   c. is radiopaque
   d. perforates the bone

3. A simple bone cyst ____.
   a. has a scalloped appearance
   b. has a multilocular appearance
   c. occurs more frequently in males
   d. occurs more frequently in females

4. Treatment of the simple bone cyst ____.
   a. is not indicated
   b. induces bleeding in the lesion
   c. is often followed by recurrence
   d. requires complete curettage of the whole lesion

5. Drilling to access the simple bone cyst lesion is accomplished ____.
   a. between the teeth roots
   b. below the teeth roots
   c. overlying the roots
   d. Drilling is not done.

6. During surgical treatment of the simple bone cyst, the access cavity should be ____.
   a. below the inferior alveolar nerve canal
   b. at the inferior alveolar nerve canal
   c. above the inferior alveolar nerve canal
   d. above the antrum

7. Diagnosis of the simple bone cyst is usually ____.
   a. based on clinical findings
   b. based on histological findings
   c. via blood tests
   d. based on characteristic radiographic findings

8. Curettage of the simple bone cyst is accomplished ____.
   a. using oblique strokes
   b. circumferentially
   c. using small vertical strokes
   d. using back-and-forth horizontal strokes
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