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CLINICAL RECORD

Shortened stapedius tendon: a rare cause of conductive hearing loss

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Abstract

Introduction: Anomalies of the stapedius tendon have been reported to cause conductive hearing loss; in theory, such anomalies limit the movement of the stapes.

Objectives: To demonstrate a rare cause of conductive hearing loss resulting from anomaly of the stapedius tendon and to compare the clinical findings of this patient to other stapedius tendon anomalies reported in the literature.

Method: Case report of a single case of shortened stapedius tendon and a review of the English literature on stapedius tendon anomalies.

Results: This is a case report of a 15-year-old boy with shortened stapedius tendon causing unilateral hearing loss, accompanied by a review of the literature. Contrary to other reported cases, this patient did not have an ossified tendon, but rather an extremely short tendon. The boy regained normal hearing following excision of the stapedius tendon.

Conclusion: A shortened stapedius tendon is a very rare diagnosis, yet it should be considered as a possible cause of conductive hearing loss.

Key words: Hearing Loss, Conductive; Stapedius; Tendons; Anatomy; Ear, Middle; Embryology

Background

Conductive hearing loss is a common morbidity in both the adult and paediatric population. The most common causes of conductive hearing loss in children are cerumen impaction and middle-ear effusion.

Ossification of the stapedius tendon has been reported to cause conductive hearing loss.[1,2] Furthermore, the possibility of familial inheritance has been described.[2] Ossification results in an immobilised stapes that leads to conductive hearing loss. In theory, a shortened stapedius tendon can cause conductive hearing loss by the same mechanism as an ossified stapedius tendon by limiting the movement of the stapedius.[3]

We report the case of a 15-year-old boy who was diagnosed as having a shortened stapedius tendon intra-operatively. The patient benefited from a surgical release of the shortened stapedius tendon that resulted in a significant hearing improvement. Ethical approval was acquired from the Ethical Review Board of the Montreal Children's Hospital. As no identifiable images were obtained, and in accordance with our institution's review board, consent from the patient or his family was not required.

Case report

An otherwise healthy 15-year-old boy was referred to the otology clinic for unilateral, left-sided hearing loss. There were no other otological symptoms, such as vertigo, tinnitus, discharge or pain. In the past, the patient had had several sets of pressure-equalising tubes inserted in the ear without improvement in hearing. There was no family history of hearing loss.

On otoscopic examination, both tympanic membranes were normal. An audiogram demonstrated a unilateral, left-sided, mixed hearing loss of up to 50 dB HL on low frequencies and normal hearing on the right side (Figure 1). Stapedial reflexes were absent on the left side. Tympanometry was normal bilaterally. Following a discussion with the patient and his family regarding the advantages and disadvantages of imaging techniques, the decision was made not to perform a computed tomography (CT) scan. The patient was booked for a middle-ear exploratory tympanotomy.

Intra-operatively, the left tympanic membrane was normal. The middle ear looked normal. The malleus was palpated to assess the mobility of the ossicular chain. Although the malleus was mobile, the transmission through the incus and stapes was poor, with limitation of movement focused at the stapes. Further assessment of the ossicular chain revealed a normal-looking incus and stapes but an extremely short stapedius tendon. To improve the mobility of the ossicular chain, the stapedius tendon was severed.

Post-operatively, the patient reported a significant improvement in hearing in the left ear. This improvement was documented by normal audiometric testing (Figure 1). This confirmed the intra-operative diagnosis of a shortened stapedius tendon as the cause of ossicular chain immobility.

The patient was followed up in the otology clinic for another year without any deterioration in his hearing.

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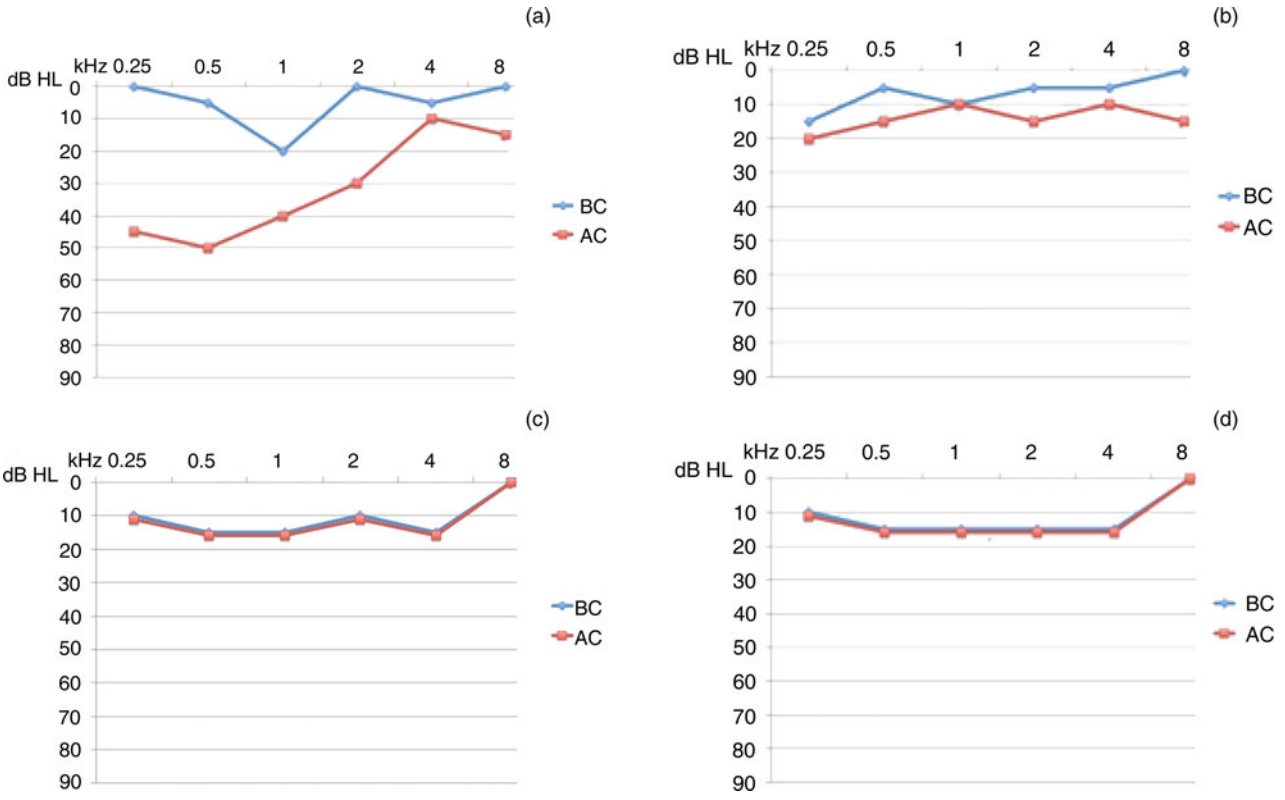

FIG. 1

Results of the pre- and post-operative audiograms: (a) pre-operative audiogram of the left ear; (b) post-operative audiogram of the left ear; (c) pre-operative audiogram of the right ear; (d) post-operative audiogram of the right ear. BC = bone conduction; AC = air conduction.

Discussion

The first reported case of an ossified stapedius tendon was made by Schuknecht and Trupiano.[4] They reported a bony bridge that emerges from the apex of the pyramidal eminence and inserts into the neck of the stapes, which caused conductive hearing loss.[4] Following that report, there have been seven reports of similar findings. In all of these reports, an ossified stapedius tendon caused the conductive hearing loss.

The musculature of the second pharyngeal arch forms the stapedius muscle, the stylohyoid muscle, the posterior belly of the digastric muscle and the muscles of facial expression. The interhyale is the internal part of the second branchial arch that forms the tendon of the stapedius muscle during embryonic development. A congenital absence or deformity of the tendon is a reported anomaly of the middle ear.[5]

- **Anomalies of the stapedius tendon are documented causes of conductive hearing loss**
- **A shortened stapedius tendon can cause conductive hearing loss by limiting the movement of the stapes**
- **Pre-operative testing can aid in the diagnosis, but usually middle-ear exploration is necessary**
- **A shortened stapedius tendon can be managed surgically by severing the tendon, thereby providing adequate movement of the stapes**

In comparison to these reported cases, our patient did not have an ossified tendon, but rather a shortened tendon. In theory, both ossified and shortened stapedius tendons can cause conductive hearing loss by limiting the movement of the stapes.

An ossified stapedius tendon can sometimes be visualised on a high-resolution CT scan.[6] In our case, a CT scan was not performed. We decided to perform an exploratory tympanotomy instead.

In this case, due to a normal tympanogram, a differentiation between ossicular chain disruption and fixation was not easily made. Intra-operatively, it was clear that the ossicles were well positioned and mobile except for the stapes. Contrary to other reports in the literature, this case did not have an ossified stapedius tendon. The tendon was clearly visualised and was simply too short for adequate movement of the stapes. Stapedial movement was gained by simply cutting the stapedius tendon. This resulted in normalised hearing post-operatively.

To our knowledge, this is the only case in the literature that discusses a short, non-ossified stapedius tendon as a cause of conductive hearing loss.

Conclusion

The various anomalies of the middle ear, including a shortened stapedius tendon, should be considered as a cause of conductive hearing loss. Occasionally, pre-operative investigation can suggest the diagnosis, but middle-ear exploration may be necessary.

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