

Traumatic Bone Cysts

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Summary

A traumatic bone cyst is a pathological formation of complex aetiology. Adequate diagnosis and treatment are additionally complicated by the broad palette of other pathological processes in the area of the jaw, which can differentially diagnostically be considered. Characteristically, in the case of a TBC a typical finding for a cyst will not be found, i.e. in the histopathological analysis cystic epithelia in the form of a cystic sheath will not be present. In the case history it is possible to disclose trauma in the affected area. TBC shows characteristic radiolucent areas on the radiograph, and most frequently does not have symptoms. This study presents a review of literature and basic characteristics of TBC. A typical finding during the operation, the PHD result and correct recording of the case history, together with a good knowledge of differential diagnostics will enable realisation of successful treatment of the patient.

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Introduction

The term traumatic bone cyst (TBC) was first used by Lucas in 1929 (1). It determines a bone cavity of irregular shape which appears like a cyst on a radiograph, and histopathologically there are no elements to confirm a diagnosis of a cyst.

Apart from the term traumatic bone cyst Barnes introduced other terms which can be found in literature, and gave a detailed list of these pathological alterations (2):

- traumatic cyst (3-10)
- traumatic haemorrhagic cyst (11-15)
- progressive bone cavity (16, 17)
- solitary bone cavity (18)
- solitary bone cyst (19, 20)
- simple bone cyst (21)
- idiopathic bone cavity (22)
- haemorrhagic bone cyst (21)
- extravasation cysts (23, 24)
- haemorrhagic cyst (3, 11)
- haemorrhagic extravasation (25) and
- solitary haemorrhagic cyst (26)

Aetiology and pathogenesis

The aetiology and pathogenesis are still not clear. According to Barnes (2) there are various possible causes and mechanisms which have been mentioned in literature on traumatic bone cysts. These are: degeneration of bone tumours (14, 27), disorder in calcium metabolism (28), various mild infections (28), local disorder of bone growth (29), venous obstruction (30), intensified osteolysis (31), disturbed blood flow due to a subperiosteal haematoma caused by trauma (32), degeneration of a bone cyst (8), ischemia with necrosis of the bone caused by primary vascular or neurogenic disorders (9).

The most widely accepted theory suggests bleeding within the bone caused by trauma. Instead of the organisation of a blood clot and healing, the clot liquefactively narcotises or is resorbed in another way. The surrounding bone is destroyed by enzymatic activity. In this way the bone cavity enlarges, stimulated by the increased pressure of its content, which, at least partly, is caused by poor venous drainage (33).

However, the following data are not in agreement with this theory:

- At least 50% of patients do not report trauma (34).
- Although trauma exists in the remaining 50%, the time of its occurrence does not correspond with the estimated period of the cyst development (16).
- According to the latest information, there is no difference in the frequency of trauma in the case histories of patients suffering from traumatic bone cysts and other groups without TBC (9).
- Data indicating that there is a higher incidence of trauma in the frontal part of the mandible does not agree with data on the highest incidence of traumatic bone cysts in the posterior part of the mandible (9).

Clinical manifestations

Localisation and incidence

On the basis of an investigation of 255 cases during the period 1955 - 1979 (34) TBC occurred in

the mandible in 89%, while it occurred in the maxilla in only 11%. In the mandible only 25% of TBC occurred in the frontal segment, while as many as 67% occurred in the frontal part of the maxilla. Thus TBC occurs frequently in the mandible, mainly in the posterior part (angulus-ramus?), while in the maxilla they are rare and are mainly located in the frontal part. Out of the examined 255 cases 59% were male and 41% female. The incidence was highest in very young subjects, 10 - 20 years of age (9, 14, 34). They are slightly more frequent in white people (74%) (35), and are most often found as a single unilateral lesion. Occasionally they can be found bilaterally, or even several on one location (1, 7, 9, 14, 32, 34, 35), which is more of a curiosity than the rule.

Clinically, the soft tissues are without any changes. There is no increased movability of the teeth or changes in their colour (36). The teeth are rarely sensitive to percussion (9). There is rarely a sensation of pain (9, 14, 34) or even paresthesia (14, 22). The blood count is unchanged (37). There is usually no bone expansion (33), particularly in the early phases, while in the later phase it is possible to perceive bone expansion in 18 - 50% of patients (14, 34, 37). It can be said that the asymptomatic nature of the disease is the reason why TBC is occasionally detected accidentally on a radiograph, performed for completely different reasons and because of other diseases. Saito et al (38) reported that out of 1238 examined patients with a finding of a jaw cyst, only 1.2% had a diagnosis of TBC.

Diagnostics and differential diagnostics

The majority of TBC range from a lesion of 1 cm in diameter to those which involve the whole corpus and ramus of the mandible (37). The growth of some TBC can cause fracture of the mandible (39), while others can have spontaneous regression (27). This may be the reason why they are rarely found in persons older than 20 years (40). Cases have also been reported of TBC in the condyl of the lower jaw or zygomatic bone (41).

On the radiograph they most often appear well circumscribed, isolated and unilaterally radiolucent areas which lie under the apexes of the roots of the teeth on the same side. Multilocular lesions are rare.

The structure of the mandible canal may in some cases be preserved and in other cases not (38). There is a possibility of connection with remaining roots and impacted wisdom teeth (11, 42). There is no resorption of the teeth roots. Changes in the bone follow their contour giving their upper part a wavy appearance (9, 37, 38). The cortical layer of bone or lamina dura may or may not be preserved (37). There is no loss of vitality of the tooth or at least there is no evidence that the tooth is not vital as a result of cyst growth (9, 14, 3-38, 40).

For differential diagnostics the following can be considered: periapically circumscribed inflammatory processes, periapical cyst, odontogenic, residual, cyst of the nasopalatine canal, globulomaxillar cyst, medial mandibular cyst, ameloblastoma, metastatic carcinoma, hyperparathyroidism, Hand-Schüller-Christian, Niemann-Pick and Gauscher's disease, eosinophilic granuloma, fibrous dysplasia, cherubism, central giant-cell granuloma of traumatic or endocrinological etiology, aneurysmatic bone cyst, arteriovenous shunts, haemangiomas, focal osteoporotic defects, bone defects due to ectopic position of the glandular tissue of the sublingual or submandibular salivary glands and early stage of cementoma (periapical cemental dysplasia) (33, 45).

Pathology

During the surgical operation an empty bone cavity is usually found which occasionally contains a clear liquid of yellowish colour (straw colour) or a blood coloured liquid (9, 22, 34, 37). There is very thin layer of connective tissue on the walls (9, 37, 38), although there is no finding of cystic epithelia usually found in a cyst (37). If the cavity is situated posterior from the mental foramen, it is possible to find that the n. alveolaris inferior is freely suspended within it (9, 37, 38). In contrast to other cysts of the jaw the hydrostatic pressure of TBC is relatively low, while the osmotic pressure in relation to blood is slightly higher. The protein composition in the cystic liquid is similar to that in serum. It contains slightly more bilirubin (43). The walls of a TBC have the property of a semi-permeable membrane (44). As there is no epithelial sheath (37) according to definition TBC is not a real cyst. The surrounding bone often shows increased osteoclastic resorption

and possibly an increase in the number of blood vessels (26), although it appears as though there is no direct vascular or lymphatic connection with the cystic cavity (43). Under the microscope bone fragments can be seen with little connective tissue (not more than a few cells thick), some haemosiderins and in some places under the connective sheath a thicker layer of granulation tissue (8, 9, 38). In some places there are extravasated red blood cells (9).

Treatment and prognosis

Treatment is surgical, as is also the final diagnosis. The surgical operation consists of evacuation of the content, cochleation of the cavity in order to stimulate bleeding in the cavity. The wound is then sutured. This is followed by the formation/creation and organisation of a clot, and healing by the formation of new bone. Some TBC heal spontaneously without any intervention (27, 37). This is probably the reason why they are rarely found in older age groups. Recurrences are rare after surgical treatment (14, 34, 35, 38).

Conclusion

In everyday practice, during work with patients and when analysing radiograph images, it is possible to come across formations which radiographically and clinically have the appearance of cystic changes. In some cases it is not immediately possible to determine the cause. For example there is no non-vital tooth nearby, remaining root, impacted tooth, the case history shows no evidence of trauma in the affected area, and neither are there any significant subjective disorders in the patient. In the case that the case history shows the existence of trauma in the affected area then the decision is probably somewhat easier. This is the point when we can differentially diagnostically suspect a traumatic cyst. In order to decide on the final diagnosis it is then necessary to carry out exploration of the area and cochleation of the cavity, which at the same time is the main therapeutic procedure. A histopathological diagnosis will confirm the existence of a TBC if during the operation some tissue is removed from the cavity. If no tissue is found in the cavity for

histopathological examination a decision on diagnosis of a TBC will depend on individual experience. Knowledge of the symptomatology, correct

interpretation of the radiograph and correct recording of case history will be helpful when deciding on the diagnosis and relevant treatment.