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Superficial Parotidectomy: Anterograde Compared with Modified Retrograde Dissection of the Facial Nerve in Benign Parotid Tumors

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Abstract

Background: The most common site for salivary gland tumors is the parotid gland; accounting for (64% - 80%) of all cases .The pleomorphic adenoma is the most common tumor (53% to 77%) of all cases in the parotid gland. The treatment of choice for most parotid tumors is surgical excision. One of the main aims of superficial parotidectomy is to minimize injury to the facial nerve and maximize the rate at which it recovers. Two techniques are used for dissection of the facial nerve in parotid surgery: antegrade technique and retrograde technique**.**

Objectives: The aim of this prospective study is to compare between the two techniques to know the best method of dissection to preserve the facial nerve integrity.

Patients and Methods: This study presents the surgical excision of benign parotid tumors in 60 patients who complained from a mass in the parotid region. These cases were collected from maxillofacial surgery unit in AL-Shaheed Gazi AL-Hariri Hospital / Medical city/Baghdad from May 2009 to July 2011 and in AL-Hussain hospital in Thi-Qar from 2013-2016 .The age of those patients ranged from (19 – 60) years with a mean of 40.9 years. The patients divided into two groups, the 1st group (30 patients) underwent antegrade superficial parotidectomy and the 2nd group (30 patients) were underwent retrograde superficial parotidectomy. The assessment of facial nerve function is categorized into 6 grades according to House- Brackmann grading system. This assessment was started in 1 week, 1 month, 3 months and 6 months postoperatively.

Results: The rate of nerve injury in antegrade technique was 30% at the end of week 1 and 20% at the end of month 1 while for retrograde technique was 40% at the end of week 1 and 10% at the end of month 1, It shows that the nerve injury in week 1 is more in retrograde than antegrade technique .The nerve recovery in antegrade technique was 40% at week 1 and 55% at the end of month 1 while for retrograde technique 70% recovered in the first week and 30% at end of month 1 . It shows that the recovery from injury is faster in retrograde than ante grade technique.

Conclusions: There were more initial serious nerve injuries in the retrograde groups than in the antegrade groups but recovery was faster in the retrograde group. The rate of permanent nerve injury was not affected by the choice of dissection technique.

Introduction

Tumors of the salivary glands constitute an important area in the field of oral and maxillofacial pathology [(1)] The annual incidence of salivary gland tumors around the world ranges from about **(1 - 6.5)**

Cases Per 100,000 people. The most common site for salivary gland tumors is the parotid gland; accounting for **(64% - 80%)** of all cases .The pleomorphic adenoma is the most common tumor **(53% to 77%)** of all cases in the parotid gland [(2)].

The treatment of choice for most parotid tumors is surgical excision [(3)] .is effective treatment for most parotid tumors involving the superficial lobe .

One of the main aims of superficial parotidectomy is to minimize injury to the

facial nerve and maximize the rate at which it recovers **[(4)].** The goal is to avoid facial disability yet attain complete resection without perforation of the capsule/pseudo capsule [(5)].

Two techniques are used for dissection of the facial nerve in parotid surgery:

1.Antegrade technique: The nerve trunk is identified as it leaves the stylomastoid foramen and dissection then proceeds peripherally.

2.Retrograde technique: The peripheral nerve branches are identified initially and dissection proceeds towards

the nerve trunk [4]

The **conventional antegrade approach** is the standard procedure for a trainee to master, but location of the nerve trunk may challenge even an experienced surgeon who operates on **obese patients**, those with **large tumors**, or who does **revision operations.**

The retrograde dissection demands considerable skill **[6].** Retrograde dissection of the nerve is a useful option if the surgeon fails to identify the nerve trunk directly, or in revision surgery where the technique has a more established role.

Finally, it is better to know the best method to preserve the facial nerve since it is the aim of every surgeon when performing the parotid surgery.

Aim of the study

Determine the use of antegrade and retrograde dissection techniques in the identification of the facial nerve and comparison between the two techniques to know the best method of dissection to preserve the facial nerve integrity in parotid surgery.

Patients and methods

The sample:

- The patients were collected from maxillofacial surgery unit in AL-Shaheed Gazi AL-hariri hospital / Medical City/Baghdad during the period from May 2009 to July 2011,and AL-Hussain Hospital in Thi-Qar 2013-2016.
- Only sixty cases had been fulfilled the criteria for this study and were selected from eighty five cases presented (malignant tumors).
- Fourteen of those patients were referred from different hospitals. Two of them had been surgically interfered by incisional biopsy of the parotid mass.
- 40 of the selected patients were females, and 20 of them were males, the age of those patients ranged from (19 –60) years.

Specification of the sample:

- Patients had benign parotid tumors confirmed by fine needle aspiration cytology and by incisional biopsy in two cases.
- Patients with facial nerve weakness were excluded from this study.

- Patients with malignant tumors were also excluded from this study.
- All patients had a mass confined to the parotid region without neck extension.
- The patients divided randomly into two groups, the 1st group (30patients) underwent antegrade superficial parotidectomy and the2nd group (30 patients) were underwent retrograde superficial parotidectomy.
- No additional surgical procedures were performed on the adjacent structure.

Surgical technique:

Ante grade technique:

The skin incision (modified Blair's) runs over the vertical preauricular skin crease, starting above the tragus, curving underneath the earlobe and behind it. Over the mastoid tip area, a round extension of the incision is created in the posteroinferior direction. The incision is then directed behind the mandibular angle and in the anteroinferior direction, parallel to the mandible and some 2 cm lower, in an upper neck skin crease. It extends about 2 cm anterior to the angle

Fig.2.1, Fig.2.2.

Fig. 2.1 Blair incision

Fig. 2.2 Blair incision with excision of scar from previous incisional biopsy

Fig. 2.3 The Tragal pointer and

Fig. 2.4The Facial nerve

Retrograde technique:-

The incision and reflection used is the same as antegrade technique.Stensen's Duct is used as a landmark for the identification of the buccal branches of the facial nerve..The dissection should displace the parotid upwards and downwards, and hence, avoiding too deep and narrow tunneling. Great care should be exercised to avoid inadvertent entry into the tumor during preservation of the facial nerve.

Statistical analysis

All the data of the sample were subjected to computerized statistical analysis using SPSS version 15 (2006) computer program.

The statistical analysis included:

1. Descriptive statistics: Including means, standard deviation, statistical tables and figures.

2. Inferential Statistics: that includes:-

- **Paired sample t-test: -**to assess the significant differences regarding age, gender, direction or position.

In the statistical evaluation, the following levels of significance were used:

Non-significant	**NS**	**P > 0.05**
Significant	*	**0.05 ≥ P > 0.01**
Highly significant	**	**0.01 ≥ P > 0.001**
Very highly significant	***	**P ≤ 0.001**

- **Kruskal-Wallis Test**: - to compare between two different groups (measure the difference in the injury of facial nerve) that have ordinal variable (means every number in the scale refer to its own condition).

Friedman Test: - to compare between two different groups (measure the difference in the recovery of facial nerve) that have ordinal variable (means every number in the scale refer to its own condition).

Results

Descriptive statistics of the sample

The sample consisted of twenty subject collected from the Maxillofacial Surgery Department at AL-Shaheed Gazi AL-hariri Hospital / Medical city/Baghdad ,and from AL-Hussain Hospital in Thi-Qar.

The age range of the sample

The sample aged between **19-60 years** with a mean age of **40.9 years**

Descriptive statistics of the groups using house-brackmann grading system

Time	Grading	Groups	
		Ante grade n=10	Retrograde n=10
one week	I	1	1
	II	4	2
	III	3	6
	IV	1	1
	V	1	0
	VI	0	0
one month	I	3	4
	II	3	3
	III	4	3
	IV	0	0
	V	0	0
	VI	0	0
three months	I	6	7
	II	3	3
	III	1	0
	IV	0	0
	V	0	0
	VI	0	0
six months	I	9	10
	II	1	0
	III	0	0
	IV	0	0
	V	0	0
	VI	0	0

Nerve injury

Ante grade technique

House-brackmann (HB) grading system is considered serious for HB III and above.

At the end of week 1, 10 patients (30%) had serious nerve injury in which three of them show HB III and one patient had HB IV and one patient had HB V (fig 3.5).

At the end of 1 month, four patients (20%) had serious nerve injury with one patient (10%) at the end of month 3 and at the end of month 6; no patient had serious nerve injury

Retrograde technique

At the end of week 1, 13 patients (40%) had serious nerve injury, three patients from them had HB III.At the end of month one (10%) patient had serious injury , and at the end of month 3; no patient had serious nerve injury.

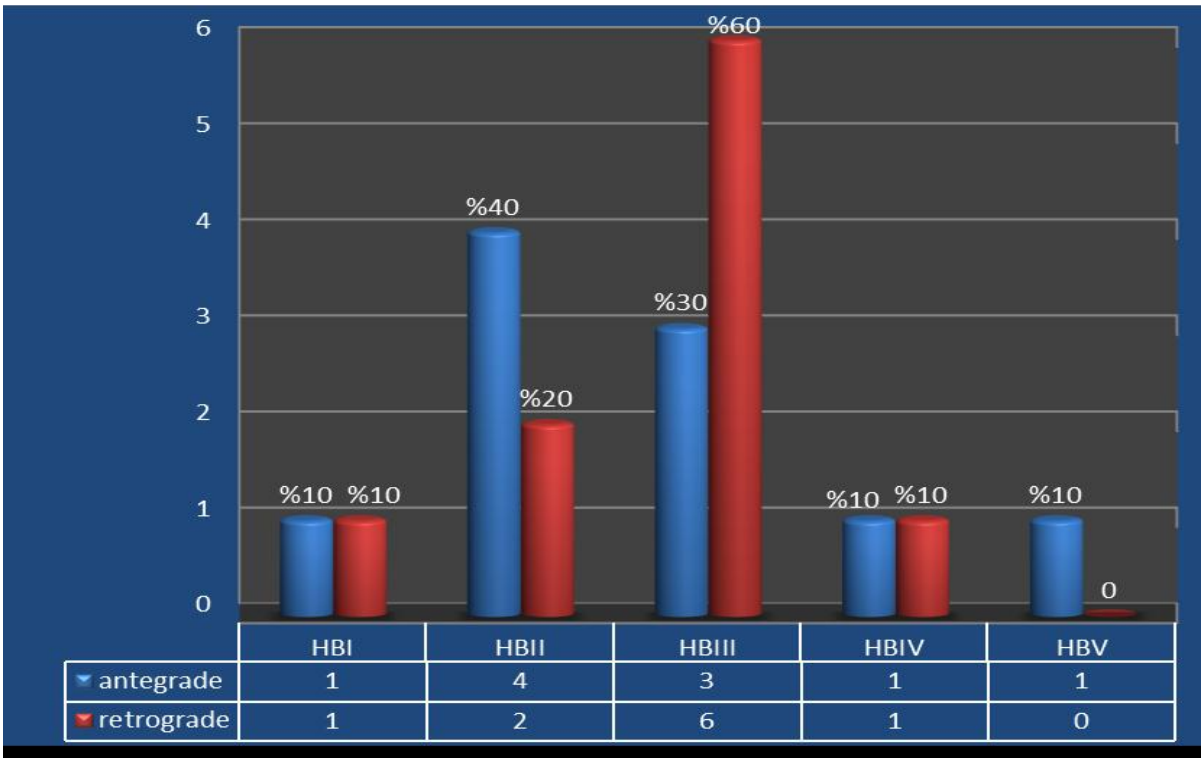

Table 3.1 shows that the nerve injury in week 1 is more in retrograde than antegrade technique but becomes less in month 1 and month 3 in retrograde than ante grade technique.

Inferential Statistics of the surgical technique

Kruskal-Wallis Test: we used to compare between the antegrade and retrograde groups at each time intervals (week 1, month 1, month 3 and month 6).

Friedman Test: we used to compare between the time intervals for each group regarding facial nerve recovery

For both tests we have rank value and p-value.

The differences regarding the nerve injury in two groups

Kruskal-Wallis Test				
Ranks N=10			df=1	
Time	group	Mean Rank	t-value	p-value
week	anterograde	10.1	0.104	0.747 (NS)
	retrograde	10.9		
month	anterograde	11.15	0.271	0.602 (NS)
	retrograde	9.85		
month3	anterograde	11.15	0.345	0.557 (NS)
	retrograde	9.85		
month6	anterograde	11	1	0.317 (NS)
	retrograde	10		

The statistical analysis shows:-

Week 1: the highest rank (more nerve injury) was for retrograde technique but this was non-significant because the p-value greater than 0.05.

Month 1: the highest rank was for antegrade technique because retrograde has faster recovery rate than antegrade but this was non-significant because the p-value greater than 0.05. **Month 3 and 6:** the same as month 1.

The differences regarding the nerve recovery in antegrade and retrograde technique groups

Friedman Test				
Ranks N=10			df=3	
group	Time	Mean Rank	t-value	p-value
anterograde	week	3.65	22.56	0.000 ***
	month	2.9		
	month3	1.9		
	month6	1.55		
retrograde	week	3.75	22.62	0.000 ***
	month	2.7		
	month3	1.95		
	month6	1.6		

The statistical analysis shows:-

Antegrade technique :

The highest rank (more nerve injury) was in **week 1** then as we proceed with time , the rank value decreases that means we have recovery in the facial nerve which is very highly significant because the p-value is below 0.001 .

Retrograde technique :

The highest rank (more nerve injury) was in **week 1** then as we proceed with time , the rank value decreases that means we have recovery in the facial nerve which is very highly significant because the p-value is below 0.001 .

Discussion

Facial nerve morbidity increased with age and contributed to the ischemic injury to the nerve during surgery as

The age of the patients :-

the blood vessels of old patients become frail and easily traumatized this concise with studying done by[4] . In this study there was no significant difference in the age of the patients **(p = 0.572)** and this concise with studying done by Pavel Dulguerrous et al in 1999 (7)**.**

Facial nerve injury :-

facial nerve injury was higher in the retrograde technique during the **first week** postoperatively than in the ante grade technique.

This may be due to the small diameter of the peripheral nerves branches when compared to the main trunk , also some branches are longer than other branches the marginal mandibular branch was smaller and longer than branches of the upper division of the facial nerve which increase the length of dissection of the marginal mandibular branch .This is with agreement with also the resulting edema further impedes the microcirculation of the nerve, during such injury the nerve remains grossly normal and this coincide with Wang et al 2002[8].

Although the facial nerve injury was more in retrograde technique in comparison with ante grade technique but it was not significant **(p > 0.05)** which is similar to the study shown by Barry O'Regan , GirishBharadwaj , 2010[4, 9] **.**

Facial nerve recovery :-

the recovery rate for retrograde was **faster** than ante grade in **month one** postoperatively while in the ante grade technique the recovery rate seemed to be **slower** which may be contributed to the ischemic injury to the main trunk as the main factor as described by in which the main blood supply to the main trunk is ligated during routine exposure of the main trunk. This was based upon the premise that the trunk of the facial nerve received blood supply from a constant branch of the stylomastoid artery as described by **Pia F, Policarpo M, Dosdegani R, et al.** [5] and also the long duration of the exposure of the main trunk and long procedure in which there is direct stretching on the main trunk.

There was significant difference **(p = 0.000)** in the recovery rate between time intervals in the retrograde and antegrade technique and that means there was improvement in the healing

process of the facial nerve with time because neuropraxia usually recover spontaneously over a few hours to few months in which neither the axon nor the sheath is cut but only complete block of nerve transmission despite intact nerve fibers .This is in agreement with Barry O'Regan et al. (9)

Conclusions

1. The retrograde technique may provide an adjunctive or alternative approach.

2. Selective or individual exposure of branches of the nerve is possible and helps to avoid unnecessary exposure of the trunk, which may reduce the risk of nerve injury across the face.

3. Although there were more initial serious nerve injuries in the retrograde group than in the ante grade group, recovery was faster in the retrograde group.

4. The rate of permanent nerve injury was not affected by the choice of dissection technique.

5. Retrograde technique is superior on ante grade regarding the surgical time and the rate of recovery of the facial nerve during month one and month three.

Recommendations

1. We recommend the use of facial nerve stimulator which will decrease nerve injury.

2. Additional variables should be included in the comparison which includes the histopathology of the lesion, the size of the lesion, the blood loss, the volume of normal tissues removed.

3. Study the clinical outcomes and drawbacks in the management of malignant parotid tumors using retrograde approaches.

4. Study the comparison between the ante grade technique and other techniques like extra capsular dissection and partial superficial parotidectomy.

5. Study the comparison between the retrograde technique and other techniques like extra capsular dissection and partial superficial parotidectomy.

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الغدة النكفية السطحية: مقارنه بين الطريقة التراجعية مع الطريقة التقدمية المحورة في استكشاف العصب الوجهي عند استئصال الاورام الحميدة من الغدة النكفية

مرتضى محمد باقر الخرسان

الخلاصة

المقدمة

الغدة النكفية هي الموقع الأكثر شيوعا لأورام الغدة اللعابية ونسبتها (٦٤ ٪ -- ٨٠ ٪) من جميع الحالات والورم الغدي المتعدد الأشكال هو الورم الأكثر شيوعا (٥٣ ٪ إلى ٧٧ ٪) من مجموع الحالات في الغدة النكفية . والعلاج الأمثل لمعظم الأورام النكفية هو الاستئصال الجراحي. أحد الأهداف الرئيسية لاستئصال الغدة النكفية السطحية هو تقليل الضرر إلى عصب الوجه وتحقيق أقصى قدر من المعدل الذي يتعافى به وتستخدم اثنين من التقنيات لتشريح العصب الوجهي في جراحة الغده النكفية : التقنية التقدميه والتقنية التراجعية.

الأهداف :

مقارنة بين الطريقتين لمعرفة أفضل طريقة للتشريح للحفاظ على سلامة العصب الوجهي.

المرضى والطرق :

اجريت هذه الدراسة على الاستئصال الجراحي للأورام الحميدة في الغده النكفية لستين مريض يعانون من ورم الغدة النكفية. وجمعت هذه الحالات من وحدة جراحة الوجه والفكين في مستشفى الشهيد غازي الحريري / المدينة الطبية / بغداد في الفترة من مايو ٢٠٠٩ إلى يوليو ٢٠١١ ومستشفى الحسين التعليمي ف ذي قار من الفترة ٢٠١٤ ولغاية ٢٠١٧ وتراوحت أعمار هؤلاء المرضى من (١٩ -- ٦٠) سنة بمتوسط قدره ٤٠.٩. تم تقسيم المرضى إلى مجموعتين ، خضعت المجموعة الاولى (ثلاثون مريض) الى استئصال الغدة النكفية السطحية بطريقه التقنية التقدميه والمجموعة الثانيه (ثلاثون مريض) خضعت لاستئصال الغدة النكفية السطحية بطريقه التقنية التراجعية. يتم تصنيف وتقييم وظيفة العصب الوجهي إلى ٦ درجات وفقا لنظام الدرجات House-Brackmann وقد بدأ هذا التقييم في الاسبوع الاول ، الشهر الاول، ثلاثه أشهر وستة أشهر بعد الجراحة.

النتائج :

الإصابة في العصب الوجهي في التقنية التقدميه كانت٣٠ ٪ في نهاية الأسبوع الاول و ٢٠ ٪ في نهاية الشهر الاول بينما الإصابة في التقنية التراجعية كانت ٤٠ ٪ في نهاية الأسبوع الاول و١٠٪ في نهاية الشهر الاول. تبين ان الاصابة في الأسبوع الاول أكثر في التقنية التراجعية من التقنية التقدميه وكان الانتعاش في العصب في التقنية التقدميه ٤٠ ٪ في الأسبوع الاول و ٥٥% في الشهر الاول والتقنية التراجعية ٧٠ ٪ انتعشت في الأسبوع الأول و ٣٠% في الشهر الاول فإنه يدل على أن التعافي من الإصابة أسرع في التقنية التراجعية من التقنية التقدميه.

الاستنتاجات :

هناك المزيد من الإصابات العصبية الأولية في التقنية التراجعية مما كان عليه في التقنية التقدميه ولكن التعافي كان أسرع في التقنية التراجعية ولم تتأثر نسبة الإصابة العصبية الدائمة بطريقة اختيار أسلوب التشريح.