The Journal of Laryngology & Otology
December 2004, Vol. **118,** pp. 933–936

Main Articles

Long-term ventilation of the middle ear using a sub-annular tympanotomy technique: a follow-up study

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Abstract

The results of a nine-year series of patients who underwent long-term middle ear ventilation using a tympanotomy technique are presented. The original series of 26 cases was published in 1995. The same series has now expanded to 37 cases, which form the basis of this follow-up study. In contrast to the original series we found a high spontaneous extrusion rate (68 per cent) and in 27 per cent of cases complications necessitated removal of the subannular T tube. In favour of the technique was a low perforation rate after extrusion or removal (eight per cent). Although only nine per cent underwent re-ventilation this is unlikely to represent resolution of the middle ear effusion in the remaining cases.

We conclude that the adverse effects of the subannular tympanotomy technique for long-term ventilation of the middle ear outweigh the benefits when compared with the traditional technique of placing a T tube through a myringotomy incision.

Key words: Otitis Media With Effusion, Surgical Procedures, Operative; Treatment Outcome

Introduction

The use of long-term tympanic membrane ventilation tubes (LTTMVTs) in patients with intractable middle ear effusion is well established.[1–3] Unfortunately, LTTMVTs are associated with a variety of complications, including infection (20–35 per cent),[4–7] perforation (9–57 per cent)[8–13] and tympanosclerosis (up to 50 per cent).[14–16]

Despite a raised complication rate, we still considered LTTMVTs useful in cases of intractable middle ear effusion, particularly where there is severe retraction, atelectasis, tympanosclerosis or previous failed ventilation tube insertions. The report of the original series, by Martin-Hirsch *et al.*,[17] proposed that the technique of long-term ventilation of the middle ear using a tympanotomy technique was a viable remedy in such intractable cases. It concluded that, in addition to providing long-term middle ear ventilation, the technique benefited from a low complication rate. We wished to examine the same patient cohort to see if these benefits still applied over an extended period of nine years, and with a larger case series.

Materials and methods

A total of 37 ears (24 patients) from the Bradford Royal Infirmary were studied (Table 1). They represented all consecutive patients who had undergone ventilation tympanotomy from 1991 to 2000. The age range was five to 58 years, with a mean of 14.5 years at the time of insertion.

All patients had undergone previous trans-tympanic grommet insertions. The indication for ventilation tympanotomy was intractable middle ear effusion associated with hearing loss, and one or more of the following:

(1) Posterior tympanic membrane collapse or retraction.
(2) Severe atelectasis of the anterior tympanic membrane.
(3) Severe progressive myringosclerosis as a result of previous tympanic membrane ventilation tube insertions.

Surgical technique

The surgical technique was first described in 1960 by Ersner and Alexander.[18] Simonton[19] (1968) further

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Accepted for publication: 27 September 2004.

TABLE I

DETAILS OF PATIENTS WHO UNDERWENT VENTILATION TYMPANOTOMY AT BRADFORD ROYAL INFIRMARY BETWEEN 1991 AND 2000

Patient no.	Date of surgery	Age (years)	Side	G	Previous grommets	Duration (months)	Outcome	Perf	FV
1	Mar. 91	6	R	T	1 Sheehy 1 Goodes 1 Shepherd	27	R	N	
2	Jan. 92	5	L	T	1 Sheehy	28	E	N	Y
3	Mar. 93	14	Both	T	1 Shepherd 1 Sheehy (bilateral)	6 (bilat)	E	N	
4	May. 93	9	Both	T	2 Shepherd 3 Sheehy (bilateral)	16 (bilat)	R	N	
5	Mar. 94	15	Both	T	2 Sheehy (bilateral)	3 (R) 57 (L)	R	N	Y Both
6	Apr. 94	14	L	C	1 Sheehy	19	E	N	
7	Apr. 94	15	R	C	1 Sheehy	27	E	N	
8	Dec. 94	17	Both	T	1 Shepherd 1 Sheehy (bilateral)	30 (L) 62 (R)	E	N	
9	Jan. 95	5	Both	T	1 Shah	30 (R) 48 (L)	E	N	
10	Jan. 95	10	Both	T	3 Sheehy (bilateral)	42 (bilat)	E	Y® N (L)	
11	Apr. 95	13	R	T	1 Sheehy	20	E	N	
12	Apr. 95	26	Both	T	2 Sheehy (bilateral)	71 (L) In situ®	E (L) In situ®	N	
13	Jul. 95	6	Both	T	1 Sheehy (bilateral)	74 (bilat)	E	Y (bilat)	
14	Jul. 95	5	Both	T	2 Sheehy 1 mini Shah (bilateral)	20 (bilat)	E	N	
15	Aug. 95	7	L	C	1 Shepherd	9	E	N	
16	Oct. 95	8	Both	C	2 Shah (bilateral)	7 (bilat)	E	N	
17	Nov. 95	13	R	C	1 Shepherd	20	E	N	
18	Mar. 96	10	Both	T	1 Shepherd (bilateral)	6 (bilat)	R	N	
19	Jul. 96	18	R	T	1 Shepherd 1 Sheehy	44	E	N	
20	Mar. 97	5	Both	T	2 Shah 1 Sheehy (bilateral)	12 (bilat)	R	N	
21	Oct. 97	8	Both	T	1 Sheehy 1 Goodes (bilateral)	7 (bilat)	E	N	
22	Feb. 99	58	L	T	1 Shepherd 1 Shah 1 Sheehy 3 Goodes	24	E	N	
23	Aug. 99	32	R	T	2 Shah 2 Sheehy	7	R	N	
24	Aug. 00	32	R	C	1 T tube	In situ	In situ	In situ	

G = grade of surgeon; C = consultant; T = trainee; R = removed; E = extruded; Perf = perforation; FV = further ventilation undertaken.

described the technique, following which Silverstein[20] (1970) developed the Silverstein permanent aeration tube (SPAT). The following description is unchanged from the technique described and illustrated by Martin-Hirsch *et al.*[17] in the original Bradford series (1995).

All cases were performed under general anaesthesia. After induction of anaesthesia, positioning of the patient and skin preparation, the posterior canal wall was injected with one per cent lignocaine with 1:80 000 adrenaline. A standard curved tympanotomy incision was made approximately 0.5 cm from the annulus and a tympanomeatal flap elevated ensuring integrity of the annulus and chorda tympani. Any adhesions between the medial wall of the middle ear and collapsed tympanic membrane could then be divided. A Xomed Treace T tube was inserted into the posterior-inferior middle ear under the flap. If the tube did not lie flush with the posterior-inferior bony wall then a shallow groove could be drilled using a small cutting burr. Care was taken to ensure that the tube was longer than the edge of the flap to prevent burial after healing took place (see Figure).

Results

Thirteen patients underwent bilateral middle ear ventilation and the remainder unilateral middle ear ventilation using the tympanotomy technique. The

https://doi.org/10.1258/0022215042790510 Published online by Cambridge University Press

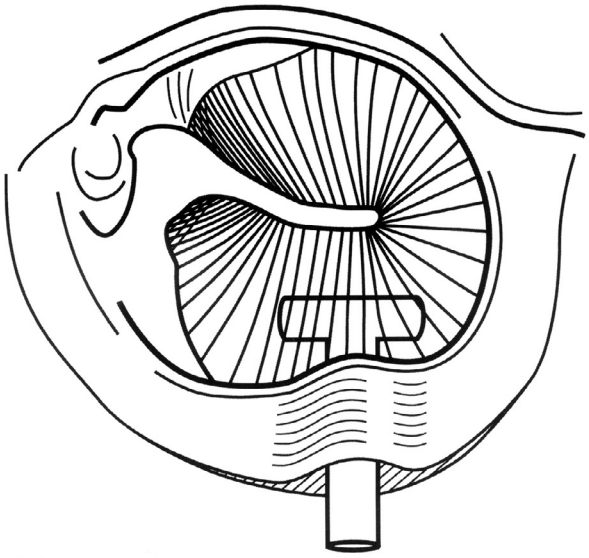

FIG.
Subannular T tube in situ.

mean operating time was 17.5 min per ear. Twenty-five out of 37 (68 per cent) of the subannular T tubes underwent spontaneous extrusion. The mean interval between insertion and extrusion was 29.6 months (range 6–74 months). Ten out of 37 subannular T tubes were removed because of persistent infection which failed to respond to medical therapy, and one was removed because of blockage. The mean interval between insertion and removal was 16.2 months (range 3–57 months). After extrusion or removal perforation was found on three sides and of the remaining cases three sides underwent re-ventilation. Only two out of 37 tubes remained in situ and patent at the time of writing. The results represent entries in the clinical records up to patient discharge or last outpatient visit.

Discussion

The results of this study unfortunately do not match the optimism that followed the original four-year series. The ideal management of intractable glue ear, especially when associated with severe retraction, collapse, atelectasis or tympanosclerosis, remains uncertain. Despite the limitations of a retrospective study and the recognized shortfalls encountered when drawing data from clinical records, this series probably gives an accurate representation of likely outcome after long-term middle ear ventilation using a tympanotomy technique. On the face of it the low perforation rate (eight per cent) appears encouraging, and although in the remaining 92 per cent re-ventilation was not undertaken it is unlikely that this was because it was not required; more likely it represents relinquished efforts to establish ventilation in an intractable condition.

Although it was not possible to ascertain from the clinical records the site of the defect in the eight per cent that had a perforation, the subannular placement raises concern about erosion of the fibrous annulus, possibly resulting in marginal perforation. In the 68 per cent that were extruded and the 27 per cent that required removal it is likely that the tubes became blocked sometime earlier. It remains unknown how long useful ventilation was maintained following subannular T tube insertion.

In conclusion, long-term ventilation of the middle ear using a tympanotomy technique does not compare favourably with the traditional technique of placing a Goodes T tube through a myringotomy incision for cases of intractable middle ear effusion.

- **The problems of long-term ventilation of the middle ear in patients with chronic otitis media with effusion and for patients with atelectasis are well known**
- **Previous studies from the authors of this paper suggested that short- to medium-term outcome of ventilation for effusion made using a subannular T tube was a viable alternative to a similar T tube placed through a myringotomy (*J Laryngol Otol* 1995;109:1151–4)**
- **The present paper, which is based on the long-term outcome of an expanded cohort of similar patients, concludes that the adverse effects of the subannular approach outweigh the benefits**
- **The authors conclude that the traditional technique of T tube insertion through a myringotomy incision is thus to be preferred**

Acknowledgment

We wish to thank Mr Charles Vize for his permission to publish a study on this patient series.

References

1 Per-Lee JH. Experience with a permanent wide flange middle ear ventilation tube. *Laryngoscope* 1968;**79**:581–91
2 Jurgens GL, Paparella MM. Three new middle ear ventilation tubes. *Trans Am Acad Ophthalmol Otolaryngol* 1972;**76**:1017–19
3 Goode RL. T-Tube for middle ear ventilation. *Arch Otolaryngol* 1973;**97**:402–3
4 Herzon FS. Tympanostomy tubes: Infection complications. *Arch Otolaryngol* 1980;**106**:645–7
5 McLelland CA. Incidence of complications from use of tympanostomy tubes. *Arch Otolaryngol* 1980;**106**:97–9
6 Slack RW, Gardner JM, Chatfield C. Otorrhoea in children with middle ear ventilation tube. A comparison of different types of tubes. *Clin Otolaryngol* 1987;**12**:357–60
7 Brockbank MJ, Jonathan DA, Grant HR, Wright A. Goode T-tubes: do the benefits outweigh their complications? *Clin Otolaryngol* 1988;**13**:351–6
8 Rothera MP, Grant HR. Long-term ventilation of the middle ear using Goode type tympanostomy tubes. *J Laryngol Otol* 1985;**99**:335–7
9 Hawthorne MR, Parker AJ. Perforations of the tympanic membrane following the use of Goode-type long-term tympanostomy tubes. *J Laryngol Otol* 1988;**102**:997–9
10 Strachan D, Hope G, Hussain M. Long-term follow-up of children inserted with T-tubes as a primary procedure for otitis media with effusion. *Clin Otolaryngol* 1996; **21**:537–41

11 Todd GB. Audit of the incidence of persistent perforation of the tympanic membrane following T-tube removal or extrusion. *J Laryngol Otol* 1993;**107**:590–2
12 Gibb AG. Long-term ventilation by Per-Lee tube. *J Laryngol Otol* 1986;**100**:503–8
13 Per-Lee JH. Long-term middle ear ventilation. *Laryngoscope* 1981;**91**:1063–73
14 Tos M, Bonding P, Poulsen GP. Tympanosclerosis of the drum in secretory otitis after insertion of grommets. A prospective comparative study. *J Laryngol Otol* 1983; **97**:489–96
15 Stangerup SE, Tos M. Do grommets affect hearing? In: ??. *Cholesteatoma and Mastoid Surgery*. Amsterdam: Kugler and Ghedini; 1989:377–81
16 Maw AR. Development of tympanosclerosis in children with otitis media with effusion and ventilating tubes. *J Laryngol Otol* 1991;**105**:614–17
17 Martin-Hirsch DP, Woodhead CJ, Vize CE. Long-term ventilation of the middle ear using a tympanotomy technique. *J Laryngol Otol* 1995;**109**:1151–4
18 Ersner MS, Alexander MH. In: Coates GM, Schenk HP, Miller A, eds. *Otolaryngology*, vol. 1. Hagerstown, MD: WF Prior, 1960:40–7
19 Simonton KM. Ventilation tympanotomy. *Arch Otolaryngol* 1968;**87**:98
20 Silverstein H. Permanent middle ear aeration. *Arch Otolaryngol* 1970;**91**:313–18

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Mr P. Jassar takes responsibility for the integrity of the content of the paper.
Competing interests: None declared