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ORIGINAL ARTICLE

Variations of facial nerve distribution in the parotid gland.

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ABSTRACT… Objective: To study anatomical variations of facial nerve encountered during parotid gland surgery. **Study Design:** Observational Study. **Setting:** Anatomy Department with the Collaboration of General Surgery Department at Dow University of Health Sciences and Dow Hospital (Ojha Campus Karachi). **Period:** December 2020 to May 2021. **Material & Methods:** Dissection of parotid gland was done in 50 cases including 10 cadavers (20 parotid glands) in anatomy department and 40 patients (40 parotid glands) admitted in general surgery ward undergoing parotid gland surgery for any pathology of the gland. Total 60 parotid glands were studied. Mean age of the cases was 31.6 ± 2.14 years with age range of 20-60 years. There were 10 female and 40 male cases. **Results:** In this study 60 parotid glands were dissected in 50 cases and facial nerve configuration was studied. In 46(92%) cases facial nerve pattern could be classified into main five types of the nerve pattern but in 04(08%) cases facial nerve pattern did not fit into any category of the classification. Type-III pattern of facial nerve distribution was commonly seen in 21(35%) glands. **Conclusion:** It is very important to keep knowledge of anatomical variations in facial nerve branching pattern in parotid gland to avoid its Injury during surgery.

Key Words: Facial Nerve, Nerve Injury, Parotid Gland, Parotid Gland Tumors.

INTRODUCTION

Salivary gland tumors account 3% of total tumors. Parotid gland tumors account 80% of the tumors involving salivary glands. In parotid gland tumors superficial or total parotidectomy is done with preservation of the facial nerve. It is a big challenge to the surgeon to explore facial nerve carefully and save it from injury during parotid gland surgery. That's why knowledge of the facial nerve branching pattern is very important to avoid any complication.

During parotid gland surgery especially when removing deep lobe tumor, chances of facial nerve injury are very high due to its anatomical variations. If anastomotic branches are present, injury to some facial nerve branches will not cause permanent paralysis, and it will recover most likely later on. Frequency of transient facial nerve palsy is 15%-66% after parotid gland surgery and this rate is higher in total parotidectomy as compared to partial and superficial parotidectomy. Permanent facial nerve palsy after parotid gland surgery has been found in 2.5%-5% cases. Facial nerve is present between superficial and deep lobes of the gland. Facial nerve emerges from the stylomastoid foramen and passes over the posteromedial portion of the parotid gland for short distance. It divides within parotid gland into two main trunks cervico-facial and temporo-zygomatic, which further divide into terminal branches.

Purpose of this study is to highlight the importance of knowing facial nerve anatomical variations in the parotid gland and providing guidelines to the surgeons so that surgeons may avoid nerve injury and morbidity related to it during parotid gland surgery and the purpose of safe surgery may be accomplished.

MATERIAL & METHODS

This observational study was conducted at Department of Anatomy, Dow University of Health

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Sciences from December 2020 to May 2021. The study was conducted on 50 cases including 10 cadavers (20 parotid glands) in anatomy department and 40 patients (40 parotid glands) admitted in general surgery ward undergoing partial or total parotidectomy due to parotid gland tumor. There were 10 female and 40 male cases. Total 60 parotid glands were studied. Mean age of the cases was 31.6 ± 2.14 years with age range of 20-60 years. Study sample was selected using non-probability convenient sampling technique. Parotid gland was dissected using incision anterior to the ear tragus down to the ear lobule. Then inverted S shape incision extended behind the ear and the mandible downward posteriorly. Incision was further extended down to the neck in case of anterior parotid lesion. Flaps were elevated and anterior border of sternocleidomastoid muscle was dissected up to the mastoid process. Digastric muscle posterior belly was visualized. Dissection of external auditory canal cartilage was done to the bony portion. Distal to stylomastoid foramen, facial nerve main trunk was visualized and its dissection done peripherally. After exploration of the nerve, its branching pattern was drawn and classified into five main types according to Katz and Kopuz classification (Figure-1 to 5). Ethical consent was taken from the patients in surgical ward. Approval for conducting this study was taken from the institutional ethical review committee (Ref.no# 722-ERC, dated: 26/12/2020). Results were analyzed using SPSS-20 software and expressed in tabular and graphical forms.

RESULTS

Total 60 parotid glands were dissected in 50 cases (including 40 patients and 10 cadavers) and facial nerve branching configuration was studied. In 46(92%) cases facial nerve pattern could be classified into main five types of the nerve pattern but in 04(08%) cases facial nerve pattern did not fit into any category of the classification. Type-III pattern was the most common facial nerve distribution pattern seen in 21(35%) glands. Type-V pattern was not found in any case.

Type of facial nerve pattern	Number of the parotid glands N (%)	Total
Type-I I-A I-B	 07 (11.7%) 05 (8.3%)	12 (20%)
Type-II	05 (8.3%)	05 (8.3%)
Type-III III-A III-B III-C	 13 (21.7%) 05 (8.3%) 03 (5%)	21 (35%)
Type-IV IV-A IV-B		08 (13.3%)
Type-V	00 (0%)	00%

Table-I. Frequency of facial nerve branching patterns found in 46 parotid glands.

There were 10 (20%) females and 40 (80%) males. Out of total 60 parotid glands, 17(28%) were right side glands, 23 (39%) were left side glands and 20(33.3%) bilateral glands were dissected in 10(20%) cadavers.

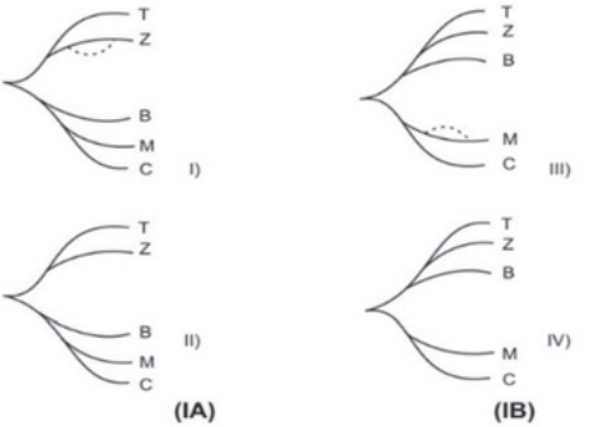

Fig-1. Type I facial nerve (straight branching) with variations.

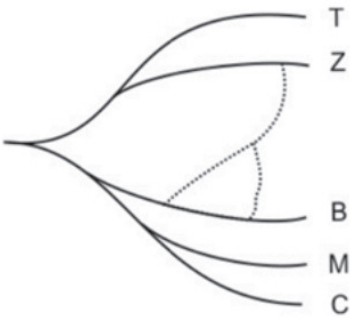

Figure-2. Type-II Facial nerve major connections between buccal and zygomatic nerves.

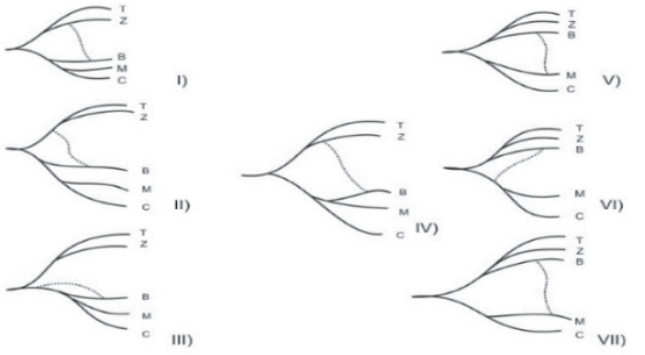

Figure-3. Type III facial nerve with major connection between buccal & any other nerve.

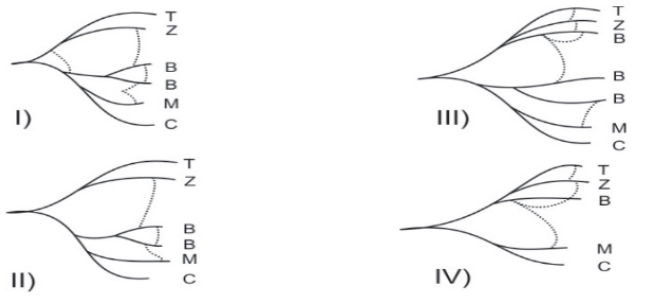

Fig-4. Type IV Complex branching pattern.

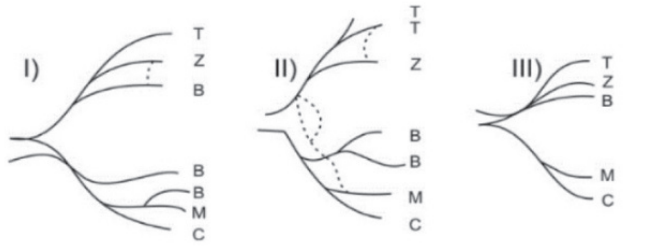

Fig-5. Type V two main trunks.

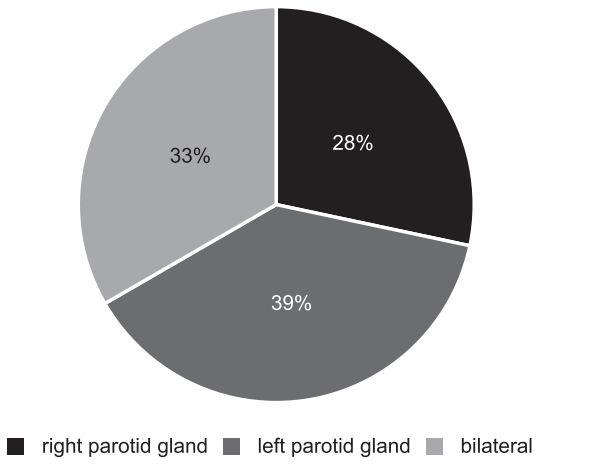

Figure-VI. Frequency of parotid glands dissected in the study group. (n=60 glands).

DISCUSSION

Successful parotid gland surgery in case of tumors depends upon facial nerve proper exploration and preservation by avoiding its injury.[11] It requires thorough anatomical knowledge of the nerve different variations in distribution pattern and about anastomotic branches within the gland. In our study facial nerve pattern was compared to the 5 patterns of nerve branching described by Katz and Kopuz.[12] In 46(92%) cases nerve pattern fit into the classification but in 04(8%) cases nerve branching pattern did not fit into any category. Most common nerve pattern in our study was type-III, found in 21(35%) cases. Type-III is very important for the surgeon due to its greater safety because of extensive anastomosis of the buccal nerve.[13] In previous studies most common nerve patterns have been mentioned as type-IV 39%, type-III 60% and type-I 43%.[14] Clinically type-I is important because injury of a branch will cause paralysis of the muscles supplied by it, although anastomosis pattern was fond on labiobuccal musculature in 26.3% cases, it is similar to previous study by Mahore et al (24%).[15]

According to Stankevicius et al type-IV pattern was most commonly found in their study in 27% cases. In their study group 82% trunks split into bifurcation, 09% into trifurcation while 09% had separate double trunks.[16] In our study type-I pattern was found in 20% cases that is comparable to previous literature showing 13% by Martinez et al.[17] In our study type-II pattern was found in 8.3% cases. This is different in previous studies reporting 13% by davis et al, 43% by Kitamura et al and 24% by Kopuz and Katz et al.[18] Type-III pattern was found in 35% cases in our study. It is similar to previous studies reporting 60% by Callender et al, 33% by Park et al, 44% by Katz et al and 36.7% by Farooq et al.[19] El Kininy et al reported type-V pattern in 03%, type-IV in 15%, type-III in 12%, type-I in 06% while type-II pattern was not found in any study case.[20] Frequency of type-V in literature varies from 03%-12% while in many studies this patter is not found.[21] Type-III pattern is usually found most commonly in previous studies ranging from 10%-60%. And there was no study who did not found this pattern like type-v pattern which is not so common.[22]

Depending upon origin of the buccal nerve from upper division, type-IV is further divided into two sub types, IV-A having origin of buccal nerve from upper trunk and type IV-B having origin of the buccal nerve from both upper and lower trunks. In our study IV-A was found in 10% and IV-B was found in 3.3% cases. Previous studies also report similar results with origin of buccal nerve from upper trunk ranging from 12% to 42% and from both upper and lower trunks from 4%-36% in various studies.[23]

CONCLUSION

If surgeon is aware of facial nerve branching patterns during parotid gland surgeries, injury to the nerve and its related complications can be avoided and a safe surgery can be done.

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2	Farukh Mustafa Memon	Proof reading and final approval.	
3	Hira Ahmed	Abstract and recording.	
4	Zaheer Amjad	Data collection.	
5	Uzma Nusrat	Found additional literature for information, Data composing.	
6	Maria Khan	Data collection, Found references.	