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Main Article

Follow up after middle-ear ventilation tube insertion: what is needed and when?

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Abstract

Introduction: There is a paucity of evidence to guide the post-operative follow up of patients undergoing middle-ear ventilation tube insertion for the first time. This study was conceived to identify current practice at our institution (Ninewells Hospital, Dundee) and to inform subsequent change in our follow-up procedure.

Methods: Two cycles of data collection and analysis were performed. All paediatric patients undergoing ventilation tube insertion for the first time were identified. Patients who had previously undergone ventilation tube insertion or additional procedures such as adenoidectomy or tonsillectomy were excluded. The first data collection period comprised all of the year 2000, and the second 18 months over 2003–2004. A minimum of 20 months' follow up was allowed for. Data regarding clinical findings and audiometry were recorded at each follow-up appointment.

Results: We identified a total of 50 patients meeting our criteria for inclusion in the first cohort. There were a total of 156 appointments between surgery and data collection (a mean of 3.12 per child). A total of 113 (72 per cent) appointments lead to no medical intervention. The only statistically significant difference between patients requiring further ventilation tube insertion ($n = 10$) and those not requiring further treatment during the study period ($n = 40$) was the average hearing threshold ($p < 0.01$). These findings prompted a change in the post-operative regime; all patients undergoing ventilation tube insertion were subsequently seen at three months for a pure tone audiogram, and further review depended on clinical and audiometric findings. Records for 84 children were identified and collected for the second cohort, there were a total of 154 appointments (a mean of 1.83 per child). In only 18 appointments (12 per cent) were normal findings and hearing recorded and children given a further review appointment. Sixteen of 29 (55 per cent) children with abnormal clinical findings (otorrhoea, tube blockage or extrusion) required some form of intervention ($p < 0.05$). Twenty-six had a mean hearing threshold worse than 20 dB at first review. Nineteen (73 per cent) required further intervention of some sort ($p < 0.01$).

Conclusions: Our study demonstrated that the vast majority of review appointments resulted in no clinical intervention. We therefore question the need for regular follow up in this patient group. Twenty per cent (10 of 50 and 18 of 84) of our patients required further ventilation tube insertion within the study periods. This is consistent with rates reported in the literature. Children with abnormal clinical findings or a mean hearing threshold greater than 20 dB were significantly more likely to require further intervention. We would recommend one post-operative review with audiometry, three months after surgery. At this initial appointment, further review should be offered to those children with poor hearing, early extrusion, blockage or infection, as they are more likely to require further ventilation tube insertion. This strategy is dependent on good links with community primary care providers and easy access to secondary care for further management, should this be required.

Key words: Ventilation Tube; Grommet; Follow up

Introduction

Middle-ear ventilation tube insertion is the most common operation performed on children in Europe and North America.[1,2] The indications for ventilation tube insertion have been widely studied; a recent meta-analysis[3] has suggested that both young children in day care and older children with a significant (>25 dB) hearing loss lasting more

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than three months benefit from this procedure. There is a paucity of evidence to guide the post-operative follow up of these patients. In 2000, primary care groups in the USA started to withdraw funding for follow-up appointments with otolaryngologists following ventilation tube insertion. In response to this, the American Academy of Otolaryngology – Head and Neck Surgery issued guidelines[4] based on a questionnaire survey of its members, advocating one early follow-up appointment and then six-monthly review until the tubes had extruded and the patient had been free of recurrent middle-ear effusions for at least six months. This survey was based on the self-reported current practice of the respondents and offered no experimental evidence to support its recommendations. Similar advice was subsequently issued by the Paediatric Association of America, based on the same survey findings.[5] A pilot study assessing primary care follow up of these patients was reported in 1995.[6] There seemed to be a high level of satisfaction in both the ENT surgeons and the general practitioners involved in this study. Patient's parents were less happy, with 53 per cent reporting that they would have preferred follow up in the ENT department. Unfortunately, no follow-up study has been reported.

Materials and methods

Two cycles of data collection and analysis were performed. All paediatric patients undergoing ventilation tube insertion for the first time were identified by examining the computerised surgical theatre logs. Patients who had previously undergone ventilation tube insertion or additional procedures such as adeno-tonsillectomy were excluded. We then obtained patients' case notes and, for each post-operative clinic visit, identified the clinical findings, the audiometric findings, any clinical activity undertaken and the ultimate outcome of the consultation. Pure tone audiometry thresholds were recorded at 0.5, 1 and 2 kHz in both ears. The first data collection was for the year 2000.

The findings, presented below, prompted a change in our department's post-operative regime. Thereafter, all patients undergoing ventilation tube insertion were seen at three months and pure tone audiography performed. Further review depended on clinical and audiometric findings.

The second cohort of patients was collected between June 2003 and December 2004. Follow-up data were available until collection in September 2006, a minimum of 20 months. Identical inclusion and exclusion criteria were applied. Data were tabulated on a Microsoft Excel spreadsheet and analysed using the Statistical Package for the Social Sciences software.

Results

First cohort

We identified a total of 50 patients, 30 male and 20 female, meeting our inclusion criteria. The mean age at surgery was 5.3 years, (range of two to nine years). Forty-two patients had bilateral ventilation tube insertion for persistent otitis media with effusion (OME). Eight patients underwent unilateral ventilation tube insertion for recurrent acute otitis media refractory to medical treatment.[7] The interval between surgery and the first review appointment ranged between one and seven months, with a median value of three months. There was a total of 156 appointments between surgery and data collection (a mean of 3.12 per child). One hundred and forty-three appointments also included audiological assessment of hearing. In 113 (72 per cent) of these appointments, the clinical and audiometric findings were satisfactory and the patient was simply given a further review appointment. Ten (6 per cent) appointments identified recurrent middle-ear effusions associated with significant hearing loss (mean threshold 35 dB) and led to the patient being placed on the waiting list for further ventilation tube insertion. Eight (5 per cent) appointments identified an infection and lead to antibiotic treatment. At the time of data collection, eight patients were still under review.

The only statistically significant difference between those patients requiring further ventilation tube insertion ($n = 10$) and those not requiring further treatment during the study period ($n = 40$) was the average hearing threshold ($p < 0.01$). There was no difference in age at surgery ($p = 0.15$) or gender ($p = 1.00$). The patient group who required further ventilation tube insertion had a mean hearing threshold of 28 dB (standard deviation (SD) 8.5, range 16 to 49), whereas those not requiring further surgery had a mean of 18 dB (SD 12, range four to 47). At first review, only four of the 10 children requiring further ventilation tube insertion had patent ventilation tubes in place; extrusion or discharge was noted in the other six.

Second cohort

One hundred and one patients meeting all criteria were identified: 62 males and 39 females. Mean age was again 5.3 years (range 10 months to nine years). Eighty-two children had bilateral ventilation tube insertion for OME, 12 had bilateral ventilation tube insertion for recurrent acute otitis media and seven had unilateral ventilation tube insertion for refractory acute otitis media. Complete records for 84 children were collected; nine patients did not attend for review despite two appointment letters being sent, and notes on eight patients were lost. Seventy-two (86 per cent) children were seen as recommended at three months. Four were seen earlier because of otorrhoea. Three children were given six-month appointments in error. Four children did not attend the three-month appointment but attended at six months. There was a total of 154 appointments (a mean of 1.83 per child). In only 18 appointments (12 per cent) were normal findings and hearing recorded and the child given a further review appointment. Forty-nine patients were seen at three months, with normal clinical and audiometric findings. Thirty-two of these were discharged from follow up. Ten patients were given a single further appointment

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and subsequently discharged. At the time of data collection, seven children remain under follow up, all under four years of age.

Twenty-nine patients had abnormal clinical findings at first review. Sixteen of these 29 (55 per cent) children required some form of intervention during the study period, a statistically significant result ($p < 0.05$). These findings are summarised in Table I (note that one child had both tube blockage and otorrhoea). Audiometric data were available for 73 children; 26 had a mean hearing threshold greater than 20 dB at first review, and 19 of these (73 per cent) required further intervention – this was statistically significant ($p < 0.01$). The interventions required are summarised in Figure 1. A total of 18 children required further ventilation tube insertion, 12 boys and six girls, (mean age of 4.33 years). Nine of these 18 children had abnormal clinical findings and a mean threshold of 25.9 dB. They were kept under follow up and underwent further ventilation tube insertion when the first set of tubes had extruded and there was evidence of persistent OME. The other nine children had patent tubes in situ and were discharged from follow up, but were referred back by their general practitioner with recurrence of OME after the first set of tubes had extruded. Three children had mean thresholds greater than 20 dB at first review and should theoretically have been kept under follow up.

Discussion

Reviewing children following ventilation tube insertion creates a significant workload for otolaryngology out-patient clinics and audiological services. This has been felt more acutely as recent UK-wide modernisation of audiology services has stretched this resource. Moreover, this patient group can be difficult and time-consuming to test. Our study demonstrated that the vast majority of review appointments resulted in no clinical intervention, and we therefore question the need for regular follow up in this patient group. The proportion of appointments resulting in further follow up during which no abnormality was identified was successfully reduced from 72 to 12 per cent. It is not clear why 12 per cent of apparently normal post-operative children were followed up – this may have been due to parental or general practitioner request,

TABLE I

INTERVENTIONS REQUIRED IN PATIENTS WITH ABNORMAL CLINICAL FINDINGS AT FIRST REVIEW

Finding	Pts (*n*)	Intervention		Discharged* (*n*)
		Type	*n*	
Otorrhoea	12	Topical therapy	8	0
		Mastoidectomy	2	
		Further VTI	2	
Blockage	9	Further VTI	2	1
		Under review	6	
Extrusion	9	Further VTI	3	3
		Under review	3	

*Patients discharged from follow up. Pts = patients; VTI = ventilation tube insertion

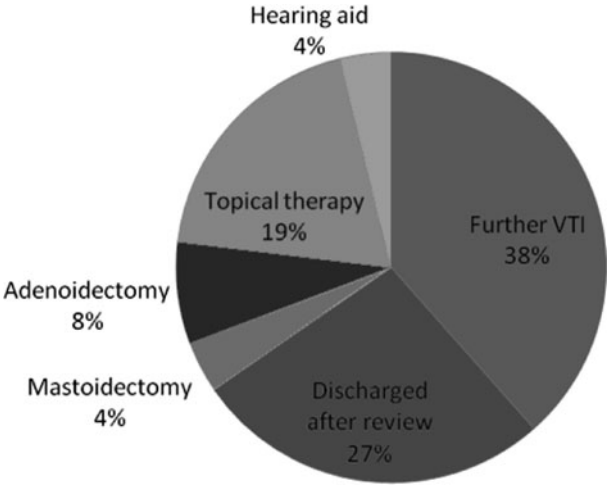

FIG. 1

Interventions required in patients with a pure tone audiometry mean hearing threshold of greater than 20 dB at first review.

or simply to the surgeon's preference. This lack of clarity is a failing of a retrospective study. In total, the first group had an average of 3.12 clinic appointments per child, compared with 1.83 in the second group over a similar period. This finding is to be expected, as children were actively being discharged from follow up. It is helpful to demonstrate this, as the burden of review appointments was significantly reduced – valuable evidence to support such a strategy.

Twenty per cent (10 of 50 and 18 of 84) of our patients required further ventilation tube insertion within the study periods; this is consistent with published literature.[8] In the first study period, we demonstrated that, at the first review appointment, a mean of three months post-surgery, the hearing level in children who went on to require further ventilation tube insertion was significantly poorer than that of those who did not require further intervention. In the second study, a child with abnormal clinical findings or a mean hearing threshold greater than 20 dB was significantly more likely to require further intervention. This is also to be expected; we have demonstrated that this finding can be used as a criteria to determine which patients are offered follow up.

An age of less than 18 months at the time of first tube insertion has also been shown to be a risk factor for further ventilation tube insertion.[8] In our second series, 11 children were under the age of two years at the time of first ventilation tube insertion; nine underwent the procedure for recurrent acute otitis media and two for otitis media with effusion. Interestingly, two required subsequent adenoidectomy and one a cortical mastoidectomy. The numbers are too small in this series to draw valid conclusions regarding age as a risk factor for subsequent intervention. Adenoidectomy has been shown to reduce the need for subsequent ventilation tube insertion,[9] a variable which was excluded from our series.

The incidence of post-operative otorrhoea in our second series was 14 per cent, higher than that found in other series (i.e. generally around 1 per cent).[10,11] However, a large series[12] found that up to 83 per cent

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of children suffered at least one episode of otorrhoea within 18 months of ventilation tube insertion. The signs of a ventilation tube infection are quite evident, so with appropriate advice parents should independently be able to seek medical attention and treatment.

- **Middle-ear ventilation tube insertion is the commonest surgical procedure performed on children**
- **Follow up of these patients can be time-consuming, and uses valuable ENT and audiology out-patient resources**
- **There are no guidelines to direct surgeons as to when and how to follow up patients who have had middle-ear ventilation tubes inserted**
- **This paper suggests that those children with no abnormal clinical findings and normal hearing thresholds can safely be discharged from follow up**

The optimum timing of the first follow-up appointment is unclear. Wallace and Newbegin[13] failed to show an advantage with early follow up (at week one versus week four). We would suggest that three months is an appropriate time point, as the majority of tubes are still in situ and patent at this stage, thus allowing accurate estimation of hearing.

There is a 1 per cent rate of underlying sensorineural deafness in patients referred with glue ear.[14,15] These patients may require significant input to achieve good language and academic development. With universal neonatal screening, these children should be picked up at an early age and the appropriate care established. To avoid missing such a finding, it would be prudent to review children undergoing ventilation tube insertion for the first time at least once, in order to ensure that their hearing has returned to normal limits. This early review appointment should ideally be at a time when the ventilation tubes are still in place, so that the child has no middle-ear effusion at the time of testing.

Conclusions

After considering our data, we recommend one post-operative review, with audiometry, three months after initial ventilation tube insertion. At this initial follow-up appointment, further review should be offered to those children with poor hearing thresholds, blockage, early extrusion or infection, as they are more likely to require further intervention. With adequate parental education, further review could be provided by the general practitioner as necessary. This policy must allow for rapid repeat access to otolaryngology services for patients with recurrent effusions or infection refractory to appropriate therapy.

In our setting, the above policy has markedly reduced the number of clinic appointments, without significantly increasing the burden on individual general practitioners. We feel that this has greatly improved efficiency, without having a negative impact on patient care.

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