

# IMPORTANCE OF USING FACIAL NERVE STIMULATOR DURING PAROTID SURGERY

By

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## ABSTRACT

**Background:** Parotid gland surgery is a difficult procedure because of the unique pathology of the parotid gland and the intimate relationship with the facial nerve. A devastating complication of a parotidectomy can be postoperative facial paralysis. Proper safe surgical technique is paramount for facial nerve preservation.

**Objective:** To describe the goals and benefits of facial nerve monitoring during parotid surgery.

**Patient and Methods:** This prospective study was conducted on 20 patients of both sexes with count age determination, who attached to the out-patient E.N.T clinic at Bab El Sha'ria (Sayed Galal) Hospital from October of 2019 to January of 2021. All the patients with the complaint of parotid swelling and the study compromised the patients who were submitted to superficial parotidectomy after completing all the clinical examinations and investigations.

**Results:** Mean age of all studied patients was  $42.90 \pm 17.68$  years, with a minimum age of 13 years and maximum age of 75 years. There were 6 males (30%) and 14 females (70%) in the considered patients. Superficial parotidectomy was done in all 20 patients. Histopathological types were pleomorphic adenoma in 14 cases (70%), Warthin's tumor in 5 cases (25%) and chronic nonspecific inflammatory cells in 1 case (5%). Postoperative complication was in 1 case (5%) as facial nerve affection.

**Conclusion:** Facial nerve monitoring during parotid surgery is an adjunctive method to assist the functional preservation of the facial nerve.

**Keywords:** Facial nerve monitoring, Facial nerve, Parotidectomy.

## INTRODUCTION

Facial nerve injury is a feared complication of parotidectomy. Facial nerve paralysis can cause cosmetic and functional morbidity, ocular complications, diminished quality of life, and medical malpractice litigation (*Guntinas-Lichius & Eisele, 2016*).

Temporary facial nerve dysfunction occurs in 20% to 40% of patients undergoing parotidectomy, whereas permanent facial nerve dysfunction is

uncommon and occurs in 0% to 4% of patients (*Lambiel et al., 2021*).

There are numerous factors that may influence Facial nerve injury during parotidectomy, including tumor size, type, location, extent of surgery, inflammation reoperation. Facial nerve injury mechanisms during parotidectomy include nerve division, stretch, compression, ligature entrapment, thermal and electrical injuries and ischemia. The surgeon has control over most of these mechanisms of

facial nerve injury and proper safe surgical technique is paramount for facial nerve preservation (*Savvas et al., 2016*).

Nerve monitoring is an adjunctive method that a surgeon can choose to use during surgery to assist with the functional preservation of a motor nerve or nerves (*Ryu & Kim, 2016*).

**The aim of this work was to** study the importance of identification and stimulation of facial nerve during parotid surgery to avoid its injury.

## PATIENTS AND METHODS

This prospective study was conducted on 20 patients of both sexes with count age determination, who attached to the out-patient E.N.T clinic at Bab El Sha'raya (Sayed Galal) Hospital from October of 2019 to January of 2021. All the patients with the complaint of parotid swelling and the study compromised the patients who were submitted to surgical parotidectomy after completing all the clinical examinations and investigations. All the study group signed informed consents before surgery.

**Inclusion criteria:** Patients with parotid swelling without facial nerve affection.

**Exclusion criteria:** Patients with facial nerve affection.

**All patients were subjected to:**

### Careful history taking:

- Personal history: name, age, sex, occupation and residence.
- Complaint and history of the present illness.
- Evaluation of the patient with a parotid mass should always start with a history concentrating on tumor

presentation. Factors such as slow versus rapid growth, pain, facial paresis or paralysis, and overlying skin changes or associated lymphadenopathy (can be informative in the distinction between benign and malignant lesions).

- Risk factors for malignancy such as prior radiation exposure and tobacco abuse.
- Past history: Diabetes, hypertension, possible coagulation disorders and allergies that could affect general anesthesia.
- Operations: Previous parotid operation, medications and dietary supplements.

### Examination:

- General examinations.
- A careful examination of the head and neck (concentrate on the preauricular and malar skin).
- The external auditory canal and tympanic membrane.
- Ipsilateral and contralateral facial nerve functions with a standardized grading system.
- Local examinations: Inspection both intra-orally and extra-orally. Intra-oral examination included observations for asymmetry, discoloration, pulsation, obstructions in the duct orifices and swelling of the deep lobe of the parotid gland.
- Palpation: The superficial location of the salivary glands allowed palpation and visual inspection. For extraoral examination, the patients head should be inclined forwards in order to

maximally expose the parotid and submandibular glands. A normal parotid gland was barely palpable, and a normal sublingual gland was not palpable.

**Investigations:** Full laboratory investigations included CBC, T3, T4, TSH, liver and kidney functions, PT, PC, INR, and FBS, fine needle aspiration (FNA), neck ultrasound, and CT for head and neck.

**Surgical procedure:** The first step for avoiding facial nerve lesions consisted in safely identifying the trunk of the facial

nerve as it exited from the skull through the stilomastoid foramen, at the level of the tympanomastoid suture, tragal pointer or posterior belly of the digastric muscle (*Guntinas-Lichius & Eisele, 2016*).

**Statistical analysis:**

Data were collected, revised, coded and entered to the Statistical Package for the Social Science (IBM SPSS) version 20. The qualitative data were presented as number and percentages while quantitative data were presented as mean, standard deviations and ranges.

**RESULTS**

The study involved 20 patients of adult males and females. Mean age of the considered patients was  $42.90 \pm 17.68$  years with range among 13 and 75 years. Out of 20 patients, 14 (70%) patients were females, and 6 (30%) patients were males.

Distribution of the studied cases according to associated medical problem showed that 14 (70.0%) of patients had

diabetes, 11 (55.0%) had hypertension, and 2 (10.0%) had hepatitis. The incidence of smoking among the studied patients was 40%. The most common presentation was parotid swelling in 70% of patients, followed by chronic parotitis in 15% and the least common presentation was branchial fistula in 5% (**Table 1**).

**Table (1): Distribution of the studied cases according to age, gender, medical problem, smoking and clinical presentation**

		No.= 20
<b>Age</b>	Mean $\pm$ SD	42.90 $\pm$ 17.68
	Range	13 – 75
		<b>No. (%)</b>
<b>Gender</b>	Female	14 (70.0%)
	Male	6 (30.0%)
<b>Medical problem</b>	Diabetes	14 (70.0%)
	Hypertension	11 (55.0%)
	Hepatitis	2 (10.0%)
<b>Smoking</b>	Yes	8 (40.0%)
	No	12 (60.0%)
<b>Presentation</b>	Parotid swelling	14 (70%)
	Chronic parotitis	3 (15%)
	Parotid cyst	2 (10 %)
	Branchial fistula	1 (5%)

Intra-operative outcome according to site and size of lesion were as follows (**Table 2**).

**Table (2): Distribution of the studied cases according to site and size of lesion**

		No.= 20
Site	Superficial lobe of parotid	19 (95.0%)
	Deep lobe of parotid	1 (5.0%)
Size	Mean $\pm$ SD	3.50 $\pm$ 0.49
	Range	2.9 – 4.3

Regarding the histopathological types of lesion, 70% of the studied patients presented by pleomorphic adenoma, 25% presented by warthin's tumor, and the least

common histopathological diagnosis was chronic nonspecific inflammatory cells which was reported in 5% of studied patients (**Table 3**).

**Table (3): Distribution of the studied cases according to histopathological types**

Histopathological types	No.	%
Pleomorphic adenoma	14	70.0%
Warthin's tumor	5	25.0%
Chronic nonspecific inflammatory cells	1	5.0%

Facial nerve was successfully identified in all the patients (100%) by nerve stimulator, with no intra-operative complications during surgery. Early post-operative facial nerve deficit of the marginal mandibular nerve was reported

in 1 case (5%), the case was diagnosed as pleomorphic adenoma with lesion at deep lobe of the parotid gland which was managed conservatively by neurotonics and vitamin B6 supplementation (**Table 4**).

**Table (4): Distribution of the studied cases according to postoperative complication**

Post-operative complication	No.	%
Facial nerve affection	No	19 95.0%
	Yes	1 5.0%
Hematoma	No	20 100.0%
	Yes	0 0.0%
Wound Infection	No	20 100.0%
	Yes	0 0.0%
Frey's syndrome	No	20 100.0%
	Yes	0 0.0%

## DISCUSSION

Complications of parotid surgery are diverse but the facial nerve damage or dysfunction is the major concern in parotid surgery and complete excision with minimal facial nerve damage or dysfunction is one of the primary objectives.

This study of 20 patients, female dominates with females (70%) to males (30%) and the mean age was 42.90  $\pm$  17.68years. The same female to male ratio was found by *Rahman et al. (2011)* who reported superiority to females over males, and the mean age was 40 years.

Our study showed that 75% of patients presented by pleomorphic adenoma, 25% presented by warthin's tumor. Both pleomorphic adenoma & warthin's tumor were the most common histopathological diagnoses, followed by chronic nonspecific inflammatory cells that were reported in 5% of patients. This result was in concordance with *Subramaniam et al. (2020)* as pleomorphic adenoma was the most common histology (34.3%) in their study, followed by skin cancer metastases (32.3%). *Ali et al. (2010)* stated that 74% had benign lesions and 36% had malignant tumors. The most common benign tumor was pleomorphic adenoma (57%), and the most common malignant tumor was mucoepidermoid carcinoma (16%).

Majority of the surgeries (95%) had no post-operative facial nerve affection, and only one case (5%) complaint of facial nerve affection. In contrary to our results, in a study by *Shashinder et al. (2010)*, facial nerve dysfunction was reported in 28% cases immediately after surgery. In a series of parotidectomies, *Rahman et al. (2011)* observed 26.6% temporary facial weakness compared to *Fadel et al. (2012)* who observed 34% transient facial weakness. On the contrary, *El-Shakhs et al. (2013)* observed temporary facial paralysis in only 16.6% of parotidectomies and after surgery. For the frequency of temporary facial weakness, *Klintworth et al. (2010)* reported it at 8.5% which quite low.

After anatomical preservation in parotid surgery, many theories have explained the facial nerve dysfunction. This can be caused by mechanical trauma, such as crushing and compression during

surgery or ischemic injury during nerve dissection (*Lameiras et al., 2019*).

*Dulguerov et al. (2010)* found that, after anatomical preservation, nerve stretching could be the most possible etiology of facial nerve dysfunction. The frequency of the facial nerve dysfunction may also be associated with nerve identification techniques, but more recent evidence suggests no difference between ante grade and retrograde techniques in the rate of temporary nerve dysfunction (*Mashrah et al., 2018*).

*Musani et al. (2014)* reported that among patients undergoing parotidectomy, 80% underwent superficial parotidectomy, while 20% underwent total parotidectomy, 23% of patients experienced facial nerve palsy in the superficial parotidectomy group, while 49% experienced facial nerve palsy.

*Tung et al. (2014)* showed that in a cohort of six year follow-up, all their patients suffered immediate postparotidectomy facial nerve dysfunction with weakness of marginal mandibular branch, and 7% also had co-existing zygomatic branch dysfunction, and 83% regained total nerve function and recovered well.

*Huang et al. (2015)* have patients that underwent partial superficial parotidectomy and patients underwent superficial parotidectomy, 6 (7.6%) and 55 (22.8%) patients in the respective groups suffered immediate facial nerve paralysis having a significant difference.

*Doikov et al. (2010)*, *Makeieff et al. (2010)* and *Wang et al. (2012)* observed positive results in patients that underwent different types of parotidectomy with

facial nerve monitoring, regarding the incidence of temporary or permanent facial paralysis, and the period of time necessary for the temporary facial paralysis to recover.

*Lowry et al. (2011)* found that the most common reasons to use intraoperative monitoring in USA were helping to identify the nerve (20%), medicolegal concerns (14%), increased safety (11%), and the belief that intraoperative facial nerve monitoring (IFNM) was the standard of care (11%).

*Sood et al. (2015)* revealed that intraoperative facial nerve monitoring may provide real-time feedback to reduce blunt trauma over the facial nerve or its branches that may occur during nerve manipulation, dissection, electro-cautery, and surgical instrumentation.

So, surgeon's experience and surgical techniques could possibly play a vital part in having a decreased occurrence of facial nerve dysfunction in post-parotidectomy patients.

## CONCLUSION

Facial nerve monitoring during parotid surgery is an adjunctive method to assist the functional preservation of the facial nerve.

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## أهمية استخدام عصب الوجه التنبيهي أثناء جراحات الغدة النكفية

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**خلفية البحث:** جراحة الغدة النكفية هي إجراء صعب بسبب الأمراض الفريدة للغدة النكفية والعلاقة الحميمة مع العصب الوجهي ويمكن أن تكون المضاعفات المدمرة لاستئصال الغدة النكفية علي هيئة شلل الوجه بعد الجراحة. وتعتبر التقنية الجراحية الآمنة المناسبة أمراً بالغ الأهمية للحفاظ على العصب الوجهي.

**الهدف من البحث:** دراسة أهداف وفوائد تنبيهه ومتابعة العصب الوجهي أثناء جراحة الغدة النكفية.

**المرضى وطرق البحث:** أجريت هذه الدراسة المستقبلية على 20 مريضاً من كلا الجنسين مع تحديد العمر، والذين ترددوا على عيادة الأنف والأذن والحنجرة في مستشفى باب الشعرية (سيد جلال الجامعي) من أكتوبر 2019 إلى يناير 2021 حيث كان المرضى يعانون من تورم بالغدة النكفية وجميعهم خضع لعملية استئصال الغدة النكفية السطحية بعد الانتهاء من جميع الفحوصات السريرية والمعملية.

**نتائج البحث:** كان متوسط العمر لكل المرضى  $42.90 \pm 17.68$  سنة بحد أدنى 13 سنة وأقصى عمر 75 سنة وكان هناك 6 ذكور (30%) و 14 إناث (70%) في المرضى الموجودين بالدراسة وتم إجراء استئصال الغدة النكفية السطحي في جميع المرضى العشرين وكانت أنواع الأنسجة المرضية هي الورم الحميد متعدد الأشكال في 14 حالة (70%) وورم وراثيين في 5 حالات (25%)، وخلايا إنتهابية مزمنة غير محددة في حالة واحدة (5%). ومضاعفة ما بعد الجراحة في حالة واحدة (5%) علي شكل تأثر العصب الوجهي.

**الاستنتاج:** تُعد مراقبة العصب الوجهي أثناء جراحة الغدة النكفية طريقة إضافية للمساعدة في الحفاظ الوظيفي على العصب الوجهي.

**الكلمات الدالة:** مراقبة العصب الوجهي، عصب الوجه، إستئصال الغدة النكفية.