

Intraoperative fallopian canal dehiscence in chronic otitis media Shreya Sharma¹, Abhinav Srivastava^{2*}, Abdur Rahman³, O.N Sinha⁴, Chander Mohan⁴

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Abstract

Introduction: Chronic otitis media is a long-standing inflammation of the middle ear cleft and it is characterized by ear discharge and a permanent abnormality of the tympanic membrane. From clinical aspects, facial nerve is the most vulnerable structure in the otologic surgery because of its long and tortuous course in the temporal bone and occurrence of Fallopian canal dehiscence make it vulnerable and is one of the most common anatomical variations witnessed by an otologist during surgery. The present study has been undertaken with aim to find out prevalence of intraoperative fallopian canal dehiscence in chronic otitis media. **Material and Methods:** This was a one-year hospital based prospective cross-sectional study carried out in the department of otorhinolaryngology and Head and neck surgery, Rohilkhand medical college and hospital, Bareilly. A total of 54 patients of Chronic otitis media who satisfied the inclusion and exclusion criteria and underwent surgery were enrolled in the study. **Observations:** Prevalence of Dehiscent facial nerve was 20.37% with maximum number of dehiscences were of 2-4mm dimension and cholesteatoma was the most common cause of dehiscence with 72.7% of dehiscences have duration of ear discharge greater than 10 years. **Conclusion:** The incidence of the fallopian canal dehiscence in otologic surgery is highly variable. The surgeon must keep in mind that any surgery which is performed in the middle ear could traumatize or damage the facial nerve at the site of the fallopian canal dehiscence.

Keywords: Fallopian canal, Dehiscence, Cholesteatoma, Facial Asymmetry.

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Introduction

Chronic otitis media is a long-standing inflammation of the middle ear cleft without reference to etiology or pathogenesis and it is characterized by ear discharge and a permanent abnormality of the tympanic membrane. The recurrent attacks of otorrhea and mucosal changes are characterized by osteogenesis, bone erosions and osteitis of temporal bone and ear

ossicles. The disease is often associated with a bone eroding process due to cholesteatoma, granulation or osteitis. The risk of complications is high in attic-antral type[1]. The Fallopian canal refers to a bony canal through which the facial nerve traverses the petrous temporal bone, from the internal acoustic meatus to the stylomastoid foramen. It is the longest bony canal through which a nerve passes. As the middle ear is in close proximity to the facial nerve and other important structures, any pathology of the ear causing bony destruction puts the facial nerve at jeopardy and risk increases many fold in conditions with absence of protective bony cover over the nerve. Dehiscence of the fallopian canal can be seen in both

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normal and diseased ear and can be either congenital or acquired. Congenital dehiscences of the fallopian canal are the results of failure of the ossification progression either along the length of the facial tympanic segment or around its circumference. The canal dehiscences are not congenital anomalies, but variations of normal developmental anatomical processes. The most common pattern of dehiscence is in the oval window, resulting from the failure of the two ossification centres to fuse [2]. Acquired cases are most commonly associated with atticofacial type of COM with underlying cholesteatoma. Although surgery for chronic disease is a common practice, lack of literature asserting true incidence of acquired fallopian canal dehiscence and absence of guidelines to assist in preoperative prediction of this condition leads to many cases of inadvertent injury to the facial nerve and subsequent morbidity[3]. Another study done showed that the dehiscence rate was highest with cholesteatoma, followed by adhesive otitis media, chronic otitis media and tympanosclerosis. The canal dehiscence was mainly seen in the tympanic segment and second genu, and was rare in the mastoid segment. Labyrinthine fistula was the most common pathology that coexisted with the dehiscence[4]. Facial nerve is different than all other nerves in the human body due to the length and tortuosity of its intratemporal, it measures 30 mm course and is the longest bony-cover canal route of any cranial nerves and is at jeopardy due to closed area causing no space for swelling resulting in compression of the nerve.⁵ From clinical aspects, facial nerve is the most vulnerable structure in the otologic surgery because of its long and tortuous course in the temporal bone and occurrence of Fallopian canal dehiscence make it vulnerable and is one of the most common anatomical variation witnessed by an otologist during surgery. Although dehiscences are most commonly detected in the tympanic segment and at the level of fenestra ovalis, they may also be seen at the level of geniculate ganglion as well as in the mastoid segment. Based on the site, dehiscence of the facial canal was classified in 5 basic groups:[6]

- 1) If the dehiscence is before the cog, it is classified as Geniculate ganglion dehiscence.
- 2) If the dehiscence is between the second genu and the cog, it is classified as tympanic or horizontal segment dehiscence.
- 3) If the dehiscence is located in the second genu very close to the lateral semicircular canal, it is classified as dehiscence at the second genu.
- 4) If the dehiscence is protruding over the oval window only, it is classified as dehiscence of oval window niche.

- 5) If the dehiscence is after the lower level of the oval window at the mastoid or vertical segment, it is classified as vertical segment dehiscence.

Initially, fallopian canal dehiscence was considered the most common anomaly of the temporal bone. Attempts were made to correlate this finding with other anomalies of facial nerve and middle ear. Later it was observed, that fallopian canal dehiscences can occur frequently without malpositions of facial nerve or branching and without middle ear anomalies. An accurate preoperative evaluation of facial canal anatomy and its relationship with the surrounding pathology is necessary in these cases[7]. Understanding the ear anatomy with detailed radiographic information on the bony canal of the facial nerve and determining the extension and site of cholesteatoma can minimise the likelihood of facial nerve damage during the operation. Published reports place the incidence of fallopian canal dehiscence around 28% [8]. Facial nerve injury during otologic surgery, when occurs, is the most frightening complication encountered at the postoperative period leading to severe psychological trauma to the patient because of the variable facial asymmetry it causes as a result of injury. Further dehiscence of the fallopian canal puts the facial nerve at jeopardy. The present study has been undertaken with aim to find out prevalence of intraoperative fallopian canal dehiscence in chronic otitis media, aetio-pathogenesis and the most common location and length of dehiscence of fallopian canal.

Material and methods

This was a one-year hospital based prospective cross-sectional study carried out in the department of otorhinolaryngology and Head and neck surgery, Rohilkhand medical college and hospital, Bareilly from 1st November 2018 to 31st October 2019. A total of 54 patients of Chronic otitis media who satisfied the inclusion and exclusion criteria and underwent surgery were enrolled in the study.

Inclusion Criteria: All patient with chronic otitis media willing to give consent for the study.

Exclusion Criteria: All patient with chronic otitis media not willing to give consent for participation in the study as well as patients with tumor of ear.

The medium of communication with the patient was in vernacular language. After getting a written informed consent from patient, a thorough ENT examination with appropriate investigation was done as per the institute protocol.

Observations and results

A total of 54 cases were enrolled during a period of one year and 80% of cases of COM were within 35 years of age with almost equal male and female distribution. Cholesteatoma was seen in 68% of study population. Prevalence of Dehiscent facial nerve was seen in 11 out

of 54 patients accounting for 20.37%. (Fig 1) with Tympanic/Horizontal segment (8 patients) and 2nd genu (8 patients) was the most common segment involved with exposed nerve followed by vertical segment where only 2 cases were documented. (Table 1 and Fig 2)

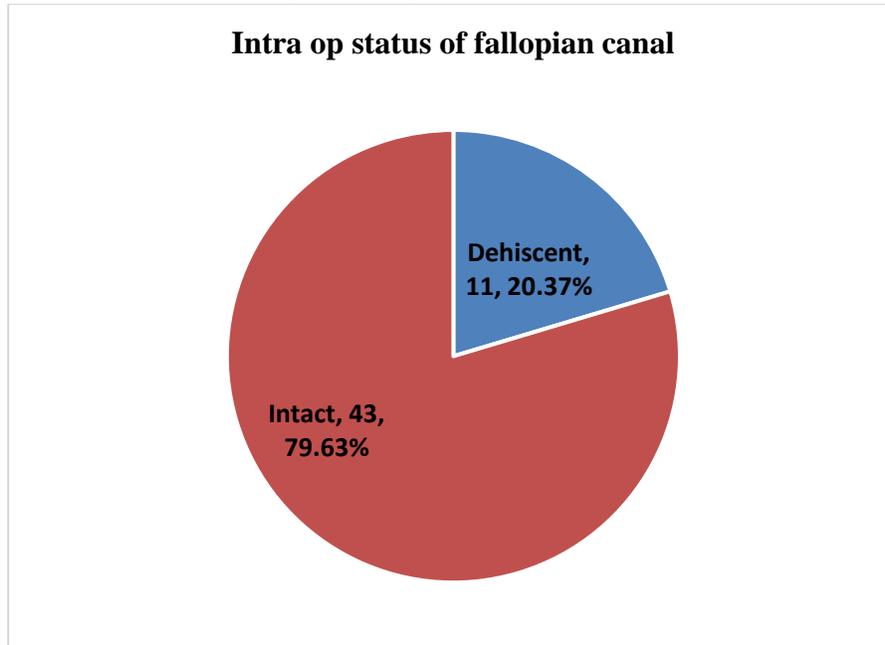


Fig 1: Intra op Status of Fallopian Canal

Table 1: Site of Dehiscence

Site of dehiscence	No. of patients
Tympanic/horizontal segment	8
2 nd genu	8
Vertical segment	2

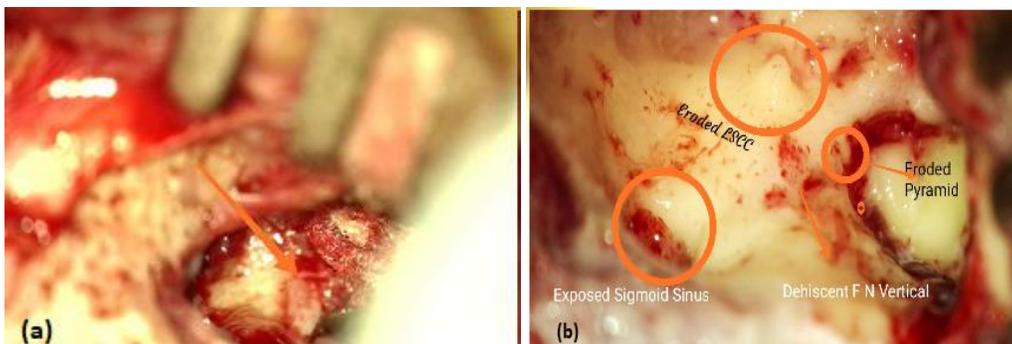


Fig 2: Dehiscence at (a) Horizontal segment; (b) vertical segment

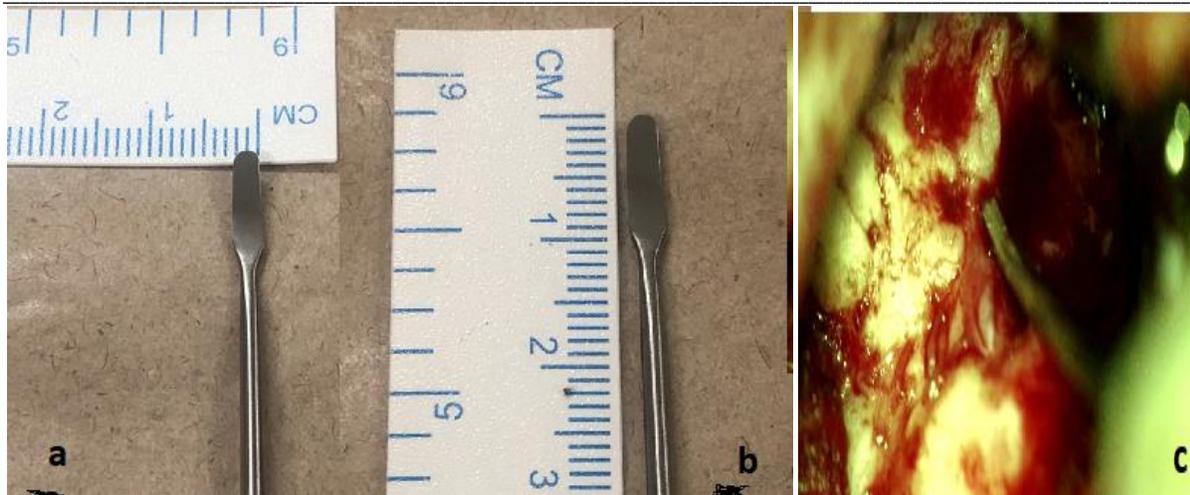


Fig 3 (a,b):Calibration of microelevator to measure segment of dehiscent nerve

c) Intra-op measurement of dehiscent nerve using microelevator as a measuring tool

Table 2: Dimension of Dehiscence

Dimension of dehiscence	No. of patients	Percentage (%)
<2mm	1	9.09%
2-4mm	9	81.82%
>4mm	1	9.09%

Out of the 11 patients with dehiscence, maximum number of dehiscences were of 2-4mm dimension. Followed by those of length <2mm and >4mm in no specific order. (Table 2 and Fig 3)

Table 3: Correlation of Intra-op Pathology with Dehiscence

Intra-op pathology	No. of patients	Percentage (%)
Cholesteatoma	8	72.7
Granulations	1	9.1
Retractions	6	54.5
Polyp	1	9.1
Perforation	2	18.2

Out of the 11 patients with dehiscence having Intra-op pathology, maximum 8(72.7%) of dehiscences were Cholesteatoma,6(54.5%) of dehiscences were

Retractions, 2(18.2%) of dehiscences were Perforation and 1(9.1%) of dehiscences were had both Granulations and Polyp. (Table 3)

Table 4: Degree of Facial Weakness in Dehiscence

Degree of facial weakness	Number	Percentage (%)
Grade I	8	72.7
Grade II	1	9.1
Grade III	2	18.2
Grade IV-VI	None	-

Majority of the patients with fallopian canal dehiscence, 8(72.7%) had Grade I facial function according to House-Brackmann Facial Nerve Grading System, i.e they had normal facial function. 1(9.1%) patient had Grade II, i.e Mild Dysfunction, and

2(18.2%) patients had Grade III, i.e Moderately Severe Dysfunction. None of the patients in our study had Grade IV, Grade V or Grade VI facial function. (Table 4)

Table 5: Duration of ear discharge (in years) in cases with dehiscence facial nerve

Duration of ear discharge (in years)	Number	Percentage (%)
< 10 years	3	27.3
≥ 10 years	8	72.7
Total	11	100.0

Out of the 11 patients with dehiscence, maximum 8(72.7%) of dehiscent cases have Duration of ear discharge ≥ 10 years and 3(27.3%) of dehiscent cases have Duration of discharge < 10 years. (Table 5)

Discussion

The mean age was found to be 24.8. Similar results were also seen by Ozbek C et al[9] and Chrisanthus J et al[10] who found the average age to be 29.7 and 28 years respectively thereby concluding that disease starts and has its maximum affect in younger age group of patients. There was a slight female predominance in the present study. Similar results were seen by Bulja D et al [5] and Bucak A et al[8], whereas male preponderance was seen in studies done by Ozbek C et al [9] whereas, an equal sex ratio was seen in the study by Lin JC et al[1]. In the present study, prevalence of dehiscent facial nerve was seen in 20.37%. Similar results were seen by Gülüstan F et al[11] who found fallopian canal dehiscence in 23.6% of the cases. There were variable results, Martino ED et al[13] found that prevalence of only 6.4% whereas Bulja D et al[5] in their examined records found the prevalence to be 33.8%, which was higher than our findings. So, the prevalence of fallopian canal dehiscence was found to be variable. Out of the total patients with fallopian canal dehiscence, maximum had a dehiscence at the Tympanic segment and at the 2nd genu. Our findings correlated with those observed by Lin JC et al [1], Yetiser S et al[6] and Ozbek C et al[9] where tympanic segment was also the most common dehiscent site with extension of the cholesteatoma as the most common suggested aetiology. Dehiscence of the fallopian canal can be seen in both normal and diseased ear and can be either congenital or acquired. Out of the 11 patients with dehiscence, maximum number of dehiscent cases were of 2-4mm dimension (81.82%). Kozerska M et al[12] studied the micro CT of the dehiscent cases of the tympanic segment of the facial canal of 36 temporal bones. They found the length of the dehiscent cases in most cases to range from 0.5 to 1.4mm which was less than those found by us and the possible reason for this may be the difference between CT scan and intra-op finding. Most of the patients had a discharging ear for more than 8 years which could explain that the long-standing duration of discharge caused the disease to

deteriorate over time. Out of the 11 patients with dehiscence, Cholesteatoma, 6(54.5%) was the main pathology associated. Similar results have been found in studies done by Ozbek C et al [9] and Martino ED et al[13]. The local osteitis and chronic mechanical pressure may significantly contribute to bone erosion and dehiscence. The present study showed majority of patients with facial nerve dehiscence found intra operatively had normal facial nerve function and with only 1 and 2 patients had Grade II and III facial nerve palsy respectively as per House Brackmann classification. Studies done by Ozkul Y et al[14] and Ikeda M[15] et al found variable grade of facial palsy. The mechanism of facial nerve paralysis due to cholesteatoma has been suggested to be due to direct pressure on the nerve. The longer the duration of the disease, more extensive and severe the disease progression gets and, therefore, longer duration of the disease is associated with an increased incidence of dehiscence.

Conclusion

The incidence of the fallopian canal dehiscence in otologic surgery is highly variable. The location of the fallopian canal dehiscence by cholesteatoma is comparable with the most common areas of injury to the facial nerve, such as the tympanic portion. The surgeon must keep in mind that any surgery which is performed in the middle ear could traumatize or damage the facial nerve at the site of the fallopian canal dehiscence.

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