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# Combined approach tympanoplasty

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IN the treatment of chronic suppurative otitis media, cortical mastoidectomy, with variations, has been practised since the last century. The unsatisfactory results were due, in the main, to incomplete eradication of cholesteatoma or sepsis. A great leap forward in the evolution of this surgery is attributable to Julius Lempert, the father of modern otology. He demonstrated the immeasurable possibilities of the newer techniques—surgical approaches, use of dental drill, suction irrigation and magnification. It thus became possible to extend cortical mastoidectomy to the combination of eradication of disease with preservation or improvement of function. In the fifties, Zollner, and Wullstein influenced otological thinking along these lines. In the past decade Jansen, Smyth, Austin and others have been in the forefront in advocating the more recent innovations, particularly the use of the combined post-aural and end-aural approach to the mastoid and middle ear with preservation of the posterior canal wall, i.e. combined approach tympanoplasty.

Some otologists have reservations as to the wisdom of preserving the posterior canal wall in all circumstances. Their objections include inadequacy of exposure of epi-, meso-, and hypotympanum and thus the possibility of leaving a residuum of cholesteatoma or sepsis, or both, in a closed cavity. The aphorism 'once a cholesteatoma patient, always a cholesteatoma patient', is quoted. This is not valid in these days of meticulous microsurgery: Smyth's present figure of 3 per cent recurrence in previous cholesteatoma cases refutes such pessimism.

A proposed solution to an otological problem, by one centre, occasionally approximates that of another. Smyth's cartilage canalplasty (1969)



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is somewhat similar to the following procedure. This procedure has been carried out in approximately 100 cases during the past four years and is the result of a quest for a compromise giving adequate exposure with a subsequent closed cavity. A wedge of posterior canal wall including the 'bridge' is removed; later, the canal wall is repaired by insertion of a wedge of preserved nasal septal cartilage as a heterotopic homograft.

### Operative procedure

Through a post-aural incision the combined approach to mastoid and middle ear is used. It is the intention, *ab initio*, to preserve the posterior canal wall. The operation, including posterior tympanotomy, is proceeded with and the pathology determined. In an extensively pneumatized bone, when gross infection of mastoid segment is found, it must be presumed that a similar anatomico-pathological state exists elsewhere. Areas which tend to be overlooked are: medial wall of attic anterior and posterior to the segment of facial nerve proximal to genu; Fig. 1 (A and P); tubal area; and the hypotympanum with its almost invariably infected cell group.

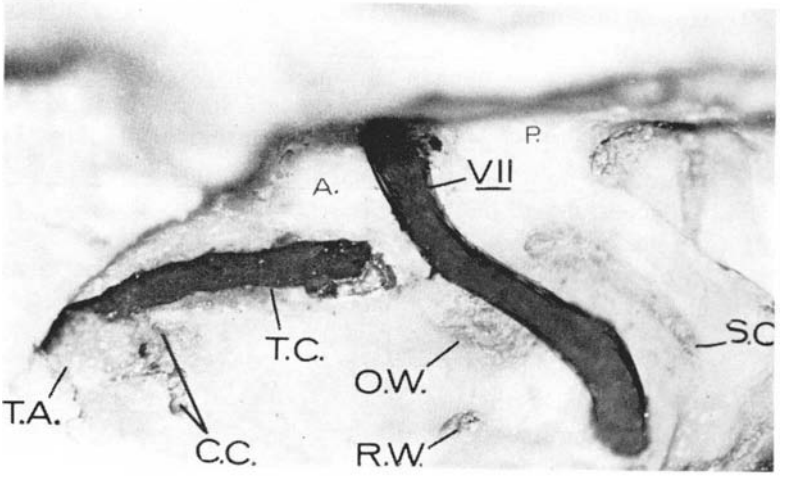



FIG. 1.

Dissection of medial wall of left middle ear.

A. Pre-facial cell group area. P. Post-facial cell group area. T.A. Tubal area. C.C. Carotid canal. T.C. Tensor canal. O.W. Oval window. R.W. Round window. *VII*. Facial nerve. S.C. Lateral semicircular canal.

The posterior canal wall is preserved if certain rigid criteria can be met. These are:

1. If cholesteatoma is present but can be removed *in toto* in its enclosed sac. In this regard the greater tendency to recurrence in children must be carefully considered.



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2. In non-cholesteatoma cases, if exposure including posterior tympanotomy is deemed adequate for removal of all infected cells and mucosa particularly in the less accessible anterior epitympanum and hypotympanum.

Removal of a wedge of the posterior canal wall, including 'bridge', with subsequent repair, is indicated:

1. If in doubt that preservation of an intact wall would limit both adequacy of exposure and the removal of all cholesteatoma and/or sepsis.

2. If exposure is restricted due to an abnormally low middle fossa dura.

3. All cholesteatomas in children except for localized, easily removable ones. In dealing with cholesteatoma in general, it does not suffice to peel off the matrix. All underlying bone, if cellular, must be exenterated; if compact, it must be polished to remove all mycelia-like fingers of cholesteatoma, if recurrence is to be obviated.

### Cartilage as grafting material

Jansen popularized the use of nasal septal cartilage as a free heterotopic homograft in tympanoplasty. As a graft material it has many advantages. It is readily obtainable as one or more pieces, by the use of a Ballenger knife during nasal septal resection. It is easily fashioned to the required shape. It is an avascular, non-antigenic material with an extremely low metabolism, hence its durability. It is preserved in a solution containing 1/4000 aqueous merthiolate with 1/3000 borax. The preservative is renewed within thirty days. The graft is stored in a refrigerator above freezing point, and is washed in saline before use.

Cartilage cells appear to survive preservation with subsequent use as a free graft. Fig. 2(B); is a section of preserved cartilage which was part of a posterior canal wall graft inserted three and a half years previously. The piece was removed at a revision operation for correction of inadequate hearing. It was stained by the method of MacConaill and Gurr, using haplofavioxanthic acid.

### Preparation of inlay graft site

Originally, two or three pieces of cartilage were used, wedged between the tegmen and the repaired canal wall, but were difficult to stabilize. The present technique entails preparation of graft bed in bone. Anterosuperior fixation is prepared by fashioning a trough in the posterior root of zygoma. Posteroinferiorly, a trough remains when the posterior tympanotomy window is opened during removal of the wedge of osseous posterior canal wall (Fig. 3). Shaping the graft as to correct curvature is accomplished by parallel incisions through about half of the graft thickness. Incisions are spaced at about 5 mm. apart. A flat piece of cartilage thus incised



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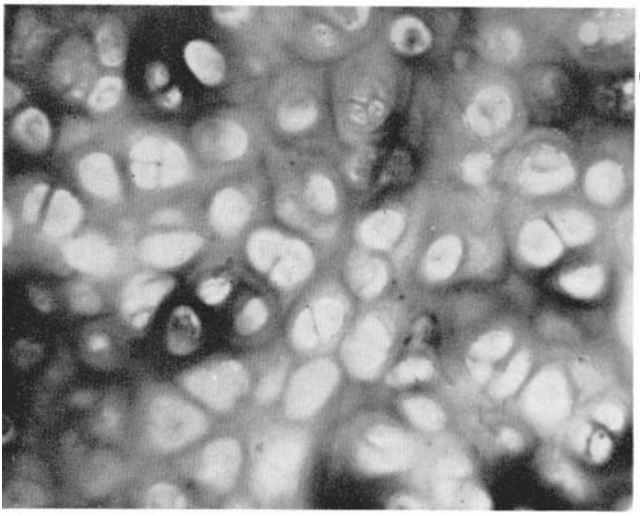


FIG. 2A.
Section of fresh septal cartilage.
Heavily collagenized areas are black.

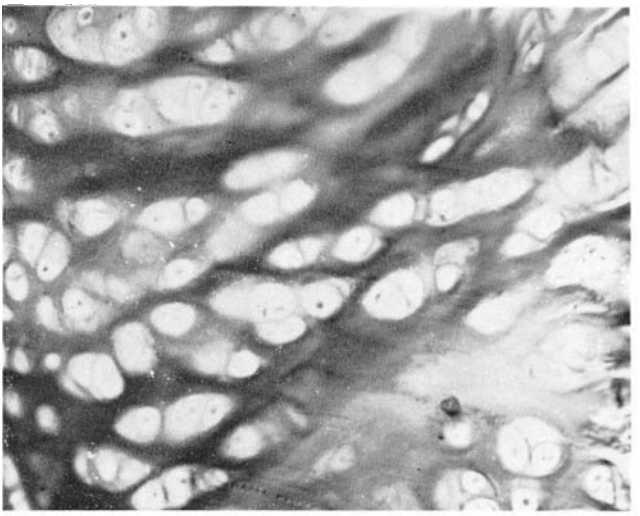


FIG. 2B.
Portion of graft after three and a half years. Note increased proportion of collagen (black), as compared with (A): also retention of typical structure of chondrocytes.
Both sections × 200.



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becomes convex on the incised surface; the incisions spread apart. A template is used to determine the correct graft size and shape. Its curvature should approximate that of the facial nerve.

Cases with loss of ossicular chain continuity due to necrosis of long process of incus and/or stapedial crura require functional reconstruction. Removal of incudal remnant and malleolar head permits thorough clearance of the epitympanum. In these circumstances, section of tensor tympani tendon at its insertion allows of sufficient forward reflection of drum remnant to give the required access to the tubal area and hypotympanum.

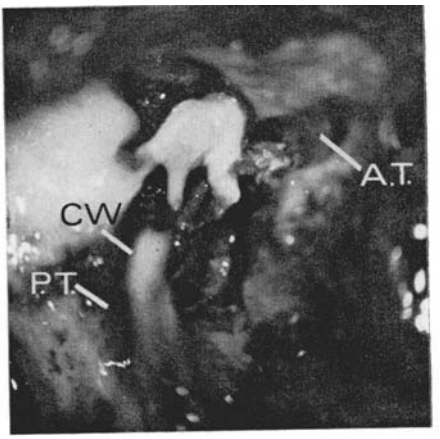



FIG. 3.

A.T. Anterior trough. P.T. Posterior trough. C.W. Canal wall.

The muscle fibres of tensor are exposed by upfracturing the cochleariform process and denuding them of bone. The lateral walls of the canal are carefully preserved. The greater part of this muscle is taken away by traction on its tendon and the residue piecemeal. A small section of the party wall between tensor canal and Eustachian tube is removed towards its anterior end. This gives a direct communication between them. The dissection in Fig. 1. shows the relevant anatomy and emphasizes the proximity of the carotid canal. Silastic sheeting is now placed over the empty tensor canal, leaving an aperture at the originally tendinous extremity, thereby creating an accessory air-transmitting tunnel between Eustachian tube and mesotympanum.

When the reparative procedures, appropriate to the interossicular transformer loss, are completed, the cartilage graft to the posterior canal wall is placed in position (Fig. 4). It is draped with temporalis fascia which is continued forwards over or under the prepared drum remnant, according to circumstances (Fig. 5). The posterior canal wall skin is laid back on



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the reconstructed wall and lightly packed. The post-aural incision is closed, with drainage.

### Comment

Lines of treatment are not rigidly drawn. They may be modified with further time and experience. It is felt that removal, with subsequent repair, of the posterior canal wall gives the best of both worlds. It permits a combination of adequacy of exposure thus implying greater ultimate

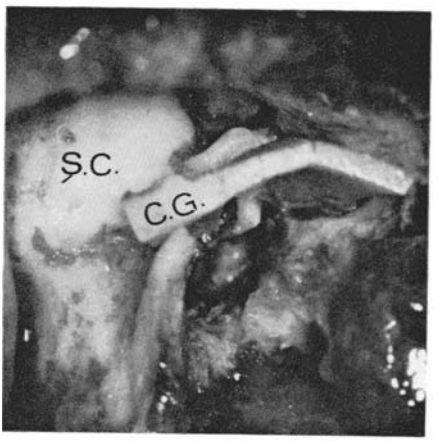



FIG. 4.
S.C. Lateral semicircular canal. C.G. Cartilage graft *in situ*.

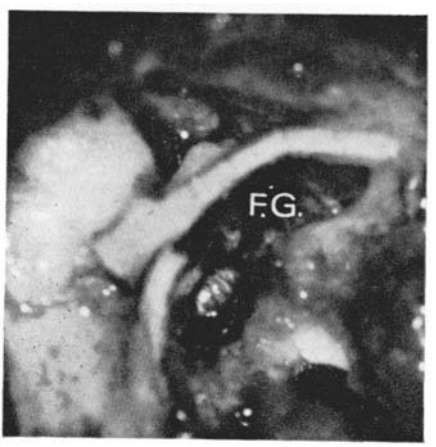



FIG. 5.
F.G. Facial graft.
Note: Handle of malleus external to fascia.



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safety with preservation or improvement of function. It obviates the economic and social disabilities of an open cavity.

The purpose of the silastic-covered air tunnel is to permit continued aeration of the mesotympanum despite possible post-operative partial occlusion of the tubal area by fibrosis.

**Summary**

The use of a vital homograft—preserved nasal septal cartilage as a semi-rigid material for the repair of the posterior canal wall in tympanoplasty, is presented.

The creation of a new air-transmitting tunnel from pro- to mesotympanum by the use of an empty tensor tympani canal covered with silastic sheeting, is described.

**Acknowledgements**

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