

## Causes of failure of combined approach tympanoplasty in the treatment of acquired cholesteatomas of the middle ear and the mastoid

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### Abstract

Forty cases of failed combined approach tympanoplasty were analysed. The commonest cause of failure was adhesions between the facial ridge and the tympanic membrane, causing segmental attico–mastoid malaeration in 51.3 per cent of cases followed-up continually. Other causes were, large dermoids, incomplete removal of squamous epithelium, and eustachian tube obstruction. Eustachian tube dysfunction did not appear to be a major cause of failure.

**Key words:** Mastoid surgery, complications

### Materials and methods

One hundred and forty-one patients (151 ears) with acquired cholesteatoma of the middle ear and the mastoid treated by combined approach tympanoplasty followed-up over a period ranging from five to 23 years were analysed. The average follow-up time was 14.5 years.

Forty ears from a total of 151 failed. Failure was defined as a recurrence of the original condition, a residual cholesteatoma or incomplete first stage removal, all necessitating a modified radical mastoidectomy. Recurrences of asymptomatic retraction pockets (pre-cholesteatomas) were followed-up regularly until they progressed to frank cholesteatomas when a modified radical mastoidectomy was performed. This period varied from six months to 14 years. Non-attendance, for years, complicated the assessment of the time of formation of retraction pockets and/or final failure.

Dacron reinforced silastic used in the late 70s and early 80s frequently caused severe reactions and scarring and was abandoned; since when a medium or thick silastic is used although the latter does seem to cause mucosal reaction. Most attic defects were closed by bone or cartilage grafts but over the past few years small attic defects have been left alone, since their closure did not seem to prevent recurrences. Cartilage grafts to replace the lost fibrous annulus are no longer used, as they do not seem to prevent retraction pockets. Ventilation tubes were inserted for secretory otitis media in eight cases but in only three of them was it recurrent.

### Results

Table I shows that significant abnormalities of the tympanic membrane or the middle ear (attico–mastoid malaeration or large residual cho-

TABLE I  
STATE OF THE TYMPANIC MEMBRANE AND/OR THE MIDDLE EAR PRECEDING FAILURE AND SUBSEQUENT COURSE OF THE DISEASE

Thirty-seven cases showed onset of retraction pockets or large residual cholesteatomas, or attico–mastoid segmental malaeration within five years. Of the 37 cases, 25 were converted into modified radical mastoidectomies within five years.

1 case was converted into modified radical mastoidectomy in the 6th year  
2 cases were converted into modified radical mastoidectomy in the 7th year  
3 cases were converted into modified radical mastoidectomy in the 8th year  
1 case was converted into modified radical mastoidectomy in the 9th year  
1 case was converted into modified radical mastoidectomy in the 10th year  
1 case was converted into modified radical mastoidectomy in the 12th year  
1 case was converted into modified radical mastoidectomy in the 14th year

Two failed cases are awaiting further surgery.

Three cases were “lost” after the operation and seen several years later with natural modified radical mastoidectomy.

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TABLE II  
CAUSES OF FAILURE

	No. of cases
Facial ridge–tympanic membrane adhesions	19
Severe silastic reaction	6
Incomplete removal from sinus tympani due to grossly overhanging facial nerve	4
Difficulty in removing recurrence from round window	1
Large dermoids	4
Total eustachian tube obstruction	2
Could not be assessed with certainty (multiple causes: eustachian tube dysfunction, recurrent otitis media, silastic reactions and adhesive changes)	10

lesteatomas) present for five years led to failure (25/40 cases). In the rest of the cases (12/40) future failure was foreseen by the presence of retraction pockets. Three cases could not be assessed from this point of view because of their prolonged absence from regular review.

Table II shows that the commonest cause of failure was adhesions between the facial ridge and tympanic membrane causing segmental malaeration of the attico–mastoid segment if associated with obstructed posterior tympanotomy. This led either to an attic perforation with rapid squamous invasion of the attico–mastoid segment or obstructive mastoiditis or a combination of both. Severe reaction to dacron reinforced silastic was a cause of facial ridge–tympanic membrane adhesions. In some cases there were multiple factors i.e., a combination of eustachian tube dysfunction, recurrent otitis media, and some silastic reaction with adhesions at the facial ridge–tympanic membrane level.

### Discussion

The failure rate for acquired cholesteatomas following combined approach tympanoplasty has been reported to vary from five to 62 per cent [Sheehy and Robinson, 1982 (5 per cent); Sanna *et al.*, 1987a (5.2 per cent); Sanna *et al.*, 1987b (8.8 per cent in children); Smyth, 1985 (14 per cent); Kinney, 1988 (19 per cent in adults and 39 per cent in children); Cody and McDonald, 1984 (61 per cent); Sade *et al.*, 1986 (62 per cent)]. This enormous variation in the failure rate has caused confusion, disbelief and cynicism. Sade *et al.* (1986) and Cody and McDonald (1984) felt that most cases will fail in time. To overcome this criticism of time-related failure, an attempt was made to find out the length of the post-operative period which would encompass all failures and indicate future failure in the rest. It would appear from an analysis of these cases that within five years, 62.5 per cent of the failed cases were converted into modified radical mastoidectomies and the rest had evidence of retraction pockets or segmental attico–mastoid malaeration foreboding future failure; hence the selection of a minimum five-year follow-up period.

The failure rate in this series has been 26.4 per cent. The single most important cause of failure has been adhesions between the facial ridge and the tympanic membrane if associated with obstructed posterior tympanotomy, resulting in segmental attico–mastoid malaeration, causing rapid cholestea-

toma formation via an attic perforation, a retraction pocket or obstructive mastoiditis. This has been the cause of partial or total absorption of the bony posterior meatal wall. Routine dividing of the tendon of the tensor tympani and pushing the tympanic membrane laterally was performed to widen the gap between the tympanic membrane and the facial ridge. Silastic sheeting was used with a view to prevent these adhesions in this very narrow part of the middle ear. The inevitable surgical trauma to the mucosa, inflammation, or retraction of the tympanic membrane can cause these adhesions. Severe mucosal reaction to reinforced silastic has been an important cause of these adhesions in six patients. This has been avoided in the latter part of the series.

This study indicates that primary eustachian tube dysfunction causing serious ventilatory problems occurs in about five per cent of patients. Ventilation tubes were used in 14 cases from a total of 151 including six in the successful group. It is not surprising to find that the use of ventilation tubes to correct the attic retraction pockets are likely to fail because of obstruction at a higher level (facial ridge–tympanic membrane level), unless the posterior tympanotomy is patent. Eustachian tube obstruction played a part in the failures and eustachian tube dysfunction may play some part in the formation of these adhesions as a result of recurrent secretory otitis media.

Modified radical mastoidectomy with Type III tympanoplasty and an aerated mesotympanum is widely accepted as a successful procedure for cholesteatomas. Yet there have never been any doubts raised regarding ventilation of the mesotympanum, indicating adequate eustachian tube function. There is no reason for this function to be any different in cases treated by combined approach tympanoplasties. The fundamental difference between the two procedures from the aeration point of view, lies in the formation of adhesions at the facial ridge–tympanic membrane level in combined approach tympanoplasty. If these adhesions can be prevented, the success rate in combined approach tympanoplasties may not be very different from that of modified radical mastoidectomies.

It has been argued that the mastoid is a dead space after intact canal wall surgery. Formation of a retraction pocket and subsequent failure occurs because of the dead space which can be prevented by obliterating the mastoid (Sade *et al.*, 1986; Palva, 1993). There are no dead spaces in the living body and the mastoid is no exception. It becomes a dead

space only if there is obstruction at the facial ridge–tympanic membrane level or at the level of the aditus. The best way to avoid the ‘dead space’, is to ventilate it. Successful ventilation of the attico–mastoid segment prevents retraction pockets because of equal pressures in the attico–mastoid segment and the external auditory meatus. Although Sade *et al.* (1986) and Sade (1987) had an unusually high rate of absorption of bony posterior meatal wall (21 per cent) resulting in squamous invasion of the mastoid, in the present series of failures there have been 11 such cases. All cases showed malaeration of the attico–mastoid segment associated with obstructive mastoiditis due to facial ridge–tympanic membrane adhesions. In only one of the 11 cases was there absorption of the bony posterior meatal wall well clear of the annulus.

There were four cases of large residual cholesteatomas necessitating lowering of the bridge to facilitate removal. This unnecessary failure was avoidable by not delaying the second stage beyond 18 months.

### Conclusions

It was felt that the single most important cause of failure of combined approach tympanoplasty was attico–mastoid segmental malaeration as a result of adhesions between the facial ridge and tympanic membrane. These adhesions can be prevented by the use of silastic sheeting. These steps and dealing with avoidable problems should further reduce the failure rate. Whether this low failure rate is acceptable at the price of demanding surgery and prolonged follow-up is a matter of individual choice.

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