Different techniques for identification of facial nerve during superficial parotidectomy

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Background
Parotidectomy is a common surgical procedure for the treatment of benign and malignant lesions of the parotid gland. Identification of the facial nerve trunk is essential during surgery of the parotid gland to avoid facial nerve injury. A comprehensive knowledge of its anatomy and meticulous dissection are the keys for the identification of the facial nerve trunk and its branches.

Aim
To compare between the traditional antegrade parotidectomy and retrograde in identification of facial nerve during superficial parotidectomy, determination the best anatomical landmark, the time of exploration of facial nerve, outcomes, facial nerve complication, duration of surgery, patient satisfaction as well as other complications.

Methods
Twelve patients who were diagnosed with having parotid gland neoplasms, and had undergone superficial Parotidectomy were recruited and assessed for eligibility at General Surgery Department, Beni-Suef University Hospital. Patients were divided according to the surgical technique into two equal groups, group A (the antegrade dissection group), and group B (the retrograde dissection group), follow-up was 6 months.

Results
There was no statistically significant differences between both groups regarding pain, paresthesia and pathology postoperation (P value>0.05). Longer mean operation time was observed in the antegrade dissection group in comparison with the retrograde dissection group (2.06±0.75 and 1.61±0.31 h, respectively), which was statistically insignificant (P value>0.05). There was a statistically significant increase in facial nerve injury among patients in the antegrade dissection group in comparison with the retrograde dissection group (P value=0.046). There was no statistically significant difference between techniques regarding hospital stay duration and complications three months postoperation (P value>0.05).

Conclusion
Retrograde facial nerve dissection technique is better than the classical antegrade technique in the superficial parotidectomy within this study.

Keywords:
antegrade technique, facial nerve, injure, parotidectomy, retrograde technique

Introduction

The most common site for salivary gland tumors is 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 [1].

Despite developments in operative techniques, surgery for benign parotid tumors remains associated with a relatively high rate of postoperative sequelae, with facial nerve palsy being the most significant [2].

Facial nerve is the main factor in concluding a successful parotid surgery. The main aim is to avoid any damage to facial nerve that may cause facial disability. It supplies the muscles of facial expression and holds an important position in postoperative complications as facial paralysis poses a deep anatomical, functional, and psychological impact on the welfare of patient [3].

Numerous soft tissue and bony landmarks have been proposed to assist the surgeon in the identification of

facial nerve. Most commonly used anatomical landmarks to identify facial nerve trunk are stylomastoid foramen, tympano-mastoid suture, posterior belly of digastric, tragal pointer, and mastoid process and peripheral branches of the facial nerve [4].

Controversies are present regarding the best approach technique that avoids the injury of facial nerve. Such techniques include the antegrade parotidectomy and the retrograde parotidectomy [5,6].

Patients and methods

This comparative interventional study included 12 patients who were diagnosed with having parotid gland neoplasms, and had undergone superficial Parotidectomy. They were divided according to the surgical technique into two equal groups, group A (the antegrade dissection group), and group B (retrograde dissection group). They were recruited and assessed for eligibility from General Surgery Department, Beni-Suef University Hospital and they were followed-up for 6 months.

Inclusion criteria included: age between 10 and 60 years old, both sexes, with informed consent from patient regarding postoperative facial nerve paresis. Exclusion criteria included patients who are not fit for surgery or with malignant tumor or with previous operation or scar at site of operation or who have facial nerve affection preoperative.

Preoperatively examinations
General examination included the assessment of the head, neck, chest, pelvis, and abdomen. Local examination included the inspection of the soft tissue: skin integrity, swelling, abrasions, skin bullae, contusions, and ecchymosis. Neurovascular examination included assessment of facial nerve movement, facial expressions. Clinical and Radiological ultra sound (US) on parotid region, computed tomography (CT) with IV contrast on parotid.

Preoperatively evaluations
Laboratory investigations including complete blood count, coagulation profile in the form of prothrombin time (PT), platlets count (PC), and international normalized ratio (INR), liver function tests serum glutamic-oxaloacetic transaminase (SGOT) and serum glutamic pyruvic transaminase (SGPT), kidney function tests (Urea, Creatinine). ECG and chest radiography were done for patients older than 40 years or when these is specific indication.

Consent from the patients
The following were discussed with the patient and patient's relatives in depth: nature of the swelling, steps of operation, facial nerve and its function, postoperative complication including facial nerve paralysis, and parathesia, postoperative rehabilitation program and average time of this program, the possible complications and the precautions taken to avoid and how to manage if occurred.

Postoperative stages
1) In the recovery room: The patient was observed for vital signs. 2) In the ward the facial nerve expressions was observed. All patients received parenteral antibiotic (third generation Cephalosporin) every 12 h till the third day and continued for 1 weeks more on oral antibiotic after discharge. Wounds were dressed after 2 days of the surgery.

Postoperative instructions and discharge
Most of patients were discharged on the second to third day of surgery. Some important instructions were given to the patients and their escort: 1- to keep movement of facial muscles, 2- to repeated dressing on the wound.

Follow-up
After discharge, first visit was scheduled one week postoperatively for the following: clinical evaluation of the wound for skin integrity and sutures, examination of facial nerve movement and facial expressions was performed, wound and sutures were assessed, and the nature of pathology of parotid mass and surgical margins was evaluated.

Ethical consideration
The study was carried out on patients attending to General Surgery Department in Beni-Suef University Hospital after approved by local ethical committee and an informed consent. Ethical clearance from the human ethics committee was obtained before commencement of the study.

Statistical analysis of data
Data were analyzed using Statistical Program for Social Science (SPSS) version 20. Quantitative data were expressed as mean ±SD. Qualitative data were expressed as frequency and percentage. The results were considered: Non-significant when the probability of error is more than 5% ($P>0.05$), significant when the probability of error is less than 5% ($P<0.05$), highly significant when the probability of error is less than 0.1% ($P <0.001$).

Table 1 Comparison between techniques regarding demographic data

| | Technique | | Chi square test | |
	Group A antegrade No (%)	Group B retrograde No (%)	X^2	P value
Sex				
Female	2 (33.3%)	5 (83.3%)	3.086	0.079
Male	4 (66.7%)	1 (16.7%)		
	Mean±SD	Mean±SD	**Independent t test**	
Age	38.33±11.9	35.17±9.06	0.518	0.616

Results

Table 1 shows no statistically significant difference between the studied techniques regarding demographic data.

Table 2 shows no statistically significant difference between techniques regarding the amount of blood loss.

Table 3 shows no statistically significant difference between techniques regarding pain, paresthesia, and pathology postoperation.

Table 4 shows statistically significant difference between techniques regarding operation time.

Table 2 Comparison between techniques regarding amount of blood loss

| | Technique | | | Chi square test | |
	Group A antegrade		Group B retrograde	X^2	P value
	6	40–50 cc	6	20–30 cc	3.086	0.079

Table 5 shows a statistically significant increase in facial nerve affection among patients in the retrograde Technique.

Table 6 shows shows a statistically significant increase in solitary branch affection among patients in the retrograde Technique.

Discussion

The comparison between both groups regarding pain, paresthesia and pathology post operation revealed no statistically significant difference between the antegrade dissection group and the retrograde dissection group (P value>0.05). The present study revealed no statistically significant relation between the pain, paresthesia and pathology postoperation (P value>0.05). A retrospective study by Kligerman et al. [7] studied the retrograde parotidectomy and facial nerve outcomes and demonstrated that 18.2% of patients experienced temporary paresis and 2.3% experienced minor permanent paresis limited to one branch. Furusaka et al. [8] found that retrograde

Table 3 Comparison between techniques regarding pain, paresthesia, and pathology postoperation

| | Technique | | Chi square test | |
	Group A antegrade No (%)	Group B retrograde No (%)	X^2	P value
Pain postoperative				
Mild	4 (66.7%)	5 (83.3%)	0.444	0.505
Moderate	2 (33.3%)	1 (16.7%)		
Paresthesia				
Mild	4 (66.7%)	5 (83.3%)	0.444	0.505
Moderate	2 (33.3%)	1 (16.7%)		
Pathology				
Plemorphic adenoma	2 (33.3%)	5 (83.3%)	1.500	0.221
Warthin's tumor	3 (50.0%)	1 (16.7%)		
Myxoid background	1 (16.7%)	0		

Table 4 Comparison between techniques regarding operation time (hours)

| | Technique | | Independent t test | |
	Group A antegrade	Group B retrograde	T	P value
Operation time				
Mean±SD	1.30±0.75(h)	2.06±0.31(h)	1.381	0.458

Table 5 Comparison between techniques regarding facial nerve affection and Edema in suture line

	Technique		Chi square test	
	Group A antegrade No (%)	Group B retrograde No (%)	X^2	P value
Facial nerve affection				
No	5 (50.0%)	4 (60.0%)	4.000	0.046
Yes	1 (50.0%)	2 (20.0%)		
Edema in suture line				
No	4 (66.7%)	6 (100.0%)	2.400	0.121
Yes	2 (33.3%)	0		

Table 6 Comparison between techniques regarding solitary branch affection

	Technique		Chi square test	
	Group A Antegrade No (%)	Group B Retrograde No (%)	X^2	P value
Solitary branch affection	**0**	**2 (20.0%)**	4.000	0.046

parotidectomy with a cervical branch approach was associated with significant decreases in the incidence of facial nerve paralysis, surgical time, and surgical blood loss, compared with anterograde parotidectomy.

Regarding the operation time, the present study revealed longer mean operation time among patients in the retrograde dissection group in comparison with the antegrade dissection group (1.30±0.75 and 2.06±0.31 h, respectively) there is statistically significant difference between both groups (P value>0.05). Such results are in agreement with Mashrah *et al.* [9] that reported that there was reduction in the operative time, amount of blood loss and amount of healthy salivary tissues removed in retrograde dissection group compared with antegrade dissection group. Additionally, Khazaeni *et al.* [10] indicated no significant difference was observed between the retrograde and antegrade dissection methods (it was 130 min in the antegrade and 132 min in the retrograde technique).

Regarding the incidence of facial nerve injury, the present study revealed a statistically significant increase in facial nerve injury among patients in the retrograde dissection group in comparison with the antegrade dissection group (P value=0.046). Additionally, 33.3% of patients in the antegrade dissection group have edema in suture line and none of patients in the retrograde dissection group has any edema, however, no statistically significant differences were found between both groups regarding edema (P value>0.05).

Similarly, a meta-analysis study by Mashrah *et al.* [9] suggested that the method of identification and dissection of the facial nerve may be considered as a risk factor for post-parotidectomy complications. However, there was no statistical difference between antegrade facial nerve dissection technique and retrograde facial nerve dissection technique. A previous study by Tukaram *et al.* [11] demonstrated that by using House Brackmann (HB) grading scale for grading facial nerve injury at 1 week postoperation, 50% of patients in antegrade group and 11.76% patients in retrograde group had no/mild facial nerve injury. While 50% patients in antegrade group and 76.47% patients in retrograde group had serious nerve injury (grade III/IV). All patients in antegrade group and 76.47% patients in retrograde group recovered completely at 4-month interval. A prospective study by O'Regan and Bharadwaj, [12] indicated that a high rate of serious nerve injury (HBIII or above) was associated with retrograde dissection at 1 week. Serious nerve injuries (HBIII or above) were slow to recover after the antegrade technique at 3 months. While, there was no difference between groups in the rates of full nerve recovery at 6 months. Khazaeni *et al.* [10] demonstrated that in the retrograde method, nerve branch paralysis is less probable, and in case of occurrence, it would involve one or two branches only, whereas in the antegrade method, the nerve trunk is injured, causing damage to all nerve branches.

The present study revealed statistically significant difference between solitary branch affection (P value>0.05). The present study revealed statistically significant relation between the solitary branch affection and the technique used for facial nerve trunk identification (P value>0.05). Contrarily, a recent study by Khazaeni *et al.* [10] indicated that solitary branch affection was found to be statistically higher in the retrograde group in comparison with the

antegrade group for parotidectomy. Finally the present study revealed samples of the study is not enough for comparison between the two groups in details but with more experience and meticulous dissection results could be improved.

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Conflicts of interest
There are no conflicts of interest.

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