Cerebellopontine Angle Osteoma Causing Hearing Impairment: CT and MR Findings

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We present a case of right cerebellopontine angle osteoma causing sensorineural hearing loss in a 60-year-old woman. CT and MR imaging showed a densely calcified nodule with fatty bone marrow component protruding from the inner surface of petrous bone but not involving the internal auditory canal. Osteoma should be included in the differential diagnosis of calcified masses in cerebellopontine angle.

Key words: Cerebellopontine angle, Hearing loss, Osteoma

Osteomas of the temporal bone are uncommon lesions and most of them are located in the external auditory canal or mastoid. Tumors protruding from the inner surface of petrous bone are rare. Only a few cases of cerebellopontine (CP) angle osteomas not involving the internal auditory canal have been reported in the English literatures, and only one had axial imaging study [1-3]. We herein report the CT and MR findings of one proved case of osteoma arising from the inner surface of the petrous bone.

CASE REPORT

A 60-year-old woman, who suffered from dizziness and right partial hearing loss for years, was admitted to our hospital due to progression of the symptoms. Audiogram revealed mild to moderate sensorineural hearing loss. The auditory evoked potential test revealed moderate hearing impairment and suspected the 8th cranial nerve or an inner ear lesion over the right side.

Brain CT scan (HiSpeed CT/i, GE Medical System, Milwaukee, Wis.) with thin section (slice thickness/pitch, 3mm/1) over posterior fossa showed a calcified lesion at right CP angle behind the orifice of the internal auditory canal (Fig. 1a). The lesion measured 10x9x6mm. On bone window settings, the lesion depicted a lower density at the inner zone as compared to the peripheral zone. Three-dimensional (3-D) CT reconstruction with shaded surface display (slice collimation/pitch/reconstruction interval/threshold = 3mm/1/1.5mm/above 200 HUs) demonstrated a bony protrusion from the inner surface of the right petrous bone with obvious separation between the internal auditory canal and tumor base (Fig. 1b). T1-weighted MR images (TR/TE, 450ms/25ms) showed that the lesion had a high-signal-intensity inner zone with signal intensity similar to the occipital bone marrow and had a signal-void peripheral zone. On T2-weighted (2500/90) and Short T1 inversion recovery...
(STIR) images (TR/TE/TI, 4000/25/100), the lesion turned out to be almost signal-void in appearance and revealed no obvious compression of the right 8th cranial nerve. Mild enhancement was detected at the adjacent meninges (Figs. 1c-1e). Preoperative diagnosis was a bone tumor with fatty marrow components.

Surgical resection of the lesion was performed from right suboccipital approach. Under microscopic surgery, the lesion pedunculated from the inner surface of the right petrous bone. It was located behind and did not involve the internal auditory canal. Only some adhesion bands instead of compression were detected between the lesion and the 8th cranial nerve. After lysis of the adhesion bands, the lesion was easily detached from the dura and was totally removed. The gross specimen appeared as a smooth surface with hard consistence. Microscopically, it was composed of lamellar bone with well-formed Haversian canals. Some fibroblasts, collagen fibers and adipose tissue were noted within the intertrabecular spaces. No hematopoietic element was detected. The EMA (epithelial membrane antigen) stain revealed negative result, which excluded the possibility of meningeal origin (Fig. 1f). Histologically, the lesion was diagnosed as a cancellous or fibrous type osteoma. The clinical condition of the patient was improved after operation.

![Figure 1](image1.png)

**Figure 1.** a. Noncontrast-enhanced CT scan in bone window setting reveals one calcified nodule (arrow) at right CP angle with relatively hypodensity in its inner zone. b. Three-dimensional CT scan demonstrates a protruding bony lesion (arrow) abutting to the inner surface of the petrous bone, with a significant distance behind the orifice of the right internal auditory canal (curved arrow). c. Coronal T1-weighted MR image reveals that the lesion (arrow) has high-signal-intensity inner zone (as bright as the adjacent occipital bone marrow fat) and signal-void periphery. d. Coronal T2-weighted MR image shows that the lesion (arrow) is almost signal-void in appearance and has some small foci of intermediate signal intensity. e. Coronal T1-weighted MR image after gadopentetate dimeglumine administration reveals band-like enhancement around the lesion (arrow) that was proved to be reactive meninges. f. Cancellous-type osteoma. The osteoma was composed of lamellae bone with some fibroblasts, collagen fibers and adipose tissue within the intertrabecular spaces. No hematopoietic element was seen (hematoxylin and eosin stain, original magnification x50).
DISCUSSION

Osteomas of the temporal bone are benign neoplasms that are probably derived from preosseous connective tissue [1]. These tumors are composed of mature bone and histologically consist of dense lamellae with organized Haversian canals. The intertrabecular stroma is usually cellular and contains osteoblasts, fibroblasts, and giant cells. Two types of lesions are generally described: the ivory or eburneous osteoma. The ivory osteoma is composed of compact bone without significant stroma, and mostly occurs in membranous bone. The rare cancellous or fibrous osteoma appears as a spongy bone with prominent fibrous stroma [1,2].

Osteomas have been reported on almost every part of the temporal bone, including the squama, mastoid, middle ear canal, and styloid process. The mastoid appears to be the most common site, followed by the squama and internal auditory canal [1,2]. Osteoma which arises from the inner table of the petrous bone extending through the dura is rare. It may simulate some clinical features of the acoustic schwannoma such as hearing loss and occasionally trigeminal neuralgia, seizure or contralateral homonymous hemianopia [2-5].

The pathogenesis of temporal osteoma is not certain, but it seems likely to develop at the junction of membranous (squamous) and enchondral (petrous) bones, in a manner consistent with the hypothesis of propensity for growth at the junction between different tissues [6]. However, the etiology of these lesions is unknown, with a variety of predisposing factors such as trauma, infection, and heredity [1].

CT findings of osteoma are characteristic as a calcified mass without associated soft tissue component. Bone window images may demonstrate a sharp and smooth-marginated lesion, sometimes with lower density at inner zone. The density of the inner zone may result from fibrous stroma and scattered bone marrow fat [2,4]. 3-D CT scan with shaded surface display may depict the anatomical relationship between osteoma, the parent bone and the internal auditory canal in different projections and can be helpful for surgical planning.

On MR imaging, the hyperintense inner zone of the lesion on T1-weighted images and hypointense signal on T2-weighted and STIR images are consistent with fatty marrow. The peripheral zone is signal-void on all pulse sequence images representing dense cortical bone and lamellae of the osteoma. Postcontrast images show rim-like enhancement of the lesion, which is consistent with reactive adhesion of meninges observed at surgery. The adhesion bands involving the right 8th cranial nerve rather than direct tumor compression was supposed to be the cause of hearing impairment in our case.

The differential diagnosis of a CP angle tumor includes acoustic schwannoma (75% incidence), meningioma (8-10%), epidermoid (5%), and other schwannomas (2-5%) [7]. Calcification is rarely observed in schwannoma and epidermoid. These tumors can easily be excluded based on CT findings. Focal or diffuse calcification in meningioma is common, accounting for 20 to 25% of cases [7]. Occasionally, meningiomas appear densely calcified and can mimic osteoma on CT. MR imaging can be helpful in differential diagnosis. Fat marrow components and lack of strong enhancement are in favor of osteoma.

In summary, osteomas arising from the inner surface of petrous bone are rare. Clinical manifestation of hearing loss may mimic an acoustic neuroma. CT findings are diagnostic, and 3-D CT reconstruction images may be helpful in surgical planning. MR imaging can detect subtle adjacent meningeal reaction. Patients with symptomatic osteoma at cerebellopontine angle are advised to surgical excision. Although it is uncommon, an osteoma should be included in the differential diagnosis of a densely calcified tumor at cerebellopontine angle.

REFERENCES

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我們報告一名60歲女性因患有右側小腦橋腦角骨瘤導致聽力受損的病例。電腦斷層與磁振造影檢查顯示一緻密鈣化結節，內含脂髓，由岩骨內緣凸出，但未侵犯內耳聽道。在小腦橋腦角之鈣化腫塊，骨瘤必須列入鑑別診斷。

關鍵詞：小腦橋腦角，聽力受損，骨瘤