The Journal of Laryngology & Otology (2009), ***123***, *572–574.*

doi:10.1017/S0022215108002764

Clinical Record

Imaging case study: enlarged superior vestibular nerve canal with sensorineural hearing loss

M I Redleaf, J M Pinto, J J Klemens

Abstract

Objective: We report a new temporal bone anomaly – an enlarged superior vestibular nerve canal – associated with sensorineural hearing loss.

Case report: A 10-month-old male infant presented with sensorineural hearing loss together with bilaterally enlarged superior vestibular nerve canals. Compared with published temporal bone computed tomography measurements, our patient's canals were normal in length but approximately double the normal width. In addition, careful review of the imaging did not clearly identify a bony wedge between the superior and inferior vestibular nerve canals.

Conclusion: Enlarged superior vestibular nerve canal malformation may be a marker for sensorineural hearing loss. Increased vigilance amongst otologists may establish the prevalence of this anomaly and its possible effects on hearing.

Key words: Superior Vestibular Nerve Canal; Temporal Bone; Anatomy; Malformation; Sensorineural Hearing Loss

Introduction

Many abnormalities of the otic capsule which result in sensorineural hearing loss (SNHL)[1] are visible on computed tomography (CT) of the temporal bone.[2] We present a child with SNHL whose temporal bone CT showed bilateral widening of the superior vestibular nerve canal, with bilateral distortion of the nerve's entry site into the vestibule.

Case report

A 10-month-old male infant failed his newborn hearing screening test.

Physical examination was unremarkable. Auditory brainstem response testing showed no waves detectable below 70 dB on the left and none detectable below 80 dB on the right.

Temporal bone CT (Figure 1) showed bilaterally enlarged superior vestibular nerve canals and bilateral distortion of the vestibules at the nerve entry site. The superior vestibular nerve canal length and width at the most medial portion (i.e. their exit from the internal auditory canal) were measured from the temporal bone CT using the Centricity Dicom viewer software. The canal depth in the z axis was estimated from the number of serial sections in which it appeared. The right canal's length was 2.28 mm, its width was 2.24 mm and its depth was approximately 3 mm. The left canal's length was 2.74 mm, its width was 1.82 mm and its depth was approximately 2 mm. The bony wedge between the superior vestibular nerve and inferior vestibular nerve canals was not well seen on CT, so our depth estimate remains crude. The remaining structures appeared normal, including the facial nerve and the internal auditory canals.

Discussion

This radiographic finding of isolated enlargement of the canal for the superior vestibular nerve has not previously been reported in ears with SNHL, nor has it been reported in normal hearing ears. Schuknecht's 1993 pathological analysis of the temporal bone[1] identified many inner-ear malformations, but no enlargements of the superior vestibular nerve canal. A careful survey of this author's photomicrographs of temporal bones from patients with congenital hearing loss identified five which clearly show a normal superior vestibular nerve canal. Another eight photomicrographs of temporal bones from patients with congenital hearing loss show areas of temporal bone directly adjacent to the superior vestibular nerve canal into which an enlarged canal – similar in size to that seen in our patient – would have intruded, had it been present.

A 1995 radiographic review of inner-ear malformations[2] also gave no evidence of this particular malformation.

Two recent studies of vestibular canal measurements in temporal bones found the average length of the superior vestibular nerve canal to be 2.30 mm[3] and 1.944 mm.[4] The second study also calculated the average width of the superior vestibular nerve canal at its most medial

From the Department of Surgery, Section of Otolaryngology-Head and Neck Surgery, The University of Chicago, Illinois, USA.
Accepted for publication: 7 April 2008. First published online 23 May 2008.

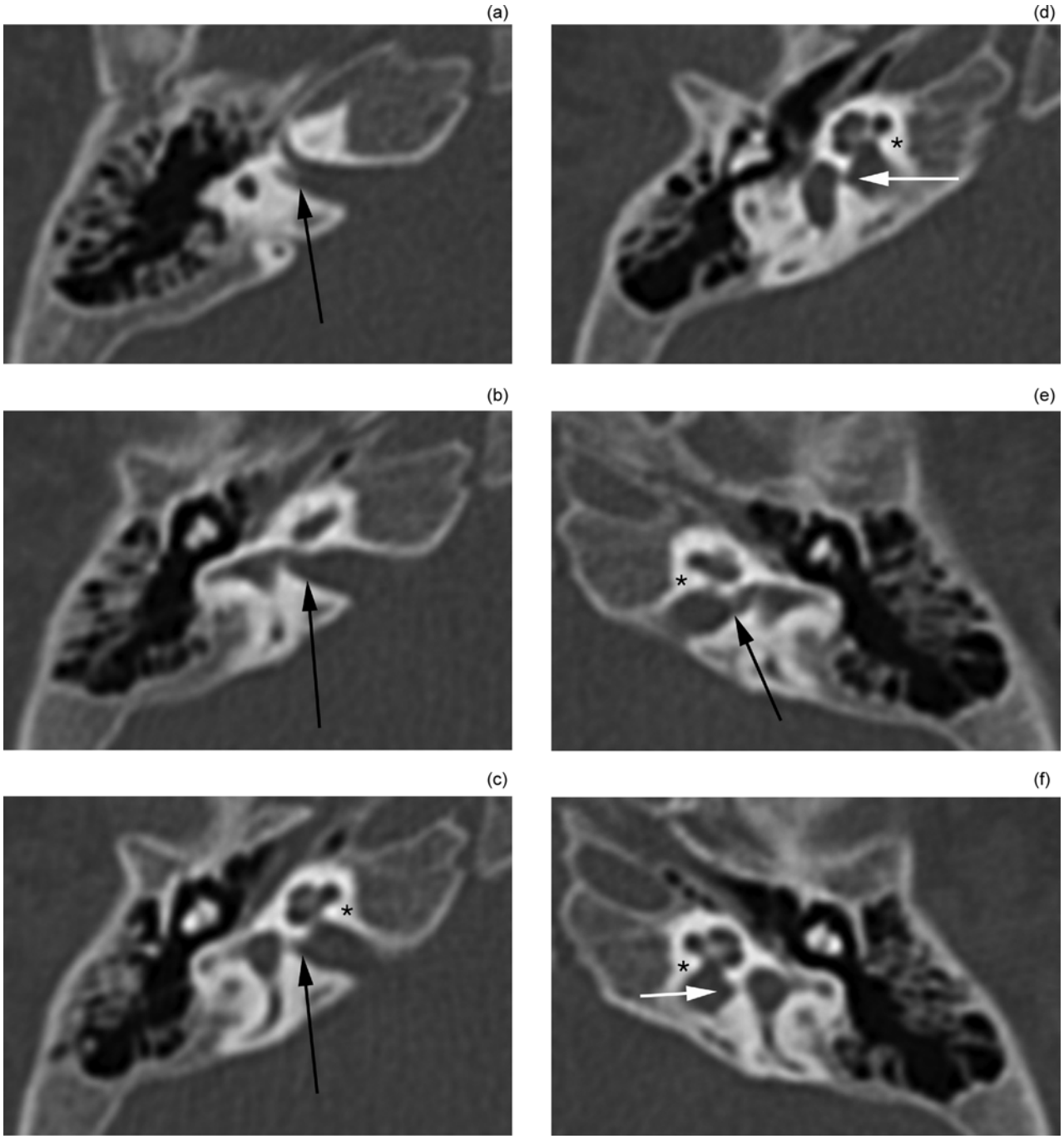

FIG. 1

Axial, noncontrast, bone window computed tomography scans of the right and left temporal bones of an infant with congenital sensorineural hearing loss. The only visible malformation is the bilateral enlargement of the superior vestibular nerve canal and the distortion of the vestibule at the nerve entry site. Arrows indicate the superior vestibular nerve canals at their most medial portion, where width measurements were taken. Auditory nerve canals are indicated by asterisks directly adjacent. Small white arrows indicate inferior vestibular nerve canals.

portion, which is its widest portion, to be 1.04 mm. Our patient's superior vestibular nerve canals were 2.28 and 2.74 mm in length – close to these previously measured averages. Our patient's superior vestibular nerve canal widths were 2.24 and 1.82 mm, approximately twice the normal width. Direct coronal images could not be obtained in this paediatric patient; therefore, the depth of the superior vestibular nerve canal was estimated from the number of sections in which it was visible on axial imaging. In addition, careful review of the temporal bone CT did not clearly identify a bony wedge between the superior and inferior vestibular nerves. The vestibular canals may have been confluent in this patient.

Unfortunately, magnetic resonance imaging could not be obtained for this child. Therefore, the superior vestibular nerve canal may be filled with nerve, cerebrospinal fluid or a combination of the two.

https://doi.org/10.1017/S0022215108002764 Published online by Cambridge University Press

- **Pathological analysis of the temporal bone has identified many inner-ear malformations, but enlargement of the superior vestibular nerve canal has not previously been reported**
- **This paper describes a 10-month-old male with sensorineural hearing loss together with bilaterally enlarged superior vestibular nerve canals**
- **This inner-ear malformation may be a marker for sensorineural hearing loss**

This anomaly should be added to the canon of inner-ear malformations, and further study may establish its role, if any, in SNHL.

References

1 Schuknecht HF. *Pathology of the Ear.* Philadelphia: Lea & Febiger Press, 1993;115–89
2 Valvassori GI, Mafee MF, Carter BL. *Imaging of the Head and Neck.* Stuttgart: Thieme, 1995;42–51
3 Goebel JA, O'Mara W, Gianoli G. Anatomic considerations in vestibular neuritis. *Otol Neurotol* 2001;**22**:512–18
4 Gianoli G, Goebel J, Mowry S, Poomipannit P. Anatomic differences in the lateral vestibular nerve channels and their implications in vestibular neuritis. *Otol Neurotol* 2005;**26**:489–94

Address for correspondence:
Dr M Redleaf,
5841 S Maryland Ave,
MC 1035,
Chicago, Illinois 60637, USA.

E-mail: mredleaf@surgery.bsd.uchicago.edu

Dr M Redleaf takes responsibility for the integrity of the content of the paper.
Competing interests: None declared