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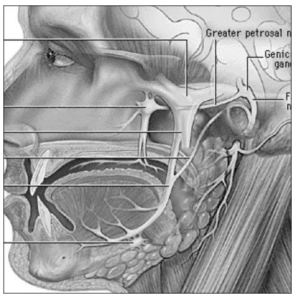

# FACIAL NERVE;
## PATTERN OF DISTRIBUTION IN THE PAROTID GLAND

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**ABSTRACT ...** farooqahmed156@hotmail.com Superficial or total parotidectomy with preservation of the facial nerve has been commonly used for many years in the surgical treatment of parotid gland tumors. **Objective:** During dissection of the parotid gland variations are observed. The operating surgeon should be familiar with these variations, to reduce the incidence of post operative facial nerve paralysis. **Setting:** The study was conducted in the department of Anatomy, Quaid-e-Azam Medical College and Department of Surgery Bahawal Victoria Hospital Bahawalpur during the year 2001 to 2003. **Material & Methods:** Facial nerve was dissected in a total fifty seven specimens, 21 cadavers (bilateral) and 15 patients (unilateral). Their ages were between 25 to 65 years. Of these 9 were females and the rest were males. **Results:** In this study fifty seven parotid glands were dissected. Out of fifty seven patients, 89.5% had facial nerve configuration that could be classified into five main types & 10.5% did not fit into any of these categories. Type III was the commonest (36.7%) while type II & V were not present in any of the case dissected. Type I & IV were seen in 26.3% of the dissected cases each. **Conclusion:** In parotid gland surgery if the branching variations are kept in mind, the surgeon will be safe from unpleasant surprises.

**Keywords:** Parotid Gland, Facial nerve, Parotid Gland tumors.

## INTRODUCTION

Parotid neoplasm account for 80% of the total salivary gland neoplasms. Superficial or total parotidectomy with preservation of the facial nerve has been commonly used for many years in the surgical treatment of parotid gland tumors[4]. The challenge to the head and neck

surgeon during parotid gland surgery is to carefully dissect and preserve the facial nerve. Therefore, the knowledge of facial nerve anatomy and its variations is vitally important.

During surgery especially during removal of deep lobe tumors, facial nerve can be injured because of its variations & anomalies. As we know, injury to some branches of the facial nerve during surgery is less likely to result in permanent paralysis if anastomotic branches are present[7]. Familiarity with these common variations in facial nerve anatomy is an absolute necessity for the operating surgeon for careful dissection and preservation of the facial nerve and complete removal of the tumor in parotidectomy.

The purpose of the present study is to highlight the different patterns of intra- parotid distribution and anastomosis of facial nerve in our community and to reduce post operative morbidity related to facial paralysis during surgery by providing guidelines for the operating surgeons.

## MATERIAL & METHOD

A total of fifty seven specimens/cases were dissected for facial nerve distribution, [21 cadavers (bilateral) and 15 patients (unilateral)]. Their ages were between 25 & 65 years. Out of these 9 were females and the rest were males. The study was carried out at the Anatomy Department of Quaid-e-Azam Medical College and Department of Surgery Bahawal Victoria Hospital Bahawalpur during the year 2001 to 2003.

The parotid incision was made anterior to the tragus of the ear and extending down below the lobule of the ear. An inverted S shaped extension was then made behind the ear and down and behind the angle of the mandible. In case of anterior parotid lesion the incision was extended further down the neck. After elevating the flaps the anterior border of sternocleidomastoid muscle was dissected to the mastoid process. The posterior belly of digastric muscle was visualized. The cartilaginous portion of external auditory canal was dissected to the bony portion. The main trunk of facial nerve was visualized distal to the stylomastoid foramen and dissected peripherally. Following dissection, schematic illustrations of facial nerve branching were drawn and according to the branching pattern they were classified into groups as described by Katz & Kopuz[5,7].

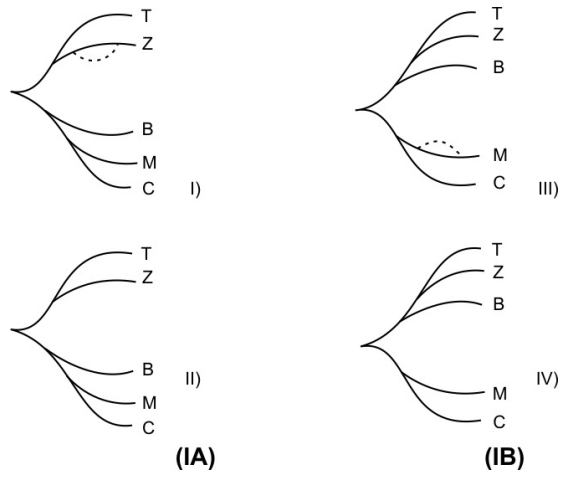


Fig-1. Type I facial nerve (straight branching) with variations.
Left Type IA I). Zygomatic sending a loop to itself
ii). Absent zygomatic loop (v)
Right Type iii). Buccal nerve arising from upper division & mandibular sending a loop to itself
iv). Mandibular loop is absent.

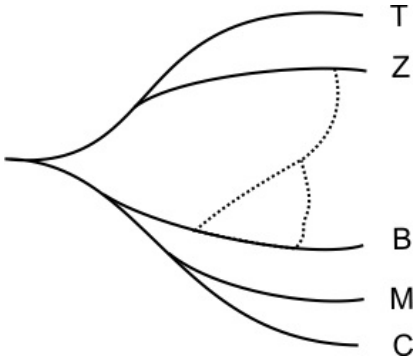


**Fig-2. Type II facial nerve major connection between buccal & zygomatic nerves**

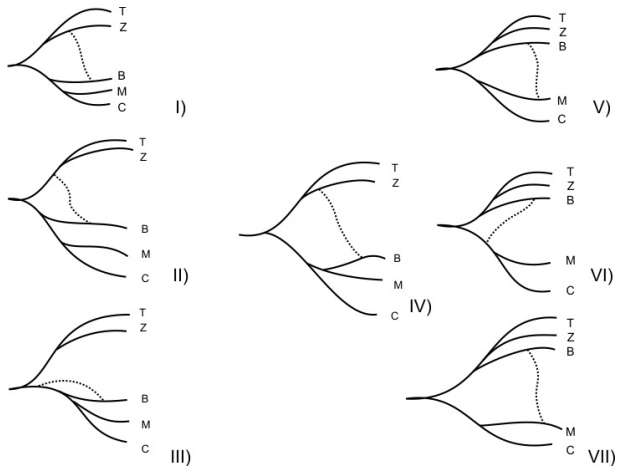


**Fig-3. Type III facial nerve with major connection between buccal & any other nerve.**

Type IIIA i). Anastomosis between zygomatic & buccal nerve
ii). between buccal & upper division (V).
iii). between buccal and lower division (V).
Type IIIBiv). between buccal nerve (arising from mandibular) & zygomatic & mandibular nerve
Type IIICv). connection between buccal nerve arising from upper division & lower division (V).
vii). Type III C with additional anastomosis between upper & lower divisions (V).

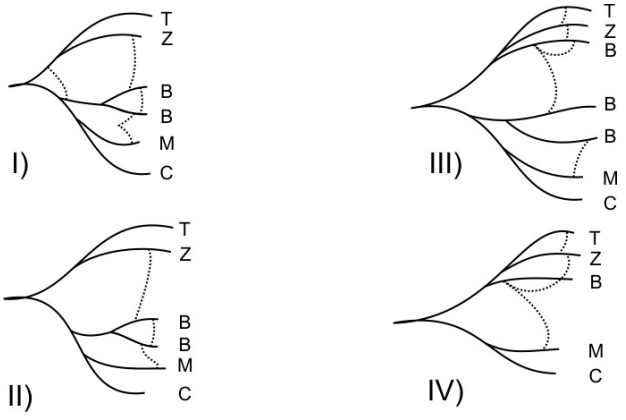


**Fig-4. Type IV Complex branching pattern.**

Type IVA i). Buccal nerve arising from upper division
ii). No anastomosis between buccal nerve & upper division (V).
TYPE IVB iii). Buccal nerve arising from both division.
iv). Buccal nerve arising from upper division only (V).

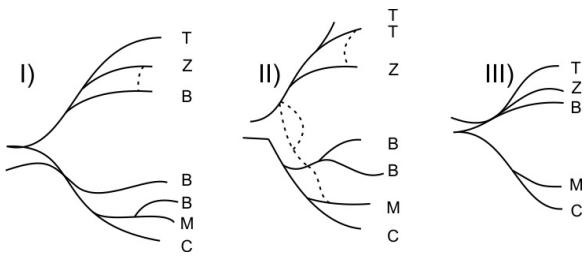


**Fig-5. Type V two main trunks.**

i). Type VA upper & lower division arising from major trunk, buccal nerve arises from both divisions, minor trunk joins lower division.
ii). Type VB upper division from major & lower from minor trunk, buccal nerve arises from both division.
iii). Type VC upper & lower division both arise from the major trunk & minor trunk enters the upper division as a separate branch.

## RESULTS

Out of fifty seven specimens, 30(52.6%) were left and 27(47.4%) were right sided. Statistical analysis for sex distribution was not performed as the number of cases was not sufficient.

In all cases, main trunk was divided into a larger zygomaticotemporal (upper) division and a smaller cervicomandibular or lower division.

Out of fifty seven specimens, 15(26.3%) were straight branching or Type I. Type I is sub divided into IA & IB depending on the origin of buccal nerve from lower and upper divisions respectively. Type IA has a zygomatic loop while IB has a mandibular loop. Nine cases (15.8%) were of IA variety, zygomatic loop being absent in two of them (3.5%). IB was identified in six (10.5%) dissections with mandibular loop absent in half of them (Fig.1) (Table I).

Type II (Fig.2) with major interconnections between zygomatic and buccal branches was not reported.

The most prevalent type was type III (Fig.3) 21 cases (36.8%). 12(21%) of these cases were identified as III A. Of the 12 cases, 3(5.2%) had a loop between buccal &

upper division and 2(3.5%) between buccal and lower divisions instead of buccal & zygomatic. Type III B where buccal nerve was arising from mandibular nerve and sends branches to zygomatic nerve was not identified. Nine cases (15.7%) of type IIIC (major connection between buccal nerve arising from upper division and mandibular nerve) were dissected, 3 of these (5.2%) deviated from the normal as buccal nerve anastomosed with the lower division instead of the mandibular nerve & one of these had an additional anastomosis between upper and lower divisions.

**Table I Intra parotid branching pattern of facial nerve**

| Authors | Type I % | Type II % | Type III % | Type IV % | Type V % | Most Common Type | | Least common type | | Population |
|---|---|---|---|---|---|---|---|---|---|---|
| Davis | 13 | 20 | 28 | 39 | - | IV | 39% | I | 13% | - |
| Callander | 24 | - | 60 | 16 | - | III | 60% | IV | 16% | Spanish |
| Kitamura | 43 | 17 | 10 | 30 | - | I | 43% | III | 10% | Japanese |
| Park | 6 | 14 | 33 | 47 | - | IV | 47% | I | 6% | Korean |
| Bernstein | 9 | 9 | 25 | 57 | - | IV | 57% | I, II | 9% | - |
| Katz | 24 | 14 | 44 | 15 | 3 | III | 44% | V | 3% | - |
| Kopuz | 24 | 12 | 14 | 38 | 12 | IV | 38% | V | 12% | Turkish |
| Farooq | 26.3 | - | 36.7 | 26.3 | - | III | 36.7% | II, V | 0% | Pakistani |

**Table II Origin of buccal nerve**

| Authors | Origin of buccal nerve from upper division | Origin of buccal nerve from lower division | Origin of buccal nerve from both division |
|---|---|---|---|
| Davis | 20% | 66% | 4% |
| Katz | 12% | 84% | 4% |
| Kopuz | 18% | 46% | 36% |
| Farooq | 42.1% | 52.6% | 5.2% |

Type IV (Fig. 4) with a complex branching pattern was observed in 15(26.3%) cases. Depending upon the origin of buccal nerve from lower or both division, type IV is sub-classified into IVA & B respectively. Nine of the type IV cases (15.8%) were of the A variety and six (10.5%) of B type. One case of IVA had no buccal nerve anastomosing with the upper division & one of IVB had a buccal nerve arising from upper division only.

No case of type V (Fig.5) i.e. two main trunks or trifurcation was dissected.

Six cases had a branching pattern not conforming to any of the above mentioned groups; four of these (7%) had anastomosis between upper and lower divisions but not amongst their branches. Two dissections had a single trunk of facial nerve from which all the branches were arising.

Bilateral (21 cases) facial nerve configuration was different on the two sides in 15(71.4%) and similar in six (28.5%) specimens (Table III).

| Table: III Bilateral Facial Nerve Configuration | | |
|---|---|---|
| **Author** | **Bilaterally similar** | **Bilaterally different** |
| Kopuz | 47.3% | 52.7% |
| Farooq | 28.5% | 71.4% |

Buccal nerve arose from lower division in 52.6%, upper division in 42.1% and from both divisions in 5.2% cases (Table II).

Anastomotic connections were present between upper and lower divisions in 8.7%, buccal nerve and lower division 8.7% and buccal nerve & upper division in 19.2% cases. No anastomosis was found between main trunk & either upper or lower divisions (Table IV).

| Table IV: Anastomosis between main trunk of facial nerve & its division | | | | | |
|---|---|---|---|---|---|
| **Study** | **Main trunk & lower division** | **Main trunk & upper division** | **Upper & lower division** | **Buccal nerve & upper division** | **Buccal nerve & lower division** |
| Kopuz | 8% | 60% | - | - | - |
| Farooq | - | - | 8.7% | 19.2% | 8.7% |

## DISCUSSION

Successful surgical intervention in case of parotid tumors depends upon good exposure and preservation of facial nerve. This requires a thorough knowledge of extra temporal anatomy of facial nerve and an awareness of possible anastomosis/ variations amongst its branches.

Types of facial nerve from I-IV in our study are generally similar to those described in the literature[1,2,3,5,6,7,8] with 28% of the cases having minor variations and 10.5% cases not fitting into any of the existing classes. The most common pattern was Type III (36.7%). Type III is important because it allows the surgeon a greater safety margin due to extensive anastomosis of the buccal nerve. These findings differ from those of the previous studies showing a distinct racial variation. The commonest types reported were, Type IV 39% Davis et. al[3], Type III 60% Callander[2], Type I 43% Kitamura[6], Type IV 47% Park[8], Type IV 57% Bernstein[1], Type III 44% Katz[5] & Type III 38% Kopuz[7] (Table I).

Type I is important clinically as sacrificing a branch would cause paralysis of the muscles it supplies despite anastomotic pattern over the labiobuccal musculature was seen in 26.3% of the cases, this is similar to the findings of Katz.& Catalano[5] and Kopuz et. al[7] (24% in both studies) but different from Bernstein & Nelson[1] 9%, Davis et. al[3]13% and Park & Lee[8] 6%. Type IA was identified in 15.8% and I B in 10.5% cases. They have been reported to be as frequent as 18% to 26% & 6% to 24% in the literature respectively[1,2,3,5,6,7,8].

The findings for type II 0% were different from previous studies. (Table 1). Type III (36.7%) was the most common, no case of type IIIB was seen whereas IIIA and IIIC had a frequency of 21% & 15.7% respectively. The incidence for Type IV in literature varies from 15% to 57%[1,2,3,5,6,7,8)] which conforms to our findings i.e. 26.3%.

Type V reported as 3% to12%[5,7] was not identified in any of the specimens in our study, as trifurcation was reported to be as frequent as 5% to18%[7].

Anastomotic connections between main trunk and upper and lower divisions reported by Kopuz et. al[7] were not seen but anastomosis between upper and lower divisions 8.7%, buccal nerve and upper division 19.2% and buccal & lower division 8.7% were observed in the present study.

## CONCLUSIONS

In parotid gland surgery if the branching variations are kept in mind, the surgeon will be safe from unpleasant surprises.

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**Great minds have purposes, other have wishes**

**Washington Irving**