IDENTIFICATION OF THE FACIAL NERVE TRUNK DURING SUPERFICIAL PAROTIDECTOMY BY TRIDENT LANDMARK

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ABSTRACT

Background: The facial nerve is one of the most important structures encountered during surgical removal of parotid gland tumours especially since these closely approximate the nerve . The importance of the facial nerve and controversies about how to identify it are exemplified by the multiple anatomical landmarks described to identify the facial nerve during parotidectomy. The trident landmark is one of these anatomical landmarks (The facial nerve forms the center point between the base of the styloid process and the origin of the posterior belly of the digastric muscle).

Aim of the study: To evaluate the accuracy of the trident landmark as a proposed anatomical landmark for easy, accurate and safe identification of the facial nerve trunk during superficial parotidectomy.

Patients and methods: This clinical prospective study was conducted between January 2018 and September 2018 at Al Fayoum University Hospital (FUH), Fayoum University, Egypt and Kafr El-Sheikh university hospital (KUH), Kafr El-Sheikh University, Egypt. It included 25 patients; 14 (56%) males and 11(44%) females with a mean age of 42.68 ±17.53 years. All patients had benign tumors of the superficial lobe of the parotid gland and were subjected to superficial parotidectomy. Outcome was evaluated regarding clinical success of facial nerve identification by trident landmark and early post operative complications.

Results: All 25 patients were subjected to superficial parotidectomy. Facial nerve trunk was successfully identified in all the patients with no intra-operative complications. Operative time ranged from 70 to 135 minutes with a mean time 106.80 ±16.13 minutes. Facial nerve deficit of the marginal mandibular nerve (MMN) was noted in 1 patient (4 %), Surgical site infection (SSI) was noticed in 1 patient (4%), Skin flap necrosis in the retroauricular area was also viewed in 1 patient (4%) and no hematoma was noticed in all the patients.

Conclusion: Ttident landmark described here facilitates the identification of facial nerve trunk during superficial parotidectomy with relative ease, safety and accuracy. This can be a very useful method to minimize the facial nerve injury during parotid surgery.

KEY WORDS: facial nerve trunk, superficial parotidectomy, styloid process, mastoid process, digastric muscle.

INTRODUCTION

Salivary gland tumors are rare neoplasms and consist about 2-3 % of the head and neck tumors[1]. About 80% of salivary gland tumors occur in parotid, and approximately 70-75% of the parotid tumors are benign[2]. The recommended treatment for benign tumors of the salivary glands is complete resection with surgical margins. With complete resection of the tumor and the tumor sections involved, the prognosis is excellent.

Several structures pass through the parotid gland and are of considerable surgical importance; the facial nerve is the most important among these structures[2].

Risky course of the facial nerve within the parotid gland makes it susceptible to considerable damage risk during parotid surgery[3].

Knowledge of the key landmarks of the facial nerve trunk (FNT) in parotid gland is essential for a safe and effective surgical intervention[4].

Several landmarks have been discovered and used. These landmarks include the Posterior belly of Digastric muscle (PBD) [5, 6], transverse process of axis [7], styloid process [8], Tragal pointer (TP) [9], tympanomastoid suture (TMS) [10, 11], stylomastoid artery[12] and trident landmark[13].

PATIENTS AND METHODS

As a clinical prospective case series study, the study was conducted between January 2018 and September 2018 at Al Fayoum University Hospital (FUH), Fayoum University, Egypt and Kafr El-Sheikh university hospital (KUH), Kafr El-Sheikh University, Egypt. It included 25 patients with benign tumors of the superficial lobe of the parotid gland.

Candidate patients underwent superficial parotidectomy after assessment for eligibility. Pre-operative assessment included thorough clinical examination including facial nerve assessment, routine laboratory investigations, radiological assessment, fine needle aspiration cytology (FNAC) and post-operative assessment. Pre-operative medical information was provided to all patients regarding the tumor behavior, the goals, rationale, risks and potential complications of the operation. A written consent was obtained from all patients before enrollment in the study according the ethical committee rules.

General anesthesia was the method used in all patients. No perioperative antibiotics were given unless specifically indicated. All patients were put in hyperextended neck with the face turned to the opposite side. Infiltration of vasoconstricting agent (adrenaline 1:200) along the planned skin incision was used.

In the present study, the initial steps of surgery were similar to a routine parotidectomy with a modified Blair incision along the preauricular skin crease that turns below the root of the ear lobule anteriorly in a horizontal neck crease, approximately 5 cm below the angle of the mandible (Figure 1).

Figure 1: An intra-operative image for "modified Blair" incision

A subplatysmal and SMAS flaps were elevated to expose the parotid gland with the capsule. The greater auricular nerve was identified and preserved (Figure 2).

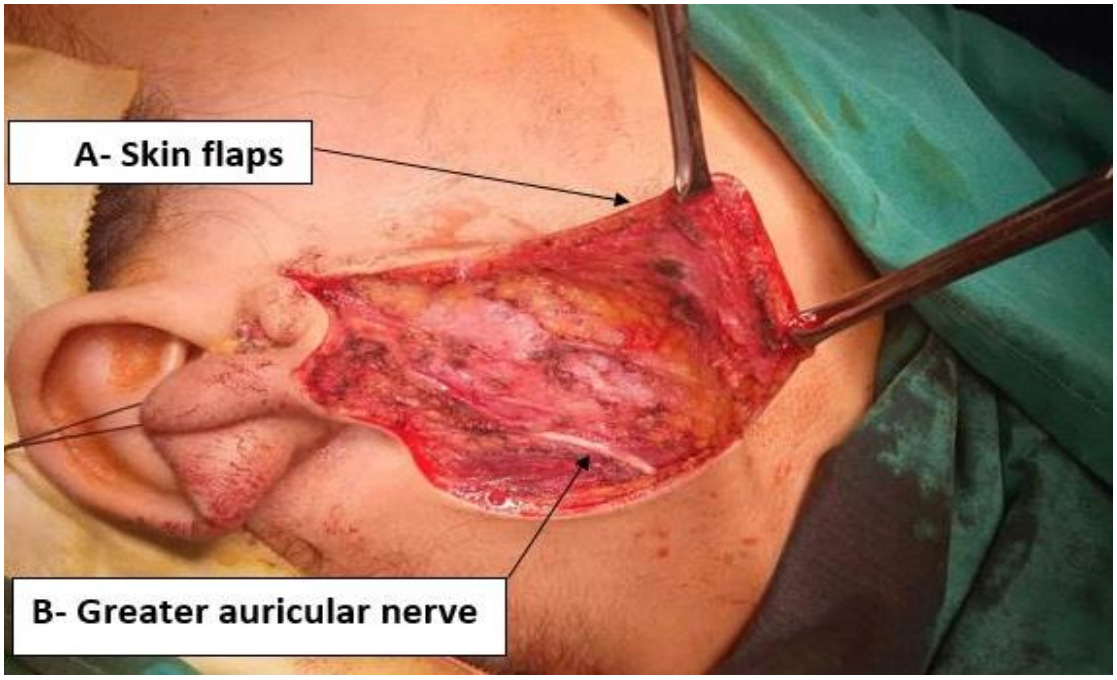

Figure 2: An intra-operative image showing a) skin flaps, b) greater auricular nerve.

Dissection was performed using a bipolar cautery vertically along the anterior surface of the tragal cartilage until the bony anterior wall of the external auditory canal (EAC), from there the dissection was done using a blunt instrument.

The next bony structure which is the only bony landmark present immediately deep to the bony EAC was the base of the styloid process which could be easily identified, this forms the upper point of the trident landmark.

The posterior belly of the digastric muscle was identified deep to the sternocleidomastoid muscle and was followed to its origin from the mastoid tip (Figure 3).

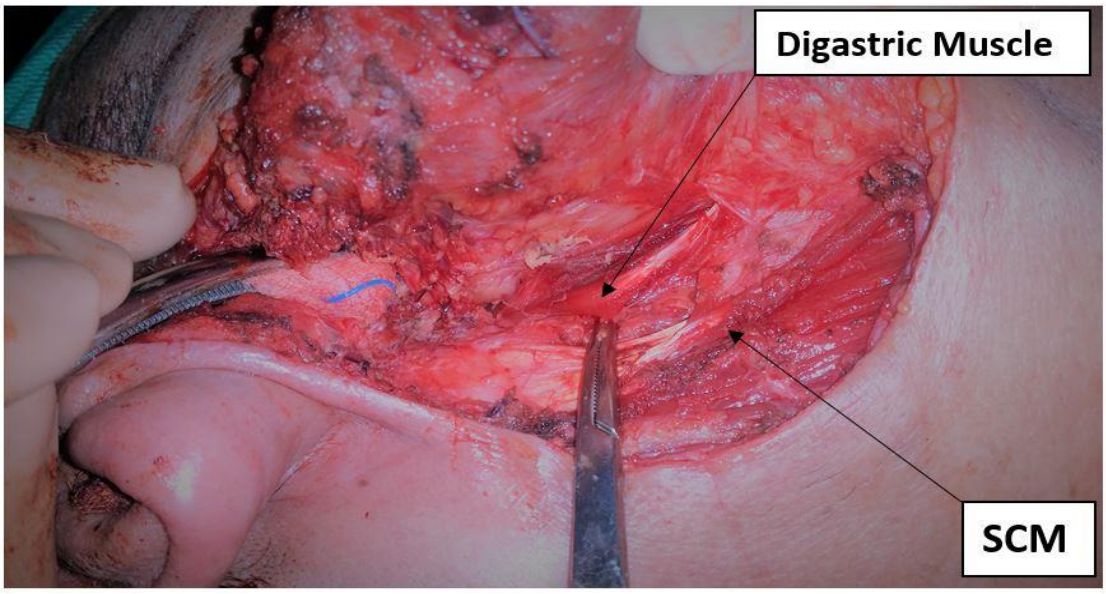

Figure 3: An intra-operative image showing the postero-inferior aspect of the parotid gland separated from the anterior border of the SCM.

The superior border of the origin of the posterior belly of digastric muscle from the digastric notch of mastoid process formed the lower point of the landmark , the area in-between these two points contained the facial nerve trunk (0.5 – 0.9 cm).

The emergence of the facial nerve in between the two structures was similar to the central prong of a trident (Figure 4).

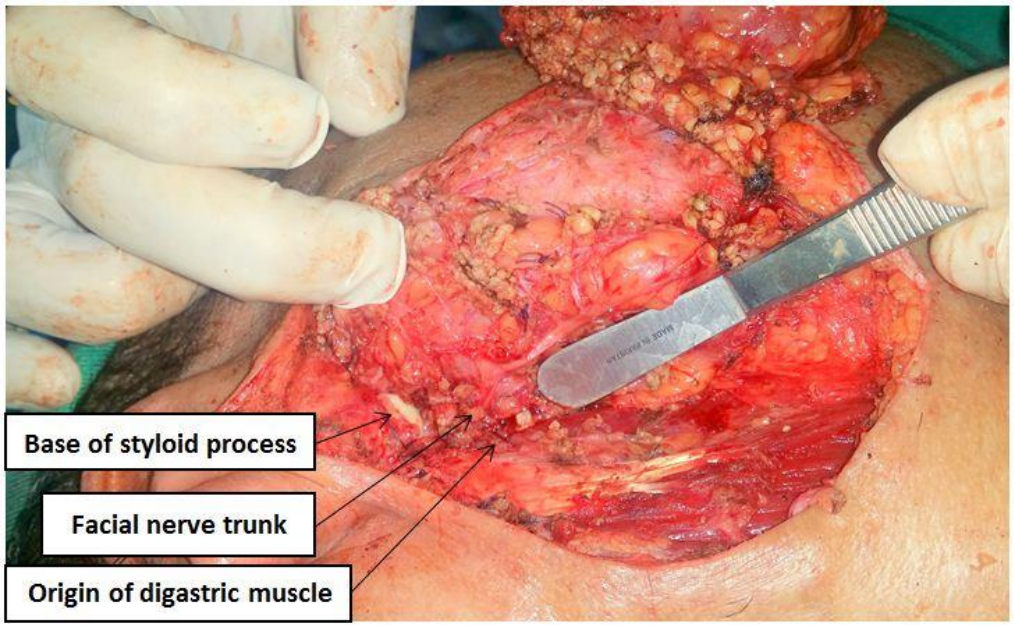

Figure 4: An intra-operative image showing location of facial nerve trunk and landmarks

Careful dissection in the direction of the central prong of the trident helped in identifying the facial nerve.

Once the main trunk of the facial nerve was identified, the rest of the dissection was similar to the routine parotidectomy, tracing the divisions and further branches of the facial nerve with haemostasis, closure in layers over a hemovac drain with Vicryl sutures and 6-0 fast-absorbing sutures in the skin.

RESULTS

Study included 25 patients; 14 (56%) males and 11(44%) females with

a mean age of 42.68 ±17.53 years.

Table (1): Demographic data (n=25)

	No.	%
Gender		
Male	14	56.0
Female	11	44.0
Age (years)		
Min. – Max.	15.0 – 79.0	
Mean ± SD.	42.68 ± 17.53	
Median	40.0	

Right parotid gland was affected in 14 patients (56%) and left parotid gland was affected in 11 patients (44%), tumor size ranged clinically from 1 cm to 8 cm with mean size 3.20 ±1.35 cm.

Different types of consistency were noted in the study group namely; soft to firm in 2 patients (8%) and firm in 23 patients (92%).

Table (2): Clinical data (n=25)

Clinical criteria	No.	%
Side		
Right	14	56.0
Left	11	44.0
Size (cm)		
Min. – Max.	1.0 – 8.0	
Mean ± SD.	3.20 ± 1.35	
Median	3.0	
Consistency		
Soft to firm	2	8.0
Firm	23	92.0

The size of the swellings measured by US ranged between 0.90 and 7.50 cm with a mean size 3.04 ±1.37cm while the size of the swellings measured by CT ranged between 1.00 and 7.80 cm with a mean size 3.10 ± 1.38 cm.

There was no statistically significant difference between the radiological size measured by neck US and neck CT (p = 0.417).

Table (3):Descriptive analysis of the patients according to radiological criteria (n=25)

Radiological criteria (cm)	US neck	CT neck	Z	P
Min. – Max.	0.90 – 7.50	1.00 – 7.80		
Mean ± SD.	3.04 ± 1.37	3.10 ± 1.38	0.811	0.417
Median	3.0	3.0		

Z: Z for Wilcoxon signed ranks test
p: p value for comparing between US neck and CT neck

Preoperatively, 21 patients (84%) were diagnosed by FNAC as PA, 3 patients (12%) were diagnosed as adenolymphoma and 1 patient (4%) was found to have chronic nonspecific inflammation

Table (4): FNAC finding (n=25)

FNAC	No.	%
Pleomorphic adenoma	21	84.0
Adenolymphoma	3	12.0
Chronic nonspecific inflammatory cells	1	4.0

Facial nerve trunk was successfully identified in all the patients (100%) with no intra-operative complications was noticed during surgery namely; facial nerve injury, tumor or capsule rupture and great vessel injury.

Early post-operative complications such as facial nerve deficit of the marginal mandibular nerve (MMN) was noted in 1 patient (4 %), which was managed conservatively by neurotonics and vitamin B6 supplementation. Other post-operative complications such as, surgical site infection (SSI) was noticed in 1 patient (4%) which was managed conservatively by frequent dressing and antibiotics, skin flap necrosis in the retroauricular area was also viewed in 1 patient (4%) which was managed conservatively and no hematoma was noticed in all the patients.

Table (5): Post-operative assessment complications (n=25)

Post-operative assessment	No.	%
Concussion of the marginal mandibular nerve (MMN)		
No	24	96.0
Yes	1	4.0
Hematoma		
No	25	100.0
Yes	0	0.0
Wound Infection		
No	24	96.0
Yes	1	4.0
Skin Flap necrosis		
No	25	100.0
Yes	1	4.0

DISCUSSION

Facial nerve injury is the most common complication of parotid surgery as the two structures are intimately related to each other. The facial nerve along with the accompanying vessels creates a potential plane which lies in between the deep and superficial lobes of the parotid gland. Dissection in this plane is never possible until and unless the surgeon identifies the nerve and proceeds along the nerve and its branches. This clearly indicates to the fact that parotid gland surgery is purely an anatomical dissection.[14]

A detailed understanding of the operative anatomical landmarks during parotid surgery and a meticulous surgical exploration can help safeguarding the facial nerve trunk (FNT) and its branches.[15]

Landmarks for facial nerve trunk identification was described in the earlier part of the previous century as a result of the general awareness of poor surgical results (Wong, 2001).[16] Landmarks selected must be reliable and, above all, easy to identify (Roscic, 1980).[17] Bony structures are more suitable than soft tissue or cartilaginous landmarks because of their rigid and reliable anatomical location (de Ru et al., 2001).[18]

Trident landmark is a novel landmark for identification of FNT during parotid surgery introduced to literature by Joseph et al. (2015) who described the FNT between two fixed bony landmarks: the origin of the posterior belly of the digastric muscle from the digastric notch of the mastoid and the base of the styloid process with a distance ranged from 0.45 cm to 0.99 cm (mean: 0.72 cm).[13]

In the current study, we tried to assess the safety and accuracy of the trident

landmark for identification of the FNT during superficial parotidectomy. We have followed the same technique described by Joseph et al. (2015).[13]

In our study there was no intra-operative complications namely; injury of the facial nerve trunk, tumor or capsule rupture and great vessel injury. Post-operative paresis of the marginal mandibular nerve was noticed in one patient (4%).

Gaillard et al. (2005) reported that there is a high percentage of facial nerve dysfunction (42.7 % on the first postoperative day) immediately after parotidectomy which gradually improves over time to the tune of 30.7 % at 1 month post operatively and 0 % at 6 months after the surgery. The marginal mandibular branch was reported as the single most affected nerve branch following parotidectomy (48.2 %). The main landmark for FNT identification in their study was not specified.[19]

Papadogeorgakis (2011) noted in his study including 156 patients that transient facial nerve dysfunction declines from 60% after total parotidectomy, to 26% after superficial parotidectomy, 18% after partial superficial parotidectomy, and 11% after extra-capsular dissection. The rates of permanent dysfunction were reported as 4%, 1.9%, 0.2%, 1.2% and 3.5%, respectively. The main landmark for FNT identification in their study was not specified.[20]

Owusu et al. (2013) reported the incidence of immediate facial nerve paresis was 21 % (9/43). In this series also the most common branch involved was the marginal mandibular nerve (n = 7). The main landmark for FNT identification in their study was not specified.[21]

In the current study the early post-operative complications namely; SSI was noticed in one patient (4%), skin flap necrosis also was noticed in one patient (4%) and no wound haematoma was noticed in all the patients.

Papadogeorgakis (2011). Minor post-operative complications such as wound infections, hematomas, and small necrotic areas of skin were encountered in 19 of the 156 patients (12%). Partial skin necrosis occurred in only one patient, below the ear. [20]

Ruohoalho et al. (2017) reported in their study on 132 patients the postoperative surgical site infection in 17 of the 132 patients (12.9%) and it was variable according to the type of surgery; being 2 of 32 patients underwent SP (6.3%). In this series wound hematoma was encountered in 2 of 132 patients (1.5%); being 1 of the 32 patients underwent SP (3.1%).[22]

Infante-Cossio et al. (2018). 10 of 79 patients presented with hematoma at 1 week (12.7%) and the rate of surgical site infection was 0%.[23]

Regarding to the post-operative pathology, it was in accordance to that reported in literature. In the present study, pleomorphic adenoma was the commonest (84%), followed by adenolymphoma, which was noted in 12% of the patients.
We conclude that trident landmark described here facilitates the identification of facial nerve trunk during superficial parotidectomy with relative ease, safety and accuracy. This can be a very useful method to minimize the facial nerve injury during parotid surgery.

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