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TRANSMEATAL TYMPANOTOMY*

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The emergence of transaural tympanotomy as an invaluable aid towards improving certain types of hearing must be attributed to the pioneer work of Julius Lempert[1] on tympanosympathectomy. His method was subsequently used by Rosen[2] for surgery of the stapes. Its value lies in the fact that it has opened up new fields in otology by allowing, simply and easily, the inspection of the contents of the middle ear.

Technique. Rosen's method[2] is carried out under local anaesthesia under magnification supplied by the Zeiss otoscope. The circumferential incision begins posterior to the edge of the drum at 6 o'clock, 6 mm. from the annulus, and ends at 12 o'clock. The fibrous annulus is elevated from the sulcus tympanicus. Care must be taken to prevent perforation of the drum or injury to the chorda tympani. The posterior half of the tympanic membrane is folded forward. The contents of the middle ear are now exposed. Not infrequently the stapes is obscured by the posterosuperior bony rim, which must be removed.

Indications. This technique opened up a field of surgery for the treatment of middle-ear deafness which was new to otologists. The main indication is otosclerosis. It must be clearly understood that stapediolysis has not displaced the fenestration operation. Altman points out: 'The recently revised operation of stapes mobilization is in the midst of rapid changes and development. It is not possible to predict how far it will replace fenestration as the preferred surgical treatment for stapes fixation'.

Stapediolysis obviously has many advantages over fenestration. It is a minor surgical procedure and can be performed in quite elderly people, and in cases of unilateral otosclerosis, where fenestration is rarely advised. It may also eliminate the conductive loss in cases of small air-bone gap. Moreover, the patient is hospitalized for only 24 hours. Nevertheless, it cannot be over-emphasized that mobilization is a preliminary procedure and it is advisable to prepare the patient psychologically for failure.

Stapediolysis has captured the imagination of otologists throughout the world. Various techniques are being evolved. The percentage of cases which have improved is slowly mounting, but no standard method has been devised. Lindsay[3] rightly says, 'The histopathology of otosclerosis is the one factor of stapes-ankylosis which does not change, but as the years go on we are more aware of the many variations which exist'. The tendency is at present to divide the cases as follows, according to the degree of pathology present and the resultant fixation of the stapes. Shea[4] and Belluci[5] classify their cases on almost similar lines:

Class 1. There is no narrowing of the stapediovestibular joint; the footplate is blue; palpation of the anterior end of the stapes reveals some degree of fixation but the posterior end is movable. Here the indirect method of stapediolysis is applicable. Pressure with a needle is applied through the lenticular process of the incus *via* the incudostapedial joint; or, failing this, through the head or neck of the stapes. These methods are usually successful.

Class 2. Where there is narrowing of the stapediovestibular joint, but not involving the anterior or posterior crus, the footplate is blue and, owing to the flexibility of the stapes, slight motion can be seen on palpation at one end of the footplate. At the anterior end there is definite fixation, and sometimes the whole footplate is involved. Here the mobilizing forces have to go through the lesion, causing some degree of trauma. In this category the percentage of refixation is high.

Class 3. In this group, if advanced otosclerosis should occur involving the anterior crus, the footplate and the vestibular wall, then mobilization is performed by means of the anterior crurotomy of Fowler.[6] The anterior crus is divided above the otosclerotic lesion, and the footplate is fractured; sound is now transmitted to the oval window through the posterior part of the footplate and the remaining crus.

Class 4. Where there is a large otosclerotic mass present involving the whole footplate or where both crura are fixed by the otosclerotic lesion, the obvious treatment would be to perform the fenestration operation. But Shea,[4] in the USA, and Portmann and Claverie,[7] in France, have developed a new and bold approach. The footplate is removed, preferably *in toto*. Both crura of the stapes are divided and the stapes is displaced out of the operative field. The incus is left *in situ*. A vein graft is taken from the back of the hand. The periosteum is removed for about 2 mm. on all sides of the oval window. The graft is placed with adventitia towards the fenestra. If the stapes has not been disorganized, the head of the stapes is fitted to the lenticular process of the incus and the posterior crus rests on the vein graft, slightly invaginating it. If the stapes is damaged, then a polythene tube is used as a columella. The original ossicular-chain principle is now re-established and the results claimed are good.

Dangers and Complications in Transmeatal Tympanotomy

The dangers in this operation are obvious and manifold.

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The following are the most probable complications:

1. Tearing of the tympanic membrane, where a large perforation is present. A myringoplasty may be required to restore good hearing.

2. Damage to the chorda tympani. Loss of taste and numbness are felt on that side of the tongue, but these lessen and disappear after 3 - 4 months.

3. Dislocation of the incudostapedial joint. Apparently this may be done with impunity. However, one question arises: Does the blood supply to the lenticular process of the incus go through this joint and will necrosis ultimately occur? This point is referred to below.

4. Fracture of the head or neck of the stapes may occur; also fracture of both crura, or fracture of the footplate with depression of a fragment into the vestibule.

5. Haemorrhage may be severe when the surgeon operates near the footplate.

6. Labyrinthitis sometimes follows when he works on the footplate or chisels it out of an otosclerotic mass.

7. Facial paralysis is possible during local anaesthesia but does not last long. It sometimes occurs if the Fallopian canal is prominent and bulges over the oval window, and is even more likely if there is a dehiscence in the bony Fallopian canal.

Anomalies Encountered in the Operation

Transaural tympanotomy has not only made us more familiar with the anatomy of the middle ear but has demonstrated that anatomical variations and anomalies occur not infrequently and may be responsible for many cases of middle-ear deafness. Apart from defects associated with grosser changes, here are a few of the commoner anomalies, which may be very disconcerting when the contents of the middle ear are exposed and the operator is not aware of these anatomical variations:

1. Fixation of the malleus, incus and stapes or fixation of the incudostapedial joint sometimes occurs.

2. The crura of the stapes may be infantile (i.e. large and bulky) or they may be very delicate and break easily.

3. The stapedial tendon may be absent.

4. Abnormal bars of bone may be found.

5. The oval window may be hidden between the promontory and the Fallopian canal. In that event mobilization of the footplate is impossible.

6. Duplication of the round windows, and variations in size, may occur. The round window may be completely occluded by otosclerotic bone. The loss of hearing is then comparable to that with occlusion of the oval window. Strands of mesenchymal tissue may form bizarre patterns over the round window.

7. Erosion or necrosis of the lenticular process of the incus is not uncommon with a normal tympanic membrane. This may well have a bearing on the question mentioned above concerning the possibility that necrosis might result if the blood supply to the lenticular process were jeopardized.

8. Dehiscence of the middle ear, allowing the jugular bulb to herniate, or a glomus jugulare tumour, may be found.

9. Dislocation of the incus may occur in a fracture of the skull, giving rise to conductive deafness with or without facial palsy. It may also follow operation on the mastoid bone. (Recently I had an interesting case of a patient aged 20 who had undergone a cortical mastoid operation 12 years previously. Bone conduction was good; air conduction showed a loss of 50 decibels. At operation it was found that the incus had been dislocated. This was rectified and hearing was restored.)

Other Indications

Congenital fixation of the stapes footplate is an interesting condition which may be diagnosed by clinical means. Shambaugh[8] has described 5 cases and many more are recorded. The key to diagnosis is absence of progression of the hearing loss. Children with a history of purely conductive non-progressive impairment of hearing, in whom the otological findings are essentially normal, may be diagnosed as cases of ossicular discontinuity or congenital ossicular fixation occurring at the stapes footplate. A flat audiometric curve of 50 decibels of pure conductive loss is very suggestive of congenital fixation of the stapes footplate. The uniform bony fusions may be thick or thin. If thin, the footplate is readily mobilized; if thick, fenestration may be advisable.

The transaural approach may also be used for persistent recurrent serous otitis media. The tympanic membrane is elevated and, if necessary, a small polythene tube can be left *in situ* for a few months. Transaural tympanotomy is also usually performed during examination of the ossicular chain preceding tympanoplasty or myringoplasty, and simplifies cases of facial decompression of the transverse part of the nerve. The transaural approach is ideal for cases of labyrinthotomy for Ménière's syndrome, which nowadays may be performed through the foramen ovale, and not, as previously, by opening the mastoid bone. The stapes is displaced, and replaced after destruction of the labyrinth.

The comparative ease with which direct inspection of the middle ear contents may be performed has given considerable stimulus to the treatment of conductive deafness. It now rests with the otologists to ensure that overenthusiasm does not cause these methods to fall into disrepute. Major transmeatal procedures should be undertaken only by operators experienced in cadaver surgery of the middle ear and used to working through a microscope.

REFERENCES

1. Lempert, J. (1946): Arch. Otolaryng. (Chicago), **43**, 199.
2. Rosen, S. (1955): N.Y. St. J. Med., **55**, 69.
3. Lindsay, J. R. (1958): Laryngoscope (St. Louis), **68**, 1409.
4. Shea, J. (1958): Ann. Otol. (St. Louis), **67**, 932.
5. Belluci, R. J. (1958): Laryngoscope (St. Louis), **68**, 1422.
6. Fowler, E. P. (1958): Acta oto-laryng. (Stockh.), **46**, 319.
7. Portmann, M. and Claverie, G. (1957): Ann. Otol. (St. Louis), **66**, 49.
8. Shambaugh, G. E. jr. (1952): *Ibid.*, **61**, 873.