

## Variations in Facial N branching pattern – Expected consistencies and surprises

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**Abstract:** Facial N is the most important anatomical structure of interest in parotid surgeries, the dissection and preservation of branches of which is the key step in parotidectomy procedures. Even after an apparently well preserved nerve trunk and its branches, some patients have bothersome post operative nerve deficits. This is most likely due to unrecognized injury to the anastomosing fibres among various branches. With high variations among the branching pattern, it is obligatory to meticulously dissect and preserve all the branches and the anastomosing fibres for a good post operative outcome. We have studied the branching pattern of facial N in meticulously performed 32 parotid surgeries at our department and have compared it with previous similar studies. Davis Type 2 happened to be the commonest branching pattern in our study followed by Type 1. We didn't encounter any type 3 pattern in our patients. There was a significant inconsistency in the frequency of branching pattern among various studies, signifying the inherent extreme variability of its anatomy. Hence a thorough knowledge of the entire branching pattern and a dedicated dissection to preserve all the branches and anastomosing fibres becomes mandatory to avoid unpleasant postoperative nerve deficits.

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### I. Introduction:

Parotidectomy, either superficial or total conservative, has been a common surgical procedure performed for parotid neoplasms. While superficial Parotidectomy has been the minimal surgical procedure for benign parotid neoplasms, total conservative Parotidectomy is done for malignant tumors of parotid with intact functioning facial nerve. Dissection of the facial nerve trunk and its branches till the periphery is the key and critical step in all parotid surgeries. Though many landmarks are available to identify the facial N trunk, the branching pattern beyond the trunk is variable with each patient and the anastomosis among the branches are unpredictable. Hence meticulous dissection beyond the trunk, along the branches, till the periphery with preservation of the anastomosing fibres is crucial in preserving the facial N function during parotid surgery. Our study determines the facial N branching pattern in patients who underwent parotidectomy at our institution.

### II. Materials and methods:

This is a retrospective analysis of clinical records and operative images of patients who underwent parotidectomy for parotid neoplasms at our department between January 2016 and June 2017. Patients with recurrent tumors and those with preoperative facial N involvement by tumor were excluded from the study. All patients were operated under general anaesthesia, with supine neck extended position. A modified Blair incision was used. Skin flaps were elevated anteriorly till masseter and inferiorly beyond the level of hyoid. After dissecting the gland off the cartilaginous external auditory canal, Conley's cartilaginous pointer was used as guide to identify the facial N trunk which lies 1 cm below and deep to the pointer. The bifurcation and the branches beyond were meticulously dissected preserving all the branches and any anastomosing fibres if present. For total conservative Parotidectomy, the dissected branches were safely hooked up with thin tapes and the deep lobe was removed between the branches. The wound was closed with suction drain.

The branching pattern was classified into six types based on the description by Davis (1956)<sup>[1]</sup>

**Type I:** No anastomosis between branches of Facial Nerve

**Type II:** Presence of an anastomotic connection between branches of temporofacial division.

**Type III:** A single anastomosis between temporofacial and cervicofacial division.

**Type IV:** A combination of Type II and III

**Type V:** Two anastomotic ramii passed from cervicofacial division to intertwine with branches of temporofacial division.

**Type VI:** Plexiform arrangement, the mandibular branch sends twing to join any members of temporofacial division.

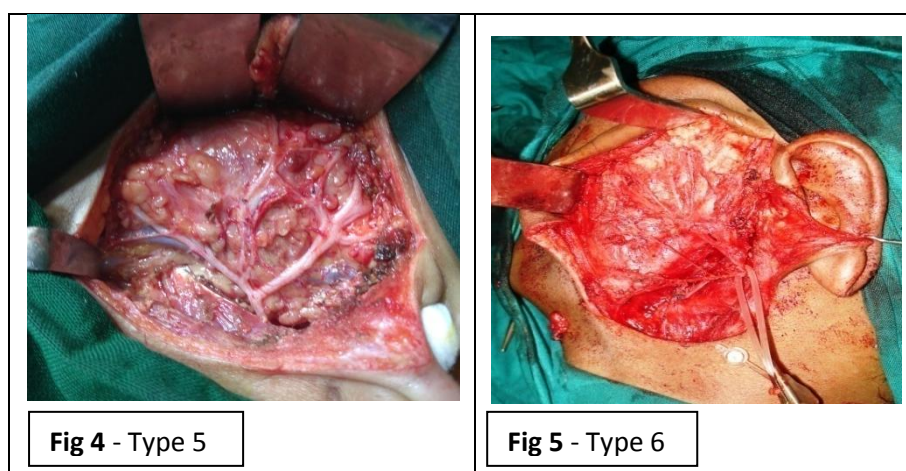
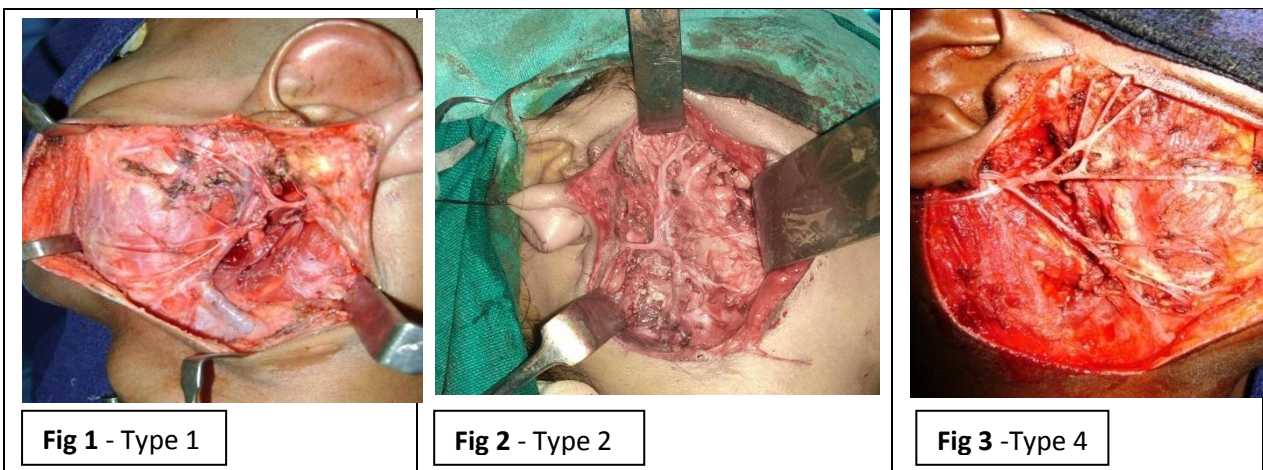
The branching pattern of each facial N dissected was noted and the respective percentage calculated

### III. Results

Of the 32 patients included in the study, 80% were female. Most common pathology was pleomorphic adenoma (78%). It was observed that the commonest branching pattern was type 2 (Fig 2 ) followed by Types 1, 5, 4 and 6 in the order of decreasing frequency (Table 1and Figures 1-6)

**Table 1:** Frequency of branching patterns in our study

Type of branching pattern	Frequency % (n=32)
Type 1	31.25(10)
Type 2	37.5 (12)
Type 3	0(0)
Type 4	12.5(4)
Type 5	15.62(5)
Type 6	3.12(1)



#### IV. Discussion:

Facial N is the single most important anatomical structure involved in Parotidectomy surgeries, one of the commonly performed procedures in head and neck. Though the facial N trunk lies in a constant anatomical position, the branching pattern is highly variable [2]. Awareness of variable branching pattern is essential, because most post operative motor deficit in the nerve territory after a apparently preserved pes anserinus is unrecognized injury to various anastomosing fibres among the branches. Hence meticulous dissection with preservation on all branches along with the anastomosing fibres is absolutely essential for good postoperative outcome in terms of nerve function.

After Davis et al classified the branching pattern of facial N, several authors have studied the same based on his classification [3, 4, 5, 6]. We have compared our observation with those studies (Table 2)

**Table 2:** Frequency of various branching pattern in various studies based on Davis classification

Author	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6
Davis (1956) N – 356	13%	20%	28%	24%	9%	6%
Myint (1992) N – 79	11.4%	16%	34%	19%	7.6%	12.7%
Ekinci (1994) N-27	52%	7% -	7%	30%	4%	-
Kim Suh (2002) N – 23	57%	17%	17%	9%	-	4%
Ahmed (2004) N – 57	26.3%	-	36.7%	26.3%	-	-
K P Singh	45%	10%	30%	10%	-	5%
Our study	31.25%	37.5%	-	12.5%	15.62%	3.12%

Unlike all other above mentioned studies, Type 2 was the most common branching pattern in our study (37.5 %). Type 1 was the next common type. One patient had type 6 pattern, whereas no type 3 pattern was observed in any of our patient. The inconsistency in the frequency of branching pattern among various studies including ours (Table 2) explains the inherent high variability of branching pattern among individuals. But all patterns fall into any of the above classified types. Hence thorough knowledge on these patterns would help the surgeon to anticipate, dissect and preserve all the anastomosing fibres between branches, thereby preserving its function well.

#### V. Conclusion

Facial N has highly variable branching pattern. This is reflected by the inconsistency in the frequency of different patterns in various studies. Most post operative motor deficit in the nerve territory after an apparently preserved pes anserinus results from unrecognized injury to various anastomosing fibres among the branches. Hence only a dedicated dissection of the branches and preservation of all the anastomotic fibres can avoid worrisome postoperative facial N functional deficit and unpleasant surprises.

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