Patient with Audible Popping Sounds Emanating from the Ear Canal

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Abstract
We describe a most unusual case of a 40-year-old male who presented with audible popping sounds emanating from his left ear canal. The process of identifying the source of the sounds and treating the underlying cause is presented in detail.

Key Words: Acoustic immittance, tinnitus, tympanic membrane

Sounds generated in the head are not unique. While most are perceived only by the patient, occasionally, the sounds can be heard by persons nearby. These sounds have been given labels such as "objective" or "extrinsic" tinnitus (Atkinson, 1947). With Kemp's (1978) discovery of the otoacoustic emissions (OAEs), substantial interest has been generated in sounds emanating from the ear canal. The OAEs, however, are very low intensity level signals that typically require special instrumentation to detect and measure. There are a few cases in the literature where ear canal sounds could be heard by other people without instrumentation. For example, Glanville et al (1971) reported on a father and two of his children who exhibited a high-pitched tinnitus from the ear canal that could be heard by other people. In fact, one of the children produced sounds of sufficient magnitude that they could be heard several feet away. Huizing and Spoor (1973) reported a similar case of a female with audible sounds coming from the ear canal.

Sources of other sounds emanating from the head have been attributed to vascular anomalies, jaw movements, or muscular contractions. An example of the latter is palatal myoclonus (MacKinnon, 1968), which produces a rapid clicking sound.

We report in this case study a patient who exhibited a peculiar, audible popping sound of unknown origin that emanated from the ear canal.

CASE REPORT

A 40-year-old male presented to an outpatient otolaryngology clinic with the complaint of periodic popping sounds coming from his left ear. The patient reported that the popping sounds began several months previously, usually occurred spontaneously, lasted for a few seconds, and were sufficiently loud that other people could hear them, which was a source of embarrassment to him and his family. The patient also complained of a "clogged" feeling in that ear but denied any hearing loss or other otologic symptoms. Case history revealed the patient to be a frequent user of cotton swabs, which had resulted in a left tympanic membrane (TM) perforation approximately 1 year earlier.

Audiometric testing revealed that hearing was within normal limits (WNL) bilaterally in the 500- to 2000-Hz range. Above 2000 Hz, the left ear exhibited a slight drop. Upon administering acoustic immittance testing of the left ear, the audiologist reported a very audible popping sound with pressure changes, in spite of the fact that the ear canal was hermetically sealed. Tympanometric results were peculiar with perturbations present that appeared to coincide with the popping sounds. Routine otoscopy revealed a small inferior quadrant TM perforation of the left ear while the right ear exam was normal. Pneumatic otoscopy produced a very audible popping sound with pressure changes.
Based on these unique and puzzling findings, a follow-up audiometric and otologic evaluation was scheduled at the Department of Otolaryngology, Boston University Medical Center.

Follow-up testing and examination occurred approximately 3 weeks later. Repeat audiometric testing, shown in Figure 1, revealed thresholds similar to previous test data. When pressure changes associated with tympanometry were applied, an audible popping sound was heard. The popping sound evidently had a low-frequency component since the immittance device microphone reflected the perturbations seen in Figure 2. Of further interest was the apparent shift in peak pressure with changes in tympanometric pressure. For example, with tympanometric sweeps beginning at +200 Pa, the peak pressure was at +200. If a reverse sweep was conducted, that is, starting at −200 Pa, the peak pressure was at −200 Pa (Fig. 3). Tympanometric gradient and equivalent ear canal volume were WNL and similar in the two ears. Ipsilateral acoustic reflexes obtained via a screening protocol were present bilaterally at expected levels when elicited with a 1000-Hz stimulus.

Micro- and endoscopic examination of the ear demonstrated a moist canal and TM. After debridement, a pinpoint perforation could be seen in the anterior-inferior quadrant. Pneumatic micro-otoscopy demonstrated a tenacious mucus plug lying medial to the perforation. Application of positive pressure opened the perforation, and on release of this pressure, a bubble formed and popped repetitively (as the middle ear pressure vented), which produced an
The patient reported and could demonstrate on occasion the ability to produce the popping sound by digital manipulation in the area of the tragus. A video tape with audio recording was made with an endoscope and microphone while the patient produced the popping sound by digital manipulation. Under reduced speed playback, it became obvious that the mucus bubbling through the TM perforation was the likely source of the popping sound emanating from the ear canal.

To test this assumption, a small steri-strip patch was placed over the TM perforation. While pure-tone thresholds were unchanged, acoustic immittance testing revealed the cessation of the popping sound (Fig. 4) with changes in air pressure. Subjectively, the patient reported an immediate resolution of his symptoms. He was no longer able to elicit the popping sound with digital manipulation and was relieved that this embarrassing popping sound had been terminated.

**SUMMARY**

The findings reported in this case study were unique and puzzling at first. While the TM perforation occurred over a year before the patient presented with the complaint, onset of the popping sounds did not occur until several weeks later. Apparently, key events and circumstances needed to evolve before the conditions were ideal for the production of the popping sounds. The pinhole TM perforation acting in concert with the presence of the mucus plug medial to the TM and a malfunctioning eustachian tube appeared to be the critical elements needed to produce the popping sounds. It is possible that other factors contributed but were not identified.

It was assumed at the completion of the evaluation and treatment that the digital manipulation that produced the popping sounds was from middle ear muscle contraction caused by tactile stimulation in the area of the tragus. Unfortunately, we could not test this assumption with detailed acoustic reflex testing because the TM patch effectively eliminated the popping sounds.

The findings of this case report suggest that unusual or atypical acoustic immittance findings should be further explored with oto-, micro-, or endoscopic examination.

**REFERENCES**


