



Labyrinthine Fistula-Our Experience at a Tertiary Hospital

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Abstract This study has aimed to determine the anatomical site of labyrinthine fistula in patients of chronic suppurative otitis media at our centre. Labyrinthine fistulae (LF) are caused by abnormal communications between the inner ear and surrounding structures resulting in perilymph leakage and hearing loss. Labyrinthine fistula represents as erosive loss of the enchondral bone overlying the semicircular canals without loss of perilymph. The manifestations of fistula like vertigo, hearing loss vary in severity and complexity, commonly ranging from very mild to incapacitating. Cholesteatoma induced fistula most commonly involves lateral semicircular canal probably because of its close proximity to the middle ear, but can involve other semicircular canals and rarely cochlea. This is a retrospective analysis of 36 patients of chronic suppurative otitis media with history of vertigo undergoing tympanomastoid surgery in whom there was an evidence of labyrinthine fistula on HRCT scan of temporal bone. The incidence of patients with labyrinthine fistula presenting with vertigo, nystagmus, sensorineural hearing loss, history of vertigo were analysed. The anatomical location of the fistula was supported by Radiological evidence. Patients underwent either canal wall down mastoidectomy or cortical mastoidectomy. The anatomical site and length of the labyrinthine fistula were analysed. Amongst the 36 patients of chronic suppurative otitis media with labyrinthine fistula 22 (61.1%) patients had atticointral disease, 4 (11.1%) patients had chronic otitis media with extensive granulation, 2 (5.5%) patients had Tubotympanic disease with

polyps, 4 (11.1%) patients had Tuberculous otitis media, 1 (2.77%) patient had Tubotympanic disease with extensive tympanosclerosis eroding the dome of lateral semicircular canal, 1 (2.77%) patient had extensive cholesteatoma with cerebellar abscess, 1 (2.77%) patient had fistula in the promontory following trauma, 1 (2.77%) patient had extensive tympanosclerosis with erosion of promontory. It was noticed that, in 14 (38.88%) patients the fistula was at the centre, in 17 (47.22%) patients the fistula is towards the ampullary end of horizontal semicircular canal and in 5 (13.88%) patients the fistula was towards the non ampullary end of lateral semicircular canal. The maximum length of fistula noticed was 6 mm and the minimum length of the fistula noticed was 2 mm. Labyrinthine fistula are most commonly noticed in the ampullary end of the lateral semicircular canal. The average length of the fistula was found to be 4 mm. Careful elevation of the cholesteatoma matrix over the endosteal membrane and immediate placement of temporal fascia over the exposed fistula is important to avoid injury to the inner ear. Maximum number of fistula were seen in the atticointral type of Chronic suppurative otitis media. Prior knowledge of anatomical location of the fistulous tract in HRCT temporal bone is important to address the fistula.

Keywords Labyrinthine fistulae (LF) · Lateral semicircular canal (LSSS) · Posterior semicircular canal (PSCC) · Superior semicircular canal (SSCC)

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Objective

This study has aimed to determine the anatomical site of labyrinthine fistula in patients of chronic suppurative otitis media at our centre.

Introduction

Labyrinthine fistulae (LF) are caused by abnormal communications between the inner ear and surrounding structures [1] resulting in perilymph leakage and hearing loss. Labyrinthine fistula represents as erosive loss of the enchondral bone overlying the semicircular canals without loss of perilymph. Erosion of the bone by cholesteatoma is produced by pressure from an expanding cholesteatoma sac or by collagenase activity in its lining membrane. This loss of the overlying protective bone allows pressure or mass induced motion of the underlying endosteum, perilymph, and, by contiguity, endolymphatic compartment, evoking vestibular symptoms. Presence of vertigo and/or positive fistula test, sensorineural hearing loss should raise a suspicion for a fistula, however their absence does not guarantee an intact bony labyrinth. The manifestations of fistula like vertigo, hearing loss vary in severity and complexity, commonly ranging from very mild to incapacitating. Labyrinthine fistula is a possible complication of chronic otitis media with cholesteatoma, with an estimated incidence rate between 2.4 and 16.7%, which in about 90% of cases, involves the lateral semicircular canal (LSSS) [2, 3]. Cholesteatoma induced fistula most commonly involves lateral semicircular canal probably because of its close proximity to the middle ear, but can involve other semicircular canals and rarely cochlea. The purpose of this study is to determine the anatomical site of labyrinthine fistula in patients of chronic suppurative otitis media in our centre.

Materials and Methods

This is a retrospective analysis of 36 patients conducted at Department of Otorhinolaryngology and Head and Neck Surgery, RL Jalappa Hospital, Kolar between January 2016 and December 2019. In this study, we have included 36 patients of chronic suppurative otitis media with history of vertigo undergoing tympanomastoid surgery in whom there was an evidence of labyrinthine fistula on HRCT scan of temporal bone. Patients with Chronic suppurative otitis media without complaints of vertigo and normal HRCT temporal bone were excluded from the study. The incidence of patients with labyrinthine fistula presenting with vertigo, nystagmus, sensorineural hearing loss, history of vertigo were analysed. The anatomical location of the fistula was supported by Radiological evidence. Patients underwent either canal wall down mastoidectomy or cortical mastoidectomy. After complete eradication of the disease, the cholesteatoma matrix covering the fistulous tract was addressed at the end of the surgery after a

thorough wash in order to avoid damage to the inner ear. The cholesteatoma over the fistula was removed meticulously using a flag knife taking care not to injure the membranous labyrinth. At the end, the defect was covered with temporalis fascia graft. During the process of eradication of the disease from middle ear in one patient who developed labyrinthine fistula over lateral semi circular canal following trauma, a fractured bone chip over the promontory got accidentally elevated and the promontory fistula was immediately covered with fibrofatty tissue. The anatomical site and length of the labyrinthine fistula were analysed.

Intraoperative Pictures of Labyrinthine Fistula

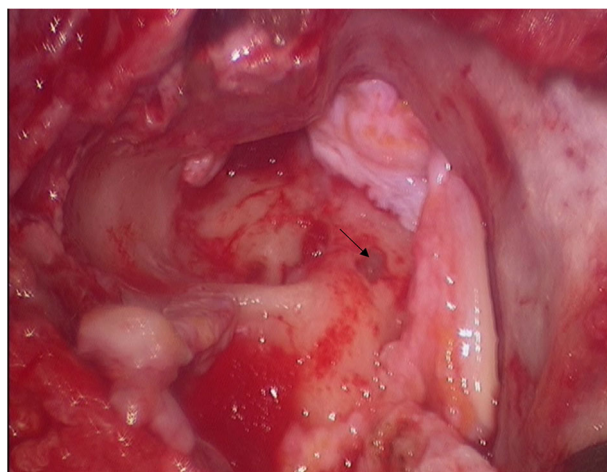


Fig a:Labyrinthine fistula over the lateral semicircular canal

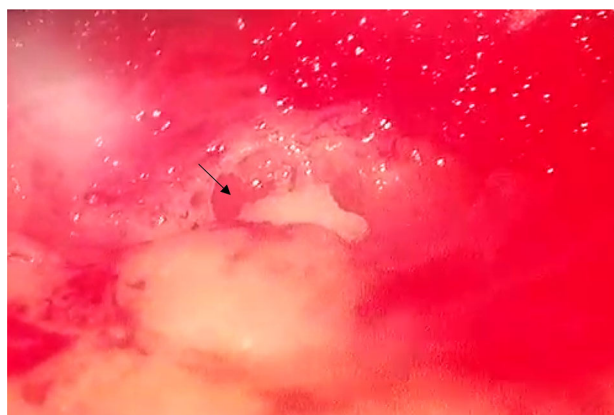


Fig b: Labyrinthine fistula over the lateral semicircular canal

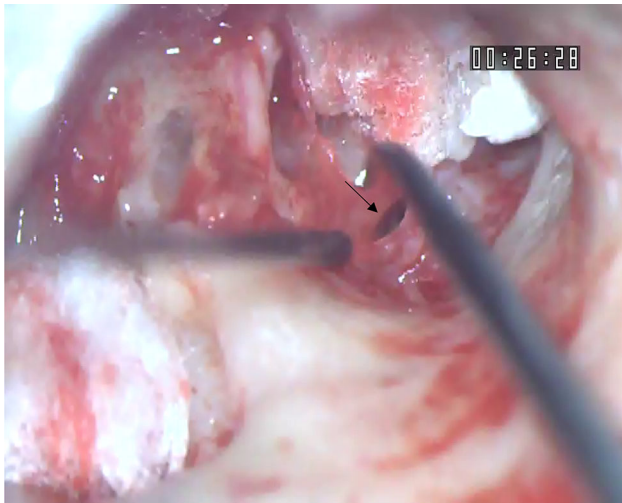
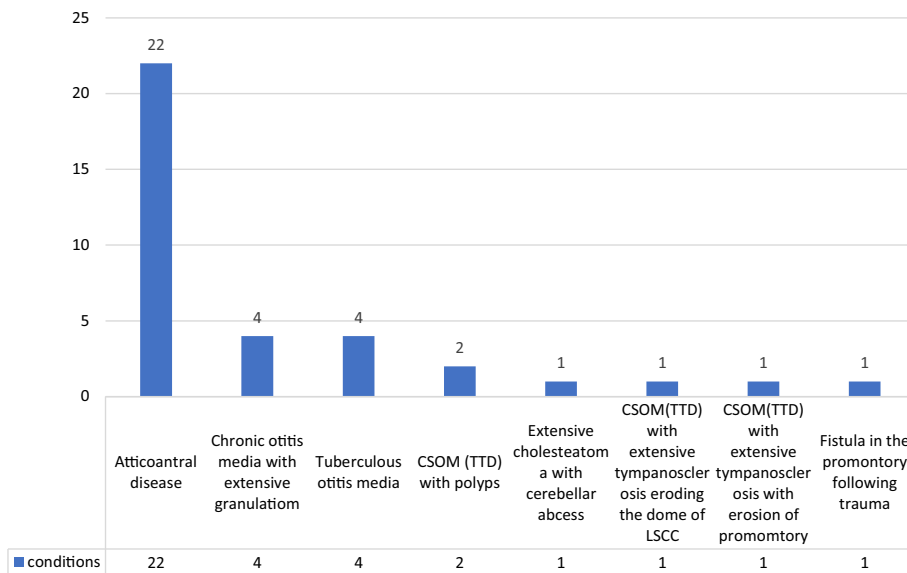


Fig c: Labyrinthine fistula over the promontory

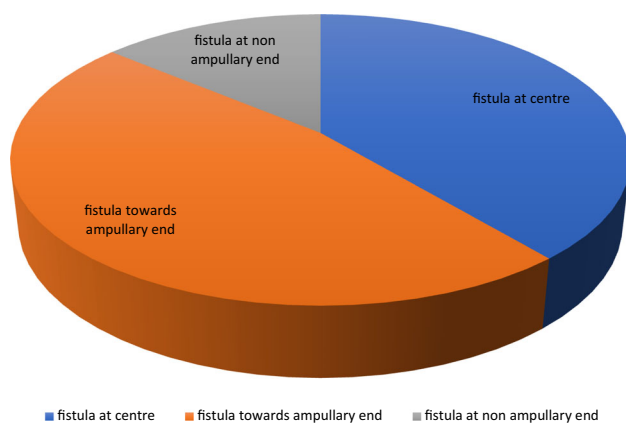
Results

Amongst the 36 patients of chronic suppurative otitis media with labyrinthine fistula 22 (61.1%) patients had atticotympanic disease, 4 (11.1%) patients had chronic otitis media with extensive granulation, 2 (5.5%) patients had Tubotympanic disease with polyps, 4 (11.1%) patients had Tuberculous otitis media, 1 (2.77%) patient had Tubotympanic disease with extensive tympanosclerosis eroding

the dome of lateral semicircular canal, 1 (2.77%) patient had extensive cholesteatoma with cerebellar abscess, 1 (2.77%) patient had fistula in the promontory following trauma, 1 (2.77%) patient had extensive tympanosclerosis with erosion of promontory. 24 (68%) patients had vertigo at the time of initial presentation. 20 (56%) patients had induced nystagmus. 21 (59%) patients had history of vertigo. 7 (21%) patients had sensorineural hearing loss. Fistula test was positive in only 6 (17%) patients. In 33 (92%) patients labyrinthine fistula could be appreciated in HRCT scan. In 31 (86.11%) cases, labyrinthine fistula was involving lateral semicircular canal, 4 (11.11%) cases were involving posterior semicircular canal and 1 (2.77%) in promontory. It was noticed that, in 14 (38.88%) patients the fistula was at the centre, in 17 (47.22%) patients the fistula is towards the ampullary end of horizontal semicircular canal and in 5 (13.88%) patients the fistula was towards the non ampullary end of lateral semicircular canal. The maximum length of fistula noticed was 6 mm and the minimum length of the fistula noticed was 2 mm. Post surgery 74% patients were completely relieved of symptoms whereas 26% were partially relieved of symptoms. Post operative complications like Sensorineural hearing loss or dead ear were not noticed in any patient.



ANATOMICAL SITE OF LABYRINTHINE FISTULA IN LATERAL SEMICIRCULAR CANAL



Discussion

Labyrinthine fistulae constitute around 4–12% of complications due to cholesteatoma. In a large meta-analysis, the affected site of fistula was LSCC in 87% of cases, promontory in 8% cases, SSCC in 6% cases, and PSCC in 2% of cases [4]. Their findings are somehow similar to our findings. Radiological finding suggestive of fistula would be seen in up to 92% of cases [5]. Our findings are also quite similar to that described in the literature.

In our centre, we generally conduct canal wall down mastoidectomy in cases of cholesteatoma with labyrinth involvement, having a high prevalence of cholesteatoma of large extension at the first diagnosis. However the management of fistula has always been debated in the literature by various authors and is still ongoing.

Chang Hyun in his review of 23 cases with fistula, showed that not only did the fistula size, but also location of fistula, number of fistula and even preserving posterior canal wall had no statistically significant bearing on hearing preservation rate [6].

The consensus on the surgical management of labyrinthine fistula is complete removal of epithelium from the fistula site (irrespective of size and location) and grafting with fascia/soft tissue. The goal is to provide dry and safe ear, preventing long term complications and avoiding revision surgery.

Avoidance of direct suctioning on the fistula, preventing entry of blood/irritants into labyrinth and intraoperative use of corticosteroid has shown to preserve cochlear function and reduce incidence of post-operative vertigo [7, 8].

Selection of the type of surgery depends on the aggressiveness of the disease. Various factors like hearing status in ipsilateral and contralateral ears, presence/absence of other complications, availability of patient for follow up along with surgeon's preferences and expertise demand the

surgeon to carry out canal wall down mastoidectomy or not.

In a review article, 85% were reported as having unchanged or improved hearing postoperatively. In our study, post surgery 74% patients were completely relieved of symptoms. Although postoperative hearing outcome was similar to that of several above-mentioned articles, none of our patients experienced sensorineural hearing loss or dead ear as a result of surgical manipulation.

Conclusion

Labyrinthine fistula are most commonly noticed in the ampullary end of the lateral semicircular canal. The average length of the fistula was found to be 4 mm. Careful elevation of the cholesteatoma matrix over the endosteal membrane and immediate placement of temporal fascia over the exposed fistula is important to avoid injury to the inner ear. Maximum number of fistula were seen in the atticotral type of Chronic suppurative otitis media. Prior knowledge of anatomical location of the fistulous tract in HRCT temporal bone is important to address the fistula. It is mandatory to address the fistula at the end of the procedure after thorough wash. Careful identification and management is very important to avoid damage to the inner ear.

Compliance with Ethical Standards

Conflicts of interest Study was conducted after obtaining institutional ethical clearance. No conflicts of interest.

Ethical Approval Institutional ethical committee clearance was obtained for this study.

Research Involving Human Participants and/or Animals No.

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