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Use of the trimmed Shah permavent tube in the management of glue ear

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Abstract

Twenty-five children (mean age six years) with de novo bilateral ear effusions received a 'trimmed' high grade silicone (HGS) Shah permavent ventilation tube in one ear and a conventional polyethylene Shah grommet in the other.

The extrusion rate and the degree of tympanosclerosis formation was examined. At 29 months the conventional grommet had extruded in 90 per cent of children and a recurrent middle ear effusion was found in over 50 per cent of these ears.

The average length of stay for the conventional grommet was 12.5 months. Five permavent tubes had extruded, one was extruding but the remainder were all in place and patent. Comparing ears on each side the amount of tympanosclerosis was worse in the ear with the conventional grommet in 47 per cent of children and worse on the permanent side in 11 per cent of the children.

The 'trimmed permavent' appears to act as a medium to long-term grommet which self extrudes without serious complications. Its use at the primary operation in young children may save repeated insertions of conventional grommets.

Key words: Otitis media with effusion; Middle ear ventilation

Introduction

Insertion of grommets remains one of the commonest ENT operations. Despite doubts regarding their long-term value in protecting against chronic middle ear disease (Skinner *et al.*, 1988) they are extremely effective in restoring hearing in children with middle ear effusion (MEE). In the UK 50 per cent of children, aged five to seven years are affected by glue ear (Brooks, 1976) as well as many infants and pre-school children (Shah, 1982). The hearing disability caused by glue ear can be significant, even in the presence of a near normal pure tone audiogram (Shah, 1991a). In restoring aeration to the middle ear clefts grommets usually return the hearing to normal. The extrusion rate of grommets varies between patients but is about six to nine months for Shepard grommets and nine to 15 months for Shah grommets (Hampel *et al.*, 1991; Hussain, 1992). This falls short in treating a disease that can often last three years or more: 30–40 per cent of children who have grommets inserted require two or more insertions (Curley, 1986; Wight *et al.*, 1987; Smyth 1992). With over 40 000 grommet operations per year (Pringle, 1993) avoidance of a second operation may save over 10 000 children from repeated hospitalization and anaesthesia. It would also avoid the suffering that occurs during the wait for the repeat insertion and could have serious resource implications.

A second problem that seems to be associated with grommet insertion is the formation of tympanosclerosis of the tympanic membrane (Brown *et al.*, 1978; Tos and Stangerup, 1989). The clinical impression of one of the authors (NSS) after many years use of a high grade silicone permavent ventilation tube suggests that this tube causes less tympanosclerosis than other types of tube.

A ventilation tube that stayed *in situ* for two to three years, extruded spontaneously and had minimal complications would have an important part to play in the management of secretory otitis media. We believe that a 'trimmed' high grade silicone permavent ventilation tube would achieve this aim and the present study was designed to assess its effectiveness.

Methods and materials

Twenty-five children aged between three and 10 years (mean age 6 years) with de novo middle ear effusions and without a history of significant acute otitis media were entered into the study. There were 16 boys and nine girls. All tympanic membranes were examined pre-operatively to ensure that no tympanosclerosis was present. With full informed consent from the parents each child received a 'trimmed' high grade silicone permavent tube in the right ear and a conventional Shah grommet in the left ear. The permavent was 'trimmed' as shown in Figure 1. The trimmed tube in the illustration weighs only 8 mg as compared with 13 mg for the complete tube. All operations

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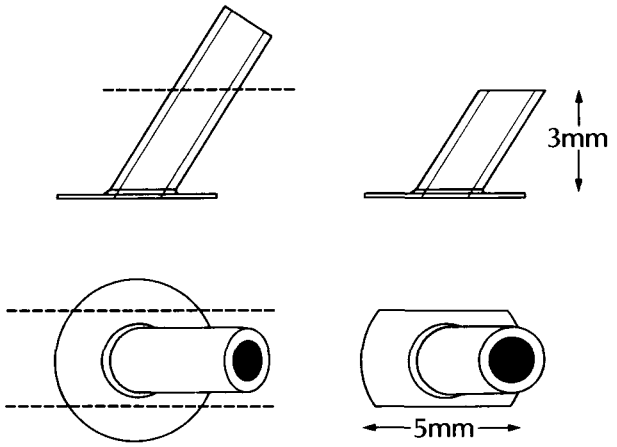

FIG. 1
Dimensions of the trimmed permavent tube.

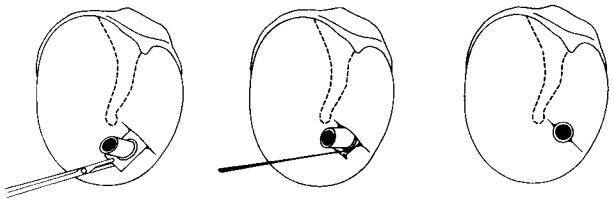

FIG. 2
Method of insertion of the trimmed permavent tube.

were carried out by one of two surgeons (MBP and VA). A deliberate effort was made to avoid rupturing the radial vessels during myringotomy and excessive suction was avoided in the evacuation of the glue. The trimmed permavent was inserted as shown in Figure 2. As the shaft of the permavent is attached to the base at an acute angle the flanges can be individually fashioned by performing a parallel trim of the base in an appropriate orientation so as to suit the site of the myringotomy and the angle of the tympanic membrane. The conventional grommet was inserted in the usual manner via a similar position and size-matched myringotomy. The patients were followed-up at three to six monthly intervals. A 12-month assessment was made (Shah *et al.*, 1991b) and a 29-month assessment which is reported here. Tympanometry was used to assess the patency of the remaining ventilation tubes and to confirm the presence of any recurrent middle ear effusion. The tympanic membrane was examined with a microscope and the tympanosclerotic plaque was drawn onto a preprinted tympanic membrane diagram. The percentage area of tympanic membrane affected by tympanosclerosis was then calculated using a grid. The appearance of most tympanic membranes was also recorded photographically. The time of extrusion was taken as the midpoint between the date at which the grommet was found to have extruded and the date of the last clinic at which it was *in situ*.

Results

At the 12-month assessment all 25 children attended. All 25 trimmed permavents were *in situ* and 11 Shah grommets had extruded. In 16 (64 per cent) cases the tympanosclerotic plaques on the conventional Shah grommet side were significantly larger than on the trimmed permavent side.

The results of the 29-month assessment are described in Table I. At 29 months only 17 patients attended for assessment. The remaining children were either lost to follow-up or repeatedly failed to attend our research clinics. The degree of tympanosclerosis was found to be obviously worse on the side with the conventional grommet in eight (47 per cent) of the children and worse on the permavent side in two children (11 per cent) with no difference between the sides in the remaining seven (41 per cent). Table II compares the percentage area of drum affected by tympanosclerosis for the two types of tube: there is no statistically significant difference.

No trimmed permavents extruded before 21 months. At 29 months five trimmed permavents had extruded and one was extruding (but still patent). Of the five that had extruded four had been in place for 24 months and one for 27 months. There were no residual perforations. Fifteen of the 17 Shah grommets had extruded and in nine (53 per cent) of the 15 ears without a grommet there was a recurrent middle ear effusion. One of these ears had a grommet reinserted because of frequent infections. In the remaining

TABLE I
SUMMARY OF EXTRUSION RATES, MEE RECURRENCE RATES AND TYMPANOSCLEROSIS

Patient no.	Assessed at (months)	Right ear-trimmed permavent tube	Left ear-grommet	Recurrence of glue ear	Tympano-sclerosis	Other complications
1	26	extruded at 24 months	extruded at 9 months	yes L	worse L	
2	26	extruded at 24 months	extruded at 12 months	no	no TS	frequent otalgia L
3	29	*in situ*	extruded at 12 months	yes L	worse L	otorrhoea × 1 on L
4	24	*in situ*	extruded at 12 months	yes L	worse R	
5	26	*in situ*	extruded at 12 months	yes L	worse L	
6	26	*in situ*	extruded at 9 months	no	worse L	
7	24	*in situ*	extruded at 16 months	no	no difference	
8	27	*in situ*	extruded at 14 months	yes L	worse L	
9	20	*in situ*	extruded at 12 months	no	no difference	
10	29	extruded at 27 months	extruded at 9 months	yes L	worse L	otorrhoea × 3 on L
11	28	*in situ*	*in situ*	no	no TS	
12	24	*in situ*	extruding	yes L	worse R	
13	29	*in situ*	extruded at 15 months	no	worse L	residual perforation L
14	29	*in situ*	*in situ*	no	no difference	
15	22	extruding	extruded at 12 months	yes L	no difference	
16	26	extruded at 24 months	extruded at 12 months	no	no difference	
17	29	extruded at 24 months	extruded at 9 months	yes L + R	worse L	

L = Left; R = right; TS = tympanosclerosis.

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TABLE II
NUMBER OF PATIENTS SHOWING A PARTICULAR DEGREE OF TYMPANOSCLEROSIS

Percentage area of drum affected by tympanosclerosis	Permavent tube	Shah grommet
None	10	6
1–10	2	4
11–20	4	4
21–30	1	2
31–40	0	1

eight ears it was felt that because of a patent permavent and good hearing in the permavent ear reinsertion of a grommet was not necessary, saving these children from another operation.

In terms of symptoms it was interesting to note that for three children who had discharge with ventilation tubes *in situ* the discharge was on the side with the conventional grommet. One of these children developed a perforation when the grommet fell out.

Discussion

One of the most commonly used long term-tubes is the Goode T-tube. The problems encountered with these tubes are well recognized (Von Schoenberg *et al.*, 1989; Pritchard *et al.*, 1992) namely otorrhoea and residual perforations, which is why many surgeons prefer to reinsert conventional grommets instead. The Shah high grade silicone permavent tube with its mesh circular disc fashioned from combining the designs of the Crabtree and Per-lee tubes seems to have less effect on the ear drum. The trimmed permavent described in this paper is lighter than the full permavent and softer than the Goode tube: because of the trimming a smaller surface area of flange is in contact with the medial surface of the drum. The flange is angled so as to fit the shape of the tympanic membrane and yet still allow a view down the lumen. The light weight of the tube ought to produce less stress on the tympanic membrane and the angled shape less pressure on the edges of the myringotomy.

It would appear that at 12 months the trimmed permavent causes less tympanosclerosis when compared to the conventional Shah grommet. At 29 months although there is less tympanosclerosis with the permavent tube the numbers are too small to claim a statistical significance.

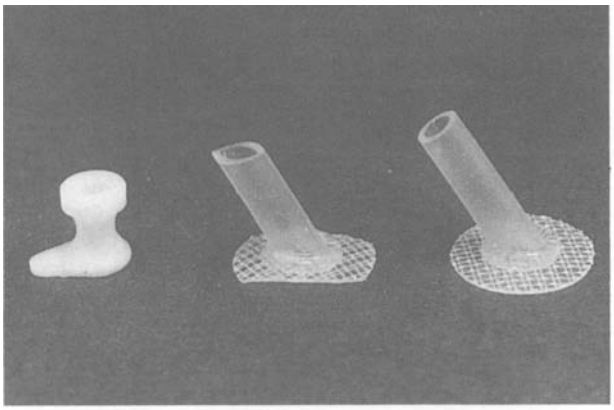

FIG. 3
Comparison of the Shah grommet (left) permavent tube (right) and trimmed permavent tube (middle).

However it appears that the new tubes are no worse than conventional ones.

The causes of tympanosclerosis remain unknown. Brown *et al.* (1978) and Tos and Stangerup (1989) both showed significantly more tympanosclerosis in an ear with a grommet when compared to an ear which had a myringotomy alone. These authors felt that it was the presence of the foreign body that played the major role in tympanosclerosis formation. Other suggested aetiologies include middle ear inflammation (MacKinnon, 1971), trauma from suction (McRae *et al.*, 1989) and intraepithelial haemorrhage (Parker *et al.*, 1990). Lesser *et al.* (1988) studied stress areas of the tympanic membrane and suggested that grommet weight was an important factor. This view was shared by Hampal *et al.* (1991) who compared, lightweight, mini-Shah grommets with the standard size grommets. It is not clear whether it is the material, size, shape or some other component of the grommet which is related to tympanosclerosis induction. What seems clear is that repeated grommet insertion makes the scarring worse (Pinichero *et al.*, 1989). Use of the trimmed permavent removes the need for repeated grommet insertion and hence avoids repeated exposure to the risk factors described above.

Our results give an average stay for the conventional Shah polyethylene grommet of 12.5 months. The standard 'Shah permavent tube' stays in long-term and needs to be actively removed requiring a further anaesthetic. The 'trimmed permavent' gives a flange size in between the above two tubes (Figure 3) with the aim of providing medium term ventilation. The findings at this stage are encouraging. No trimmed permavents extruded before 21 months and of the 17 patients seen at the 29-month follow-up five tubes had extruded and one was extruding.

Of the 15 patients where the conventional Shah grommet had extruded over half (53 per cent) had recurrence of glue ear on that side. One child had symptoms requiring reinsertion but in the others we felt that further intervention could be avoided because of the presence of the functioning permavent in the other ear.

We feel that a policy of inserting a trimmed permavent at the initial operation in certain children with established glue ear is likely to significantly decrease the reinsertion rate. Children will thus be saved the trauma of a further admission and anaesthetic and will avoid the suffering between extrusion and reinsertion of a conventional grommet.

More time is needed to confirm this theory and further follow-up will allow us to determine an average length of stay for the trimmed permavent and observe what proportion of children develop recurrent glue ear when this 'medium term' tube is extruded. Smyth *et al.* (1982) suggested that 'the quality of long-term results when repeated tympanostomy is required will be further enhanced when a tube combining both longevity and freedom from complications is designed and brought into general use'. We feel that the 'trimmed permavent tube' goes a long way to fulfilling this goal.

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