

Endoscopic transcanal myringoplasty

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Abstract

The role of the rigid endoscope has been evaluated in the management of 36 cases with dry central perforation of the tympanic membrane. The graft take rate was 91.7 per cent and the air-bone gap was closed to less than 10 dB in 83.3 per cent.

The use of the rigid endoscope in the management of dry central perforation of the drum represented a significant advance in middle ear surgery. It is used, in correlation with manometry, to evaluate the tubal function before ear surgery and to treat hidden causes of tubal obstruction. It replaces the operating microscope in observation and surgery of the tympanic membrane perforation. It overcomes anatomical variations that hamper access to the entire tympanic membrane during ear surgery. It provides an extremely sharp image with high resolution.

Introduction

It is well-known that various diseases of the nose and nasopharynx may affect the function of the Eustachian tube and consequently the middle ear. The altered aerodynamics of the tubotympanic cleft is the underlying cause of virtually all forms of otitis media, ranging from middle ear effusion, through central perforation of the tympanic membrane to the life-threatening cholesteatomatous disease.

Although nasal endoscopy proved to be indispensable in diagnosing tubal obstruction, and in localizing and even treating hidden lesions in key areas (Stammberger, 1986), otoendoscopy had been limited in usefulness to close scrutiny and photography (Chen *et al.*, 1979; Konrad *et al.*, 1979). The operating microscope was the instrument of choice for middle ear surgery.

Myringoplasty is defined as an operation in which the reconstructive procedure is *limited* to the repair of tympanic membrane perforation *without* middle ear exploration or ossicular chain evaluation whereas tympanoplasty is performed to eradicate disease in the middle ear and to reconstruct the ossicular integrity (Sheehy, 1984). Under the operating microscope, a transcanal route is usually selected in myringoplasty for central perforations. When the ear canal is narrow or the anterior edge of the perforation is obscured by an anterior meatal overhang, the procedure is greatly assisted by the use of either an endaural incision in the former case or a postaural incision in the later (Smyth, 1985; Goycoolea, 1989; Paparella *et al.*, 1991).

In this report, it has been our intent to evaluate the role of the rigid endoscope in the management of dry central perforation of the tympanic membrane.

Material and methods

Adult patients with dry central perforations of the tym-

panic membrane were diagnosed clinically and assessed on pure tone audiometry. The tubal function was investigated by both manometry and endoscopy. The inflation-deflation test (Bluestone *et al.*, 1972) was performed using an electroacoustic impedance bridge Danplex ZA28.

We used Storz rigid endoscopes 18 cm long, with 0°, 30° and 70° deflection angles, and 4.0 mm external diameter. In patients with a stenotic meatus, we used endoscopes with 2.7 mm external diameter.

The endoscope was passed into the external ear canal to examine the tympanic membrane perforation, the drum remnant, the state of middle ear mucosa, the opening of the Eustachian tube and the ossicular chain. The endoscope was then passed into the nose and nasopharynx, to check key areas for hidden pathology. The ciliary beat was examined in the light reflex over the mucosa of the tube. The opening and closing mechanism of the tubal orifice was evaluated when the patient was asked to swallow. Fluorescein (Thilo) was instilled into the middle ear, and the tubal patency was tested by asking the patient to swallow five times whilst searching for fluorescein in the nasopharynx (El-Guindy, 1991).

In those cases with abnormal tubal function, endoscopic endonasal surgery was performed to clear stenotic or diseased areas, re-establishing normal drainage and ventilation of the sinuses, leading to normalization of tubal function before middle ear surgery.

Our study included only those adult patients with dry central perforation of the tympanic membrane which fulfilled the following pre-requisites:

- (1) The middle ear should be dry for the last six months.
- (2) The perforation must be surrounded by a remnant of pars tensa, because a graft-drum remnant overlap of at least 2 mm is essential for the graft take (Gibb and Chang, 1982). Subtotal and marginal perforations were excluded from this study, since elevation of a tympanomeatal flap would be thus mandatory.

TABLE I
STANDARD PARAMETERS OF TUBAL FUNCTION

1.	Passive opening pressure:
a)	330 ± 70 mmH ₂ O
b)	Above 400 mmH ₂ O
2.	Capacity for equilibrating overpressure:
a)	Equilibration to 0-level directly or stepwise.
b)	Residual positive pressure.
3.	Capacity for equilibrating underpressure:
a)	Equilibration to 0-level directly or Stepwise.
b)	Residual negative pressure.
4.	Mean percentage of swallows which open the tube.

(3) The ossicular chain must be intact as suggested by the pure tone audiometry.

(4) The tubal function should be normal as proved by manometry (Table I) and fluorescein-endoscopy.

The rigid endoscope was passed into the external auditory meatus (a transcanal route). The edges of the perforation were excised (Fig. 1), the medial surface of the tympanic membrane remnant in the vicinity of the perforation was carefully scarified to prepare a bed for the graft. A perichondrium graft was taken from the posterior surface of the tragus and trimmed to an oblong shape. It was then inserted to overlap the medial surface of the drum remnant (the recipient site) by at least 2 mm (Fig. 2). The graft was supported in position by a disc of gelfoam over the promontory. An additional free graft may be taken from the deep meatal skin and put over the perichondrium (sandwich technique).

The meatus was then packed with gelfoam soaked in an antibiotic solution. All those steps were performed under endoscopic vision, without using the operating microscope. Post-operative audiograms were done at six weeks and six months.

Results

The study included 36 adult patients with dry central perforation of the tympanic membrane. The cases were

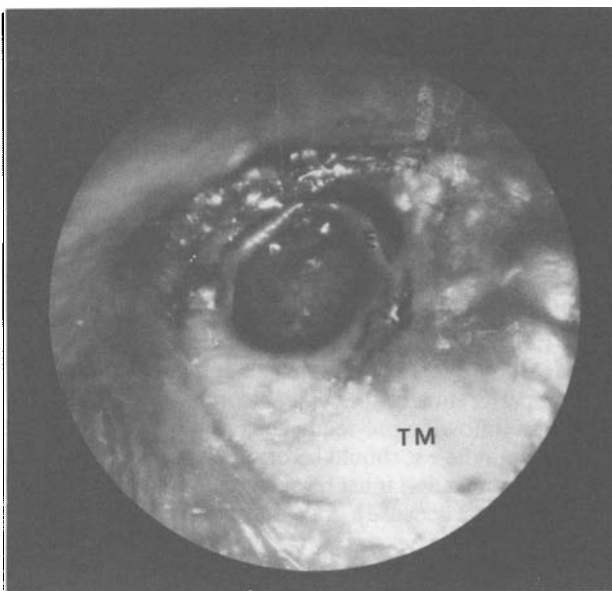


Fig. 1

An endoscopic picture showing trimming of the edges (E) of a dry central perforation in the left tympanic membrane (TM).

classified according to the site and the size of the perforation (Table II). The underlay technique was the procedure of choice in endoscopic myringoplasty. The graft take rate was 91.7 per cent. The air-bone gap was closed to less than 10 dB in 83.3 per cent.

Discussion

Since good ventilation of the middle ear is a prerequisite for successful myringoplasty, it has been our policy to investigate the tubal function in dry central perforation of the tympanic membrane and to correlate the manometric with the endoscopic findings (El-Guindy, 1991).

Normal manometric results with patency of the tube (as proved by fluorescein-endoscopy) meant good tubal function. Those patients were expected to have successful middle ear surgery. Abnormal manometric results with failure of fluorescein to pass into the nasopharynx meant mechanical tubal obstruction, which was, in most cases, correctable. Nasal endoscopy proved to be indispensable in diagnosing and treating hidden lesions in their key areas, with probable normalization of the tubal function before middle ear surgery. Whenever the tubal obstruction was diagnosed as functional or idiopathic, the ventilation of the middle ear should be guaranteed during myringoplasty by addition of a Grommet's tube to the graft or drum remnant, with guarded results.

The use of the endoscope in middle ear surgery represented a significant advance in management of dry central perforation of the tympanic membrane. The endoscopic findings were correlated with the manometric results to evaluate the tubal function before ear surgery and to prognosticate the results of myringoplasty. It allowed close inspection and photodocumentation of the tympanic membrane perforation, the drum remnant, the Eustachian tube orifice, the middle ear mucosa and the ossicular chain without elevation of a tympanomeatal flap. Nasal endoscopy proved essential in diagnosing and treating mechanical tubal obstruction, with normalization of tubal



Fig. 2

An endoscopic picture in the same patient showing a perichondrial graft (PG) inserted to overlap the medial surface of the drum remnant (TM).

TABLE II
RESULTS OF ENDOSCOPIC MYRINGOPLASTY

Description	No. of cases	Graft take	Closed air-bone gap (<10 dB)
I. Site of perforation:			
1. Anterior central	13	12	11
2. Posterior central	9	9	7
3. Inferior central	5	5	5
4. Central malleolar	9	7	7
II. Size of Perforation			
1. Large central	15	13	11
2. Small central	21	20	19
Total	36	33	30

N.B. Large perforations were those occupying one half or more of the surface area of the tympanic membrane. Subtotal and marginal perforations were not included in the study.

function before middle ear surgery. Again, the use of the endoscope in myringoplasty overcame the anatomical variations that hamper visual examination of the tympanic membrane and middle ear during ear surgery. It avoided the postaural and endaural incisions even in stenotic or tortuous ear canals. Oto-endoscopy provided an extremely sharp image with high resolution. It appeared to bring the surgeon's eye to the end of the telescope, with a magnified overview of the entire drum. The graft take and the air-bone gap closure rates were comparable to those of the literature (Halik and Smyth, 1988; Brown and Meyerhoff, 1991). The rigid endoscope can thus replace the operating microscope for the management of dry tympanic membrane perforation.

Conclusion

The use of the rigid endoscope in the management of dry central perforation of the tympanic membrane represents a significant advancement in otologic surgery. It is used, in correlation with manometry, to evaluate the tubal function before ear surgery and to treat hidden causes of mechanical tubal obstruction. It replaces the operating microscope in observation and surgery of tympanic membrane perforation. It overcomes anatomical variations that hamper access to the entire tympanic membrane during

ear surgery. It provides an extremely sharp image with high resolution. The graft take and the air-bone gap closure rates are comparable to those of the literature.

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