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*Editors:*

**Jacques Magnan, André Chays**

Service ORL  
Hôpital Nord - Université de la Méditerranée  
13 915 Marseille cedex 20, France

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## Surgical Treatment of Labyrinthine Fistula in Chronic Ear Surgery

Maurizio Falcioni, Antonello Frisina, Abdelkader Taibah, Enrico Piccirillo, Giuseppe De Donato, Fernando Mancini  
Gruppo Otologico, Piacenza, Italy

### Introduction

Labyrinthine fistula represents the most common complication in chronic otitis media, especially in cholesteatoma cases. It can be produced by resorption osteitis due to infection, or by mechanical osteolysis due to pressure [1]. Labyrinthine fistula can be identified by CT scan, clinically suspected in the presence of fistula signs, or may be an intraoperative finding. The lateral semicircular canal is by far the most common location, while the vertical canals and cochlea are not frequently involved.

The two main kinds of treatment are reported in the literature [2,3]: the fistula matrix can be left *in situ* or removed and the fistula sealed with different types of tissues (combination of fascia and bone dust is the most frequently used). Treatment selection is determined by fistula size, preoperative hearing (ipsilateral and contralateral) and fistula location, with multiple and cochlear fistulae having the highest risk of inner ear traumatism and so are better managed leaving the matrix in place. Of course the surgeon's attitude is fundamental for the final decision.

### Materials and Method

At the Gruppo Otologico between April 1982 and April 2000 124 labyrinthine fistulae in a group of 119 patients were surgically managed. This resulted in a 7.5 % incidence of labyrinthine fistula if related to the 1615 cholesteatoma cases operated on in the same period.

The mean of the patients age was 43.4 years with a range between 5 and 78 years. There were only 2 children, respectively 8 and 10 years old. The group of patients consisted of 74 males and 45 females. The right ear was involved in 63 cases while the left in the remaining 61. Bilateral fistulae were detected in only 5 patients, corresponding to 4.2 % of cases.

As already seen in the literature the lateral semicircular canal (LSC) accounted for the majority of the fistula locations (107 cases, corresponding to 86.3 %). It should be

Address for correspondence : Dr Maurizio Falcioni - Gruppo Otologico - Via Emmanuelli 42 - 29100 Piacenza, Italy  
Tel: +39-0523-754362 - Fax: +39-0523-453708 - eMail: maurizio.falcioni@otologic.it

pointed out that the LSC was involved also in all cases with multiple fistulae so that it was free of disease in only 6 out of 124 cases (4.8%). The distribution of all the fistula locations is listed in Table 1.

Table 1. Fistula location (124 cases).

LSC: lateral semicircular canal; SSC: superior semicircular canal.

Location	N° of cases (%)
LSC	107 (86.3%)
SSC	3 (2.4%)
Cochlea	2 (1.6%)
Footplate	1 (0.8%)
Multiple	11 (8.9%)

The fistula was considered small or large according to the intraoperative evaluation (smaller or larger than 2 mm). There were 58 small (46.8%) and 66 large fistulae (53.2%).

A canal wall-down technique was adopted in 79.8% with 20.2% canal wall-up. This reflects the attitude of the Gruppo Otologico during recent years with the majority of the cholesteatoma cases treated with a canal wall-down technique.

The matrix was removed in 63.7% of the fistulae and left *in situ* in the remaining cases. When matching the fistula treatment with its size it appears that the percentage of removed matrix rises up to 77.6% in small fistulae, while in large fistulae the percentage of matrix left *in situ* and removed are almost the same (Table 2).

Table 2. Fistula treatment according to size (124 cases)

	Matrix removed	Matrix in situ
< 2 mm	45 (77.6%)	13 (22.4%)
> 2 mm	34 (51.5%)	32 (48.5%)
All	79 (63.7%)	45 (36.3%)

As already mentioned, the canal wall-down technique was the operation of choice in the majority of cases, and this was particularly true in cases of large fistulae (83.3%).

In the canal wall-up technique the matrix was left *in situ* in 7 cases during the first stage. In 4 of them a residual cholesteatoma was found during the second stage while the matrix disappeared in the remaining 3.

## Results

Postoperative bony threshold was of 10 dB from the preoperative level. Bony threshold remained unchanged. Improvement of the bony threshold

The mean improvement was 29.7 (range 13-51 dB) dB.

Analyzing the 6 deterioration were large fistulae, the matrix was important to point out that these 2

## Discussion

Labyrinthine fistula is the most frequent. Children are rarely affected because of time.

The presence of a labyrinthine cases, because it can remain undetected. Test is not constantly positive and a generation devices, can easily miss care should be adopted especially in the area involved in the large majority of cases; in 86.3% the LSC was the only location in association with other locations. The posterior labyrinth are particularly generally the most risky in terms of

Much debate still exists on the particularly serious in presence of between the matrix and the membrane. Removal of the fistula matrix, so that dust, or leaving the matrix in place infection. In cases in which a canal removed during the first or second the risk of infective inner ear contamination is mandatory when the selection are represented by fistulae (contralateral), fistula location and

Technically, matrix treatment cases suction should be applied distally. Borders must be sharply dissected. In our series both treatments removed matrix (63.7% vs 36.3%). However

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- 1.3%)
- 4%)
- 6%)
- 1%)
- 1%)

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**Results**

Postoperative bony threshold was considered unchanged when remaining within a range of 10 dB from the preoperative level. In the majority of cases (91.1 %) the postoperative bony threshold remained unchanged. Only 4 % of the cases presented a postoperative improvement of the bony threshold; in 4.9 % there was a deterioration.

The mean improvement was 14.5 dB (range 11-17 dB), while the mean deterioration was 29.7 (range 13-51 dB) dB.

Analyzing the 6 deterioration cases, there were 3 multiple fistulae, 4 out of 6 cases were large fistulae, the matrix was left *in situ* in 4 cases and removed in 2. It seems important to point out that these 2 cases showed the worst hearing deterioration.

**Discussion**

Labyrinthine fistula is the most frequent complication of cholesteatomatous chronic otitis. Children are rarely affected because erosion of the bony labyrinth usually takes a long time.

The presence of a labyrinthine fistula must always be suspected in cholesteatoma cases, because it can remain undetected during preoperative assessment. In fact the fistula test is not constantly positive and also the CT scan, despite increased resolution in the last generation devices, can easily miss a fistula smaller than 2 mm. This means that extreme care should be adopted especially when working at the level of the LSC, which represents the area involved in the large majority of the cases. This was recorded in 95.2 % of our cases; in 86.3 % the LSC was the only location, while in an additional 8.9 % it was found in association with other locations. Fistulae of the cochlea or the remaining portions of the posterior labyrinth are particularly rare. However cochlear and multiple fistulae are generally the most risky in terms of hearing deterioration.

Much debate still exists on the best surgical treatment for fistulae. The problem is particularly serious in presence of a large fistula due to the possibility of adhesions between the matrix and the membranous labyrinth. The 2 possible options consist of removal of the fistula matrix, so that the bony fistula can be sealed with fascia and bone dust, or leaving the matrix in place to diminish the risk of inner ear traumatism and infection. In cases in which a canal wall-up technique is performed the matrix can be removed during the first or second stage; the second option is adopted in order to reduce the risk of infective inner ear contamination. Of course performance of a canal wall down technique is mandatory when the matrix is left in place. Criteria influencing treatment selection are represented by fistula size, preoperative hearing (ipsilateral and contralateral), fistula location and the surgeon's attitude.

Technically, matrix treatment must always be left to the end of surgery and in no cases suction should be applied directly to the fistula. When the matrix is left *in situ* its borders must be sharply dissected in order to diminish the traumatism to the inner ear.

In our series both treatments were adopted, with a preponderance of removal of the matrix (63.7 % vs 36.3 %). However, as shown in our results, leaving the matrix *in situ*



does not guarantee against inner traumatism, but matrix removal appears related to a higher rate of serious damage. As a consequence, in our opinion matrix removal should be avoided when dealing with multiple or cochlear fistulae, and of course when treating the only hearing ear.

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## Management of Laby

Franco Trabalzini, Silviu Albu, G.  
*Department of Otosurgery, Padova, Italy*

### Introduction

Controversy remains regarding the complication of chronic otitis media: wall versus canal down approaches are unsettled [1]. This study was completed to evaluate the hearing function resulting from surgical therapy.

### Materials and methods

2135 cases of cholesteatoma were operated on at the Department of Otolaryngology, Ospedale Civile Veneto. 100 patients with labyrinthine fistula were included in the study. 50 males and 50 females, aged from 14 to 72 years. A hearing loss was the main symptom in 130 patients. In 70 % of cases, vestibular disturbances were documented. The follow-up ranged from 12 to 60 months. In 12 patients, the status of the postoperative cochlear function was evaluated. At frequencies of 0.5, 1, 2 and 3 kHz we observed a decrease in bone conduction PTA > 20 dB.

Several factors were evaluated: the presence of infection in the operated ear, the type of management of the matrix (matrix removal or cholesteatoma classification advocated by Chiosso), the type of labyrinth: type I refers to thinning of the labyrinth, type II the labyrinth is exposed but protected by the perilymphatic space. Type III the endosteum: the perilymphatic space represents an extensive destruction of the labyrinth according to their size at operation: small (1-2 mm) and medium (2-4 mm) and large (> 4 mm).

Address for correspondence: Pr Gregorio Baldo  
Padova - Italy  
Tel: +39-041-529-4419 - Fax: +39-041-529-4419