The Journal of Laryngology & Otology (2006), ***120***, *793–795*.

doi:10.1017/S0022215106001423
Printed in the United Kingdom
First published online 15 May 2006

Clinical Record

Unusual middle-ear mischief: trans-tympanic trauma from a hair grip resulting in ossicular, facial nerve and oval window disruption

J D Snelling, A Bennett, P Wilson*, M Wickstead

Abstract

A case of piercing of the tympanic membrane, resulting in unusual consequences, is described. This is the first reported case of the long process of a dislocated incus resulting in trauma to the horizontal portion of a dehiscent facial nerve. Simultaneous depression of the stapes footplate resulted in a perilymph leak, but with delayed presentation.

Key words: Trauma; Tympanic Membrane; Facial Nerve; Perilymphatic Fistula

Case report

A 44-year-old man presented to accident and emergency having poked a narrow, metal 'Alice' hair band into his left external auditory canal whilst playing with his daughter. He described an immediate 'bang', left-sided facial weakness (consistent with grade V House–Brackman) and hearing loss. His facial weakness improved promptly prior to arrival in hospital.

On assessment in the accident and emergency department, the patient was examined by a neurologist and considered to have normal facial nerve function and a small posterior tympanic membrane perforation. He was discharged from the accident and emergency department with simple analgesia, antibiotics and an ENT out-patient appointment.

Four days later, the patient was seen in the ENT outpatient department. At this time, it was noted that he had a House–Brackman grade III lower motor neurone facial nerve palsy, and pure tone audiometry confirmed a conductive hearing loss (Figure 1). Otoscopy confirmed a dry left posterior tympanic membrane perforation. A computed tomography (CT) scan was organized and the patient was prescribed a course of oral steroids.

At three months, the patient's facial nerve was functioning normally but his hearing deteriorated and he developed intrusive, left-sided tinnitus and episodic rotatory vertigo. Pure tone audiometry demonstrated an additional sensorineural component to his hearing loss (Figure 2), and arrangements were made for hearing therapy and an exploratory tympanotomy.

Computed tomography scanning demonstrated significant trauma to the left middle-ear cleft. There was incudomalleal and incudostapedial dislocation. The incus had rotated almost 90 degrees and was lying horizontally immediately below the horizontal portion of the facial nerve canal (Figure 3). The facial nerve appeared to be dehiscent (Figure 4). The stapes footplate was not recognizable, and there was both a tiny bone fragment and air within the vestibule (Figure 5).

An exploratory tympanotomy revealed that the incus was dislocated and lying horizontally, and it had pushed the stapes footplate through the oval window, creating a perilymph leak. The facial nerve was exposed. Repair of the perilymph leak was performed with a fat plug tissue graft.

Unfortunately, repair of the perilymph leak did not prevent further deterioration of the patient's hearing, and, at the time of writing, he had a 'dead ear' (Figure 6). The intrusive tinnitus had largely resolved and the patient had responded favourably to tinnitus retraining therapy.

Discussion

Penetrating middle-ear trauma is poorly reported in the literature. Our unfortunate patient presented with an accidental, self-inflicted injury resulting in a combination of ossicular, facial nerve and oval window disruption.

Perforating trauma to the postero-superior segment of the tympanic membrane by a long, thin foreign body places a number of middle-ear structures at risk because of their anatomical alignment. The malleus is secured by the anterior and lateral malleolar ligaments and the tensor tympani muscle and tendon. The stapes is held in place by the annular ligament and stapedius tendon. Of the ossicles, the incus is the most vulnerable because it has no muscular attachments and its soft tissue attachments are the weakest. This makes dislocation at the malleoincudal articulation, incudostapedial joint, or both, possible. High resolution CT allows accurate evaluation of the ossicular chain and middle-ear anatomy.[1]

Our patient had a dehiscent horizontal portion of his facial nerve. Reports of the incidence of facial nerve dehiscence vary widely. Within diseased ears, the rate of dehiscence is around 8.9 per cent,[2] although, in patients with cholesteatoma, the rate may be up to 33 per cent.[3] High resolution CT scanning shows a sensitivity of 66 per cent and specificity of 84 per cent in the detection of facial nerve dehiscence.[4]

From the Departments of Otolaryngology and *Radiology, Norfolk and Norwich University Hospital, Norwich, UK.
Accepted for publication: 16 December 2005.

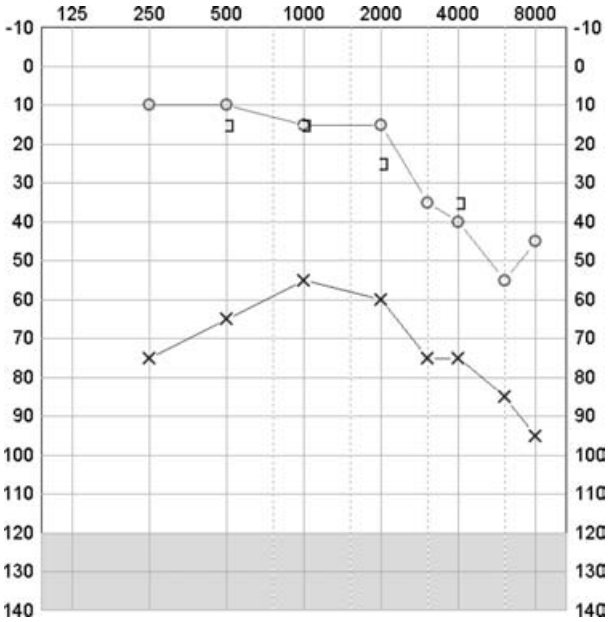

FIG. 1

Pure tone audiogram performed four days following the injury, demonstrating a moderate conductive hearing loss.

The intimate relation between the facial nerve and long process of the incus in our patient suggests that the long process of the incus, following its dislocation, directly damaged the nerve. The history of rapid onset, transient facial nerve palsy followed by recurrent palsy, suggests an initial nerve injury followed by subsequent secondary oedema.

Traumatic disruption of the stapediovestibular joint, causing a perilymph leak manifesting as hearing loss, vertigo and tinnitus, is well recognized.[5,6] Fracture of the stapes occurs in approximately one-third of traumatic ossicular lesions.[7] Symptoms of vertigo, nystagmus,

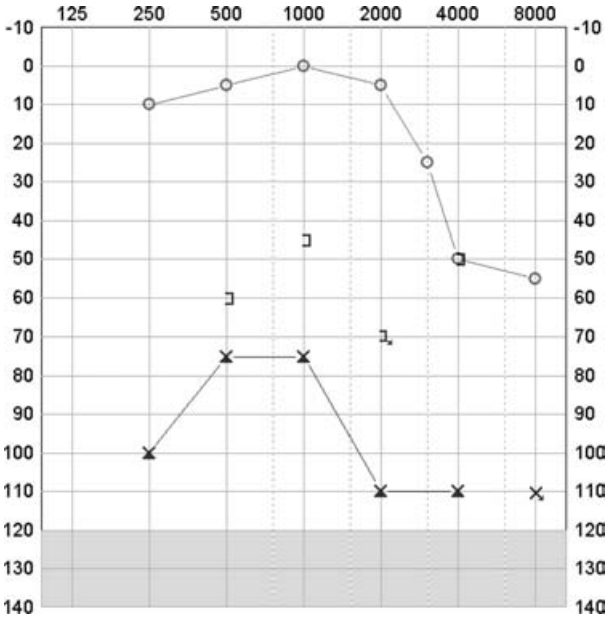

FIG. 2

Pure tone audiogram performed three months following the injury, demonstrating a mixed component hearing loss.

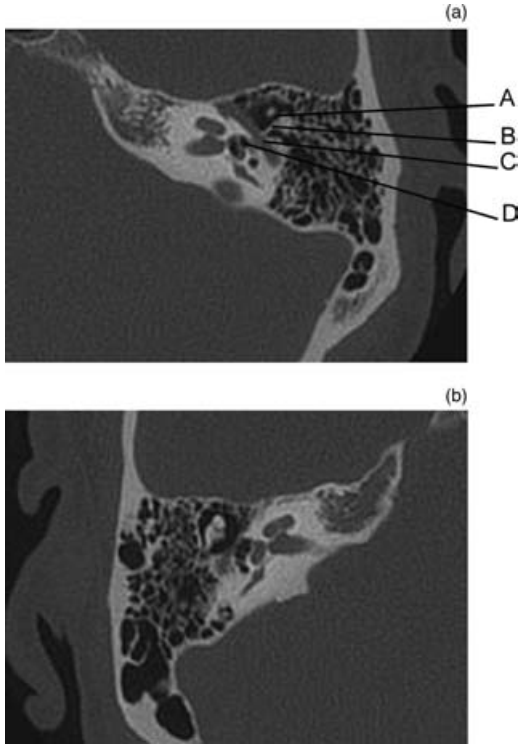

FIG. 3

Axial section of the left temporal bone (a) with matching contralateral section (b). A = incudomallear dislocation; B = long process of the incus; C = horizontal portion of the facial nerve; D = air within the vestibule

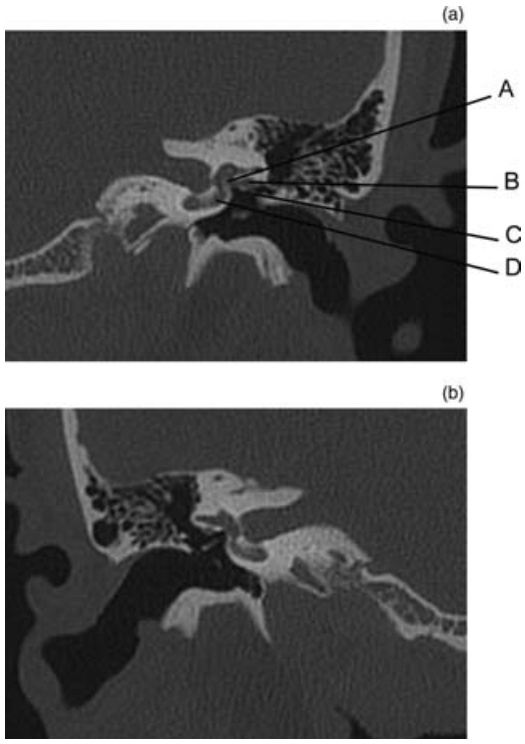

FIG. 4

Coronal section of the left temporal bone (a) with matching contralateral section (b). A = oval window niche; B = dehiscent facial nerve; C = tip of the long process of the incus; D = basal turn of cochlea

https://doi.org/10.1017/S0022215106001423 Published online by Cambridge University Press

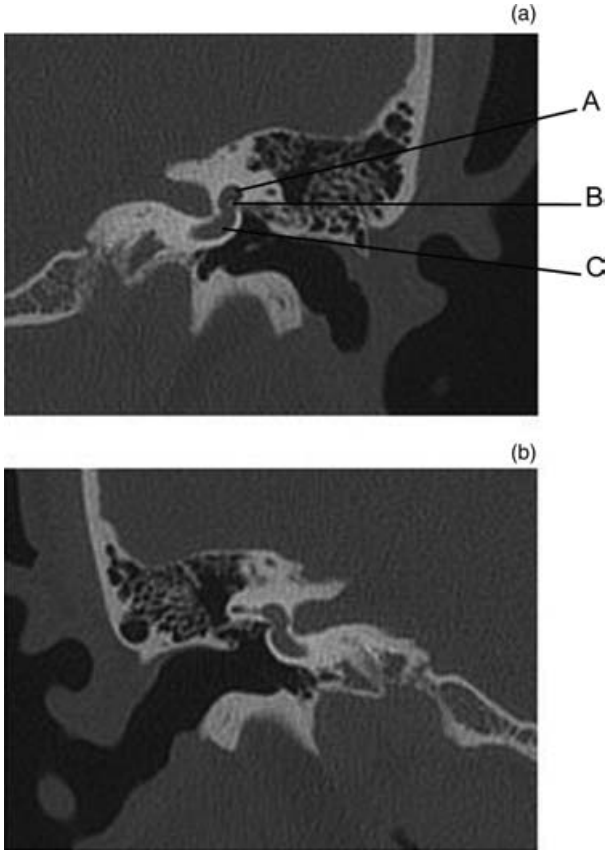

FIG. 5

Coronal section of the left temporal bone (a) with matching contralateral section (b). A = air within vestibule; B = fragment of stapes footplate within vestibule; C = basal turn of cochlea

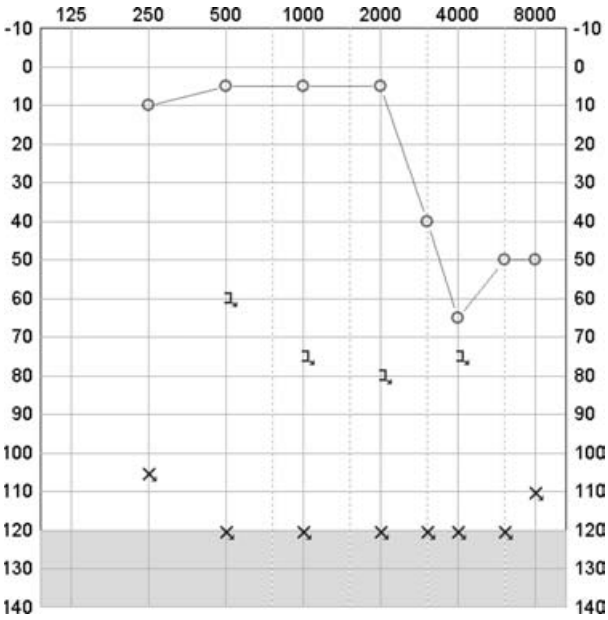

FIG. 6

Pure tone audiogram demonstrating hearing thresholds two years following the injury.

sensorineural hearing loss and tinnitus are typically present immediately following iatrogenic perilymph leak. Delayed presentation of a perilymphatic fistula has been reported following stapes surgery,[8] and the authors are aware of only one case of asymptomatic traumatic perilymphatic fistula.[9]

- **A case of trauma to the tympanic membrane with a hair band, resulting in unusual consequences, is described**
- **In this case, the long process of a dislocated incus resulted in trauma to the horizontal portion of a dehiscent facial nerve. Simultaneous depression of the stapes footplate produced a perilymph leak but with delayed presentation**
- **The clinical, audiometric and radiological features are discussed**

We can only speculate on the exact trajectory of the initial trauma, but the CT images and later operative findings suggest that the damage to the horizontal portion of the facial nerve was caused by the dislocated long process of the incus. The disruption of the stapediovestibular joint was probably caused by direct trauma from the pin.

Our case demonstrates unusual multiple middle-ear abnormalities secondary to a penetrating injury, a common mechanism of ear trauma.

References

1 Swartz J, Swartz NG, Korsvik H, Wolfson RJ, Hampel A, Ronis ML *et al*. Computerized tomographic evaluation of the middle ear and mastoid for posttraumatic hearing loss. *Ann Otol Rhinol Laryngol* 1985;**94**:263–6
2 Bayazit YA, Enver O, Muzaffer K. Gross dehiscence of the bone covering the facial nerve in the light of otological surgery. *J Laryngol Otol* 2002;**116**:800–3
3 Selesnick SH, Lynn-Macrae AG. The incidence of facial nerve dehiscence at surgery for cholesteatoma. *Otol Neurotol* 2001;**22**:129–32
4 Fuse T, Tada Y, Aoyagi M, Sugai Y. CT detection of facial canal dehiscence and semicircular canal fistula: comparison with surgical findings. *J Comput Assist Tomogr* 1996;**20**: 221–4
5 Vanderstock L, Vermeesch H, De Vel E. Traumatic luxation of the stapes. *J Laryngol Otol* 1983;**97**:533–7
6 Neuenschwander MC, Deutsch ES, Cornetta A, Willcox TO. Penetrating middle ear trauma: a report of 2 cases. *Ear Nose Throat J* 2005;**84**:32–5
7 Hammond VT. Ossicular lesions. *J Laryngol Otol* 1980;**94**: 117–22
8 Alberto R, Canale A, Lacilla M, Cavalot AL, Ferrero V. Delayed vertigo after stapes surgery. *Laryngoscope* 2004; **114**:860–2
9 Hough JVD. Otologic Trauma. In: Paparella MM, Shumrick DA, eds. *Otolaryngology*. Philadelphia: WB Saunders, 1980; 1656–1679

Address for correspondence:
Mr J D Snelling,
9 West Hill,
Sanderstead, South Croydon,
Surrey CR2 0SB, UK.

Fax: + 44 (0)20 8657 2741
E-mail: james.snelling@nhs.net

Mr J D Snelling takes responsibility for the integrity of the content of the paper.
Competing interests: None declared