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Intraoperative Distance Between the Main Trunk of the Facial Nerve and Surgical Landmarks Used in Parotidectomy: A Prospective Study

ABSTRACT

Objective: To determine the mean distance of the main trunk of the facial nerve from two commonly employed surgical landmarks (tragal pointer and tympanomastoid suture line) among a sample of Filipino adults undergoing parotidectomy.

Methods:

Design: Prospective Descriptive Study

Setting: Tertiary Government Training Hospital

Subjects: 22 patients without facial paralysis undergoing surgery for parotid neoplasms were evaluated intraoperatively.

Results: The main trunk of the facial nerve was found to be 9.0mm (standard deviation of 2.8mm) from the tragal pointer and 6.1mm (standard deviation of 2.0mm) from the tympanomastoid suture line.

Conclusion: The mean distance from the main trunk of the facial nerve to two of the most commonly utilized landmarks in identification of the nerve during parotidectomy was 9.0mm (standard deviation of 2.8mm) from the tragal pointer and 6.1mm (standard deviation of 2.0mm) from the tympanomastoid suture line. These may serve as reference values for surgeons in safer identification and preservation of the facial nerve during parotidectomy.

Keywords: *facial nerve, parotidectomy, tragal pointer, tympanomastoid suture line, anatomic landmarks*

The facial nerve and the parotid gland share an intimate anatomic relationship. The gland is divided into superficial and deep lobes by a sagittal plane defined by the branches of the nerve. However, the gland is actually unilobar and the plane created by the fanning branches of the facial nerve is not a true anatomic separation into two distinct and discrete lobes.¹

During parotidectomy, several anatomical landmarks may be used to locate the facial nerve. One of the most commonly employed is the tragal pointer. The facial nerve is approximately 1 to 1.5 cm deep and inferior to it.² Another landmark used is the tympanomastoid suture line. It is about 6 to 8mm deep or medial to the nerve.³ This is considered to be the most reliable landmark.⁴ Other landmarks may be used such as tip of the mastoid process and the central point of the transverse process of the atlas which are bony projections.⁵

To the best of our knowledge, there are limited if any local studies on the use of these landmarks during parotid surgery on Filipinos. This study aims to determine the mean distances

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of the two most commonly used landmarks, the tragal pointer and the tympanomastoid suture line from the main trunk of facial nerve during parotidectomy.

METHODS

Study Design: Prospective descriptive study from April 2012- May 2013

Setting: Tertiary government hospital

Subjects: Twenty-two patients aged 18 and above with parotid neoplasms and no facial paralysis and who gave informed consent were included in the study.

Procedure: Under general anesthesia and endotracheal intubation, patients were placed in supine position with the head rotated to the contralateral side of the parotid tumor. A modified Blair incision was carried out, skin flaps were developed and the parotid gland was exposed.

The tragal pointer, a downward-protruding cartilaginous portion of the tragus was identified. This was followed by identifying the tympanomastoid suture line, a v-shaped sulcus between the antero – inferior margin of the external auditory canal and the anterior margin of the mastoid process of the temporal bone. Dissection was done to identify the main trunk of the facial nerve as shown in *Figure 1*.

Measurements from the two landmarks (*Figure 2*) were taken once the main trunk of the facial nerve was identified prior to excision of the mass using a surgical legged caliper (HUCO Vision SA, Switzerland) as follows:

- tragal pointer: the shortest distance from the main trunk of the facial nerve to the most inferior and anterior portion of the tragal pointer;
- tympanomastoid suture line: the shortest distance from the main trunk of the facial nerve to the most anterior aspect of the palpable v-shaped sulcus; and

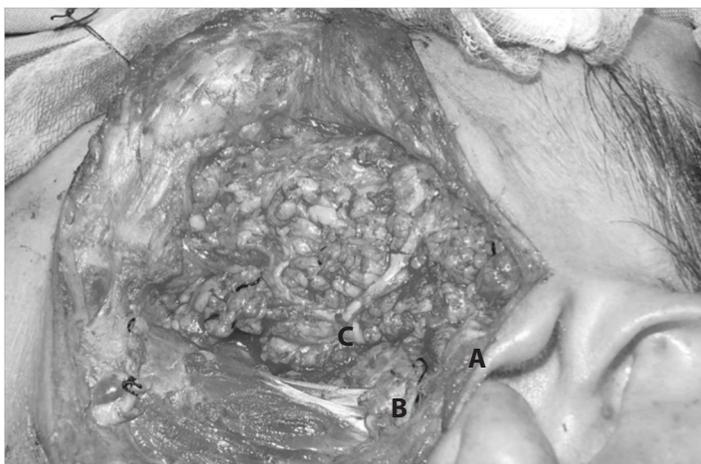
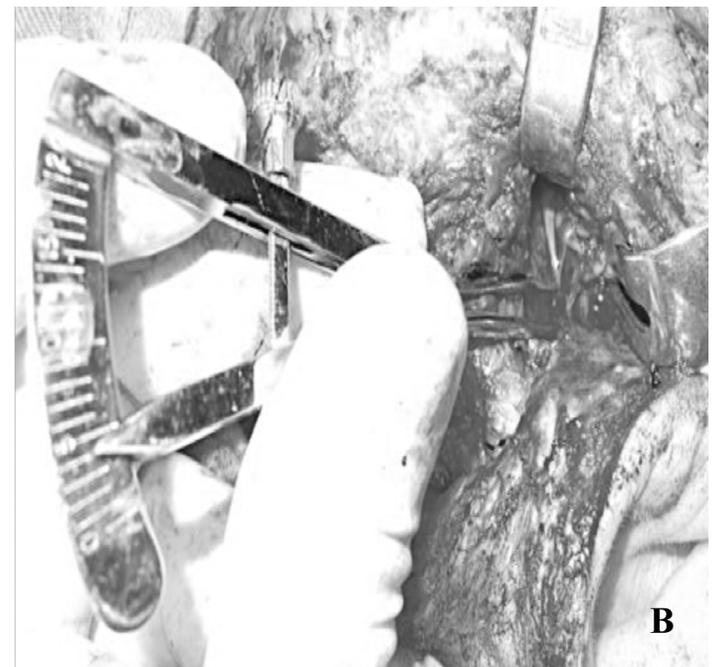


Figure 1. Identification of tragal pointer (A), tympanomastoid suture line (B), and main trunk of facial nerve (C)

Figure 2. Actual intra – operative measurement of the distance of the main trunk of facial nerve from the tragal pointer (A) and tympanomastoid suture line (B)

- main trunk of the facial nerve: the extracranial segment of the facial nerve as it enters the parotid tissue

Excision of the mass was completed which involved either superficial or total parotidectomy. Standard hemostasis and closure were performed.

Data and Statistical Analysis: Data taken were recorded and tabulated. The mean and standard deviation of the measurements from the two landmarks of interest were obtained using MS Excel (Microsoft Corporation, Redmond, WA, USA).

Table 1. Distance of the main trunk of the facial nerve to tragal pointer and tympanomastoid suture line. (n=22)

	Tragal pointer	Tympanomastoid suture line
Mean (mm)	9.0	6.1
Standard deviation (mm)	2.8	2.0
Mode (mm)	8.0	4.0
Min (mm)	5.0	4.0
Max (mm)	18.0	10.0

Table 2. Distance of the main trunk of the facial nerve to tragal pointer and tympanomastoid suture line among males and females. (n=22; males=8; females=14)

	Tragal pointer		Tympanomastoid suture line	
	Males	Females	Males	Females
Mean (mm)	8.5	9.4	6.0	6.1
Standard deviation (mm)	2.1	3.1	1.9	2.2
Mode (mm)	7.0	8.0	4.0	6.0
Min (mm)	6.0	5.0	4.0	4.0
Max (mm)	12.0	18.0	9.0	10.0

Table 3. Comparison of the mean distance of the main trunk of facial nerve to tragal pointer and tympanomastoid suture line among males and females

	Tragal pointer		Tympanomastoid suture line	
	Males	Females	Males	Females
Our result (mm)	8.5	9.4	6.0	6.1
Rea, et al ⁶ (mm)	6.7	7.1	2.3	2.6
Pather, et al ¹¹ (mm)	39.4	40.6	9.9	10.1

RESULTS

There were 22 patients included in the study, 8 males and 14 females with ages ranging from 22 to 71 years old. Of the 22 patients, 1 underwent total parotidectomy while the remaining 21 had superficial parotidectomy.

The mean distance of the main trunk of the facial nerve to the tragal pointer was 9.0 mm with standard deviation of 2.8 mm. On the other hand, the mean distance of the tympanomastoid suture line from the main trunk of facial nerve was 6.1 mm with standard deviation of 2.0 mm. (Table 1)

The mean distances of the main trunk of facial nerve from the tragal pointer and tympanomastoid suture line were 8.5 mm and 6.0 mm for males, respectively. For females, the tragal pointer and tympanomastoid suture line were 9.5 mm and 6.1 mm away from the main trunk of facial nerve, respectively. (Table 2)

DISCUSSION

This study aimed to measure the mean distance of the main trunk of the facial nerve from commonly employed surgical landmarks in parotidectomy, the tragal pointer and the tympanomastoid suture line. Similar studies comparing the distances of tragal pointer and tympanomastoid suture line from the main trunk of the facial nerve have varying results as seen in Figure 3.

Since many Filipinos have relatively smaller stature than Caucasians, it may be postulated that the distance of the main trunk of facial nerve to the landmarks should also be shorter. However, studies by Rea *et al.* and De Ru *et al.* showed shorter distances than our results, which may be explained by their use of cadavers as subjects. The cadavers were preserved and fixed using formaldehyde. Embalming may have desiccated the tissues altering texture and pliability.⁴ Thus, the measurements obtained would be shorter due to volume loss as compared to our subjects. Rea *et al.* also reflected the ears and removed the sternocleidomastoid muscles, both not representative of the intraoperative situation.⁶ Cadavers also have limited head rotation compared to living subjects. These factors may all contribute to differences in the results.

Another possible reason may be the presence of parotid tumors in our subjects compared to the subjects used in similar studies which did not have parotid tumors. The tumor may displace the facial nerve either toward or away from the landmarks of interest.

We evaluated the measurements according to gender. The mean distances of the facial nerve trunk of male subjects from the tragal pointer and tympanomastoid suture line were 8.5mm and 6.0mm, respectively. Females had mean distances of 9.5mm from the tragal pointer and 6.1mm from the tympanomastoid suture line to the main trunk of the facial nerve. Our results are consistent with the literature, which shows that the facial nerve in males had a shorter distance from the two operative landmarks in comparison to females.

Rea *et al.* postulated that the difference is mainly due to the

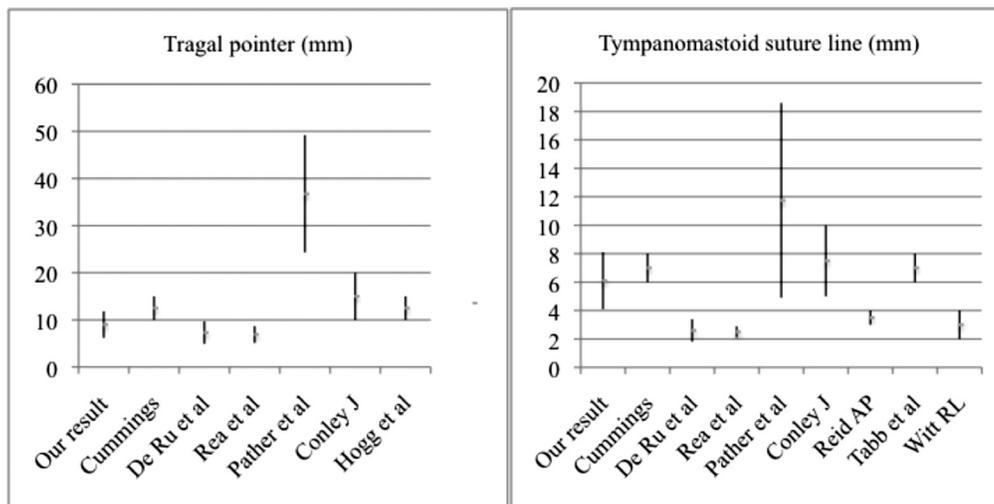


Figure 3. Comparison of the mean and range of distance of the tragal pointer and tympanomastoid suture line from the main trunk of facial nerve in different studies.

anatomic variation of the skulls of males and females. The male skull is more robust with larger mastoid process, deeper mandibular ramus, larger nuchal crest rigidity and rugose muscle attachments.⁶ Further studies may need to be done to determine such discrepancies in the measurements.

The use of landmarks and their relative distances to the facial nerve should be applied to minimize one of the complications during parotidectomy which is facial paralysis. Studies show that the prevalence rate of facial paralysis is variable ranging from 18.7%⁷ to 26.08%⁸ and can be as high as 57% for transient facial paralysis.⁹ Permanent facial paralysis is reported from about 2 to 7%.⁹ The risk for facial paralysis increases with total parotidectomy.¹⁰

A study by Dimitrov on 37 patients with parotid tumors who underwent conservative or lateral parotidectomy using the insertion of the posterior belly of the digastric muscle on the mastoid tip process and tympanomastoid fissure as anatomic landmarks in identifying the facial nerve found that these landmarks are easily recognizable and reliable start-points in facial nerve dissection that reduce the risk of traumatic injury of the nerve during parotid surgery.¹⁰

To prevent transient or even permanent facial nerve paralysis, it is a must for the surgeon to be knowledgeable of the surgical anatomy and exercise utmost care during surgery. We hope the distances we measured in our study may serve as reference values for surgeons in safer identification and preservation of the facial nerve during parotidectomy.

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