Main Article

Facial Nerve Identification during Parotidectomy by a Safe and Reliable Convergence Technique

https://doi.org/10.47210/bjohns.2025.v33i3.230

Pruthvi Raj S,[1] Bandiahanapalya Narasappa Yogesh,[1] Vijaya T N,[1] Tapasya Behera,[1] Neha K S[1]

ABSTRACT

Introduction

Parotidectomy is the technically challenging surgery where identification of facial nerve becomes utmost important to avoid aesthetic and functional complications. In our study we aim to describe a reliable and easy triangle technique to identify the facial nerve trunk.

Materials and Methods

A prospective observational study was carried out in the department of ENT at a tertiary care centre from February 2023 to February 2025. 30 patients presenting with parotid swelling to the department were evaluated and taken up for parotidectomy (superficial/total) based on clinical, radiological findings. Surgical procedures were done by using the convergence technique for identification of the facial nerve trunk. Pre-op and post-op facial nerve function was monitored clinically using House Brackmann grading.

Results

30 patients were selected for the study. Majority of the patients were males [21;70%]. Mean operative time was 80 ± 6.1mins. Most of the patients underwent superficial parotidectomy (76.67%). Pleomorphic adenoma (63.3%) was the most common tumour of parotid gland. The facial nerve was identified by convergence technique in all cases. Postoperatively temporary palsy of marginal mandibular nerve was present in 3 cases.

Conclusion

Convergence technique is a safe & reliable landmark for the identification of facial nerve trunk during parotid surgery. It can help in reducing facial nerve injury during parotidectomy.

Keywords

Facial nerve; Mastoid; Parotid Gland

The facial nerve is the seventh cranial nerve which contains sensory,motor, parasympathetic nerve fibers that provides innervation to many regions of the head and neck. It is one of the most important structures encountered during parotidectomy. The neurovascular structures that pass through the parotid gland from lateral to medial are facial nerve, retromandibular vein, external carotid artery, superficial temporal artery and maxillary artery.[1,2] The greater auricular nerve emerges along the posterior aspect of the sternocleidomastoid muscle at the Erb's point, ascends vertically across the oblique sternocleidomastoid muscle and its branches enter the gland from the neck and remains superficial.[3] Parotidectomy is indicated for various benign and malignant neoplasms, chronic inflammatory diseases, sialolithiasis, intra-parotid cysts/ sinuses and lymphadenopathy and many other diseases of parotid. There are various techniques published in literature for identification of facial nerve. In this studywe aim to elaborate the importance of convergence technique[4] of identification of facial nerve which helps to reduce the injury to facial nerve during parotidectomy.

1 - Department of ENT, Kempegowda Institute of Medical Sciences , Bengaluru

Corresponding author:

Dr. Pruthvi Raj S

email: pruthvirajjs@gmail.com

Materials and Methods

A prospective observational study was carried out in the

department of ENT at a tertiary care centre from February 2023 to February 2025.

Number of patients: 30

Inclusion criteria:

a) Patients in age group between 15-60years.

b) Patients presenting with parotid swelling (benign & malignant; Fig. 1).

c) Patients who gave written informed consent for the study.

Exclusion criteria:

a) Patients who did not give consent for the study.

b) Patients in age group less than 15years and more than 60 years.

c) Patients with inflammation of parotid (parotitis).

Patients were evaluated clinically and subjected to radiological investigations (Ultrasonography & contrast enhanced magnetic resonance imaging of parotid and neck; Fig. 2) and FNAC (Fine needle aspiration cytology) of the swelling Patients were taken up for parotidectomy (superficial/total) based on the findings. Surgical procedures were done by using the convergence technique for identification of the facial nerve trunk. Modified blair's

Fig. 1. Left parotid swelling

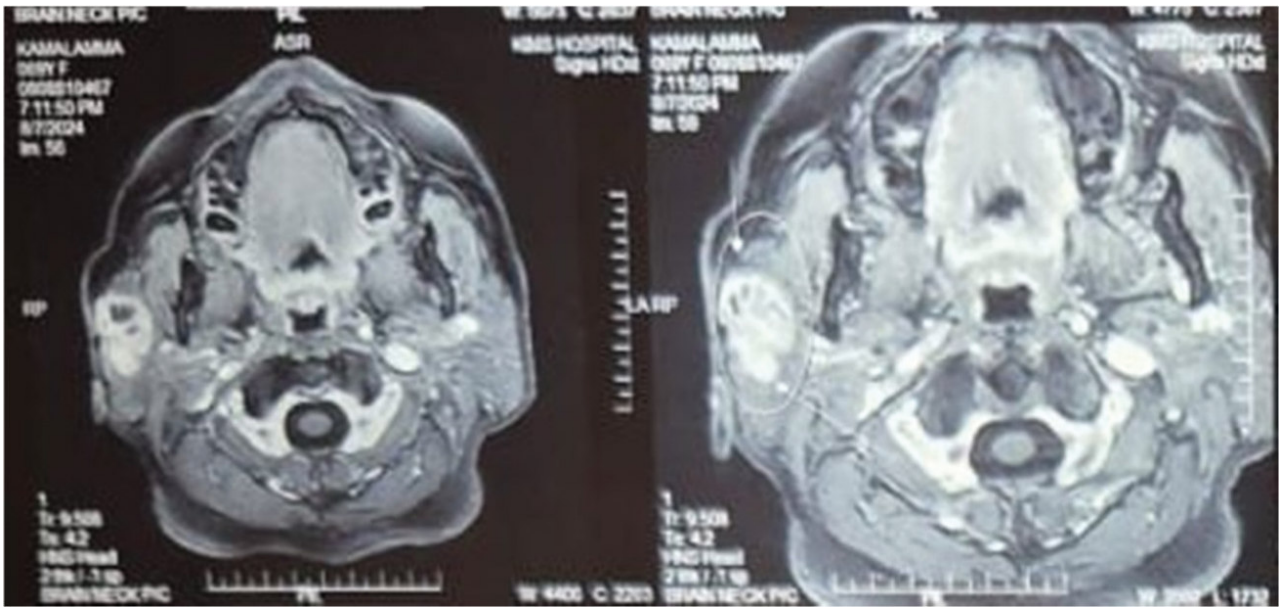

Fig. 2. Contrast enhanced MRI of parotid swelling

incision was made. Skin subcutaneous tissue dissected. Superficial musculoaponeurotic system (SMAS) & subplatysmal flaps were elevated. Greater auricular nerve identified and branch to ear lobule preserved. The tail of parotid is dissected off from sternocleidomastoid. Posterior belly of digastric is exposed and its attachment to mastoid is identified . The preauricular space is opened by dividing attachments of parotid gland to cartilaginous external auditory canal. The tragal pointer is identified. Dissection is further carried deeper to expose styloid process (Fig. 3).

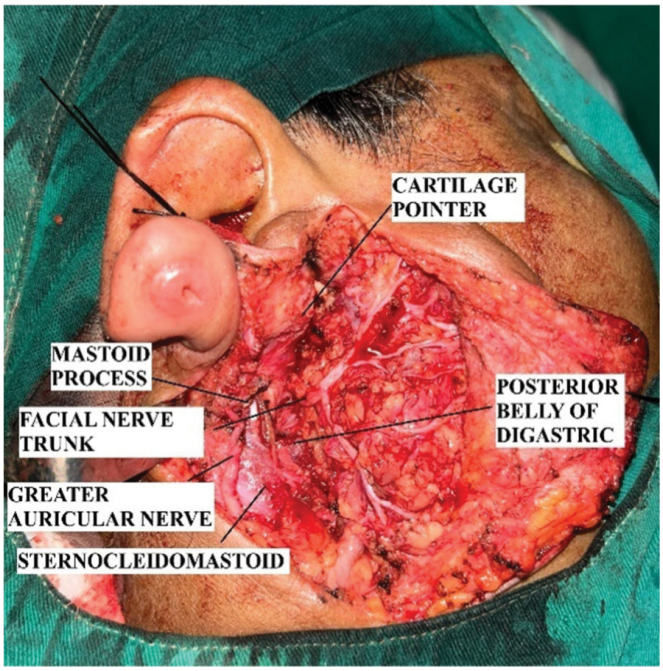

Fig. 3. Anatomical landmarks for facial nerve identification

Triangle Landmarks:[4] A triangle (Fig. 4) was made from

a. The tragus to the mastoid tip anteriorly,

b. Along the long axis of the tragus to the styloid process

c. From the mastoid tip crossing the insertion of the posterior belly of the digastric muscle to the styloid process.

Facial nerve trunk identification by convergence technique : The facial nerve trunk was identified at the point of convergence of the lines from the tragal pointer and mastoid tip across the posterior belly of the digastric muscle to the styloid process (A meeting point lateral to the styloid process at the stylomastoid foramen).

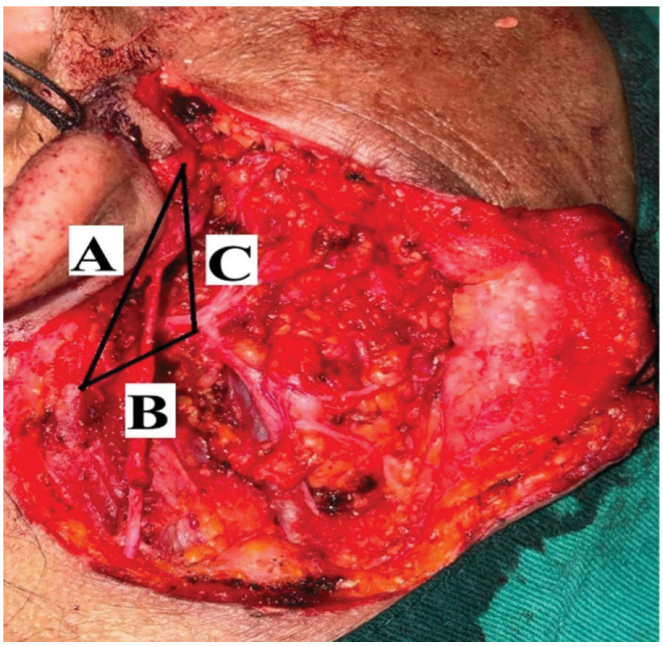

Fig. 4. Convergence triangle formed by A) line from tragal pointer to mastoid tip; B) line from mastoid tip to styloid process ; C) line from tragal pointer to styloid process

The most easily identifiable and anatomically constant landmarks (tragal pointer, posterior belly of digastric, styloid process) were selected and their respective distance to the facial nerve main trunk was measured. Pre-op and post-op facial nerve function was monitored clinically using House Brackmann grading. Patients were followed for a period of 6 months and facial nerve function was evaluated clinically using House Brackmann grading. The data was presented with descriptive statistics using mean, range and percentages.

Results

30 patients were selected for the study (table I). Majority of the patients were males [21;70%]. Mean operative time was 80 ± 6.1mins. Most of the patients underwent superficial parotidectomy (76.67%). Pleomorphic adenoma (63.3%) was the most common tumour of parotid gland.The facial nerve was identified by convergence technique in all cases. Postoperatively

temporary palsy of marginal mandibular nerve was present in 3 cases. The respective distances fromtragal pointer, posterior belly of digastric, styloid process to the facial nerve main trunk is depicted in table II.

Table I : Characteristics of study patients

CHARACTERISTICS	NUMBER
Total patients	30
Mean age	42 ± 2.1 years (19 yr – 60 yr)
Male Female M:F ratio	21 (70%) 09 (30%) 2.3:1
Operative time	Range – 60 – 140 mins Mean – 80 mins ± 6.1
Surgery	
Superficial parotidectomy Total parotidectomy	23 (76.67%) 7 (23.33%)
Hisopathological examination	
Pleomorphic adenoma Warthins tumour Parotid sialadenitis Parotid cyst Parotid sinus Adenoid cystic carcinoma Mucoepidermoid carcinoma Squamous cell carcinoma	19 (63.3%) 03 (10%) 02 (6.67%) 02 (6.67%) 01 (3.33%) 01 (3.33%) 01 (3.33%) 01 (3.33%)
Complications	
Temporary facial palsy Permanent facial palsy	03; marginal mandibular branch 00

Table II : Distance between anatomical landmarks and facial nerve trunk

LANDMARKS	MEAN DISTANCE
Tragal pointer to facial nerve trunk	12± 1.3 mm (10-15mm)
Posterior belly of digastric to facial nerve trunk	6.7 ± 0.5mm (5-10mm)
Styloid process to facial nerve trunk	9.2mm ± 0.5mm (4.1 -17.9mm)
Base of styloid process to superior border of origin of posterior belly of digastric	0.70 cm ± 0.3cm (0.42 – 0.96 cm)

Discussion

The extratemporal course of facial nervestarts from its exit from the stylomastoid foramen. It travels a short distance and then divides into two major branches namely upper zygomatico-temporal and lower cervico-facial branches. These branches supply the ipsilateral face, eye, forehead, temporal region and upper neck.[5,6]

The facial nerve is closely related to the parotid gland and other vascular structures which pass through this gland. So injury to the nerve trunk or its branchescan cause functional and aesthetic problems to the patient. As a result, it is of utmost importance to identify and preserve the facial nerve. In this study facial nerve trunk (FNT) and its brancheswere identified with relative ease and preserved by means of convergence technique.

Stylomastoid foramen (SMF) isa very constant palpatory landmark for facial nerve situated posterolateral to the styloid process from where the FNT exitsthe temporal bone. In this study the convergence point was taken as a reliable landmark based on the styloid process using the triangle technique described above to locate the FNT from the SMF.

Another landmark for FNT is tragal pointer (TP) and the nerve usually lies approximately 1-1.5 cm deep and slightly antero-inferior to the tip of the tragal cartilage (TC).[7,8] The only drawback of this is that it is a cartilaginous structure which is mobile, asymmetrical having a blunt and irregular tip. In this study convergence point was marked on the basis of styloid process with another anatomical landmark such as SMF, TC and TP. In this study triangle was considered to find out the point of convergence where mastoid process was taken mainly a outer palpatory landmark, the process lies deep to the insertion of the sternocleidomastoid muscle (SCM). Posterior belly of the digastric (PBD) lies medial to SCM. The FNT lies approximately 1.0cm deep to the medial attachment of the posterior belly of the digastric muscle to the digastric groove of the mastoid tip which is easily identifiable by drawing a line from the MT along the PBDM to the styloid process which corresponds to the other published literature.[9,10] In this study it was observed that this line meets to a point posterolateral to the styloid process with another line drawn from TP to styloid process; that is the convergence point lies over the FNT. In the present study, we found that the facialnerve trunk lies at a distance of 6.7±0.5mm mm from PBD. Rea et al. demonstratedthat the main trunk of the facial nerve was found to lie5.5 ± 2.1 mm from the PBD.[11]

The present study was done to locate the ease and accuracy of facial nerve identification using the triangle formed by the tragal cartilage, the mastoid tip and the styloid process. The FNT was accurately and quickly found at the point of convergence of the long axis from the TP to SP and from MT across the PBDM to styloid process. Postoperatively temporary palsy of marginal mandibular nerve was present in 3 cases secondary to handling and edema of nerve branch during dissection which recovered within 3 months with treatment.

Conclusion

Parotidectomy is a technically challenging surgery. Thissurgery becomes less complicated for thesurgeon once the facial nerve trunk is identified. Foreasy and prompt identification of the nerve trunk, thesurgeon needs to systematically look for the anatomicallandmarks. The point of convergence of the triangle technique is the consistent, prominent and easily identifiable anatomical landmark described in this article and it allowed a fast and safe identification of the facial nerve and will be of significant help during parotid surgery. The final success of the surgery depends to a vast extent on the safe handling of the facial nerve.

References

1. de Ru JA, van Benthem PP, Bleys RL, Lubsen H, Hordijk GJ. Landmarks for parotid gland surgery. J Laryngol Otol. 2001 Feb;115(2):122-5. doi: 10.1258/0022215011907721. PMID: 11320828
2. Saha S, Pal S, Sengupta M, Chowdhury K, Saha VP, Mondal L. Identification of facial nerve during parotidectomy: a combined anatomical & surgical study. Indian J Otolaryngol Head Neck Surg. 2014 Jan;66(1):63-8. doi: 10.1007/s12070-013-0669-z. Epub 2013 Jul 24. PMID: 24605304; PMCID: PMC3938689

3. Murphy R, Dziegielewski P, O'Connell D, Seikaly H, Ansari K. The great auricular nerve: an anatomic and surgical study. J Otolaryngol Head Neck Surg. 2012 Apr;41 Suppl1:S75-7. PMID: 22569054
4. Islam MA, Rahman MM, Mohammad T, Kazi MM, Chowdhury NH, Rahman ASML, Milki FU. Convergence Technique is the Easy and Reliable Landmark for Identification of the Facial Nerve in Parotid Surgery. On J Otolaryngol&Rhinol. 5(4): 2022. OJOR. MS.ID.000619
5. De Ru JA, van Benthem PP, Bleys RL, Lubsen H, Hordijk GJ. Landmarks for parotid gland surgery. J Laryngol Otol. 2001 Feb;115(2):122-5. doi: 10.1258/0022215011907721. PMID: 11320828
6. Witt RL, Weinstein GS, Rejto LK. Tympanomastoid suture and digastric muscle in cadaver and live parotidectomy. Laryngoscope. 2005 Apr;115(4):574-7. doi: 10.1097/01.mlg.0000161343.85009.4c. PMID: 15805861
7. Owusu JA, Parker NP, Rimell FL. Postoperative facial nerve function in pediatricparotidectomy: a 12-year review. Otolaryngol Head Neck Surg. 2013 Feb;148(2):249-52. doi: 10.1177/0194599812467299. Epub 2012 Nov 14. PMID: 23151833
8. Hogg SP, Kratz RC. Surgical Exposure of the Facial Nerve. *AMA Arch Otolaryngol*. 1958;67(5):560–561. doi:10.1001/archotol.1958.00730010574011
9. Kratz RC, Hogg S. Surgical exposure of the facial nerve. J Laryngol Otol. 1958 Nov;72(11):902-5. doi: 10.1017/s0022215100158761. PMID: 13611406
10. JANES RM. Tumours of the parotid gland. Ann R CollSurg Engl. 1957 Jul;21(1):1-20. PMID: 13445068; PMCID: PMC2413517
11. Rea PM, McGarry G, Shaw-Dunn J. The precision of four commonly used surgical landmarks for locating the facial nerve in anterograde parotidectomy in humans. Ann Anat. 2010 Feb 20;192(1):27-32. doi: 10.1016/j.aanat.2009.09.005. Epub 2009 Nov 1. PMID: 19883997.