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Case Report

Skull base osteomyelitis due to bilateral acute otitis media: Case report and literature review ☆

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ABSTRACT

Skull base osteomyelitis is a rare and serious condition that primarily affects immunocompromised individuals and can be life threatening if not treated promptly. It can have various origins, with the most common being an extension of necrotizing external otitis. It is difficult to diagnose due to a wide array of clinical presentations. Imaging plays an important role in the diagnosis, identification of the possible source of infection, the extent of the disease, the pattern of spread and identification of associated complications. Early diagnosis is crucial to promptly initiate appropriate treatment. We report here a rare case of a 68-year-old patient presenting with skull base osteomyelitis resulting from bilateral otitis media, which is a rare condition.

Introduction

Skull base osteomyelitis is indeed a rare but serious condition that affects the middle cranial fossa, involving the temporal bone, the sphenoid bone, and sometimes the occipital bone. It can have various origins, with the most common being an extension of necrotizing external otitis [1].

Early diagnosis is crucial for enabling rapid and effective therapeutic management. Symptoms may include severe head or neck pain, signs of infection such as fever, swelling or redness of the skin, as well as sore throat or difficulty swallowing. Medical imaging, such as computed tomography (CT) or MRI, can be used to confirm the diagnosis [1,2].

Case report

A 68-year-old diabetic man presented to our hospital with a history of prolonged otalgia, described as disturbing his sleep at night, and hearing loss associated with otorrhea.

On examination, bilateral otorrhea was noted, and the tympanic membranes, on both sides, appeared bulging with

Abbreviations: SBO, scull base osteomyelitis; ENT, Ears, Nose, and Throat; CT, computed tomography; MRI, Magnetic resonance imaging; CRP, C-reactive protein.

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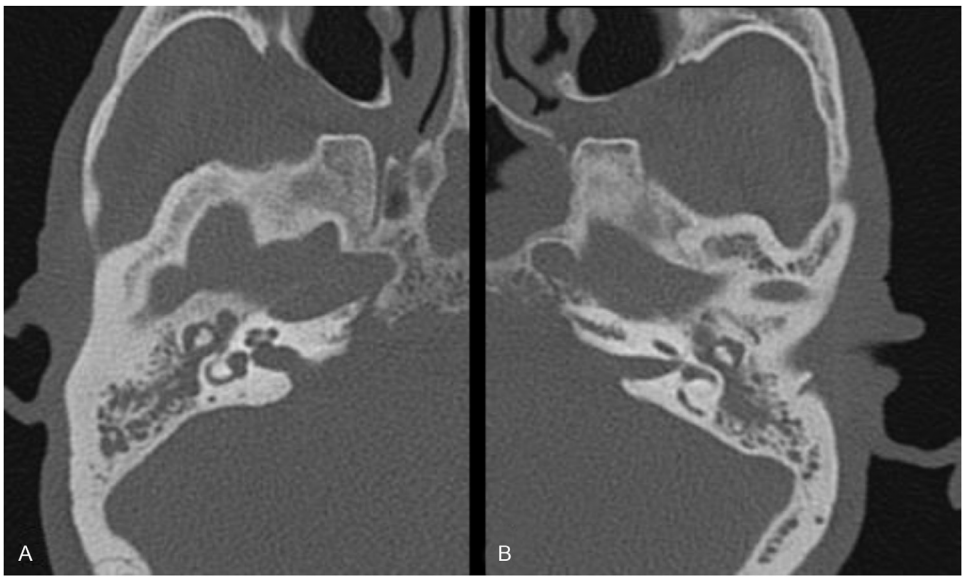

Fig. 1 – Axial sections of the noncontrast CT scan of the right (A) and left (B) ears showing bilateral filling of the middle ears and mastoids.

granulation tissue covering them. The patient was initially treated with topical ear drops and oral co-amoxiclav. After 5 days of follow-up, the patient continued to experience otalgia and headaches, leading to a decision to initiate intravenous ceftazidime and topical ciprofloxacin ear drops. Initial blood tests revealed a high C-reactive protein level (63 mg/L). The prolonged symptom history and lack of response to topical and systemic treatments raised suspicion of skull base osteomyelitis.

A non-contrast CT scan was ordered, revealing thickened tympanic membranes with bilateral filling of the middle ears and mastoids (Fig. 1), with signs of erosion of the bones of the middle cranial fossa, more pronounced at the clivus extending to the odontoid (Fig. 2).

Subsequent MRI revealed enhancing infiltrative process involving the left side of the clivus, the odontoid and adjacent tissues of the nasopharynx (Fig. 3).

Bilateral myringotomy was performed, draining serous fluid from the ears. Cultures from both ears returned positive for Pseudomonas aeruginosa. Intravenous antibiotics were broadened to piperacillin-tazobactam, and oral ciprofloxacin was added, regular aural toileting, and hyperbaric therapy. Under local anesthesia, grommets were bilaterally inserted, and serous fluid was drained from both ears.

After completing 2 months of treatment, the patient's overall clinical status improved. He reported reduced pain and improved hearing, with his CRP levels showing a downward trend until normalization.

Discussion

Skull base osteomyelitis is a rare infection that affects the middle cranial fossa, involving the temporal bone, sphenoid bone, and occipital bone. It is a serious infection that poses challenges in both diagnosis and imaging interpretation.

SBO typically falls into 2 main categories: typical and atypical. The typical form, known as otogenic osteomyelitis, is most frequently observed in elderly individuals with diabetes and is often linked to necrotizing external otitis. Atypical SBO, also referred to as central SBO, primarily affects the basisphenoid and basiocciput regions and may occur independently of prior otologic infections [1,2].

In the context of otogenic osteomyelitis, otological signs are prominent, with persistent otalgia and otorrhea. The diagnosis is considered when there is the occurrence of cranial nerve paralysis, affecting the facial nerve in more than half of the cases, associated or not with involvement of the glossopharyngeal or hypoglossal nerve, in an immunocompromised patient [1,3].

For nonotogenic osteomyelitis, neurological signs will be prominent, with persistent headaches, general malaise, and associated rhinological signs including facial pain and rhinorrhea [1,4].

Osteomyelitis of the base of the skull is most often secondary to bacterial infection. The causative agent for otogenic osteomyelitis is Pseudomonas aeruginosa, in more than 70% of cases. Its perivascular spread contributes to its severity. Proteus mirabilis and other gram-negative bacteria can be found in 30% of cases [1,5].

For nonotogenic osteomyelitis, there is often an association of Pseudomonas aeruginosa and Staphylococcus aureus, or Streptococcus, and sometimes a fungal origin [4].

The CT scan will reveal osteolytic lesions of the bony walls of the temporal bone and the base of the skull. It will be necessary to look for lysis of the tympanic membrane and the walls of the external auditory meatus, associated or not with lysis of the stylomastoid foramen. Extension to the base of the skull will be evidenced by lysis of the clivus. The scan also allows visualization of peri pharyngeal tissue infiltration [5,6].

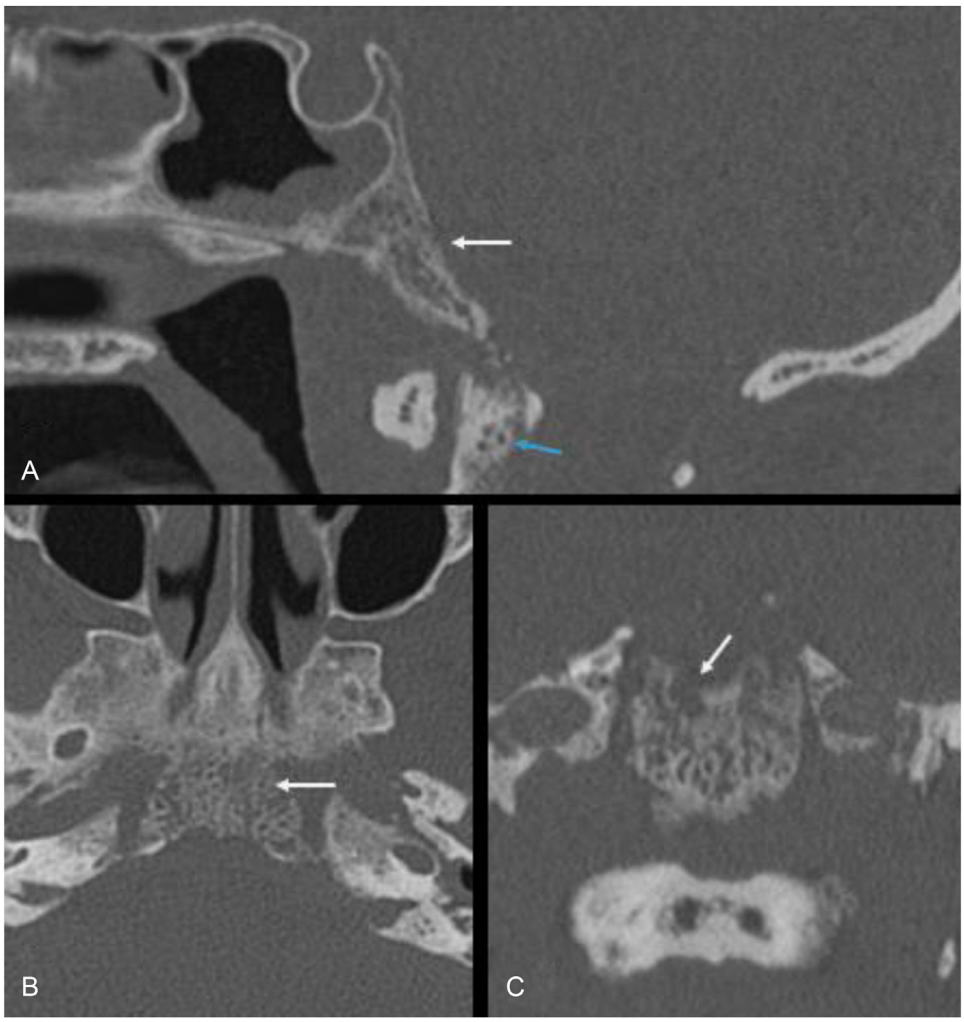

Fig. 2 – sagittal (A), axial (B) and coronal (C) sections of the noncontrast CT scan showing erosion of the clivus extending to the odontoid.

MRI is the preferred examination for diagnosis, assessing the extent, and monitoring of skull base osteomyelitis. It will reveal infiltration of the soft tissues of the external auditory meatus associated with tissue infiltration of peri pharyngeal fat spaces, bone marrow of the clivus with disappearance of the marrow fat hypersignal, and contrast enhancement on fat saturation sequences after injection. It is important to look for extension to the base foramina with contrast enhancement of the facial nerve in its second and third portions, enhancement of the mixed nerves at the jugular foramen, and infiltration of the hypoglossal nerve at the hypoglossal foramen. MRI can also reveal meningeal enhancement in contact with the clivus or the temporal meninges [3,4,6].

Biopsy is frequently required during the clinical process to rule out the presence of tumors, analyze characteristics of non-neoplastic tissue, and directly collect microbiological samples for Gram staining, culture, and antibiotic sensitivity testing [7].

Complications of skull base osteomyelitis are multiples, dominated by septic thrombosis of the lateral sinus and septic thrombosis of the cavernous sinus.

Intracranial complications can be a bacterial meningitis, an extradural or subdural empyema, presuppurative encephalitis, or abscess collections [5].

The infection can spread to the brain through several modes; by continuity through the bone wall or by contiguity through vascular mechanisms related to septic thromboses, more rarely, through hematogenous spread.

Perineural spread is the route of infection from the ENT region to the base of the skull. Any infectious process in the ENT area can spread along the nerve sheaths. The spread occurs via the leptomeningeal route. MRI allows visualization of nerve enlargement with meningeal enhancement along the nerve sheath [1,4].

The prognosis is serious, with complete recovery in about 60% of cases for otogenic osteomyelitis, while the prognosis is more reserved for sinus origin osteomyelitis, with recovery in about 30% of cases [1]. The regression of clinical signs is slow and often incomplete, especially for nerve involvement [3].

Treatment of skull base osteomyelitis typically involves the administration of intravenous antibiotics over an extended period, often combined with surgical intervention to drain pus

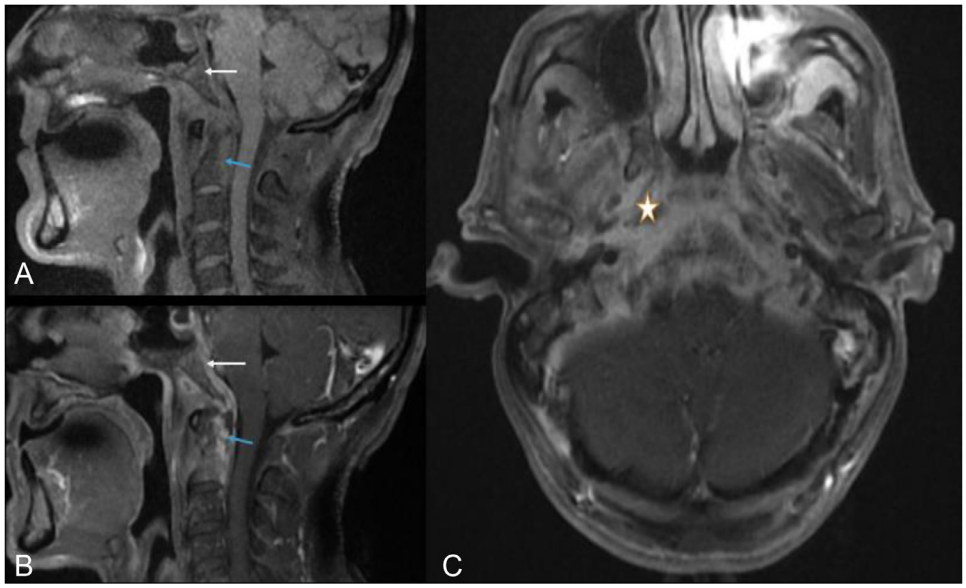

Fig. 3 – Sagittal T1 weighted MR image (A) and sagittal with axial enhanced T1-weighted MR images (B, C) through the skull base showing an enhancing infiltrative process involving the clivus (white arrows), the odontoid (blue arrows) and adjacent tissues of the nasopharynx (Asterix).

collections and remove infected tissue and visibly affected bone if necessary. Close monitoring and regular follow-up are necessary to assess treatment response and prevent potential complications [5,6].

Conclusion

Skull base osteomyelitis is a rare and serious condition that can be life threatening if not treated promptly. Diagnosing it requires a heightened level of suspicion, and delays in diagnosis are common. The most common cause is necrotizing external otitis, although sinus-related causes are even rarer. Early diagnosis is crucial, especially when evaluating any infiltrative skull base condition, particularly if biopsies fail to reveal malignancy. High-resolution bone CT scans of the skull base are essential for detecting early cortical erosion, followed by multiplanar pre- and postcontrast MR imaging to assess marrow space involvement. This comprehensive evaluation is necessary to promptly initiate appropriate treatment.

Patient consent

Written informed consent for the publication of this case report was obtained from the patient. He agrees to participate voluntarily in this study.

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