

Patterns of facial nerve branching during parotidectomy- A hospital-based study

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Abstract

Background: The purpose of this study was to evaluate facial nerve (FN) branching variations based on Katz and Catalano classification in Indian population. **Material and Methods:** The present study was conducted on 40 patients in Department of ENT and HNS, SMGS Hospital, GMC Jammu during a time period of June 2017 to March 2020. Patients with preoperative facial nerve 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. The bifurcation and the branches beyond were meticulously dissected preserving all the branches and any anastomosing fibres if present. **Results-** It was observed that the commonest branching pattern was type 3 (35%), followed by Types 1 (27.5%), type 2 (17%) and type 4 (10%) in the order of decreasing frequency. 10% patients had a nonspecific branching pattern. We did not find any patient having type 5 pattern. **Conclusion:** Knowledge of common variations in facial nerve anatomy is an absolute necessity for the operating surgeon in the careful dissection and preservation of the facial nerve and the complete removal of the tumor in a parotidectomy.

Keywords: facial nerve, parotidectomy, facial branching, blair

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INTRODUCTION

The parotid glands are paired salivary glands situated on either side of face, between the ear and the ramus of mandible. The parotid gland is surrounded by thick capsule derived from investing layer of deep cervical fascia. The main trunk of facial nerve enters the posterior surface of the gland and quickly bifurcates into upper and lower divisions. These in turn split into further branches. The pattern of branching is variable. As a general rule, the upper division gives rise to frontal, zygomatic and upper

buccal branch; the lower division gives rise to lower buccal, mandibular and cervical branches. The upper division branches are thicker and superficial in course than the lower division branches. Various classification systems for facial nerve branching pattern have been developed. The earliest branching pattern of facial nerve was described by Davis and colleagues, the classification still being widely used. Katz and Catalano¹ also gave a classification for branching pattern of facial nerve. According to their classification, there are 5 types of facial nerve branching pattern:

- Type 1: No anastomosis between main branches
- Type 2: Buccal branch subdivides and fuses with zygomatic branch
- Type 3: Anastomosis between buccal to other main branches
- Type 4: Anastomosis between two divisions
- Type 5: Facial nerve divides before leaving stylomastoid foramen

This study was conducted to evaluate different branching pattern of facial nerve during parotidectomy.

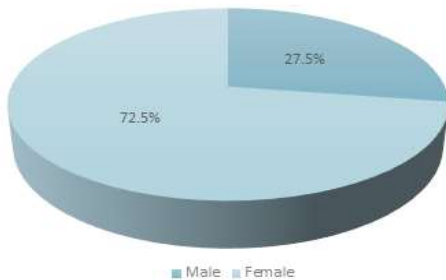
MATERIALS AND METHODS

This is a prospective study of 40 patients who underwent superficial parotidectomy or total conservative parotidectomy for parotid neoplasms at our department between June 2017 and March 2020. Patients with preoperative facial nerve involvement by tumor were excluded from the study. Risks and consequences of the suggested surgery were explained to the patient and written informed consent was taken each time. All patients were operated under general anaesthesia, with supine neck extended position. A modified Blair incision was used. After dissecting the gland off the cartilaginous external auditory canal, Conley’s cartilaginous pointer was used as guide to identify the facial nerve 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 and suction drain kept.

The branching pattern was classified into five types based on the description by Katz and Catalano.¹

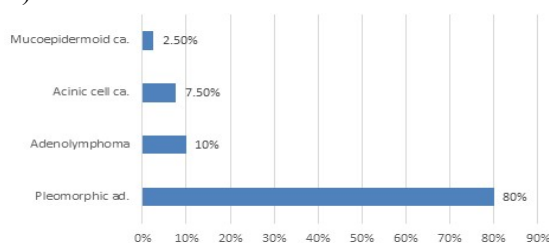
RESULTS

In our study, out of 40 cases, 29 (72.5%) were females and 11(27.5%) were males. Most of the patients belonged to age group 31 to 45 years with mean age of presentation 37.2 years.



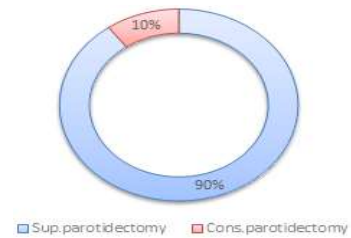
Graph 1: Sex distribution

Most common pathology was pleomorphic adenoma(80%), followed by adenolymphoma (10%), acinic cell carcinoma (7.5%), and mucoepidermoid tumor (2.5%).



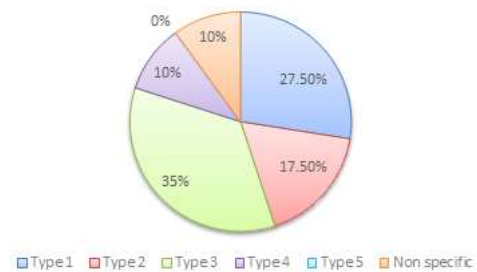
Graph 2: Type of lesions

Most (90%) of these patients underwent superficial parotidectomy and in only 4 cases (10%)underwent total conservative parotidectomy due to involvement of both lobes of parotid gland.



Graph 3: Type of surgery

It was observed that the commonest branching pattern was type 3 (35%), followed by Types 1 (27.5%), type 2 (17%) and type 4 (10%) in the order of decreasing frequency. 10% patients had a nonspecific branching pattern. We did not find any patient having type 5 pattern.



Graph 4: Chart title

DISCUSSION

Even though many studies describe the anatomy of the facial nerve and its trunk, facial nerve palsy remains a common complication post-surgery of parotidectomy. Early identification of facial nerve is essential in preserving the mimic function and facial expression. The knowledge of facial nerve and its trunk anatomy and topography is essential in performing successful parotid gland surgery. Most postoperative motor deficit in the nerve territory after an apparently preserved pes anserinus results from unrecognized injury to various anastomosing fibres among the branches. The fixed points, according to anatomic positions that are shown in the drawings, however, are not always the same during surgery on patients with parotid tumors that deviate, obscure, and even involve the main divisions or the main trunk. Therefore, surgeons should keep this in mind and take precautionary measures to avoid the injury. Mean age of presentation of 37.2 years, with majority of patients in the age group of 31-45 years. Majority of patients in our study (72.5%) were females and 27.5% were males, coinciding with increased prevalence of benign salivary gland disease

in females. Majority of patients in our study were undergoing surgery for pleomorphic adenoma (80%). This finding is consistent with higher incidence of pleomorphic adenoma. Rest of the cases included adenolymphoma (10%), acinic cell carcinoma (7.5%) and mucoepidermoid tumor (2.5%). Given a high number of benign lesions in our study, most of the patients in our study underwent superficial parotidectomy (90%) and rest underwent total conservative parotidectomy (10%). The purpose of the present study was to highlight the different patterns of intra- parotid branching and anastomosis of facial nerve. The surgeons should keep in mind chances of variation in branching pattern to reduce post-operative morbidity related to facial nerve injury. Various studies have been conducted in the past on this subject. Although most of the studies classified branching pattern into 6 different types^{2,3,4}, Katz and Catalano reported only 5 types in their study. Our study also grouped patients based on the branching pattern described by Katz and Catalano⁵. In type1, there are no anastomotic links between main branches, but in two subtypes there is splitting and reunion of zygomatic

and mandibular branches. We observed 27.5% of cases belonging to this group. Katz and Catalano observed 25% cases belonging to this group. In type 2, the buccal branch subdivides and fuses with the zygomatic branch. This type of pattern was seen in 17.5% cases. Katz and Catalano observed 14% cases belonging to this group. In type 3, there are major anastomotic links from buccal branch to other major branches. In the present study, regardless of the lower number of studied subjects, type III was the most common (35%). Katz and Catalano observed 44% cases belonging to this group. In type 4, which was seen in 10% of our cases, there is complex branching and anastomotic links between the two divisions. Katz and Catalano observed 14% cases belonging to this group. We did not observe any case belonging to type 5 where the facial nerve trunk divides before leaving the stylomastoid foramen. Katz and Catalano observed 14% cases belonging to this group. However we observed a very complex branching pattern in 4 (10%) cases, which could not be grouped in any of the defined groups of Katz and Catalano classification.

Table 1

Type of branching pattern	Frequency % (n=40) in our study	Frequency % (n=40) in Katz and Catalano study
Type 1	27.5 (11)	25
Type 2	17.5 (7)	14
Type 3	35 (14)	44
Type 4	10 (4)	14
Type 5	0	3
Nonspecific pattern	10 (4)	

Although majority of studies on facial nerve branching have described their findings in relation to Davis classification, there are not enough studies that are based on Katz and Catalano classification system.



Figure 1: showing Type 1 Facial nerve branching pattern; Figure 2: showing Type 3 Facial nerve branching pattern

CONCLUSION

Facial nerve topography during parotidectomy poses a challenging task for the surgeon because of unpredictable alterations or variation in the branching pattern of facial nerve. In depth knowledge of common variations in facial nerve anatomy is an absolute necessity for the operating surgeon in the careful dissection and preservation of the facial nerve and the complete removal of the tumor in a parotidectomy.

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