

Tympanoplasty in children – a prospective study

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Abstract

Considerable controversy surrounds the subject of tympanoplasty in children. This prospective study looked at the results of type-I tympanoplasty in children. Forty-five children in the age group of five to 14 years were selected for the study. All these cases had a central perforation without any evidence of cholesteatoma. The ear to be operated had to be dry for at least six weeks before surgery. Type I tympanoplasty was performed on these patients with autograft temporalis fascia by either the underlay or overlay technique.

The overall success rates in 45 operations evaluated one year post-operatively was 91.1 per cent. The age of the patient had no influence on the success rate. The two factors which adversely influenced the success rate were the presence of near total perforation and bilateral perforations.

It was concluded that type-I tympanoplasty has a good chance of success in children regardless of age.

Key words: Tympanoplasty; Child

Introduction

Tympanoplasty in children remains a controversial subject. Most otologic surgeons believe that the results of tympanoplasty are less satisfactory in children than in adults (Gans, 1963). Reasons cited for poor results are: immaturity of Eustachian tube function (Bluestone *et al.*, 1979), high incidence of recurrent upper airway infections and the surgical difficulty presented by a narrow external ear canal in children (Koch *et al.*, 1990). It has also been argued that a perforation may serve the same function as a myringotomy tube (Koch *et al.*, 1990).

Those advocating surgery as soon as possible have reported high success rates regardless of the patient's age. The rationale for closing a tympanic membrane perforation at an early age is to restore the child's auditory function, and to prevent ossicular destruction or growth of squamous epithelium through the perforation. Finally, an intact tympanic membrane enables the child to bathe and participate in water activities without restriction (Armstrong and Charlotte, 1965; Marko, 1972; Isaacson, 1994; Chandrasekhar *et al.*, 1995).

The optimum age for tympanoplasty is considered to be from three years to puberty (Raine and Singh, 1983; Koch *et al.*, 1990; Kessler *et al.*, 1994). While for some

children, closure of the tympanic membrane appears to be contraindicated, for others it is a necessity because of hearing problems and recurrent infections.

Several clinical series on paediatric tympanoplasty have been published, with success rates ranging from 35 to 93 per cent (Table I). It is difficult to compare these studies because each study has defined successful tympanoplasty differently and many of these studies did not look at hearing outcome (Chandrasekhar *et al.*, 1995). Surgical procedures differed among the studies.

Materials and methods

This prospective study of type I tympanoplasty in children was conducted in the Department of

TABLE I
RESULTS OF PUBLISHED PAEDIATRIC TYMPANOPLASTY STUDIES

Author	No. of ears	Age group	Success (%)
Bluestone <i>et al.</i> (1979)	51	2-16	35
Cohn <i>et al.</i> (1979)	21	4-14	81
Raine and Singh (1983)	114	<16	81
Adkins (1984)	30	6-16	87
Ophir <i>et al.</i> (1987)	155	5-12	79
Koch <i>et al.</i> (1990)	64	0-17	73
Kessler <i>et al.</i> (1994)	209	0-18	92
Chandrasekhar <i>et al.</i> (1995)	226	0-19	84.9

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The paper was presented at the Annual Conference of Association of Otolaryngologists of India, Delhi State Branch on 9th March, 1997, the 4th Annual Conference of Association of Paediatric Otolaryngologists of India on 20th September, 1997 and the 50th Annual Conference of Association of Otolaryngologists of India on 11th January, 1998.

Accepted for publication: 7 September 1998.

Otorhinolaryngology, Lady Hardinge Medical College and Sucheta Kriplani Hospital and Kalawati Saran Children's Hospital, New Delhi between March 1995 and February 1997. This study was undertaken to determine the ideal age for tympanoplasty and to identify factors which influence the results of tympanoplasty.

This series consists of cases treated by surgery both as in-patients and out-patients. The patients were followed up in the out-patient department. Variables evaluated included age, size of perforation, anaesthesia, approach, technique of repair and status of contralateral ear.

Patients were selected from those attending the ENT out-patient department of Sucheta Kriplani Hospital and Kalawati Saran Children's Hospital. Children in age group five to 14 years, who had an uncomplicated pars tensa perforation that had remained dry for at least six weeks, with no evidence of cholesteatoma and no previous attempts at closure were selected for the study. If both ears were perforated, the worse affected ear was operated on first. Ossicular chain integrity and mobility was checked preoperatively. Surgery was performed by either of the two senior authors.

The patients selected for the study were evaluated in detail. A complete history of illness and treatment received was taken. Detailed examination of ear, nose and throat followed by a general physical and systemic examination were carried out. Relevant blood and urine examinations were done. Pre-operative tuning fork tests and pure tone audiometry were performed. Type I tympanoplasty was performed by either the underlay or overlay technique under general or local anaesthesia. Temporalis fascia was used as the graft material in all the cases. The surgical approach was chosen depending upon the size of perforation and external auditory canal. After surgery patients were followed-up for a minimum of one year. At this stage i.e. one year post-operatively the pure tone audiometry was repeated.

Results

A total of 45 cases of chronic suppurative otitis media in the age group of five to 14 years were taken up for the study. In the present study, success was defined as an intact tympanic membrane and an air bone gap less than 25 db, one year post-operatively. According to these criteria we had an overall success rate of 91.11 per cent (41 cases) and a failure of 8.88 per cent (four cases). The success rate of tympanoplasty with respect to age was analysed. Children were divided into three age groups i.e. five to eight years, nine to 11 years and 12–14 years. Of nine children in the five to eight years age group eight tympanoplasties were successful (success rate 94.73 per cent) and one failed (5.27 per cent). Of 10 children in the nine to 11 years age group, nine were successful (90 per cent) and one failed (10 per cent). While in the 12–14 years age group, of the total 16 children, 14 tympanoplasties were successful (87.5

per cent) and two failed (12.5 per cent). Thus success rate was maximum in the five to eight years age group in our study.

In our study, success rate in cases with unilateral perforation was better i.e. 95.65 per cent (22 success, one failure) as compared to those with bilateral perforation 86.36 per cent (19 success, three failure). The duration of ear discharge varied from one to 12 years. Analysis of success rates in relation to the duration of ear discharge revealed that success rates were lower in cases with the longer duration of ear discharge. In patients with a one to four years duration of ear discharge, eight were successful (100 per cent) no failures; five to eight years, 25 were successful (92.59 per cent), two failures (7.41 per cent); nine to 12 years, eight were successful (80 per cent) and two failures (20 per cent). Perforations in the ear to be operated were graded according to the area of tympanic membrane involved. One hundred per cent success (10 cases) was achieved in cases where the perforation occupied less than half of the ear drum. For cases where the perforation occupied three quarters of the drum, the success rate was 91.66 per cent (22 out of 24) and for subtotal perforation the success rate was 81.81 per cent (nine out of 11).

Cases were operated both under general and local anaesthesia. For cases under local anaesthesia, success was achieved in 15 out of 17 cases (88.23 per cent) and 92.88 per cent (26 of 28 cases) for those under general anaesthesia. Success rates for cases performed by the permeal approach was 95.45 per cent (21 successful, one failure), by the endaural approach 100 per cent (one case) and by the postaural approach was 86.36 per cent (19 successful, three failures). Overlay and underlay techniques were used for graft placement. For cases operated on by the overlay technique, success was 90 per cent (nine of 10 cases) and for those by the underlay technique 94.28 per cent (33 of 35 cases). We had minor complications in nine out of 45 cases.

Conclusions

From our study it can be concluded that type-I tympanoplasty has a good chance of success in children of all age groups. The ear should be preferably dry before tympanoplasty. Longer duration of ear discharge is associated with a poorer outcome of tympanoplasty. The underlay technique yields better results than overlay. Larger perforations in children are associated with a lesser chance of success for tympanoplasty. Tympanoplasty is less successful in children with bilateral perforations, and, finally, that good hearing results are obtained in children after tympanoplasty.

Thus, one should proceed with tympanoplasty regardless of the patient's age, because in children the cochlear reserve is usually excellent, the potential for preserving and restoring hearing is high. Also in children we have an opportunity to prevent recurrent attacks of chronic otitis media or limit the sequelae of chronic infection. It also enables the

child to bathe and participate in water activities without restriction. Thus, it gives the child a safe, dry and functional ear.

References

- Adkins, W. V., White, B., Charleston, S. C. (1984) Type I tympanoplasty: influencing factors. *Laryngoscope* **94**: 916–918.
- Armstrong, B. W., Charlotte, N. C. (1965) Tympanoplasty in children. *Laryngoscope* **75**: 1062–1069.
- Bluestone, C. D., Cantekin, E. J., Douglas, G. S. (1979) Eustachian tube function related to the results of tympanoplasty in children. *Laryngoscope* **89**: 450–458.
- Chandrasekhar, S. S., House, J. W., Devgan, U. (1995) Pediatric tympanoplasty – a 10 year experience. *Archives of Otolaryngology – Head and Neck Surgery* **121**: 873–878.
- Cohn, A. M., Schwaber, M. K., Anthony, L. S., Jerger, J. F. (1979) Eustachian tube function and tympanoplasty. *Annals of Otolaryngology* **89**: 339–346.
- Gans, H. (1963) Tympanoplasty in children. *Archives of Otolaryngology* **80**: 350–352.
- Isaacson, G. (1994) Tympanoplasty in children. *Otolaryngologic Clinics of North America* **27**: 593–605.
- Kessler, A., Postsic, W. P., Marsh, R. R. (1994) Type I tympanoplasty in children. *Archives of Otolaryngology – Head and Neck Surgery* **120**(5): 487–490.
- Koch, W. M., Friedman, E. M., McGill, T. J. I., Healy, G. B. (1990) Tympanoplasty in children: The Boston Children's Hospital experience. *Archives of Otolaryngology – Head and Neck Surgery* **116**: 35–40.
- Marko, T. (1972) Tympanoplasty and age. *Archives of Otolaryngology – Head and Neck Surgery* **96**: 493–498.
- Ophir, D., Porat, M., Marshak, G. (1987) Myringoplasty in the pediatric population. *Archives of Otolaryngology – Head and Neck Surgery* **113**(12): 1288–1290.
- Raine, C. H., Singh, S. D. (1983) Tympanoplasty in children – a review of 114 cases. *Journal of Laryngology and Otology* **97**: 217–221.

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