

—Report on Experiments and Clinical Cases—

Traumatic Perilymph Fistula in Infants: A Case Report

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Abstract

Traumatic perilymph fistula is reported to be rare in infants because of the small size of the infant external meatus. We treated an infant with a traumatic perilymph fistula in the right ear. A metallic wire had penetrated the tympanic membrane. Horizontal-rotatory nystagmus was also observed. Computed tomographic images revealed dislocation of the ossicles. The perilymph fistula was closed under general anesthesia. The incus-stapes joint was separated and the footplate of the stapes was dislocated. Leakage of the perilymph fluid was apparent from the oval window and this fistula was closed with connective tissue. The perforation of the tympanic membrane was closed with temporal fascia. After surgery, the spontaneous nystagmus disappeared. The patient is under observation as an outpatient and is growing normally. (J Nippon Med Sch 2003; 70: 519–521)

Key words: traumatic perilymph fistula, infant, tympanoplasty

Introduction

The inner ear is separated from the middle ear by the membrane on the round window and the base of the stapes on the oval window under normal conditions. However, mechanical forces, such as those in ear surgery, especially stapedectomy, trauma, or congenital malformations may produce an abnormal communication between the inner and the middle ear. This pathological fistula causes various symptoms of inner ear injury, such as hearing loss, tinnitus and vertigo. Perilymph fistula (PLF) is in infants mainly due to congenital diseases, such as Mondini malformation¹ while compared with adults PLFs caused by a penetrating object are rare because of the small size of the external ear meatus². We treated an infant with a traumatic PLF caused by a

metallic wire and describe the symptoms, signs and intra-operative findings in detail.

Case Report

The patient, a 2-year-old male infant, had fallen on the ground while playing in August 2001. At that time, his mother had found a metallic wire, attached to a balloon, in the right ear canal and bleeding from the right ear and consulted an ENT clinic in her neighborhood. Horizontal-rotatory nystagmus directed towards the right was observed under Frenzel glasses. The patient was referred to us the same day for further evaluation. The patient had been normally born and had no history of meningitis. Development of speech was also normal.

On physical examination, the right tympanic membrane was found to be perforated in the posterior-

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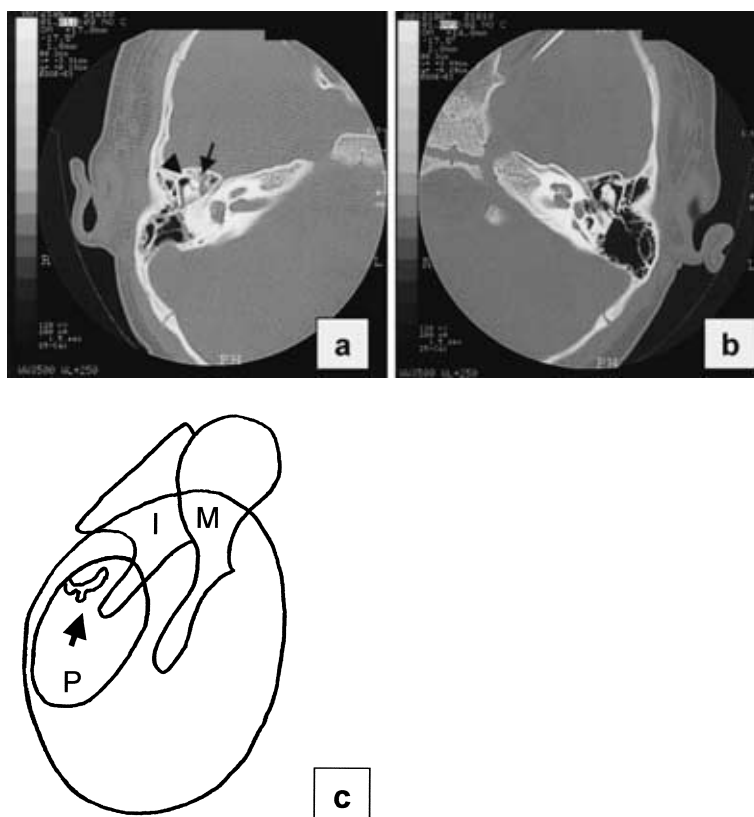


Fig. 1 Computed tomography images and a schematic drawing of the findings during surgery (a) Axial CT image, soft tissue window, showing separation of the malleus-incus joint (arrow head) and an area of low density in the right middle ear cavity (arrow). (b) Axial CT image of the contralateral ear is shown. Joining of the ossicles was normal. There were no abnormal shadows in the middle ear. (c) Schematic drawing of findings during surgery is shown. Perforation (P) of the tympanic membrane was observed in the posterior-superior quadrant. The incus-stapes joint was separated (arrow). The superstructure of the stapes was dislocated. The incus (I)-malleus (M) joint was also separated. Leakage of the lymph fluid was observed in the oval but not in the round window fossa.

upper quadrant, and leakage of fluid was not apparent at first. The incus-stapes joint was not observed. Axial CT images with soft tissue window revealed an area of low density in the middle ear cavity and dislocation of the ossicles (**Fig. 1a**) compared to the opposite side (**Fig. 1b**). Spontaneous horizontal-rotatory nystagmus directed towards the left was observed. The patient could not walk at all because of the disturbance of equilibrium.

Clear fluid began flowing out from the right ear canal one day after admission and his pillow became dripping wet within a few hours with fluid from his ear. We tried to record the auditory brain stem response to evaluate auditory acuity, but results were not repeatable. We suspected a perilymph fistula and operated on him two days after his admis-

sion under general anesthesia. We approached from the post-auricular portion, and then the round and oval windows were visualized. The incus-stapes joint was separated, the crus of the stapes was fractured and the foot plate was dislocated (**Fig. 1c**). Leakage of lymph fluid was observed from the oval but not from the round window fossa. We removed the incus and the superstructure of the stapes and we then covered the oval and round windows with connective tissue using albumin-glue and closed the perforation of the tympanic membrane with the fascia temporalis. There was no apparent congenital malformation of the middle ear. After the surgery, the spontaneous nystagmus disappeared and the patient became able to walk. The hearing level of the auditory brain stem response was 60 dBHL in the right

and 40 dBHL in the left ear one month after surgery. At present, he is under observation as an outpatient and is growing normally.

Discussion

In all age groups, 50% of PLFs are caused by otologic surgery and trauma¹. In contrast, the main causal factor of PLF in infants is congenital malformation²⁻⁴. Trauma caused by a penetrating object, as observed in our patient, is rare because of the small size of the external ear meatus. We have therefore reported the details of our case.

On diagnosis of PLF, various signs and symptoms are observed in patients and it is important to evaluate inner ear disturbance. However, infants do not always cooperate with examinations, and it is sometimes difficult to perform an exact evaluation. Computed tomography is also useful for diagnosis⁵. We could diagnose PLF based on the findings of clinical examinations such as spontaneous nystagmus as well as on computed tomographic and otoscopic findings.

Even in the case of an infant, surgical closure of the fistula is the treatment of first choice, when conservative therapy produces no improvement of signs or symptoms. In our patient, fluid flowing out of the ear wet the pillow within a few hours and there was a possibility of secondary infection including meningitis. Thus, we selected a surgical procedure promptly in the early stage. In some adult cases, it is possible to visualize the middle ear cavity from the intra-canal approach, but in our patient the post-auricular approach allowed a good view of the middle ear. Based on the intra-operative findings, we assumed the fistula of the oval window had been caused by direct force exerted on the oval window or the ossicle-chain, and that the membrane of the oval window was destroyed and perilymph fluid leaked from the inner ear.

Seltzer and McCabe reported¹ that vestibular inju-

ries were improved in 94% of patients and hearing was improved or preserved in 73% after closure of perilymph fistula. In our patient, nystagmus disappeared after surgery, though right hearing level was still lower than left. We did not place a columella on the oval window and did not reconstruct the pathway of the acoustic conduction, because we selected a more reliable way to close the perilymph fistula. Infancy is important for language and emotional development and hearing loss may disturb this development. In patients who have severe hearing loss contralaterally, the modified type III tympanoplasty should be considered to improve hearing. Since the possibility of subsequent leakage of the perilymph, which can cause recurrent meningitis⁶, cannot be disregarded, patients should be closely monitored for many years.

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