International Journal of Otorhinolaryngology and Head and Neck Surgery
Rajashekhar RP et al. Int J Otorhinolaryngol Head Neck Surg. 2018 Jan;4(1):32-37
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

Original Research Article

DOI: http://dx.doi.org/10.18203/issn.2454-5929.ijohns20175516

Management of labyrinthine fistula using Surdille flap

Rashmi P. Rajashekhar*, Vinod V. Shinde

Department of ENT, Dr D. Y. Patil Medical College, Pune, Maharashtra, India

Received: 20 November 2017
Revised: 07 December 2017
Accepted: 08 December 2017

***Correspondence:**
Dr. Rashmi P. Rajashekhar,
E-mail: rashmiprashant80@gmail.com

ABSTRACT

Background: Labyrinthine fistula (LF) is the most common intra-temporal complication of squamosal chronic otitis media represents an erosive loss of endochondral bone overlying the semicircular canals without loss of perilymph. Main treatment of LF is surgical. The aim of our study is to discuss its incidence and sex ratio. The main objective is to describe the audio-vestibular results after closure of labyrinthine fistula by our technique using surdille flap.
Methods: 234 patients with squamosal chronic otitis media presented to our institution in a period of 24 months. Out of 234 patients, 22 patients were having labyrinthine fistula. Eleven patients had fistula test positive. Rest eleven patients were found to have LF intra-operatively. All patients underwent canal wall down modified radical mastoidectomy (MRM). Treatment of LF was done surgically by using surdille flap in all the cases. Post operatively Audio-vestibular results of labyrinthine fistula surgery by our technique were studied.
Results: The results show that the cholesteatoma matrix can be removed from the fistula. Removal of the fistula generally improves the vestibular symptoms. In all patients canal wall down procedure was done with surdille flap seal over LF. In our study, incidence of LF was 9.40% and none of the patients ended up with postoperative deafness. Hearing improved in 36.40% patients whereas it remained unchanged in rest of the cases.
Conclusions: Labyrinthine fistula, very commonly seen in the lateral semicircular canal has incidence of 5-10% reported in many studies. We demonstrated that open technique with removal of matrix and sealing with three layers may be a valuable choice for the surgical treatment of LF with little risk for cochlea-vestibular functions. Advantage of using surdille flap (sealing the fistula with three layers) is that it decreases the possibility of postoperative vertigo.

Keywords: Surdille flap, Labyrinthine fistula, Cholesteatoma, Mastoidectomy

INTRODUCTION

A fistula of the labyrinth may be surgically produced or may occur as a consequence of suppurative or neoplastic ear disease. The vast majority of cases of fistula, however occur as a result of bone erosion by cholesteatoma.[1] Incidence of labyrinthine fistula being 10% of all cases of chronic otitis media (COM) with mastoidectomy has probably not changed since an important report covering a 20 year period (Shahy, Brackmann and Graham,1977).[2]

Erosion of labyrinth occurs in 7% of cases of COM. Labyrinthine fistula is the most common intra temporal complication. Cholesteatoma of posterosuperior pars tensa is the most frequent cause of lateral semicircular canal (SCC) fistula. Lateral SCC is more susceptible because of its prominence in the aditus and because it lies in the path of an enlarging cholesteatoma. Most common symptom is vertigo, often induced by straining against a closed glottis. Deafness, ipsilateral facial paresis and otalgia are associated symptoms.[3]

Clinically, fistula sign will be positive. Definitive confirmation of a LF is made by thin section bone window CT scan with 30 degree tilt axial scans. Surgical exploration always confirms presence or absence of LF.

Different sites of LF are arch of lateral SCC, lateral SCC fistula anterior to ampulla, superior SCC, posterior SCC and vestibule.[4]

Surgical treatment of LF has been controversial. Manolides et al and Sanna et al advocate canal wall up (CWU) mastoidectomy and no manipulation of cholesteatoma matrix. At a second stage procedure, the matrix which turns into small cyst, is easily removed. In more than 96% of their patients sensorineural hearing loss (SNHL) was thus avoided. Surgeons who remove matrix at initial surgery report an average SNHL in 10% of cases. Other method is canal wall down (CWD) procedure and leave the matrix intact. This preserves hearing and facilitates healing of the mastoid cavity, which in the final analysis is covered with stratified squamous keratinizing epithelium without skin appendages. We could not find any studies to support the idea that preserved matrix exhibits ongoing erosive ability.[3]

There is some debate regarding surgical technique concerning the fate of squamous epithelium overlying the fistula. Some otologists advocate preservation of the epithelium, whereas others advocate gentle removal and repair with connective tissue such as temporalis fascia with or without bone dust. This is much more difficult with large fistulae but it is essential that no cholesteatoma be left in a position from which it can erode into the vestibule or cochlea. Alternately the matrix can be left, provided it is not becoming invaginated.

If the operative procedure is an open one there is a risk of persistent postoperative vertigo due to the exposure of the fistula to caloric stimulation through the meatus. The closed cavity technique protects the vestibule from temperature variation but a second stage is mandatory. When matrix has been left on the fistula, it has been found to have disappeared in about 50% of such cases and the fistula not infrequently closes with new bone formation. The majority of cases of significant SNHL are in large fistulae and in fistulae not recognized by the surgeon until damage has already been done.[4]

In our method, all patients with labyrinthine fistula underwent canal wall down mastoidectomy to remove pathology completely. The fistulae were covered using bone dust, temporalis fascia and both of which were supported by surdille flap. Part of the flap supports 2 layers over the fistula and the rest is laid into the mastoid cavity.

The objective of our study is to find the postoperative audio-vestibular results following closure of LF by our surgical technique.

METHODS

This is a prospective study conducted for a period of 2 years from January 2014 to December 2016. Patients attending ENT OPD with ear discharge for more than 3 months duration underwent detailed ENT examination.

Inclusion criteria

Inclusion criteria were patients >18 yrs and <65 yrs; patients with squamosal chronic otitis media.

Exclusion criteria

Exclusion criteria were patients with mucosal chronic otitis media; patients with past h/o mastoidectomy; patients <18 yrs and >65 yrs.

Among them, 234 patients were diagnosed to have squamosal COM. All these 22 patients were included in our study. Complete and detailed clinical history of each patient was noted. Ear discharge was associated with hearing loss. Some patients complained of vertigo, which was usually brief, lasting seconds to minutes. Vestibular symptoms increase the probability of a LF. Patients were subjected to detailed general and systemic examination. Under local examination of ear, otoscopic and oto-microscopic details of squamosal chronic otitis media were noted. 17 patients had postero-superior retraction pocket and 5 had attic retraction pocket with chole-steatoma. 11 out of 22 patients had positive Fistula test.

Preoperative audiometric evaluations were obtained in all patients. Results were given utilizing the pure tone average of 500, 1000 and 2000 Hz. Normal auditory function was defined as 0-20 dB. These patients were further evaluated on high resolution computed tomography (HRCT) of temporal bone to look for evidence of fistula in lateral semicircular canal. 5 out of 22 patients showed fistula of >2 mm on lateral SCC. These 5 patients were among patients with positive fistula test.

All patients underwent CWD modified radical mastoidectomy (MRM) surgery at Dr. D. Y. Patil Medical college, hospital and Research centre. Out of 234 ears 22 patients were diagnosed to have LF (Figure 1) during MRM and were successfully operated using surdille flap. We attempted to preserve the cholesteatoma matrix over the fistula during bone drilling with copious irrigation. At the end of the surgery the matrix overlying the fistula was gently removed, and the area was sealed with three layers bone dust, temporalis fascia and anterior canal wall flap (Surdille flap) (Figure 2). The bone dust was obtained from non-inflammed bone cortex prior to removal of the matrix. Surdille flap is obtained by taking Lempert's incision. Meatal skin is elevated, first posterosuperiorly at the suprameatal spine, then superiorly from the notch of rivinus and tympanosquamous suture, and then posteroinferiorly from the tympanomastoid suture. Finally, the skin from the anterior meatal wall is elevated and a large surdille tympanomeatal flap is now formed. The flap dissection should be as delicate as possible. The Surdille flap is

carefully elevated from the bone just as far as the tympanic membrane.

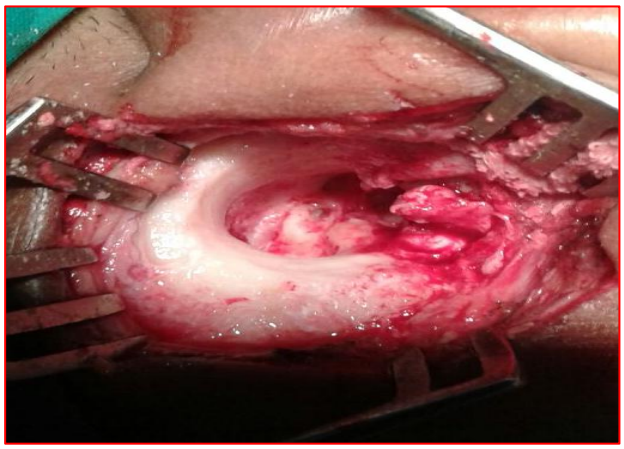

Figure 1: Lateral SCC fistula.

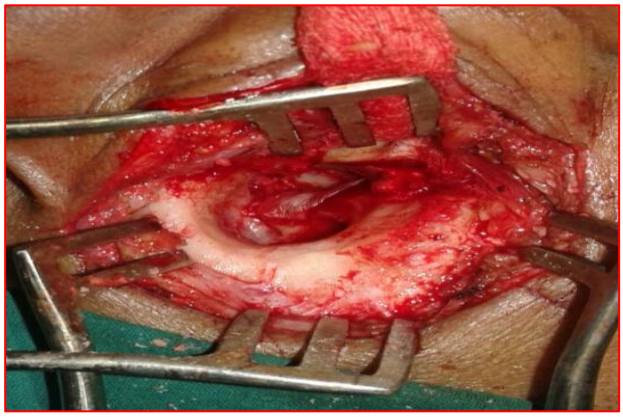

Figure 2: Closure of LF-triple layers.

Despite preoperative testing, it is possible to miss semicircular canal fistula, especially if it is small or atypical location. This is the reason that a high degree of vigilance has to be maintained for patients with the larger cholesteatoma. 11 out of 22 patients were diagnosed intra-operatively during CWD mastoidectomy. Hence, high level of suspicion is mandatory while removing cholesteatoma overlying the labyrinth.

Postoperative hearing and vertigo was assessed and the results were tabulated. All patients were followed up at 2 weeks, 1 month and 2 months. Postoperative pure tone audiometery was done at 2months and the results were noted.

Statistical analysis

The data was entered and analysed in excel. Categorical data have been depicted in proportion. For continuous data, mean and Standard Deviation (SD) has been computed. The effect of surgery on hearing loss has been analysed using paired 't' test.

Advantages of our technique

1. Postoperative tullio phenomenon (vertigo) is absent.
2. As surdille flap seals over the bone dust and temporalis fascia covering the labyrinthine fistula, temperature and pressure changes from the exterior is not transmitted to the LF.
3. Also it obliterates some portion of mastoid cavity. Hence postoperative cavity related problems are less.

RESULTS

Among 234 patients, 128were males and 106 were females. Age ranged from 20 yrs to 65 yrs. All patients presented with otorrhoea and hearing loss. Few patients complained of episodic vertigo and tinnitus. Attic retraction pocket with frank cholesteatoma was seen in 142 (60.7%) patients. While posterosuperior retraction pocket was seen in 92 (39.3%) patients.

Of the 22 patients with LF, 13(59%) patients were male and 9 (41%) were female (Figure 3). Age of patients ranged from 21 yrs to 62 yrs. All patients complained of hearing loss and otorrhoea. 16 patients presented with episodic vertigo and 6 patients complained of tinnitus. On otoscopic examination, 17 (77.3%) patients had posterosuperior and 5 (22.7%) patients had attic retraction pocket with cholesteatoma (Figure 4). Fistula test was positive in 11 patients.

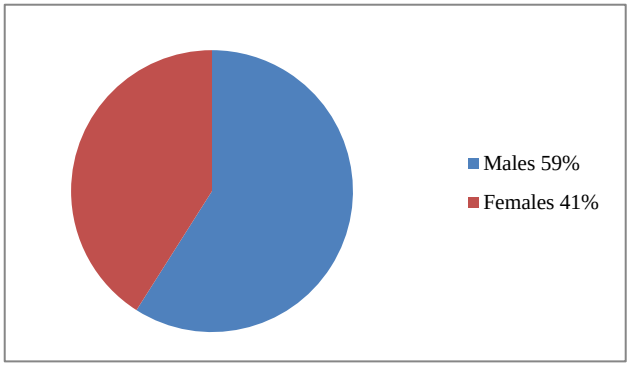

Figure 3: Labyrinthine fistula.

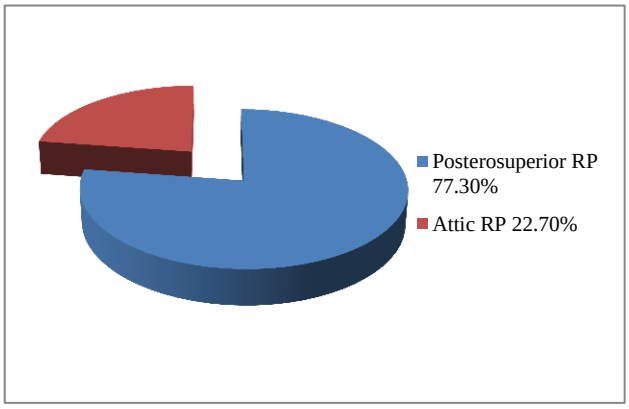

Figure 4: Site of disease.

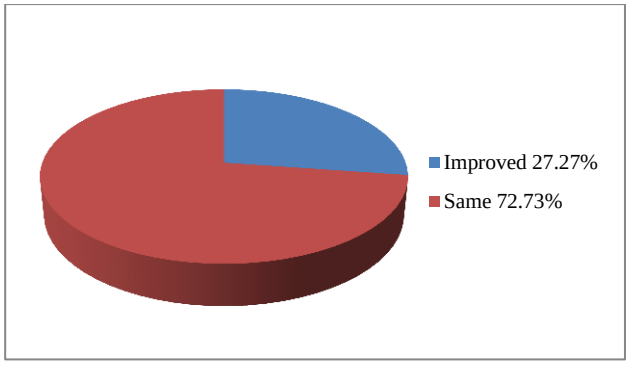

Figure 5: Postoperative hearing.

During postoperative follow up, vertigo disappeared in 15 (91.6%) patients within 2 months following the surgery. Preoperatively, Audiogram showed 6 patients with pure conductive hearing loss of 30-55 dB and 16 patients with mixed hearing loss of 25-55 dB. Postoperatively, 6 (27.27%) patients showed improvement in hearing by 10-15dB. Hearing remained unchanged in rest of the patients. However there was no deaf ear postoperatively (Figure 5).

Among 22 patients, the mean age was 41.45 yrs. The mean duration of ear discharge was 13.72 months and the mean duration of Hearing loss was 6.5 months (Table 1).

From Table 2, we can see that mean postoperative hearing loss is 39.77 as compared to mean preoperative hearing loss of 42.40. There is significant improvement in postoperative hearing. The 'p' value of paired 't' test i.e. of preoperative and postoperative hearing loss is 0.015. P<0.05 is significant. Hence the gain in hearing in our study is significant. There was no postoperative vertigo.

Table 1: Descriptive statistics.

	No. of patients	Mean	Std. deviation
Age	22	41.4545	11.95120
Ear discharge	22	13.7273	7.59186
Hearing loss	22	6.5000	5.21673

Table 2: Paired samples statistics p<0.05.

Paired t	No. of patients	Mean	Std. deviation	Std. error mean
Preop hearing loss	22	42.5000	8.55653	1.82426
Postop hearing loss	22	39.7727	7.15097	1.52429

DISCUSSION

Labyrinthine fistula occurrence is one of the most common complications in COM with cholesteatoma.[5-8] A frequency of 5-10% is reported in most studies.[9,10] Very commonly the fistula is seen in the lateral SCC. Sanna and coworkers have classified fistulas as small (0.5 to 1 mm), medium (1 to 2 mm), and large (>2 mm).[11]

The evaluation and management of LF secondary to cholesteatoma remains unsettled. Definitive preoperative diagnosis is not possible in all patients. However, presence of episodic vertigo with otorrhoea and hearing loss should increase the level of suspicion of labyrinthine involvement secondary to middle ear or mastoid pathology. Positive fistula test strongly suggests presence of LF. In our study, all patients with positive fistula test encountered LF during mastoidectomy.

Preliminary consultation with the neuroradiologist should improve the likelihood of an accurate diagnosis. Unfortunately, fistulae measuring <2 mm may be missed even with thin-section CT.[11] Use of the open technique as opposed to the closed technique is a controversial issue. Sanna et al and Sheehy and Brackmann recommend the closed technique in two stages, removing the matrix in the second stage.[13,14] The closed technique has been recommended in studies by Palva and Ramsay. The matrix was always removed during the first operation.[15] Controversy remains regarding the optimal management of this condition. Specifically, considerations of intact canal wall versus canal wall down approaches as well as total or incomplete matrix removal remain unsettled. These concerns are based on the destructive nature of cholesteatoma and the risk of losing cochlear and/or vestibular function following surgical opening of the labyrinth. Some otolaryngologists feel that preservation of cholesteatoma matrix predisposes to further progression of disease and advocate complete removal to prevent further complications.[16] Alternatively, others feel that preservation of the matrix over a fistula with exteriorization through an open cavity serves to protect labyrinthine and cochlear function.[17] The use of these different approaches was dependent on matrix treatment. There were various options: matrix left in situ, matrix removed, matrix preserved at the first stage and then removed at the second stage. Gacek described four factors that one should consider when managing LF: a) a surgeon's ability and experience; b) the location and size of the fistula; c) the residual hearing in the ear with fistula compared with the opposite ear; d) the mechanism of bony erosion of the cholesteatoma.[18]

In a study conducted at University of Medical sciences, Iran 185 patients who had undergone surgery for cholesteatoma between 2001 and 2007 were reviewed. 20 patients were found to have LF, of which 55% were male and 45% were female. All fistulae were in lateral SCC. Post-operatively, vertigo disappeared in 19 (95%) patients. Hearing remained unchanged in 18 (90%) patients. Worsening in bone conduction thresholds was observed in 2 (10%) patients. Postoperative deafness did not occur. Sandwich technique (temporalis fascia, bone dust, temporalis fascia) was used to seal the LF.[19]

In a retrospective study conducted, 16 patients were diagnosed to have LF during surgery for cholesteatoma from period 2003 to 2008. 10 (62.5%) were males and 6 (37.5%) females. Fistula involved lateral SCC in 15 patients (93.75%). Multiple fistulae were observed in one patient. All patients underwent CWD mastoidectomy and the fistula was sealed with bone dust reinforced with temporalis fascia. Postoperative hearing levels were unchanged or improved in 88% patients. According to this study, the canal wall down transmastoid approach with mastoid cavity obliteration was the favourite technique of LF treatment.[20]

Mirko Tos has explained the treatment of LF by a closed technique. Fistula on the lateral SCC was found in 14 (4.8%) ears with cholesteatoma. In 11 patients, with preserved inner ear function the cholesteatoma membrane was removed. The fistula was solidly closed with fascia, bone and again fascia. The cavity was obliterated, meatal wall reconstructed, and tympanoplasty was done at the same stage. 10 patients obtained a hearing gain, an average of 16.8 dB, while one developedanacusis.[21]

CONCLUSION

In our study, labyrinthine fistula was repaired by one stage surgery. CWD mastoidectomy was the standard surgical method done for all patients with labyrinthine fistula. Cholesteatoma matrix overlying the fistula was meticulously removed after clearing off cholesteatoma from other sites. Finally, LF was sealed with bone dust and temporalis fascia both of which were supported by Surdille flap. This reduces post-operative vertigo. Simultaneously, Surdille flap partially obliterates the cavity, so no postoperative cavity related problem. There was no postoperative dead ear. High level of suspicion is required during mastoidectomy so as to not miss labyrinthine fistula. If missed, the matrix overlying the fistula further erodes the labyrinth and may give rise to dead ear.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Glasscock-Shambaugh. Surgery of the ear. 5th Ed. In: Gross ND, McMenomey SO, eds. 2003: 438-439.
2. Ludman H. Complications of suppuratuve otitis media. Scott Brown's Otolaryngology. Volume 6. 1997: 1-29.
3. Glasscock-Shambaugh. Surgery of the ear. 6th Ed. In: Kumar A, Wiet R, eds. Aural complications of Otitis media. 2010: 447.
4. Youngs R. Complications of Suppurative Otitis media. In: Ludman H, ed. Wright T Diseases of the ear. Volume 6. 2006: 407-408.
5. Cummings: Otolaryngology-Head and Neck Surgery. 4th Ed. Philadelphia, PA: Mosby; 2005.
6. Falconi M, Lauda L. Cochlear fistula in recurrent cholesteatoma. Otol Neurotol. 2006;27:284.
7. Minor LB. Labyrinthine fistulae. Curr Opin Otolarynol Head Neck Surg. 2003;11:340-6.
8. Manolidis S. Complications associated with labyrinthine fistula in surgery for chronic otitis media. Otolaryngol Head Neck Surg. 2000;123:733-7.
9. Chao YH, Yun SH, Shin J O, Yoon JY, Lee DM. Cochlear fistula in Chronic Otitis Media with cholesteatoma. AM J Otol. 1996;17:15-8.
10. Kobayashi T, Sato T, Toshima M, Ishidoya M, Suetake M, Takasaka. Treatment of labyrinthine fistula with interruption of the semicircular canals. Arch Otolaryngol Head Neck Surg. 1995;121:469-75.
11. Sanna M, Zini C, Gamoletti R, Taibah A, Russo A, Scandellari R. Closed versus open technique in the management of labyrinthine fistulae. Am J Otol. 1988;9:470-5.
12. Herzog J, Smith PG, Kletzker GR, Maxwell KS. Management of labyrinthine fistula secondary to cholesteatoma. Am J Otol. 1996;17:410-5.
13. Sanna M, Zini C, Bacciu S, Scanellari R, Delogu P, Jemmi G. Management of labyrinthine fistula in cholesteatoma surgery. ORL J Otorhinolaryngol Relate Spec. 1984;46:165-72.
14. Sheehy JL, Brackmann DE. Cholesteatoma surgery management of the labyrinthine fistula a report of 97 cases; Laryngoscope. 1979;89:78-86.
15. Palva T, Ramsay H. Treatment of labyrinthine fistula. Arch Otolaryngol Head Neck Surg. 1989;115:804-6.
16. Parisier SC, Edestein DR, Han JC, Weiss MH. Management of labyrinthine fistula caused by cholesteatoma. Otolaryngol Head Neck Surg. 1991;104:110-5.
17. Gacek RR. The surgical management of labyrinthine fistula in chronic otitis media with cholesteatoma. Ann Otol Rhinol Laryngol. 1974;83:3-19.
18. Vartianen E. What is the best method of treatment for labyrinthine fistula caused by cholesteatoma? Clin Otol Allied Sci. 1992;17:258-60.

19. Naderpour M, Mohammadi G, Doostmohammadian N. Management of Labyrinthine fistula and Accompanying Findings: The coexistence of Labyrinthine Fistula and the Facial Canal Dehiscence. Mediterr J of Otol. 2008;4:132-7.
20. Ghiasi S. Labyrinthine fistula in Chronic Otitis Media with Cholesteatoma. J Pakistan Med Assoc. 2011;3:121-30.
21. Tos M. Treatment of Labyrinthine Fistulae by a Closed Technique. ORL. 1975;37:41-7.

Cite this article as: Rajashekhar RP, Shinde VV. Management of labyrinthine fistula using Surdille flap. Int J Otorhinolaryngol Head Neck Surg 2018;4:32-7.