

## Surgical management of retraction pockets of the pars tensa with cartilage and perichondrial grafts

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### Abstract

Stable, self-cleansing retraction pockets of the pars tensa are common incidental findings and require no treatment. In other cases, recurrent discharge occurs and there may also be associated conductive hearing loss. In a minority of cases, cholesteatoma may develop.

This paper presents the results of surgery using a graft composed of cartilage and perichondrium for retraction pockets involving the posterior half of the tympanic membrane, as well as early results using a larger graft designed to manage retraction of the entire tympanic membrane. Data on 51 patients with posterior retraction pockets are presented. Forty-two (82 per cent) patients had no aural discharge one year following surgery and the tympanic membrane was not retracted in 43 (84 per cent). The larger 'Mercedes-Benz' graft was used in four patients and the results obtained suggested that it may prove a successful technique for extensive retraction pockets.

**Key words:** Tympanic Membrane; Atelectasis; Cholesteatoma; Otolgic Surgical Procedures

### Introduction

Stable, self-cleansing retraction pockets of the pars tensa are common incidental findings and require no treatment. Some discharge intermittently and develop granulation tissue within them. Progression to frank cholesteatoma occurs in a minority. While there is no direct evidence, it seems reasonable to consider pockets that are symptomatic to be more likely to become cholesteatomas. In some cases, even extensive areas of drum retraction in the attic or pars tensa may be associated with no symptoms or evidence of progression, and these cases do not require surgical intervention.

Retraction of the pars tensa has been classified into four stages or grades by Sade.<sup>1</sup> Grade one comprises small degrees of retraction, insufficient to make contact with the long process of the incus. In grade two, deepening of the pocket causes contact with the incus, sometimes with erosion of the long process. In grades three and four, the drum is in contact with the promontory; in grade three, the mobility of the drum can be demonstrated by pneumatic otoscopy, but, in grade four, it is adherent and does not move.

The pathogenesis of pars tensa retraction pockets involves a combination of poor Eustachian tube function and progressive thinning of the drum due to loss of its middle fibrous layer.<sup>2,3</sup> It is a common complication of otitis media with effusion.

By the time the patient presents, eustachian malfunction may no longer be a factor, leaving a drum segment which remains retracted primarily due to lack of stiffness and stretching of drum tissue which occurred during the formation of the pocket. Most retraction pockets involve the posterior-superior quadrant of the pars tensa.<sup>4</sup> This type of pocket is also most often found in symptomatic cases.

Ventilation tubes have been used to encourage lateralization of retracted drum segments.<sup>5,6</sup> However, this approach does not overcome the problem of thinning of the drum and may result in a perforation. An alternative method of middle-ear ventilation is the percutaneous mastoid vent described by Yung *et al.*<sup>7</sup> This device resulted in successful lateralization of the drum in 13 of 17 ears.

The pocket can be everted and the drum can be reinforced with a soft tissue graft, such as temporalis fascia.<sup>8</sup> This procedure can be combined with a cortical mastoidectomy to provide a larger air reservoir<sup>9</sup> or the insertion of a ventilation tube. Alternatively, the thin, retracted segment of drum can be excised and the resulting perforation left to heal. This partial myringectomy procedure can be combined with the use of a ventilation tube.<sup>10</sup>

A stiffer graft can be produced using tragal cartilage and perichondrium.<sup>4,11</sup> This allows pockets involving up to half the pars tensa to be successfully treated. Cartilage is well tolerated by the middle ear,

does not undergo resorption<sup>4</sup> and results in post-operative hearing tests comparable to those for repairs using other materials such as fascia and perichondrium alone.<sup>4,8</sup> Cartilage is abundantly available and easily harvested, leaving minimal cosmetic defect; this makes it the graft material of choice for the atelectatic ear.

Larger areas can be dealt with using palisades of cartilage. This technique, first employed by Heermann *et al.*,<sup>12</sup> uses strips of cartilage placed parallel to the malleus. Good hearing results have been reported, with low rates of perforation and cholesteatoma recurrence.<sup>13,14</sup>

This paper presents the results of surgery for retraction pockets involving the posterior half of the tympanic membrane and also early results using a larger graft designed to manage retraction of the entire tympanic membrane.

## Methods

### Surgical technique

A cartilage and perichondrial graft can either be harvested from the tragus or, if a post-aural approach has been used, from the conchal bowl. This latter method has the advantage of allowing harvesting of a graft large enough for even the most extensive defect. A piece of cartilage larger than required is obtained and the perichondrium is removed from the convex side of the graft but left attached on the concave side. The cartilage is trimmed to the required size, leaving the perichondrium untouched. This produces a graft consisting of a stiff section to fill the defect and a fringe of perichondrium which can be spread over the bony tympanic ring to stabilize it (Figure 1).

A tympanomeatal flap is raised and the retracted drum is elevated. Occasionally, it is possible to elevate the pocket intact, but usually there is some tearing of the thin drum tissue, especially in areas where it is adherent to underlying structures. It is vital to ensure that all squamous epithelium is removed to prevent the development of iatrogenic

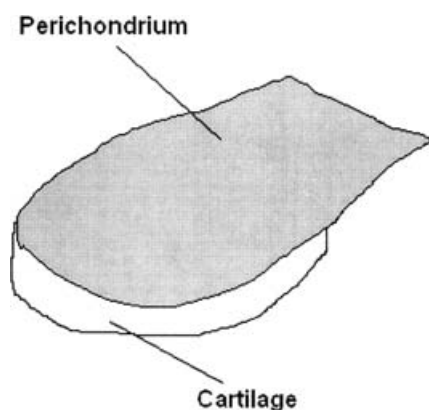


FIG. 1

Diagram of a cartilage and perichondrial graft suitable for reinforcement of a retraction pocket involving the posterior half of the tympanic membrane.

cholesteatoma. The graft is introduced as an underlay with a fringe of perichondrium spread over the bone of the external auditory meatus to stabilize it. The graft should be cut to size so that it fits snugly between the tympanic ring posteriorly and the malleus handle anteriorly (Figure 2).

In order to extend this technique to retraction pockets involving most or all of the pars tensa, a new graft has been developed (Figure 3). The total area must be slightly larger than the area of pars tensa defect to be reinforced, so that a tail of perichondrium can be placed on the bony tympanic ring under the tympanomeatal flap to anchor the graft. A channel is created by removal of a strip of cartilage from the superior edge of the graft extending inferiorly to its centre to accommodate the malleus handle (Figure 3). Two radial incisions are then made from the inferior end of this channel. This means that the graft becomes conical in shape. Because of the shape of these incisions it has been named the 'Mercedes-Benz' graft. It is introduced as an underlay, with the perichondrium posterior to the malleus handle unless all squamous epithelium has been removed from it. The anterior portion of the graft often needs to be supported with gelatin sponge.

In cases in which there is doubt about the extent of the retraction pocket, a cortical mastoidectomy is performed.

### Study design

Data were collected prospectively and stored using the Lotus Approach computer database program. Patients were recruited in Dundee (1987–1998) and Edinburgh (1998–2005). Data regarding the grade of aural discharge and the grade of retraction of the reconstructed tympanic membrane at one year, were retrieved, together with the post-operative mean air–bone gaps and hearing changes.

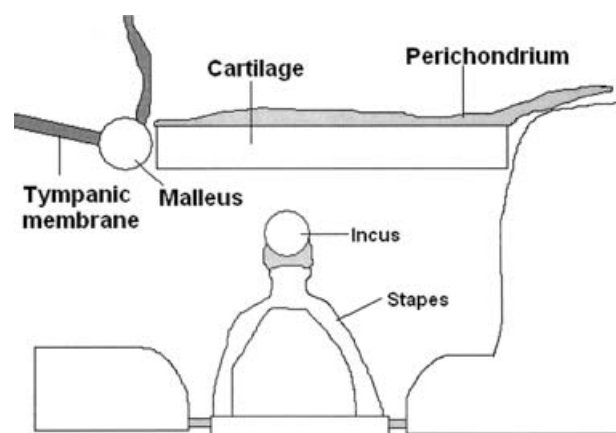


FIG. 2

Diagram showing the use of a cartilage and perichondrial graft to reinforce a retraction pocket involving the posterior half of the tympanic membrane. The graft must fit between the malleus handle anteriorly and the bony tympanic ring posteriorly.

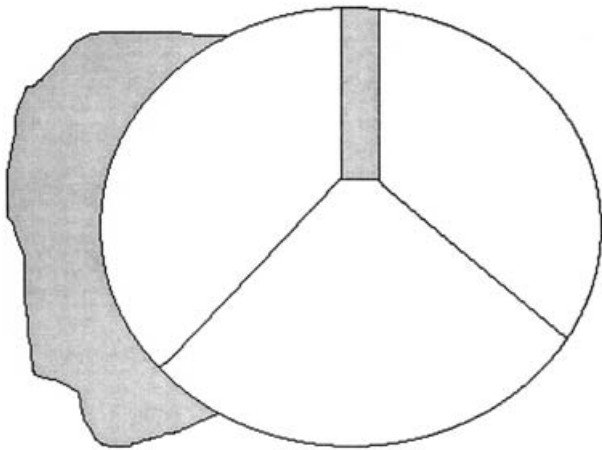


FIG. 3

Diagram showing a 'Mercedes-Benz' graft for reinforcement of a four quadrant retraction of the pars tensa.

**Results**

Data on 54 patients with posterior retraction pockets were analysed. Three were lost to follow up, leaving 51, whose scores for discharge and grade of drum retraction at one year are presented in Figures 4 and 5. Discharge was graded from zero to three to demonstrate increasing severity, and the retraction grade was based on Sade's 1979 classification.<sup>1</sup> Forty-two (82 per cent) patients had no aural discharge and the tympanic membrane was not retracted in 43 (84 per cent)

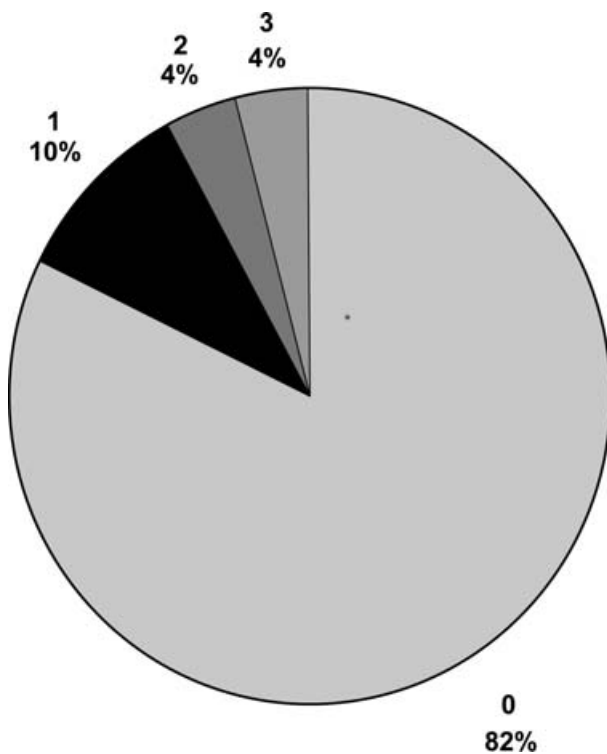


FIG. 4

Grades of discharge from each ear at one year post-operatively.

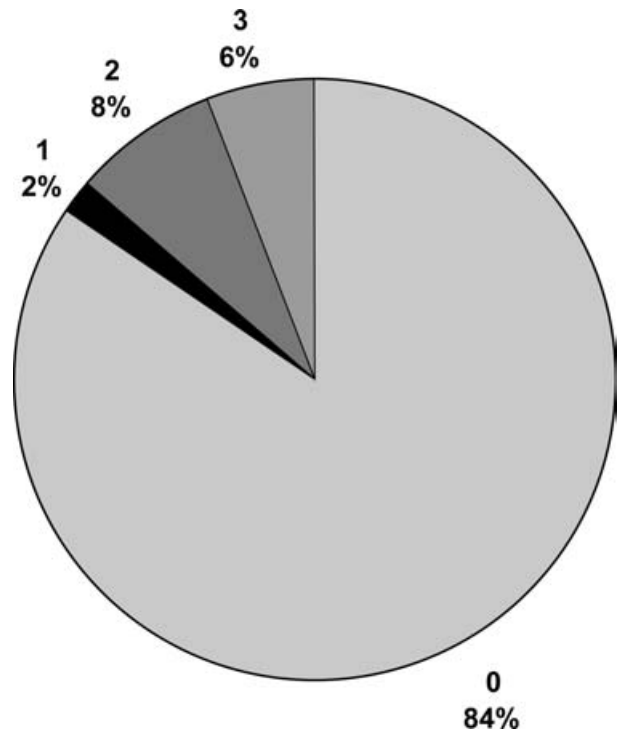


FIG. 5

Grades of tympanic membrane retraction at one year post-operatively.

cases at one year post-operatively. Hearing results were available for 50 patients. The mean post-operative air-bone gaps and hearing losses are shown in Figures 6 and 7. Twenty four of the patients underwent a cortical mastoidectomy in addition to the cartilage tympanoplasty.

Four patients were treated with a 'Mercedes-Benz' graft, and all had retraction grades of zero at one year post-operative follow up; two had a dry ear but one patient required revision surgery for a perforation. The mean air-bone gap was less than 15 dB in all three patients.

**Discussion**

Cartilage tympanoplasty is a technique employed for a number of conditions, including atelectatic

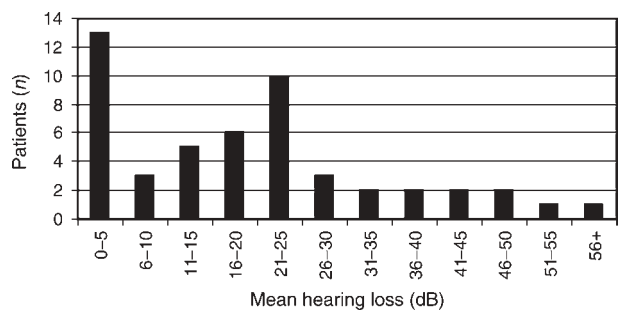


FIG. 6

Mean air-bone gaps at one year.

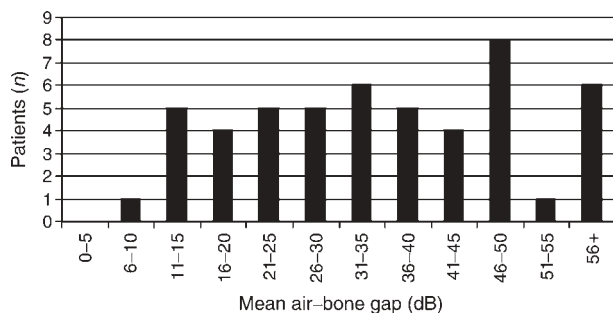


FIG. 7  
Mean air conduction thresholds at one year.

tympanic membrane, high-risk perforation and cholesteatoma. Cartilage is a useful material in the management of the atelectatic tympanic membrane, especially in the presence of Eustachian tube dysfunction, as the stiffness of the graft prevents further retraction. Levinson proposed that cartilage should be used to buttress the attic at the time of tympanoplasty in order to prevent pars flaccida retractions.<sup>15</sup> It might be expected that the hearing results obtained with a thicker graft such as cartilage would be poorer than those obtained with thinner materials. This is not borne out in practice, however; hearing does not seem to be adversely affected by cartilage grafts.<sup>8,16,17</sup> Monitoring the ear for cholesteatoma is potentially more difficult as the graft is opaque, but regular review with audiometry should avoid any significant delay in further surgery. If there is doubt about the completeness of removal of squamous epithelium, a 'second look' procedure should be planned.

There is no consensus view on when surgery for retraction pockets is indicated. We believe that surgery for patients with unstable retraction pockets which have failed to settle with medical treatment is appropriate. Dornhoffer<sup>18</sup> has developed a treatment algorithm based on a modification of Sade's classification of tympanic membrane retraction.<sup>1</sup> He proposes surgery for retraction pockets in contact with the promontory (graded III or IV). Our experience suggests that some pockets of this type do not cause any problems and can be safely left alone.

The aims of surgery in such patients are to render the ear stable, to exclude the presence of cholesteatoma and to restore hearing, or at least not to make it worse. The patients in this series all had symptoms of aural discharge and most had conductive hearing loss. The results presented here are encouraging, with almost universal graft acceptance and dry ears in 82 per cent of cases. The main indication for surgery was not hearing improvement, but this was obtained in some cases, even without an ossiculoplasty. These findings support the view that cartilage tympanoplasty is the treatment of choice for limited retraction pockets of the pars tensa.

The study also suggests that large (four quadrant) pockets may be successfully treated with a larger

'Mercedes-Benz' graft. However, more experience and longer follow up will be required to confirm this finding.

- **This paper presents the surgical technique and one year results for surgical management of retraction pockets of the pars tensa using cartilage and perichondrial grafts**
- **At one year, 84 per cent of patients undergoing treatment for posterior retraction pockets had no recurrence of retraction, and 82 per cent were free of aural discharge**
- **The use of a larger 'Mercedes-Benz' graft to treat patients with retraction of the entire pars tensa produced promising early results in four patients**

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