Case Report

Giant asymptomatic mastoid pneumocele producing a scalp swelling: A rare case report

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Abstract

**Background:** Intraosseous collections of air are rare in comparison to the extra-osseous collection. Pneumoceles are rare entities defined as enlarged pneumatized air sinuses or air cells, with focal or diffuse thinning of the surrounding bony walls. They may affect mastoid air cells and any of the paranasal sinuses.

**Case Description:** We report a rare case of extensive mastoid pneumatisation in a young male patient. Patient was completely asymptomatic with swelling as the main complaint. Short history of development raised suspicion for a malignant lesion. Cholesteatoma was also taken as a differential diagnosis. However, computed tomography (CT) scan showed gross expansion of mastoid air cells with no lesion inside it. The walls of mastoid were markedly thinned out, making the diagnosis as pneumocele. In spite of a large swelling, conservative treatment was adopted in view of no symptoms and was advised follow-up regularly to detect any possible complications.

**Conclusion:** Our case was interesting in that rare mastoid pneumoceles can be totally asymptomatic and can be large enough to raise concern for a malignant lesion. Literature shows that such mastoid pneumocele are symptomatic and require active intervention. Our asymptomatic mastoid pneumocele is a rare instance requiring no surgical procedure and was followed-up. Overall, such lesions should be treated as normal variants of physiological mastoid.

**Key Words:** Giant, mastoid, pneumocele

**INTRODUCTION**

Pneumoceles are rare and are included under the group of intraosseous collections of air along with hypersinus, pneumosinus dilatans. Pneumatocyes are extra-osseous collections and are caused by trauma, infection, tumor, or surgery.[1] Urken et al.[16] differentiated between hypersinus, pneumocele, and pneumosinus dilatans on the basis of the degree of sinus expansion and thinning of the bony walls. Pneumoceles are uncommon lesions and are actually the enlarged aerated paranasal sinuses or air cells with focal or diffuse thinning of the surrounding bony walls. Pneumosinus dilatans are very rare conditions, most commonly affecting frontal sinuses. However, they can affect any paranasal sinuses with excessive dilatation of sinuses beyond the normal boundaries of bones, but with normal thickness of bony walls. A hypersinus is a physiological variant with enlarged paranasal sinus that does not expand the surrounding bone beyond its normal contours and has bony walls that are of normal thickness.
Pneumoceles are considered to be acquired with ball valve mechanism causing the air trapping and progression of lesion. However, developmental origin has also been postulated.[5] Literature shows that the pneumoceles are frequently symptomatic and require active surgical intervention, which can cause complete reversing of pathology.

CASE REPORT

A 19-year-old male patient presented with a swelling over the right side mastoid region. The swelling was present in its small form for quite a long time but became conspicuous only for last 4-5 months. There were no symptoms other than swelling behind the right ear [Figure 1]. There was no history of pain, ear discharge, and hearing diminution. On examination, the swelling was 3 × 3 cm in dimension, bony hard, nontender, fixed to underlying bone. Skin over the swelling was normal. Computed tomography (CT) scan of the head showed the lesion to be grossly enlarged mastoid air cells. The hard surface of the swelling was actually the outer table of skull expanded by hyperpneumatization of mastoid [Figure 2a-c]. The outer table forming the wall of mastoid air cells was grossly thinned out. Septated appearance of the enlarged mastoid cells was quite visible. There was no lesion inside the mastoid air cells, such as cholesteatoma and tumor. Brain parenchyma was normal. Three dimensional (3D) reconstruction CT images showed grossly enlarged mastoid process with thinning and multiple erosions in the mastoid wall [Figure 2d]. It was diagnosed to be a case of physiologic variant of normal mastoid process, which has undergone hyperpneumatization, resulting in expansion of outer table of skull, producing superficial scalp swelling. No surgical intervention was planned as there were no active symptoms like headache, hearing deficit, mass effect, or extension to nearby structures producing symptoms. Patient was advised to report if there is rapid enlargement. There were no symptoms till 1 year after the patient first complained of the swelling.

DISCUSSION

Differential diagnosis of enlarged mastoid air cells includes hypersinus, pneumosinus dilatans. Pneumoceles are the intraosseous collections of air and are different from pneumatoceles, which are extra-osseous and caused by trauma, infection, or surgery. Pneumoceles are categorized along with pneumosinus dilatans and hypersinus as intraosseous collection of air. In both pneumosinus and hypersinus, collection of air produces enlargement of sinuses and mastoid without causing thinning of surrounding walls. A hypersinus is an enlarged sinus that does not expand the surrounding bone beyond its normal boundaries and has bony walls that are of normal thickness. Pneumosinus dilatans refers to a paranasal sinus with bony walls that are of normal thickness with focal or diffuse abnormal expansion of the sinus. Pneumoceles produce focal or generalized luminal enlargement and focal or diffuse thinning of the adjacent bony wall as in our case. Som and Bergeron[9] had clearly differentiated these three types of intraosseous collections of air depending upon symptomatology, sinus expansion, and bony wall thinning. Although, pneumoceles originate in the paranasal sinuses, they frequently extend to involve the skull base and adjacent bones, such as parietal, occipital, and atlas. Pneumoceles involving mastoid antrum and occipital and atlanto-axial bones has been reported.[5,10] Martin et al.[7] reported a case of mastoid pneumocele that had extended to involve the atlas, occipital bone, and clivus with extensive pneumatization, producing headache and localized swelling. Lo et al.[6] and Scialpi et al.[8] reported the pneumatization of occipital

Figure 1: Image showing the retroauricular swelling over mastoid

Figure 2: (a) CT Head showing grossly dilated mastoid air cells with thinning of surrounding bone. (b) CT bone window showing the enlarged and multi-septated appearance of the swelling. (c) Coronal CT cuts showing grossly enlarged mastoid. (d) 3D CT reconstructed image showing thinning and erosion of mastoid bone
and atlanto-occipital bones as an extension of mastoid pneumocele, respectively.

Various proposed causes of pneumocele include developmental, inflammatory, neoplastic, and trauma. Persistently raised intraluminal or intrasinus pressure has been proposed as the basic mechanism of pneumocele formation.[11] Partial obstruction at a focal site of bone defect or a sinus ostium with a one-way ball valve causes air trapping. A ball valve or check valve mechanism at the eustachian tube can play a role, whereby, air could be forced into the middle ear more rapidly than it could escape. Once formed, these pneumoceles can increase in size with extension to nearby bones and joints due to proliferation of accessory air cells. Sometimes, preexisting co-morbid conditions such as chronic cough, bronchitis, and sneezing could facilitate such trapping of air. Delabie et al. proposed that high nasal pressure plays an important role in the progressive formation of a pneumocele or pneumatoceles.[1]

Cerebral atrophy, acromegaly, fibrous dysplasia, and arachnoid cysts have been associated with intraosseous collection of air.[2] Overall, the pneumocele can be termed as an acquired lesion, produced by the destructive effect of persistently elevated intraluminal pressure that caused the mastoid air cells to expand. Lichtenberg et al.[5] proposed a developmental abnormality in tympanic fusion for the pneumocele formation. According to them, any abnormality in normal fusion of tympano-mastoid or tympano-squamous sutures could lead to air trapping and pneumocele formation. Sometimes, the pneumocele can give rise to extra-osseous collection of air (pneumatoceles) as a result of breach of outer table of sinus and air entering the subcutaneous spaces.[4,5]

Treatment of pneumocele is symptom dependent, and the indications for surgical intervention include intractable headache, hearing loss with or without tinnitus, and atlanto-occipital dislocation. The treatment could be as simple as myringotomy with grommet insertion as reported by Martin et al. where trapped air was let out with improvement of symptoms and re-ossification with newly formed bony trabeculae and increased thickness of surrounding cortical bone.[7] Lichtenberg et al. did mastoidectomy to relieve the pressure on external acoustic canal.[10] Endoscopic drainage of a sphenoidal pneumocele communicating with a hyperaerated mastoid was reported by Eymael and Daele and they proposed the role of endoscopic drainage in treating paranasal sinus pneumocele.[3]

Pneumoceles are frequently large enough to produce mass effect on surrounding structures like external acoustic canal or may extend into surrounding bones and joints. These usually require surgical intervention, the type of which depends upon the type, site, and the bones involved. But, purely asymptomatic localized pneumocele like the present case, causing large retroauricular mastoid swelling without any other symptoms, is quite rare and needs attention. Such type of lesions, although raise a strong alarm in the patient concerned, are benign and can be managed conservatively.

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