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Case Series

Quick identification and preservation of facial nerve using only posterior belly of digastric muscle

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ABSTRACT

Parotid glands are the largest salivary glands separated into two lobes by the neurovascular plane of the facial nerve. Superficial or total parotidectomy is considered the best therapeutic option for different Parotid lesions. There are various key indicators for locating the anatomical landmarks of the facial nerve in either anterograde or retrograde manner or using nerve monitoring, microscope, gamma probe etc. The Aim here is to promptly detect and preserve the facial nerve trunk and its terminal branches during parotid surgery with using only the posterior belly of the Digastric muscle aided with microscope. This is a one-year prospective observational study of 19 cases undergoing parotidectomy. The time taken to find the facial nerve trunk and its distance from the posterior belly of the digastric muscle were documented intraoperatively followed by post-surgery cranial nerve VII' examinations. The "facial nerve" was satisfactorily preserved in 16 out of 19 (84.21%) cases with sole usage of the "posterior belly of the digastric muscle." The mean time to identify the FNT was calculated as: 21.78 mins. The average distance of the FNT from the anterior border of the PBDM was estimated as 6.44mm. Prompt exposure of the PBDM, followed by locating the FNT just at a distance of 6.5 mm anteromedial to PBDM, can be done within 20-22 minutes, which is found to be the quickest and easiest method to identify and preserve the facial nerve with pes anserinus using PBDM as the robust indicator, preventing facial disfigurement and mental stress to the patient.

Keywords: Facial nerve trunk, Posterior belly of digastric muscle, Superficial parotidectomy, Total parotidectomy

INTRODUCTION

The largest salivary gland is the parotid gland, which is well encapsulated and split into an outer and deeper lobe by the neurovascular stratum of the facial nerve and superficial & transverse temporal arteries and veins.[1]

Parotid surgery, such as superficial or total parotidectomy, is regarded as the best therapeutic option for a variety of benign and malignant parotid gland diseases, such as "pleomorphic adenoma, Warthin's tumour, mucoepidermoid carcinoma, adenoid cystic carcinoma," and so on.[2–7] Anterogradely, the facial nerve's anatomical landmarks can be found using the tragal pointer, the posterior belly of the digastric muscle, the tympanomastoid suture, and the styloid processes. Retrogradely, the trunk can be found by first identifying the terminal branches.[8,9] other techniques for identifying the nerve include gamma probes, microscopes, nerve monitoring, and others.[10,11] In order to avoid physical deformity and the mental distress that accompanies facial nerve palsy from mishandling of facial nerve and its branches and poor surgical outcome of parotidectomy, it is imperative that the facial nerve trunk and all of its terminal branches be adequately preserved during parotid surgery. Through this case series we try to depict a prompt and easier way to detect and preserve "the facial nerve trunk and its terminal branches during parotid surgery with using only the posterior belly of the digastric muscle" aided with microscope.

CASE SERIES

We conducted a prospective observational study in the "Department of Otorhinolaryngology and Head and Neck Surgery," "Silchar Medical College & Hospital," Assam, India, in the period of 1 year. It includes 19 patients with informed consent having parotid lesions requiring and undergoing surgery. Patients having large volume tumours or requiring revision surgery and who received radiotherapy earlier were excluded. The mean age of the patients was 44 years (44.1±10.55) (Figure 1), with male:female ratio of 7:12 (Figure 2). Detailed history, clinical examination and relevant investigations like Ultrasonography, FNAC, CT scan was done and recorded. Superficial or Total Parotidectomy was performed as per requirement.

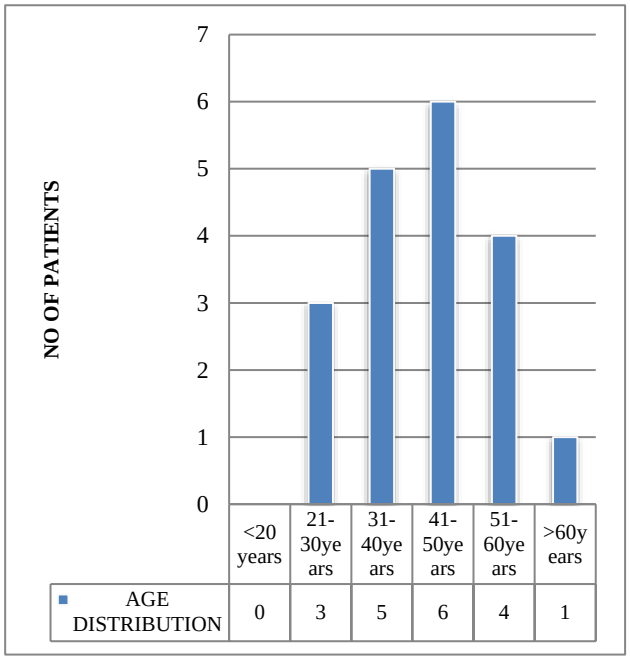

Figure 1: Age distribution.

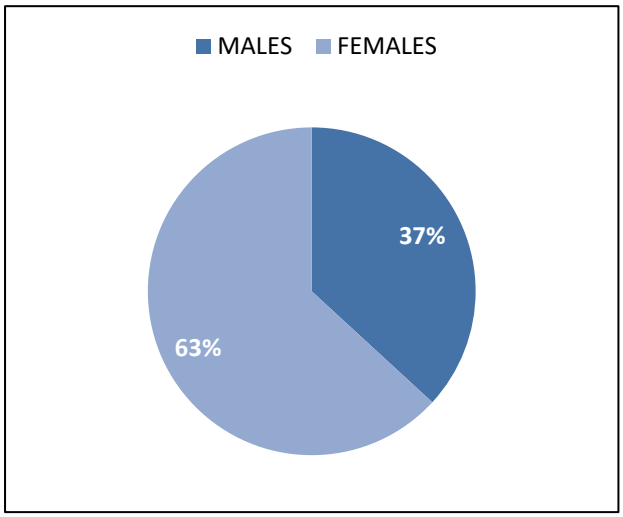

Figure 2: Gender distribution.

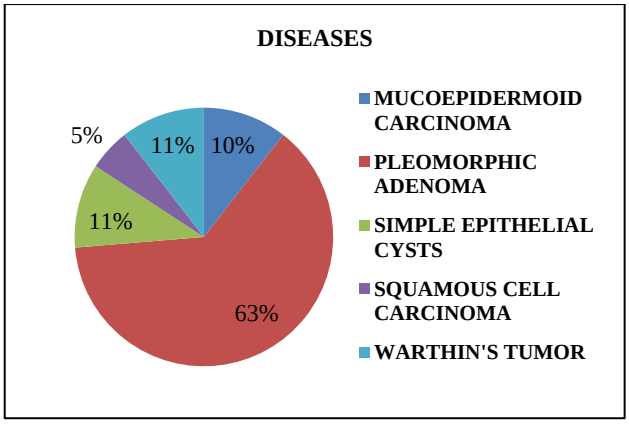

Figure 3: Various parotid lesions.

Figure 4: (A) Pleomorphic adenoma; (B) squamous cell carcinoma & (C) Warthins tumour.

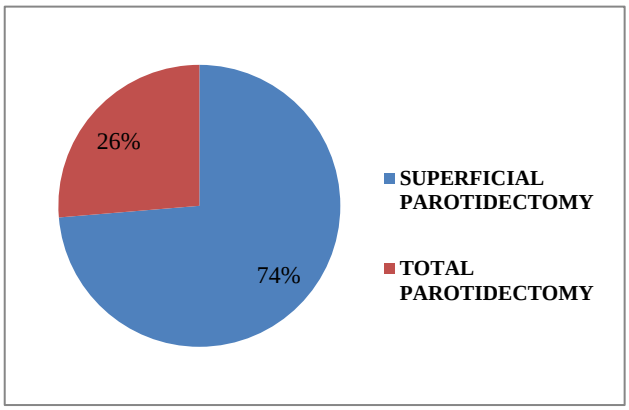

Figure 5: Surgery.

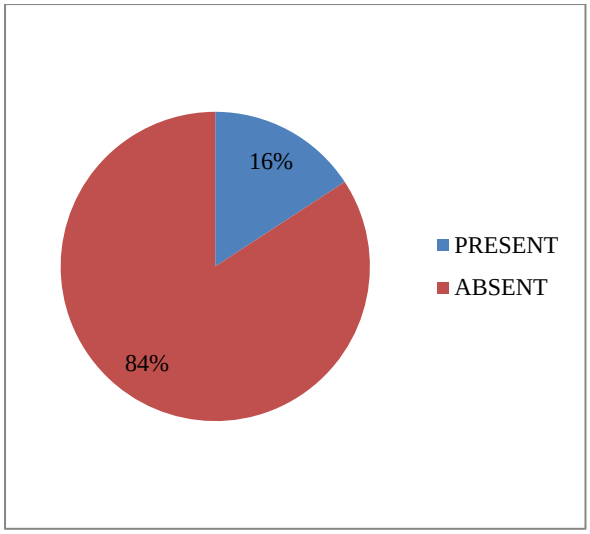

Figure 6: Facial nerve injuries.

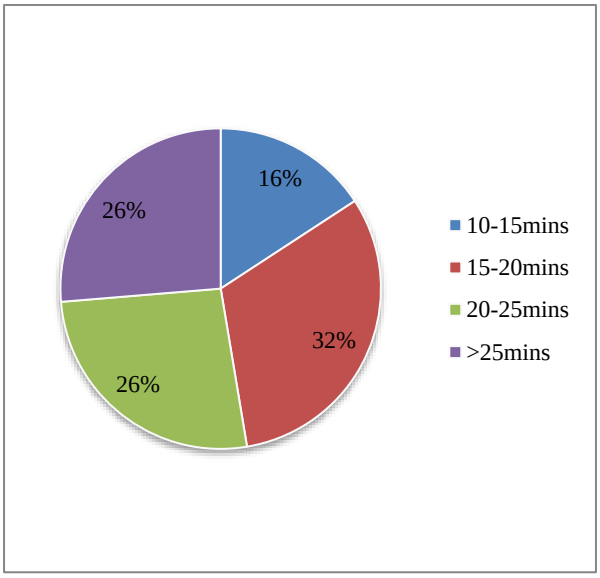

Figure 7: Time taken to locate facial nerve distance.

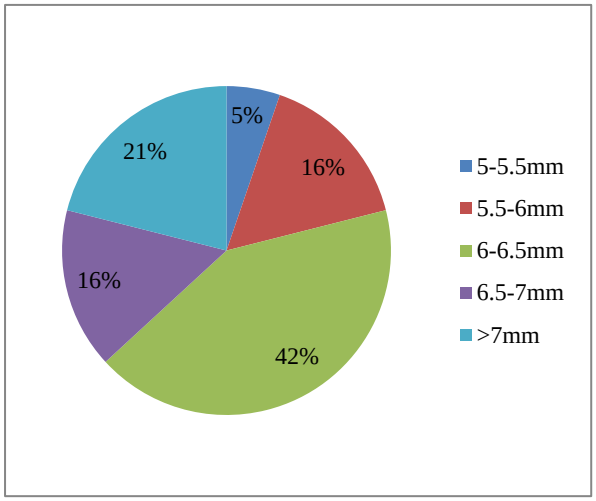

Figure 8: Distance of FNT to PBDM.

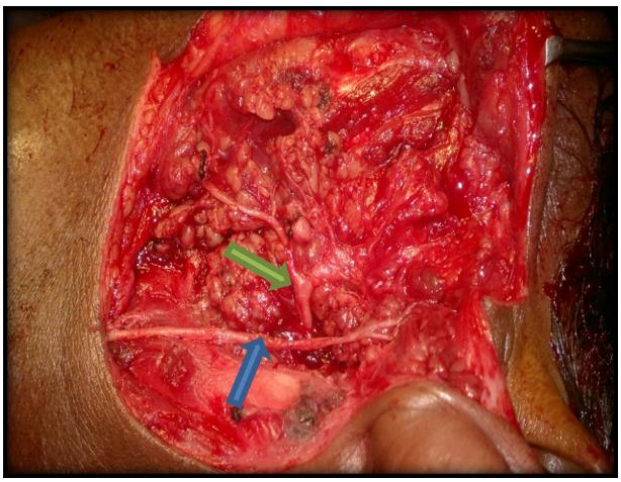

Figure 9: Intraoperative image depicting: black arrow: greater auricular nerve; green arrow: facial nerve trunk.

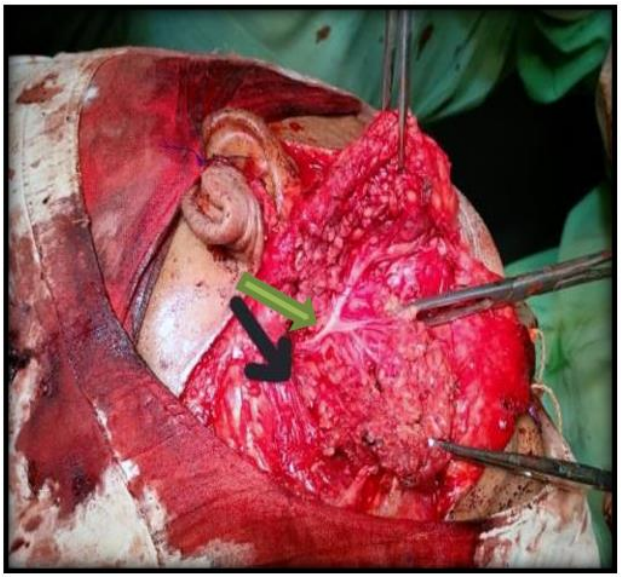

Figure 10: Intraoperative image depicting: black arrow: posterior belly of digastric muscle green arrow: facial nerve trunk.

Surgical routine includes Modified Blair's Incision followed by elevation of flap. Identification and preservation of greater auricular nerve. Identification of posterior belly of "Digastric muscle" first. Then approaching anteromedially to locate the "Facial nerve trunk" followed by tracing all the terminal branches assisted with microscope. Datas like distance of facial nerve trunk from posterior belly of digastric muscle, time taken to locate it was recorded intraoperatively. Patients were analysed immediate post op and after 1-month post-surgery along with their Histopathological reports. Surgeon's satisfaction level with this procedure was also taken into account.

We had 12 (n=19, 63.16%) cases of pleomorphic adenoma, 2 (n=19, 10.53%) of mucoepidermoid

carcinoma, simple epithelial cysts, Warthin's tumour each, 1 (n=19, 5.23%) case of squamous cell carcinoma (Figure 3).

Other than idiopathic (31.58%), smoking 36.84% and tobacco 21% was found relevant among other aetiologies. A total of 5 (n=19, 26.3%) patients underwent Total Parotidectomy whereas 14 (n=19, 73.68%) patients underwent superficial parotidectomy (Figure 4). Facial nerve trunk was preserved adequately in 16 out of 19 (84.21%) cases using the posterior belly of digastric muscle exclusively as the anatomical landmark. Only 3 patients (15.79%) suffered facial nerve paresis following surgery (HB Grade 3-5) 2 of them had injury to marginal mandibular nerve and only 1 suffered difficulty in eye closure (Figure 5).

The average amount of time spent to locate the facial nerve trunk was estimated to be 21.78 mins (21.78±5.17). The total operative time ranged from 60-150 mins (Figure 6). The average distance of the facial nerve trunk from the anterior border of the posterior belly of digastric was calculated to be 6.44 mm (6.44±0.62) (Figure 7). No other complications of parotid surgery like flap necrosis, sialocele, salivary fistula was found post operatively at 4 weeks post op.

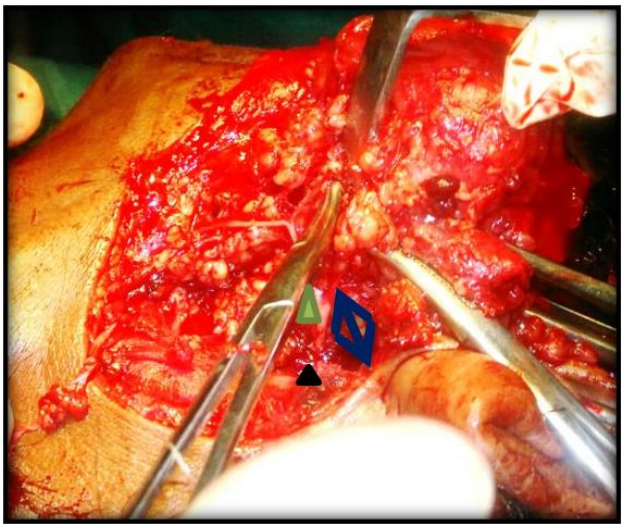

Figure 11: Black arrow: "posterior belly of digastric muscle"; green arrow: "facial nerve trunk" blue arrow: the distance.

Table 1: Demographic details with various parotid diseases undergoing parotidectomy and remarks on facial nerve viability post-surgery of the 19 patients.

S.no	Age (in years)	Sex	Diagnosis	Surgery	Time taken to locate FNT (in minutes)	Distance of FNT from PBDM (in mm)	Remarks on facial nerve palsy
1	30	Female	Pleomorphic adenoma	Superficial parotidectomy	15	6.5	None
2	35	Female	Pleomorphic adenoma	Superficial parotidectomy	17	6.2	None
3	59	Female	Squamous cell carcinoma	Total parotidectomy	31	6.8	None
4	50	Male	Pleomorphic adenoma	Superficial parotidectomy	20	7.4	None
5	55	Male	Warthins tumour	Total parotidectomy	22	5.6	HB grade 3: marginal mandibular nerve palsy
6	28	Female	Simple epithelial cyst	Superficia parotidectomy	15	7.2	None
7	54	Female	Pleomorphic adenoma	Superficial parotidectomy	19	5.6	None
8	40	Female	Pleomorphic adenoma	Superficial parotidectomy	23	6.8	None
9	45	Male	Mucoepidermoid carcinoma	Total parotidectomy	27	6.5	HB grade 3: marginal mandibular nerve palsy
10	46	Male	Pleomorphic adenoma	Superficial parotidectomy	20	5.6	None
11	48	Male	Pleomorphic adenoma	Superficial parotidectomy	17	7.4	None
12	48	Female	Pleomorphic adenoma	Superficial parotidectomy	22	6.2	None

Continued.

S.no	Age (in years)	Sex	Diagnosis	Surgery	Time taken to locate FNT (in minutes)	Distance of FNT from PBDM (in mm)	Remarks on facial nerve palsy
13	50	Male	Warthins tumour	Total parotidectomy	28	6.7	None
14	54	Female	Pleomorphic adenoma	Superficial parotidectomy	18	6.1	None
15	38	Female	Pleomorphic adenoma	Superficial parotidectomy	30	6.2	None
16	34	Female	Pleomorphic adenoma	Superficial parotidectomy	22	5.5	None
17	30	Female	Simple epithelial cyst	Superficial parotidectomy	15	7.4	None
18	62	Male	Mucoepidermoid carcinoma	Total parotidectomy	28	6.5	HB grade 5: difficulty eye closure
19	32	Female	Pleomorphic adenoma	Superficial parotidectomy	22	6.2	None

DISCUSSION

The facial nerve trunk travels about 1.3 cm out of the stylomastoid foramen before entering the parotid gland.[12] It breaks down into five branches inside the gland, superiorly into Temporal and zygomatic, and inferiorly into buccal, marginal mandibular and cervical branches. These branches supply the forehead, eye, face, temporal area, and upper part of neck separately on the same side. Due to their close relationship to the parotid gland, the facial nerve trunk and its terminal branches are extremely vulnerable to damage during surgery, which can result in facial nerve paresis.[13] In order to avoid long-term aesthetic consequences and medical-legal problems resulting from its damage, it is necessary to protect both the trunk and the terminal branches.[3]

There are a number of methods for identifying the facial nerve, including anterograde and retrograde methods, as well as the use of nerve monitors, gamma probes, and stimulators.[8-11] In this study, we have covered the most common, basic and efficient method for identifying and preserving the facial nerve trunk and its terminal branches. Finding the facial nerve trunk quickly is made easier by anatomical knowledge of the location and orientation of the fibers of the "Posterior Belly of the Digastric Muscle," which is medial to the sternocleidomastoid muscle. By drawing a line from the Mastoid tip along the PBDM to the styloid, one can clearly identify the FNT, situated roughly 0.5 cm deep between the digastric groove of the mastoid tip to the medial tandem of the 'posterior belly of the digastric muscle.' It can be quickly identified by drawing a line from the Mastoid tip to the styloid process along the PBDM, which conforms to the other published literature.[14-16]

The study found that the average distance of the facial nerve trunk from the anterior border of the posterior belly of the digastric was 6.44 mm, with an average time of 21.78 minutes to locate it. In contrast, the average distance of the FNT from the Tragal pointer, if taken into consideration, is approximately 13 mm, which is more challenging to locate since the tragal pointer is an asymmetric, movable cartilaginous structure with a skewed, blunt tip.[17] The surgeons are also completely satisfied in prompt identification and preservation of the FNT and its terminal branches using the Posterior belly of digastric muscle as a robust indicator. A good anatomical knowledge with fine surgical skills and expertise are the true treasures for protecting the delicate facial nerve and forbid facial disfigurement.

CONCLUSION

From the above study, it is revealed that, good anatomical knowledge about the facial nerve trunk in relation to Posterior belly of Digastric muscle is highly essential for preserving the nerve. Quick exposure of the "Posterior belly of Digastric muscle," followed by searching of the "facial nerve trunk" just antero-medial to the anterior border of the muscle at an approximate distance of 6.5mm can be done within an approximate time of 20-22mins from the skin incision. Followed by identification of terminal branches anterogradely assisted with microscope can help preserve all the branches of facial nerve. Pleomorphic adenoma being the most commonly occurring parotid gland lesion and superficial parotidectomy being the mostly performed surgery, requires well expertise and fine surgical skill to prevent permanent facial disfigurement.

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Ethical approval: Not required

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