Otoplast in the middle ear cleft – a rare complication of hearing aid fitting and its surgical management

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Abstract Hearing aid fitment is a routine, usually safe procedure carried out by hearing aid technicians or even audiologists. Hearing aids are often considered the benign, non-surgical alternative to rehabilitate a patient who cannot be helped surgically. It is rare to have to resort surgery to manage a complication resulting from hearing aid fitting. We report here, a case of otoplast as a foreign body in the middle ear cleft (middle ear cavity and mastoid). The otoplast was used to prepare a mould for the hearing aid and the syringe carrying the otoplast burst splashing the material into the middle ear and the mastoid. This resulted in sudden excruciating pain, further loss of hearing and intractable otorrhea. After several attempts to remove the material elsewhere, our patient underwent a successful mastoid exploration to remove the otoplast resulting in a dry ear after seven years of persistent otorrhea. Patient's professional requirement for good hearing necessitated a myringoplasty on the other (only hearing) ear. He is now happily rehabilitated with a dry but deaf left ear and a normally hearing right ear.

Keywords Otoplast · Middle ear mould · Mastoid cavity · Unusual foreign body of middle ear cleft

Introduction

The hearing aid is an instrument that amplifies sounds, particularly speech, for people with hearing impairment. Prescription and fitting of hearing aids is considered to be a safe and routine procedure for trained professionals. Fabricating a hearing aid takes about two hours. Making hearing aids is a customized process requiring skilled technicians. The tools are generally hand-held and the tasks demand precision movements. A hearing aid is considered to be an uncomplicated, non-surgical alternative for patients who cannot be operated or refuse to be operated. The procedure, however, is quite specialized and it is recommended that guidelines should be clear and protocols should be unambiguous to prevent inadvertent serious complications necessitating surgery.

Case report

A 54-year-old male patient presented to the ENT department of Shroff's Charity Eye hospital with complaints of left ear discharge since 6–7 years associated with pain. He gave history of having undergone four prior procedures elsewhere, probably including a modified radical mastoidectomy. He was then, advised to be fitted with a hearing aid. In the course of fitment, otoplast was injected for taking a mould fitting. While injecting otoplast, the syringe burst and the otoplast spilled into the middle ear and mastoid with bursting force. Patient experienced extreme pain and sudden further loss of hearing. Patient had persistent otorrhea following this procedure. He went to many ENT surgeons for this but was refused surgery, as the prognosis was poor. When patient reported to our set up, a preliminary examination under microscope was done. It revealed tough otoplast and granulation tissue completely blocking off the middle ear, aditus and mastoid bowl. Based on the above findings an exploration and clearance of the mastoid was planned.

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Fig. 1 Pre-op PTA (Left mastoid exploration to remove otoplast) shows (Right) conductive hearing loss & (Left) SNHL with only vibrational response recordable

Fig. 2 Post-op PTA (Left mastoid exploration to remove otoplast) shows (Right) conductive hearing loss & (Left) SNHL with only vibrational response recordable

Mastoid exploration revealed tenacious granulations, a piston (teflon) and ossicular remnants, causing complete occlusion of middle ear cavity, aditus and antrum. The patient, however, gave no history of any other surgery for piston placement. A large promontory polyp was removed followed by clearance of middle ear and mastoid bowl. Surgery led to the complete disappearance of symptoms and a totally dry ear, a major symptom that had crippled the patient. Patient had a subjective feeling of well being with history of subjective hearing improvement, though on

postoperative audiogram, hearing response did not improve significantly.

After a period of two years, due to professional requirements, a decision was made to operate on the only hearing right ear with safe central perforation, which had previously been refused surgery. The co-existing systemic problems of hypothyroidism, diabetes mellitus, and hypertension were additional factors making him a high-risk case for surgery on right ear for his safe central perforation. Happy with his results in the left ear,

Fig. 3 Post-op PTA (after right ear myringoplasty) shows right complete air bone gap closure with normal thresholds

patient insisted for surgery in the right ear. Considering patients request and also considering the possibility of worsening of hearing in the only hearing right ear due to constant presence of perforation and possibility of recurrent infection, myringoplasty on the right ear was done. Patient showed complete recovery with complete closure of AB gap on the right side on pure tone audiometry postoperatively.

Discussion

Otoplast is a UV light-cured synthetic resin provided with a ceramic filter comprising at least 50% by weight of aluminum trioxide. Otoplast may be used in various types of hearing aids, such as behind-the-ear and in-the-ear hearing aids. The otoplastic shell is a hollow envelope which, when used in a hearing aid, serves as a housing or a shell, dependent upon the type of hearing aid. The shell is customized to each patient's external auditory canal and a mould needs to be prepared to act as the negative on which the shell is ultimately fabricated. This is preloaded in a syringe and injected to lift the impression of the ear canal. The process needs a lot of control and undue pressure may force the material into the middle ear or even beyond the middle ear cavity into the mastoid bowl. Though rare (less than 10 reported cases in literature that we could trace), it is a serious complication of hearing aid fitment. The reported cases are from USA, Poland, Pakistan, Holland and Netherlands [1–5]. The process is considered safe and routine for most experienced hearing aid dispensers. The case from Pakistan reports a young child whose malleus had to be partially sacrificed to remove the mould material from the middle ear

and in fact, the mastoid was the unsuspected site of retained foreign body found accidentally at cochlear implantation [3].

It is important to realize that fitment of hearing aids is a specialized job and needs as much training as any other acquired skill. Mould impressions taken by an untrained hand can cause serious trauma and further deterioration of hearing. Extreme care needs to be taken to have a close liaison with an ENT surgeon and in any case of unexpected pain, patient should be referred for immediate examination. If undue pressure is exerted on a closed system of the otoplast syringe in the canal, the otoplast will burst through the tympanic membrane into the middle ear cleft- attaching itself to the ossicles and spilling into the mastoid cavity depending upon the force used.

To summarize, an unusual injury to the ear is reported in the course of a hearing aid fitting. The otoplast so inserted into the ear inadvertently can be extremely tenacious and difficult to remove (our patient underwent 4 procedures outside prior to the mastoidectomy at our center – which gave him a dry ear after seven years of discharge due to the foreign body). It would be wise to use some form of protection shield medial to the syringe to protect the tympanic membrane from inadvertent injury. Excessive force may simply rupture the tympanic membrane and then go on to the ossicles. Though rare, this is a complication that both the Otolaryngologist and the hearing aid dispensers should be wary of. Unfortunately, our patient could not recover any hearing in the traumatized ear. Fortunately, he had good result in the contra-lateral ear. Else, such patients would probably refuse hearing aid on the other side, too.

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