

Long-term ventilation of the middle ear using a tympanotomy technique

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Abstract

The technique of long-term middle ear ventilation using a tympanotomy technique is presented. This has proved successful in the management of persistent middle ear effusion despite numerous previous short- and intermediate-term tympanic membrane ventilation tubes. The technique is particularly appropriate in the presence of severe tympanosclerosis as a result of previous tympanostomy tubes, posterior tympanic membrane collapse and adhesion, and atelectasis.

Key words: Otitis media with effusion; Middle ear ventilation, surgery

Introduction

The present era of middle ear ventilation began 40 years ago and ventilation tubes are now being inserted at an annual rate of 4.7/1000 children under the age of fifteen (Armstrong, 1954; Black, 1985). During the last forty years, various types of tympanic membrane ventilation tubes (TMVT) have been designed. Most modifications involve the middle ear end as this determines ease of placement, removal and the rate of extrusion. In patients with intractable middle ear effusion long-term TMVTs are usually used, of which there are a number available (Per-Lee, 1968; Jurgens, Paparella, 1972; Goode, 1973).

Long-term TMVTs are associated with a variety of complications notably infection, perforation and tympanosclerosis. Overall 20 to 35 per cent of children are likely to experience otorrhoea after TMVT insertion (Herzon, 1980; McLelland, 1980; Slack, *et al.*, 1987), of whom approximately five per cent are likely to have persistent otorrhoea (McLelland, 1980). With Goode T-tubes Brockbank *et al.* (1988) showed an infection rate of 28 per cent of which three per cent had a persistent myringitis.

Perforation rates for trans-tympanic long-term ventilation using T-tubes vary; Rothera and Grant (1985) giving a figure of nine per cent, Brockbank *et al.* (1988) 22 per cent, Hawthorne and Parker *et al.* (1988) 27 per cent, and Todd (1993) 11.9 per cent. Gibb (1986) noted a perforation rate of 57 per cent using Per-Lee tubes, and a figure of 24.8 per cent was given in Per-Lee's study (Per-Lee, 1981).

The incidence of tympanosclerosis is increased by TMVT insertion (Tos *et al.*, 1983; Stangerup and Tos, 1989). Some degree of tympanosclerosis

develops in 40 to 50 per cent of tympanic membranes following ventilation tube insertion as compared to a spontaneous incidence of three per cent (Maw, 1991).

Given this information, the management of a child with intractable glue ear with a long term TMVT is far from ideal. The treatment becomes even more difficult when the ear presents with severe retraction or collapse, atelectasis and tympanosclerosis; or as a result of failed previous medium- or long-term tympanic ventilation tube insertions.

The aim of this paper was to evaluate the technique of ventilation tympanotomy in these patients.

Materials and methods

A total of 26 ears (14 patients) from the Bradford Royal Infirmary were studied (Table I). They represented all consecutive patients who had undergone ventilation tympanotomy over a four-year period. The age range was four to 15 with a mean of eight years at the time of insertion. All patients had had numerous previous tympanic ventilation tubes (Shepherd or Sheehy) inserted, ranging from two to five insertions before ventilation tympanotomy was undertaken. The indication for ventilation tympanotomy was intractable middle ear effusion associated with hearing loss with one or more of the following:

1. Posterior tympanic membrane collapse or retraction.
2. Severe atelectasis of the anterior tympanic membrane.
3. Severe progressive tympanosclerosis as a result

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TABLE I
SUMMARY OF CASES

Case	Age	Diagnosis at time of tunnel technique	Previous transtympanic grommets	Duration to date (months)	Result
1	7	Severe tympanosclerosis Chronic middle ear effusion Both ears	2 Sheehy collar buttons 1 tympanic T-tube	50	Good
2	6	Severe tympanosclerosis Chronic middle ear effusion Both ears	1 Shepherd 2 Collar button	48	Good
3	6	Severe tympanosclerosis Chronic middle ear effusion Posterior collapse Both ears	2 Collar buttons	37	Good
4	10	Posterior collapse Adhesive otitis media Both ears	1 Shepherd 2 Collar buttons	21	Good
5	9	Atrophic collapsed anterior segment-R ear	1 Shepherd 1 Collar button	48	Good
6	10	Severe tympanosclerosis Chronic middle ear effusion Both ears	2 Shepherd	49	Good
7	5	Anterior collapse Chronic middle ear effusion Severe horse shoe tympanosclerosis both ears	2 Shepherd	7	Good
8	7	Chronic middle ear effusion Posterior collapse Both ears	2 Shepherd 1 Collar	19	Good Extrusion R side at 17 months no infection
9	11	Chronic middle ear effusion Atelectasis/collapse Both ears	3 Shepherd	4	Good Post-op infection Rx successfully
10	12	Chronic middle ear effusion Severe tympanosclerosis L ear	3 Shepherd 1 Collar button	6	Good
11	6	Chronic middle ear effusion Tympanosclerosis Both ears	3 Shepherd 2 Collar button	49	Good R ear infection at 12 months Rx successfully
12	4	Chronic middle ear effusion Severe tympanosclerosis Both ears	2 Collar buttons	10	Good
13	15	Chronic middle ear effusion atelectasis/collapse Both ears	1 Collar button	8	Good
14	5	Chronic middle ear effusion Severe tympanosclerosis Both ears	2 Shepherd 1 Collar button	22	Good Bilateral ear infections at 7 months Rx successful

of previous tympanic membrane ventilation tube insertions.

All patients at operation had middle ear effusions.

Surgical technique

The following technique was first illustrated in 1960 by Ersner and Alexander. Later the technique was fully described by Simonton (1968). As a result of this the Silverstein permanent aeration tube (SPAT) (Silverstein, 1970) was developed.

Ventilation tympanotomy has been performed under general anaesthesia to date. After induction of anaesthesia, positioning of the patient, and skin preparation, the posterior ear canal wall is injected with one per cent lignocaine with 1:80,000 adrena-

line. A standard curved tympanotomy incision is made approximately 0.5 cm from the annulus (Figure 1) and the tympanomeatal flap elevated ensuring integrity of the annulus and chorda tympani (Figure 2). Adhesions between the medial wall of the middle ear and collapsed posterior tympanic membrane can be divided. A Xomed Treace T-tube is inserted into the postero-inferior middle ear under the flap (Figures 3 and 4). If the tube does not lie satisfactorily flush then a shallow groove can be cut (using a small burr) in the postero-inferior bony canal. The tube must be longer than the edge of the flap to prevent burial as healing takes place. The post-operative appearance one year after the procedure is shown in Figure 5.

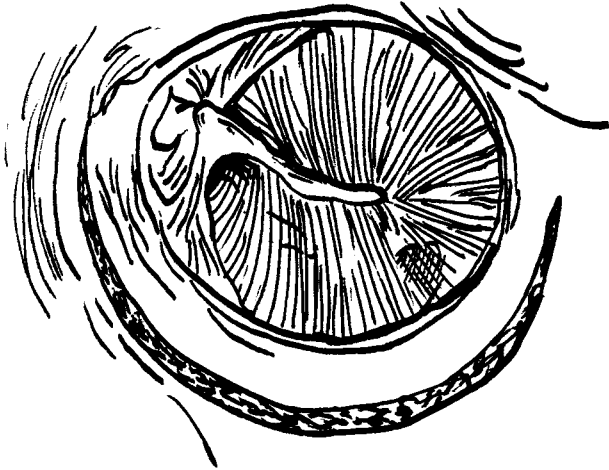


FIG. 1

Circumferential incision posterior meatal wall approximately 0.5 cm from annulus.

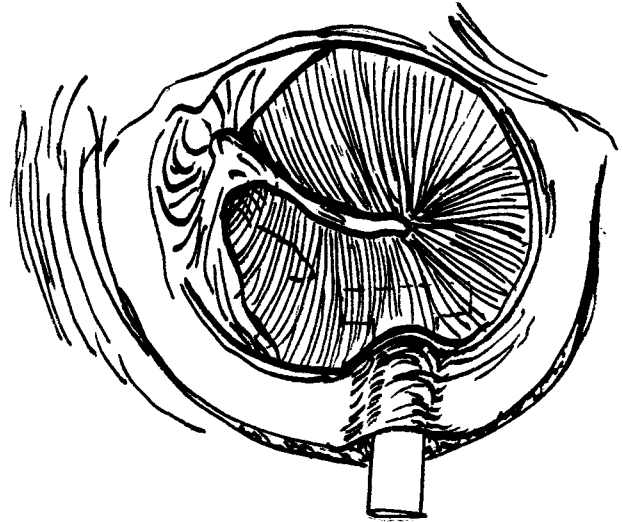


FIG. 3

T-tube placed under tympanomeatal flap.

Results

Duration of tubes

All patients have been monitored in the out-patient clinic to date. All ventilation tympanostomy tubes have remained *in situ*, maintaining ventilation of the middle ear clefts, except for one tube which self-extruded at 17 months (unrelated to infection). The longest duration to date is 50 months. All patients except two had an improvement in averaged air-bone gaps, and none deteriorated.

Complications

One patient suffered immediate post-operative infection which resolved with topical and systemic antibiotics. A further two patients had discharge on at least one occasion treated successfully with topical

antibiotic preparations. None of the ears developed a persistent myringitis as seen with long-term tympanic ventilation tubes. Patients chosen for this procedure had particularly severe disease and the progression of tympanosclerosis in relation to the ventilation tympanotomy technique could not be accurately assessed. No patient developed perforation of the tympanic membrane.

Conclusion

To date this technique has proved valuable in treating intractable middle ear effusion; particularly in patients with severe disease of the tympanic membrane which precludes trans-tympanic insertion of the ventilation tube. Although the sample collected to date is small, complication rates com-



FIG. 2

Tympanomeatal flap elevated. Adhesions between tympanic membrane and medial wall of middle ear divided.



FIG. 4

Appearance of ventilation tympanotomy and T-tube at operation.



FIG. 5

Appearance of tube at one year post-operation.

pare favourably with standard tympanostomy techniques.

The use of this approach as a primary procedure would be of interest with regard to the incidence and progression of tympanosclerosis.

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