

# Detection of Facial Canal Dehiscence on HRCT in Chronic Otitis Media: An Observational Study

Shachita<sup>1</sup>, Shivbrat Sharma<sup>2</sup>

Medical officer ENT Specialist, Zonal Hospital Dharamshala Distt Kangra (H. P), India

Corresponding author: [shivbratsharma\[at\]gmail.com](mailto:shivbratsharma[at]gmail.com)

**Abstract:** *The facial nerve is vulnerable during ear surgery when there is a dehiscence of the facialnerve canal. Otologic surgeons need a lot of information about facial nerve canal dehiscenceto avoid injury of the nerve. Dehiscence of facial canal more frequently associated with attico-antral type of chronic otitis media and more often with cholesteatoma. With the advent of high-resolution CT, it has become easy to assess facial canal status preoperatively.*

**Keywords:** Facial canal dehiscence, tympanic segment, chronic otitis media, HRCT

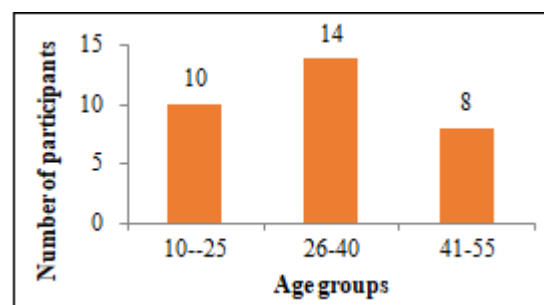
## 1. Introduction

The dehiscence of facial nerve can be congenital or acquired. Facial nerve canal dehiscence is thought not to be a congenital anomaly but a termination of the development, because the ossification patterns seemed symmetrical in 80 % of temporal bones [1]. The development of the facial nerve canal starts at 21 gestational weeks from apical otic ossification centres and at 26 gestational weeks from canalicular ossification centres near the stapedial muscle. The two centres fuse postpartum near the region of the oval window [2, 3]. However, it is not evident when the facial nerve canal has completely developed [1]. There is a report in which the authors mentioned that the development of the canal was completed by the age of 4 years from an anatomical and radiological standpoint. Acquired facial nerve dehiscence is mainly caused by chronic Otitis media mostly with unsafe or attico-antral type of disease. 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 attico-antral type [4]. The facial nerve is vulnerable during ear surgery when there is a dehiscence of the facial nerve canal. Otologic surgeons need a lot of information about facial nerve canal dehiscenceto avoid injury of the nerve. Canal dehiscence is most commonly seen in its tympanic segment and second genu and rarely seen in its mastoid segment. Facial nerve is different than all other nerves in the human body due to the length and tortuosity of its intra-temporal, 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].

With the advent of multi-slice CT, it has become easy to assess facial nerve canal status preoperatively. Thin section HRCT with modern equipment allows by means of special algorithms, imaging the osseous structures up to a spatial resolution of 0.45 to 0.65mm. It provides information not only about bony outline but also soft tissue changes making it possible to demonstrate the location and extent of disease as well as its complications.

## 2. Material and Method

32 patients who presented to ENT OPD at Dr RPGMC Tanda and were diagnosed of chronic otitis mediaattico-antral type were taken for this observational study. Out of 32 patients 18 were females and 14 were males.



**Figure 1:** Distribution of participants according to age-groups

**Bar diagram depicting n=32.14 no. of patients lying in age group of 26-40 years, 10 patients in age group 10-25 years and 8 patients in age group 41-55 years of age.**

In the present study, we found that the majority of the patients (43.8%) were in economically productive age group of 26-40. Out of these 32, two had preoperative facial palsy. One had grade 4 and the other had grade 5 facial palsy who was suspected to have congenital cholesteatoma.

**Table 1:** Distribution of participants according to Pre-op Facial nerve (n=32)

Pre-op Facial nerve	Number	Percent
Within normal limit (WNL)	30	93.8
L facial palsy Grade 4	01	3.1
L facial palsy Grade 5	01	3.1
Total	32	100.0

All of the 32 patients were assessed and were subjected to pre-operative HRCT and subjected to mastoid surgery. The data was collected and analyzed on Microsoft Office Excel 2007 and SPSS software version21. Descriptive analysis was done using frequency, percentages and Mean (+/-S. D). Chi-square test was used as test of significance,  $p < 0.05$ . Correlation was done to compare preoperative HRCT

findings with intraoperative findings. Sensitivity, specificity and predictive values were calculated, taking intraoperative findings as gold standard.

**HRCT Facial Canal:**

**Table 2:** Distribution of participants according to HRCT Facial Canal (n=32)

HRCT Facial Canal	Number	Percent
Intact	24	75.0
Eroded	08	25.0
Total	32	100.0

On HRCT facial nerve canal was found intact in 75% of the patients and eroded in 25% of the patients.

**Intra-op Facial Canal:**

**Table 3:** Distribution of participants according to Intra-op Facial Canal (n=32)

Intra-op Facial Canal	Number	Percent
Intact	25	78.1
Eroded	07	21.9
Total	32	100.0

Intra-operatively facial nerve canal was found intact in 78.1% of the patients and eroded in 21.9% of the patients.

**Table 4:** Distribution of participants according to HRCT Facial Canal & Intra-op Facial Canal (n=32)

Facial Canal	HRCT		Intra-op	
	Number	Percent	Number	Percent
Intact	24	75.0	25	78.1
Eroded	08	25.0	07	21.9
Total	32	100.0	32	100.0

Chi-square: 0.09; p=0.77; Non-significant.

On HRCT facial nerve canal was intact in 24 patients, and it was found intact in 25 patients intra-operatively. It was found eroded in 08 patients on HRCT and in 07 patients intra-operatively. The difference was not found to be statistically significant (p=0.77).

**Table 5:** Correlation between findings of preoperative HRCT Facial Canal and Intra-op Facial Canal

		Intra-op Facial Canal		Total
		Eroded	Intact	
HRCT Facial Canal	Eroded	07	01	08
	Intact	00	24	24
Total		07	25	32

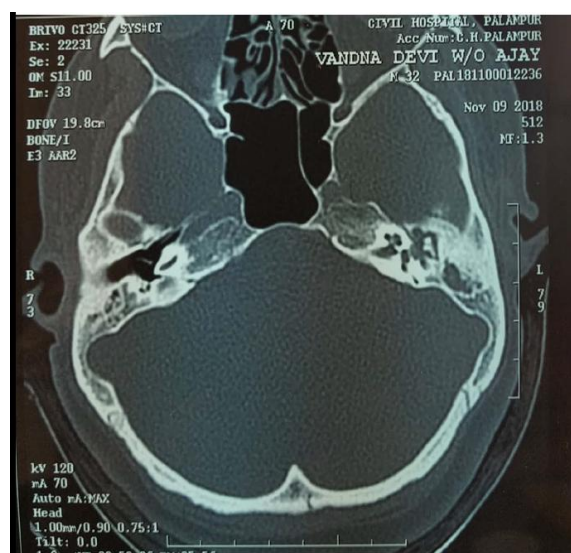
Sensitivity: 100.0%; Specificity: 96.0%; Positive predictive value: 87.5%; Negative predictive value: 100%.

It was observed in present study that facial canal was found eroded among 08 patients on HRCT and in 07 patients intra-operatively including 07 patients found to be eroded facial canal on HRCT. The facial canal was found intact in 24 patients on HRCT and in 25 patients intra-operatively including 24 patients found to be intact facial canal on HRCT. Therefore, for facial canal sensitivity of HRCT was found to be 100.0% (07/07), specificity as 96.0% (24/25), positive predictive value as 87.5% (07/08) and negative predictive value as 100.0% (24/24).

**3. Discussion**

In our study preoperative facial nerve palsy was noticed in 6.2% of the patient out of which one case presented as grade 4 facial nerve palsy turned out to be a case of congenital cholesteatoma. It is similar to study conducted by Gomaa MA et al where facial palsy was presenting complaint in 3.57% of the patients [6]. It was in contrary to Sharmila D et al where in 60 patients only in 2% of the patient's facial nerve palsy was the presenting symptom [7]. It was concluded from the present study that for facial canal HRCT was 100.0% sensitive, 96.0% specific. The positive value was 87.5% and negative predictive value was 100.0%.

It was reported eroded in 25% patients but intraoperatively found eroded in 21.9% of patients. It was dehiscence in 6 patients in tympanic part and 2 patients in vertical part, which is similar to study conducted by Khavasi P et al [8]. But sensitivity of HRCT was 42% in that study and specificity was 48% and also Datta G et al had similar results with horizontal part showed more susceptibility [9].



**Picture 1:** HRCT temporal bones axial cut showing dehiscence in tympanic segment of facial nerve on left side with soft tissue density in middle ear on left side.

Literature showed variation in sensitivity ranging from 40% to 60% and specificity 66% to 100%. Our study was contrary to findings of Kanotra S et al where sensitivity of HRCT for facial canal erosion was 33.33%, specificity was 100%, positive predictive value was 100%, and negative predictive value was 91.11% [10]. It was mentioned in a study conducted by Chavada PS et al that other warning symptoms like headache, high grade fever, vomiting, giddiness and facial asymmetry are suggestive of intra-temporal and intra-cranial complications [11]. In our study a 13 years old male child presented with history of headache, fever and photophobia, who was later diagnosed of left temporal lobe abscess. The patient was drained for the same at PGIMER Chandigarh and later on operated for left CSOM attico-antral in our department. Modified radical mastoidectomy with type 4 tympanoplasty left ear was carried out in this case. In one other case 32 years old female patient presented with facial nerve palsy left grade 5. Radical mastoidectomy was carried out in this case. Post

operatively patient was recovered to grade 2 facial palsy and she is still under follow up with us. Hence this study is supportive to our study.

On the basis of histopathology report cholesteatoma was found in 84.4% of the cases. Fibro-cartilaginous tissue was found in 9.4% of the cases and chronic inflammatory mucosa in 3.1% of the cases. 01 report could not be traced. It was found on the study that in almost all cases of facial canal erosion, pathology turned out to be cholesteatoma. It is also seen in the present study that most of the complications including facial paralysis were seen with chronic otitis media with cholesteatoma.

#### 4. Conclusion

From the above observational study, it is concluded that preoperative HRCT temporal bones play a pivotal role in assessing important structures and anatomical variations like facial canal and help surgeon to plan accordingly. Cholesteatomatous chronic otitis media is found out more frequently to be associated with complications like facial nerve paralysis.

#### 5. Conflict of interest

None declared

#### 6. Financial Disclosure

The facilities for the study including laboratory were available in the institute. No financial charges were accruing to the study subject. The study was not funded by any agency.

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#### Author Profile



**Dr Shachita**, Medical officer ENT Specialist, Zonal Hospital Dharamshala Distt Kangra (H. P)



**Dr Shivbrat Sharma**, (Corresponding author), Medical officer ENT Specialist, Zonal Hospital Dharamshala Distt Kangra (H. P)