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Research Article

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Implications of Facial Nerve Landmarks In Parotid Surgery

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ABSTRACT

The facial nerve weakness post parotid surgery can result from a combination of trauma while dissecting right on the nerve, traction injury to the nerve, heat injury secondary to use of electrocautery and prolonged operating time. We tried to study the one factor i.e. the operating time. Total of 30 patients admitted in the ENT department between year 2014 and 2018, undergoing parotid surgery for benign pathology by the same primary surgeon were selected. Facial nerve was identified in each by antegrade method. In first ten (10) patients, tragal pointer was used to identify facial nerve and for further twenty (20) cases, posterior belly digastric was used for the identification. Average time taken using tragal pointer as the landmark was 39.7 minutes and average time taken using posterior belly of digastric was 20.65 minutes. P value was found to be significant (< 0.01) by using both independent sample t test and one way ANOVA test. We found that time taken using posterior belly of digastric as landmark was significantly shorter than tragal pointer. Hence we can control the operating time by using posterior belly of digastric as the primary landmark for facial nerve identification.

Key Words: *Neuropraxia, Tragal pointer, Posterior belly of digastric, Tympanomastoid suture, Antegrade, Parotidectomy.*

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SUMMARY

The primary goal of parotid surgery is the complete removal of tumors while preserving facial nerve function. Postoperative facial nerve weakness can be temporary or permanent. Temporary weakness is much more common and incidence is between 10 and 50% of parotidectomies [1,2]. The cause of temporary weakness is neuropraxia, which can occur even after preserving anatomic integrity of facial nerve and can result from a combination of trauma while dissecting right on the nerve, traction injury to the nerve, heat injury secondary to use of electrocautery and prolonged operating time. The factors affecting the operating time and hence the incidence of neuropraxia can be surgical skill, method of identification of facial nerve and the use of facial nerve stimulator. We studied whether method of identification of nerve affects operating time or not. This study was carried out at Otolaryngology department of Employees' State Insurance hospital, Basaidarapur, New Delhi from year 2014 to 2018. Total of 30 patients undergoing parotid surgery for benign pathology by same primary surgeon were selected. Facial nerve was identified in each by antegrade method. In first ten patients, tragal pointer was used to identify facial nerve and for further twenty cases, posterior belly digastric was used for identification. Time taken from skin incision to identification of facial nerve was recorded. The sex composition of our study was 6 males and 24 females with age range from 26 years to 57 years. All patients except one had pleomorphic adenoma, which also was pleomorphic adenoma on preoperative FNAC but postoperative histopathology showed invasive features and was finally reported as squamous cell carcinoma. All 30 patients were operated by same Surgeon using Modified Blair's incision without use of facial nerve stimulator. Time taken from incision to finding trunk of facial nerve was recorded. Tests used for comparison of means were Independent T test and one way ANOVA test. Average time taken using tragal pointer as landmark was 39.7 minutes and average time taken using posterior belly of digastric was 20.65 minutes. P value was found to be significant (< 0.01) using both tests. We found that time taken using posterior belly of digastric as landmark was significantly shorter than tragal pointer. There have been many theories trying to explain facial nerve dysfunction after its anatomical preservation in parotid surgery. This may be due to mechanical trauma such as crushing, compression and stretching during surgery or due to ischemic injury as a result of nerve dissection from its surrounding. Dulgerov et. al. concluded that nerve stretching may

be the most probable etiology of facial nerve dysfunction after its anatomical preservation. [10]Frequency of facial nerve dysfunction may also be related to the technique of nerve identification, but recent evidences suggest no difference between antegrade and retrograde techniques. [11]In our study, we tried to study the one factor which can be controlled to reduce the incidence of neuropraxia i.e. operating time and found that time taken using posterior belly of digastric as landmark was significantly shorter than tragal pointer.

INTRODUCTION

The primary goal of parotid surgery is the complete removal of tumors while preserving facial nerve function. Postoperative facial nerve weakness can be temporary or permanent. Temporary weakness is much more common and incidence is between 10 and 50 % of parotidectomies. [1,2]

The cause of temporary weakness is neuropraxia, which can occur even after preserving anatomic integrity of facial nerve and can result from a combination of trauma while dissecting right on the nerve, traction injury to the nerve, heat injury secondary to use of electrocautery and prolonged operating time. The factors affecting the operating time and hence the incidence of neuropraxia can be surgical skill, method of identification of facial nerve and the use of facial nerve stimulator. We studied whether method of identification of nerve affects operating time or not.

Materials and methods

This study was carried out at the Otolaryngology and head and neck surgery department of Employees' State Insurance hospital, Basaidarapur, New Delhi from the year 2014 to 2018. Total of 30 patients undergoing parotid surgery for benign pathology by the same primary surgeon were selected. Facial nerve was identified in each by antegrade method. In first ten (10) patients, tragal pointer was used to identify facial nerve and for further twenty (20) cases, posterior belly digastric was used for the identification. Time taken from the skin incision to the identification of facial nerve was noted and recorded. The sex composition of our study group was 6 males and 24 females with age range from 26 years to 57 years.

All patients except one had pleomorphic adenoma, which also was pleomorphic adenoma on preoperative FNAC but postoperative histopathology showed invasive features and was finally reported as squamous cell carcinoma. All 30 patients were operated by the same primary surgeon using Modified Blair's incision without the use of facial nerve stimulator. Time taken from incision to finding the trunk of facial nerve was recorded. The data was entered in MS Excel spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0. Tests used for comparison of means were Independent T test and one way ANOVA test.

Results& Discussion

Average time taken using tragal pointer as the landmark was 39.7 minutes and average time taken using posterior belly of digastric was 20.65 minutes (Table 3).P value was found to be significant(< 0.01) using both tests, independent t- test and one way ANOVA test (Table 4,5 &6). We found that time taken using posterior belly of digastric as landmark was significantly shorter than tragal pointer.

The antegrade method of identifying facial nerve is the most commonly used method. [3]The four commonly used landmarks in antegrade identification of the facial nerve trunk during surgical procedures are: the tragal pointer, the posterior belly of digastric muscle, the junction of the bony and cartilaginous ear canal and the tympanomastoid suture.

Multiple cadaveric studies have been conducted to determine the reliability of these landmarks in a series of specimens.[4]However, general consensus has not been formulated on which external landmark is the most consistent and superior in identifying and locating the facial nerve trunk. Due to the lack of consensus on which single landmark is the best to use, it is now becoming a standard of care to utilize more than one of the common external landmarks when identifying and locating the facial nerve trunk prior to surgical procedures.

Different landmarks have been compared in many previous studies. The stylomastoid foramen is anatomically a very constant landmark for facial nerve but in live surgical situation it is very difficult to find this foramen as it is mainly a palpatory landmark and most importantly because it remains surrounded by thick fascia which is continuous with the periosteum of skull base. Excessive dissection in this area very often leads to permanent paralysis of the nerve. The tympanomastoid suture line is palpable as a hard ridge deep to the cartilaginous portion of the external auditory canal. The facial nerve emerges a few millimetres deep to its outer edge. Tympanomastoid suture can be identified in the cadavers without much difficulty but in live surgery it is basically a palpatory landmark and direct visualization of the suture is practically not possible.

Hence the tragal pointer and posterior belly of digastric are the two most commonly used landmarks. At the bony-cartilagenous junction, the tragal cartilage forms a triangular excrescence called the triangular process. It was called

tragal pointer by Conley,[5] to highlight the fact that it pointed to the emergence of facial nerve trunk, situated 7.5 mm (+ -2.5mm) anteriorly and more deeply to this point. [6]The only drawback of the pointer is that it is a cartilaginous structure which is mobile, asymmetrical and has a blunt and irregular tip. It lies at a distance of about 4-21 mm (cadaveric) and 13.5-19 mm (live) from the facial nerve trunk respectively. In the study on 26 cadavers by Rea et al. the facial nerve trunk was found 6.9 + - 1.8 mm from tragal pointer. [7]In the study on 40 cadavers by Pather and Osman, the facial nerve trunk was found 24.3-49.2 mm from the tragal pointer. [8]During parotidectomy, lateral retraction of the sternocleidomastoid muscle exposes the posterior belly of digastric. The facial nerve trunk lies approximately 1 cm above insertion of the muscle at mastoid tip i.e. digastric notch which is near to stylomastoid foramen. The facial nerve trunk lies at a distance of 6-9.5 mm (cadaveric) and 6-11.5 mm (live) respectively from posterior belly of digastric and has the minimum anatomical variation. Rea et al,[7] demonstrated that main trunk was 5.5+ -2.1 mm from the muscle. Pather and Osman,[8] demonstrated it to be 9.7-24.3 mm from the muscle.

As stated, postoperative facial nerve weakness can be temporary or permanent. Temporary weakness is much more common and incidence is between 10 and 50 % of parotidectomies. [1,2]The cause of temporary weakness is neuropraxia, which results from a combination of trauma while dissecting right on the nerve, traction injury to the nerve, heat injury secondary to use of electro-cautery, and prolonged operating time. The incidence of permanent facial nerve injury is generally reported as 0.5%.[1,2]The cause of such weakness is due to transection of, or cautery injury to the main trunk. Many factors affect rate at which facial nerve recovers after parotid surgery. They include age, sex, disease, location (superficial or deep lobe), tumor size, recurrent disease, type and duration of operation and total length of nerve dissected.[9]

Figures & Tables

Table 1: Time taken in 10 patients using Tragal pointer :-

S. no.	Age/Sex	Time recorded (minutes)
1	34/F	30
2	42/F	35
3	40/F	40
4	53/F	42
5	54/M	45
6	38/F	40
7	35/F	33
8	45/F	50
9	45/F	47
10	51/F	35

Table 2: Time taken in 20 patients using posterior belly of digastric :-

S. no.	Age/Sex	Time recorded (minutes)
1	30/F	22
2	42/M	25
3	35/F	20
4	50/F	18
5	55/M	19
6	43/F	21
7	57/F	15
8	37/F	18
9	46/F	20
10	55/M	25
11	26/F	24
12	45/F	20
13	52/F	17
14	56/M	22
15	48/F	22
16	36/F	20
17	42/F	18
18	45/M	26
19	40/F	21
20	46/F	20

Table 3: Average time taken :-

	Landmark	n (sample size)	Mean	Std. Deviation	Std. Error Mean
Time recorded in minutes	Tragal pointer	10	39.7000	6.46443	2.04423
	Posterior belly of digastric	20	20.6500	2.85205	0.63774

Table 4: Independent t - test :-

Levene's Test for Equality of Variances		F value	Significance level
Time recorded in minutes	Equal variances assumed	9.737	0.004

Table 5 : Independent t – test :-

t-test for Equality of Means		t value	Degrees of freedom	Significance level (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Time recorded in minutes	Equal variances assumed	11.299	28	<0.01	19.05000	1.68605	15.59628	22.50372
	Equal variances not assumed	8.896	10.789	<0.01	19.05000	2.14140	14.32552	23.77448

Table 6: One way ANOVA test :-

Time recorded in minutes	Sum of Squares	Degrees of freedom	Mean Square	F value	Significance level
Between Groups	2419.350	1	2419.350	127.658	<0.01
Within Groups	530.650	28	18.952		
Total	2950.000	29			

CONCLUSION

There have been many theories trying to explain the facial nerve dysfunction after its anatomical preservation in parotid surgery. This may be due to mechanical trauma such as crushing, compression and stretching during surgery or due to ischemic injury as a result of nerve dissection from its surrounding. Dulgerov et. al. concluded that nerve stretching may be the most probable etiology of facial nerve dysfunction after its anatomical preservation.[10]Frequency of facial nerve dysfunction may also be related to the technique of nerve identification, but recent evidences suggest no difference between antegrade and retrograde techniques.[11]

In our study, we tried to study the one factor which can be controlled to reduce the incidence of neuropraxia i.e. operating time and found that time taken using posterior belly of digastric as landmark was significantly shorter than tragal pointer.

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CONFLICTS OF INTEREST

None

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