Facial Canal Defect during Mastoidectomy for Chronic Suppurative Otitis Media

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ABSTRACT:

BACKGROUND:

The facial nerve is characterized by the long bony canal that makes it vulnerable to injury during otologic surgery. Facial canal defect could be found as an anatomic variant or due to longstanding inflammation that causes bone erosion.

AIMS OF THE STUDY:

Determination of the incidence and location of facial canal defect and identification of association between facial canal defect and other intraoperative pathological findings.

PATIENTS AND METHODS:

A case series study of eighty-four patients with chronic suppurative otitis media who underwent mastoidectomy in Al-Yarmouk Teaching Hospital through a period from October 2017 till October 2018. Data were collected regarding the intraoperative finding of facial canal defect, its location and associated pathological findings which include lateral semicircular canal erosion, dural exposure and ossicular erosion.

RESULTS:

This study included (38) males and (46) females, their ages ranged from five to fifty-eight years. The incidence of facial canal defects was (20.2%). The tympanic segment was predominantly involved (82.4%).There was a statistically significant correlation between facial canal defect and lateral semicircular canal erosion ($p<0.006$).

CONCLUSION:

The incidence of facial canal defect was 20.2%, mostly located in the tympanic segment. The presence of lateral semicircular canal erosion was significantly correlated with facial canal defects.

KEYWORDS: facial canal, defect, tympanic segment.

INTRODUCTION:

The course of the facial nerve is perhaps one of the most intricate routes of any cranial nerve. The otologic surgeons should have comprehensive knowledge of the anatomy, physiology, and the course of the facial nerve to diagnose this nerve lesions and to avoid surgical complications [1]

Dehiscence can make the facial nerve more vulnerable. Incomplete fusion at the bony cover, longstanding inflammation, prior surgery or trauma and the pressure effect of lesions like cholesteatoma are considered factors that can cause the facial canal defect [2].

During middle ear or mastoid surgery, the facial nerve is vulnerable because of its proximity to the cochlea, oval window, lateral semicircular canal, and vestibule[3]. The facial nerve canal courses above the promontory and oval window in anteroposteriorly with a rounded lateral surface that sometimes has microdehiscences[4]

The course of the facial nerve can be divided into:

1. The intracranial portion that starts from the brain stem to the internal auditory fundus with a length of approximately 24 mm.
2. The intratemporal portion runs from the entrance of the facial canal to the stylomastoid foramen. The length of this segment is 28-30 mm.
3. The extratemporal portion: Within the parotid gland the main trunk of the nerve divides into an upper temporofacial trunk and a lower cervicofacial trunk[5].

The facial nerve can be present in variant courses: The nerve runs anterior and inferior to the oval window, bi- or tri-partition of the nerve, the second genu of the nerve may be displaced posteriorly and/or laterally or the nerve may pass

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anterosuperiorly to the cochlea rather than posterosuperiorly as it normally does[6].

METHODS:

A case-series prospective study was conducted at Al-Yarmouk Teaching Hospital/otorhinolaryngology department through a period from October 2017 to October 2018. A total of eighty four patients with chronic suppurative otitis media who underwent tympanomastoidectomy were included.

Patients with confirmed tumor of the temporal bone, those with revision mastoidectomy or as approach procedure in conditions other than CSOM for example cochlear implantation were excluded.

Data were collected regarding the patients' age, gender, main symptoms at presentation, pre-operative and postoperative facial nerve function, type of chronic suppurative otitis media(squamous and mucosal), type of surgery (canal wall up and canal wall down), the intraoperative finding of facial canal defect and its location (tympanic segment, mastoid segment or both), associated findings of lateral semicircular canal fistula , dural exposure and erosion of the ossicles.

The patients participating in this study were assessed preoperatively through submitting to a full medical history including the onset and duration of the disease, analysis of the symptoms (color ,consistency and smell of ear discharge, frequency of episodes, associated hearing impairment, otalgia, dizziness, and facial weakness), previous medications and operations, family and social history.

All patients were subjected to otological examination by auroscope , microscope and/or (0º, 2.7mm) rigid otoscope to assess the condition of the tympanic membrane, middle ear mucosa and ossicles. Presence of cholesteatoma ,granulation tissue or polyp in the affected ear, fistula test performed by applying tragal pressure. Assessment of hearing status was done by tuning fork tests and pure tone audiometry. Facial nerve function was assessed preoperatively according to House-Brackmann's system by assessing the gross appearance of facial weakness and asymmetry between both sides at rest, forehead, eye and mouth. CT scan of the temporal bone with sections in axial and coronal planes was done to assess the degree of pneumatization of the mastoid, site of opacification, the position of sigmoid sinus, the state of facial canal, ossicles, lateral semicircular canal and the tegmen.

RESULTS:

A total of eighty four ears underwent tympanomastoidectomy which belong to eighty-four patients were included in this study, the age of patients ranged from (5 to 58)years with a mean age of (31.2 years). Seventeen patients had been found to have facial canal defect (FCD) 17⁄84 (20.2%).

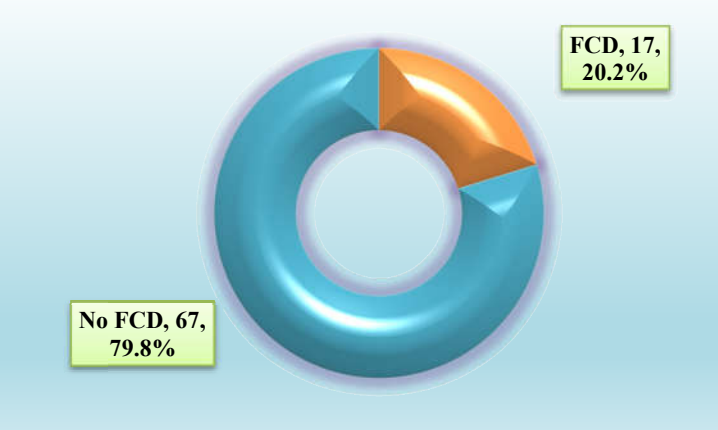

Figure 1: Incidence of FCD.

Of those (17) cases with FCD the age distribution was two patients in pediatric age (≤ 16 years) and fifteen of them were in adult age (> 16 years), while the gender distribution was seven male (41.2%) and ten female (58.8%).

The most common location for FCD was the tympanic segment 14/17 (82.4%), followed by the mastoid segment 2/17 (11.8%).FCD had been found in one patient in both the tympanic and mastoid segments 1/17 (5.9%) as shown in Figure 2.

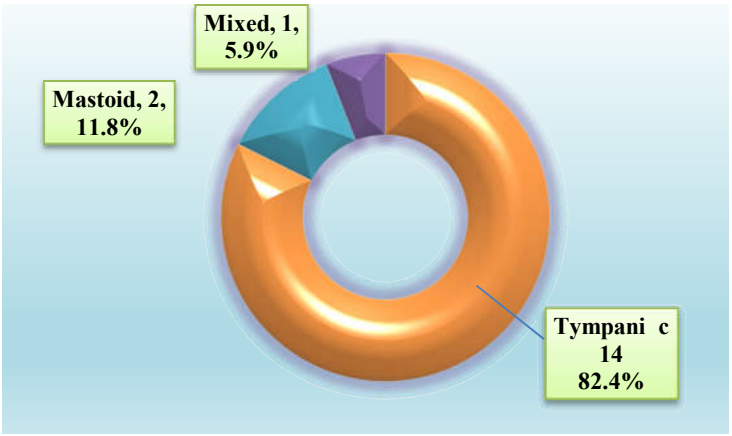

Figure 2: location of FCD.

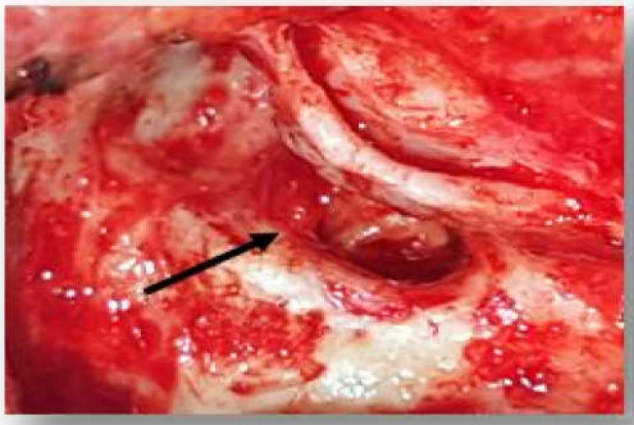

Figure 3: Facial canal dehiscence in the tympanic segment ,the arrow points to the exposed facial nerve.

FCD was the most common among ears with cholesteatoma 15/17 (88.2%) and only two patients with granulation had FCD 2/17(11.8%).There was a statistically significant correlation between presence of FCD and cholesteatoma(p<0.004).

Of the total 84 patients, only four patients presented with facial palsy preoperatively. One of them was grade III and the other three patients were grade IV according to House Brakmann's classification system. Three of them had found to have FCD in the tympanic segment and one had dehiscent tympanic and mastoid segments together. After few weeks postoperatively only one of them didn't show improvement in facial nerve function.

Of the total 84 patients with CSOM, 12 patients were found to have lateral semicircular canal erosion, six of them associated with FCD which is a statistically significant associated finding (p-value <0.006).

Erosion of the ossicles was found in 52 patients,12 of them associated with FCD, dural exposure was found in 9 cases only 5 of them associated with FCD as shown in table 1.

Table 1: Distribution of associated findings with FCD.

Associated findings	Total (n=84)		FCD (n=17)		Not (n=67)		P value
	No	%	No	%	No.	%	
LSCC erosion	12	14.3	6	35.3	6	8.9	0.006
Dural exposure	9	10.7	4	23.5	5	7.5	0.056
Ossicular erosion	52	62.0	12	70.6	40	59.7	0.932

DISCUSSION:

In this study, the age of the collected cases ranged between(5-58) years. Facial canal dehiscence were (9.5%) in age group ≤16 years and (23.8%) in age group >16 years. (41.2%) of the cases with FCD were males and (58.8%) were females. Cem Ozbek, et al study (2009)[7]conducted that the majority of patients with FCD were aged > 16 years(24.9%) and (10.3%) of the patients aged ≤ 16years had FCD while a study by Kia-Chieh Chan , et al (2011) [8] greater incidence of FCD was observed in a pediatric group(50%). In a study by Abdulkader Bucak, et al (2013) [2] (45.3%) of the patients with FCD were male and (54.7%) of them were female. While in the study of Cem Ozbek, et al (2009) [7] (69.6%) of his patients found to have FCD were male and (30.4%) of them were female.

Regarding the incidence of FCD, in this study it was (20.2%) and the most common site was the tympanic segment (82.4%) followed by the mastoid segment (11.8%) and only (5.9%) in both tympanic and mastoid segments. In a study by Kai-Chieh Chan, et al (2011) [8] and A. Trinidade, et al (2014) [9] in which the incidences were (28.7%) and (19%) respectively.

In Nomiya, et al study (2014) [10] the incidence of FCD was (68.9%) of the patients in age group of four years and older and it was (88.2%) of the patients' aged under four years. Cem Ozbek, et al (2009) [7] conducted (89.2%) of the FCD was in the tympanic segment. Also, in a study by Giuseppe et al (2011) [11] in which (92.3%) of FCD was in the tympanic segment.

In our study, four patients had facial nerve palsy preoperatively (House Brakmann's III and IV). Postoperative facial nerve function was not improved in only one of these four cases. The postoperative facial nerve functions remained intact for all the patients with intact preoperative facial nerve functions.

In a study by Abdulkadir et al (2013) [2] in which all patients with preoperative intact facial function remain intact postoperatively and three patients had not intact facial function preoperatively. two of them show no improvement postoperatively but in Cem Ozbek et al study(2009) [7] all patients with preoperative facial nerve weakness improved within weeks postoperatively.

In our study (88.2%) of patients with FCD were confirmed to have cholesteatoma with or without granulation while (11.8%) of them had granulation tissue only. In Abdulkadir, et al study (2013)[2] the incidence of FCD in patients with cholesteatoma (92.2%) was higher than in patients with COM (7.8%), also in a study by Yildirim et al (2002) [12] (18.4%) of patients with FCD had cholesteatoma and (6.8%) had COM without cholesteatoma.

In our study 12 patients were found to have lateral semicircular canal erosion, six of them associated with FCD (50%) which is a statistically significant associated finding (p value <0.006).

Erosion of the ossicles was found in 52 patients,12 of them associated with FCD (23%),dural exposure was found in 9 cases only 5 of them associated with FCD (55.5%).

In Muamer Sahin study (2019)[13] FCD was observed in(73.9%) of the patients with LSCC defect (p<0.001) and FCD was observed in (61.9%) of the patients with dural exposure and in (43.2%) of the patients with ossicular erosion.

Trinidad et al study (2014)[9] reported (14.5%) of the patients with FCD had concomitant LSCC erosion and was statistically very high significant (p< 0.0001). Although Kai-Chieh et al study (2011) [8] found that 50% of the patients with LSCC erosion had FCD but their study showed no statistical significance.

CONCLUSION:

The incidence of facial canal dehiscence was 20.2% of the patients who had CSOM and underwent mastoidectomy.The dehiscence was more commonly seen in patients with cholesteatoma and was mostly located in the tympanic segment. The presence of lateral semicircular canal erosion was significantly correlated with FCD.

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