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Partial superficial parotidectomy versus conventional superficial parotidectomy for benign parotid tumors: a controlled randomized study

Sakr MF[1], Ali RF[2], Nabawy AS[3], Hamza YM[4]

[1,3,4]Head, Neck and Endocrine Surgery Unit (HNESU), Faculty of Medicine, Alexandria University, Egypt
[2]General Surgery Department, Faculty of Medicine, Kafr Elsheikh University, Egypt

Email: : dr_reda2002@yahoo.com

ABSTRACT

Background: Different techniques of parotidectomy are used for management of benign parotid tumors. The present study was conducted to compare the safety and the oncosurgical adequacy of two different techniques of parotidectomy; namely, partial superficial parotidectomy (PSP) and conventional superficial parotidectomy (SP) for the management of benign parotid gland tumors.
Patients and Methods: This prospective controlled randomized study was conducted between August 2012 and September 2014 at the Department of Surgery, Faculty of Medicine, Alexandria University, Egypt. Patients were allocated in 2 groups (20 patients each), Group I for whom conventional SP was performed and Group II for whom PSP was performed. Both techniques were compared regarding operative and post-operative data and complications. Patients were followed-up at regular intervals for one year.
Results: Patients in both groups (20 each) were comparable regarding the demographic data, pre-operative clinical criteria and imaging features. The mean operative time was significantly shorter in the PSP group (t=3.478, p=0.001) and the estimated amount of intra-operative blood loss was also significantly less in the PSP group (t=2.560, p=0.014) as compared to SP group. There was no significant difference between both groups regarding intra-operative and post-operative complications. There was no tumor recurrence at one year post-operatively in both groups.
Conclusions: Based on the data presented, it may be concluded that PSP is an adequate and safe procedure for the treatment of benign parotid tumors located in the superficial lobe. With PSP there is no increase in post-operative morbidity. The main advantage of PSP is the significant reduction of operative time and blood loss.

Keywords: Parotid tumors, partial superficial parotidectomy, facial nerve injury.

INTRODUCTION

Before the 1940s, the surgical management of benign parotid lumps was unsatisfactory. Owing to a fear of damaging the facial nerve, the routine operation was enucleation of the tumour contents leaving the capsule in-situ. This was associated with a high recurrence rate (35%). Bailey (1941) identified and dissected the main trunk of facial nerve through the gland.(1) By the 1950s, formal superficial parotidectomy (SP) (dissection of the facial nerve) became established as the appropriate treatment for benign parotid lumps. The recurrence rate declined to below 2 %.(2)

Witt (2002)(3) reported that during operation for pleomorphic adenoma (PA), one or more branches of the facial nerve were in contact with its capsule, and he concluded that en-bloc resection is not possible and so there is little logic in removing the superficial lobe for a discrete tumor. This led to the adoption of less radical

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techniques for the management of PA, including partial superficial parotidectomy (PSP) or even peri- or extra-capsular dissection (ECD).[3-6]

The present prospective study was conducted to compare the safety and the oncosurgical adequacy of two different techniques of parotidectomy; namely, PSP and conventional SP for the management of benign parotid gland tumors.

SUBJECTS AND METHODS

Study Population;

The present controlled randomized study was conducted between August 2012 and September 2014, on 77 patients who were admitted to the surgical department at the Main University hospital, Head and Neck and Endocrine Surgery Unit (HNESU), Alexandria University, Egypt.

Inclusion criteria:

Included patients with benign tumors of the superficial lobe of the parotid gland.

Exclusion criteria:

Included malignant and suspicious tumors proved by the fine needle aspiration cytology (FNAC), previous parotid surgery, deep lobe tumors, facial nerve palsy, tumors larger than three centimeter in diameter, and scarring in or irradiation to the parotid area.

The flow-chart of patients is depicted in Figure 1 as may be seen, 17 patients were excluded from the study; six had tumors larger than 3 cm, five proved to have malignant swelling pre-operatively by FNAC, three had deep lobe involvement and three had previous parotid surgery.

The remaining 60 patients were allocated into two groups using the closed envelop method. Group I included 30 patients for whom conventional SP was performed, while Group II included 30 patients for whom PSP was performed.

Thirteen patients were excluded from the study, 6 in Group I as they proved to have malignant tumors post-operatively by definitive histo-pathology and 7 in Group II; four patients proved to have malignant tumors post-operatively by definitive histo-pathology, and the decision was changed intra-operatively from PSP to SP in 3 patients as the tumors were in contact with both divisions of the facial nerve.

Four patients were lost during follow-up in Group I and 3 in Group II as they failed to attend scheduled follow-up visits, leaving 40 patients, 20 in each group, who represented the population of the present study, of whom 21 were male and 19 were female. Their ages ranged between 12 and 79 years with a mean of 46.83±15.84 years.

The protocol of the study was approved by the ethical committee of the hospital. It was explained in details to the patients and their care-givers (relatives) and a written consent was obtained before enrollment in the study.

Pre-operative evaluation

All patients were subjected to thorough history-taking and complete physical examination. Laboratory investigations included complete blood count (CBC), blood glucose level, renal function tests (urea and creatinine), and coagulation profile. Imaging studies included neck ultrasound (US) for all patients and computed tomography (CT) scan of the neck in selected cases. Fine needle aspiration cytology was performed for all patients.

Operative technique

Conventional Superficial parotidectomy

The SP was performed as standard technique. After the skin incision and raising the flaps, the anterior border of sternocleidomastoid muscle was skeletonized carefully and both external jugular vein and anterior branch of the great auricular nerve were divided. Dissection was completed till identification of the posterior belly of the digastric muscle keeping in mind not to dissect more cephalad to the muscle to avoid facial nerve injury.

Since the facial nerve exits the stylomastoid foramen 1 cm deep to the tragal pointer, identification of the cartilage of the external auditory canal up to the tragal pointer was completed, then the following land marks; tympanic ring, anterior aspect of mastoid bone, tympano-mastoid suture and the posterior belly of the digastric muscle were identified to facilitate localization of the facial nerve. The retro-mandibular vein was divided and ligated in some patients to facilitate the dissection of the facial nerve.

Once the main trunk of the facial nerve was identified, the dissection proceeded forward till its bifurcation into upper and lower divisions then complete dissection of the five terminal branches and removal of all parotid tissue lateral to the facial nerve was performed (Figure 2).

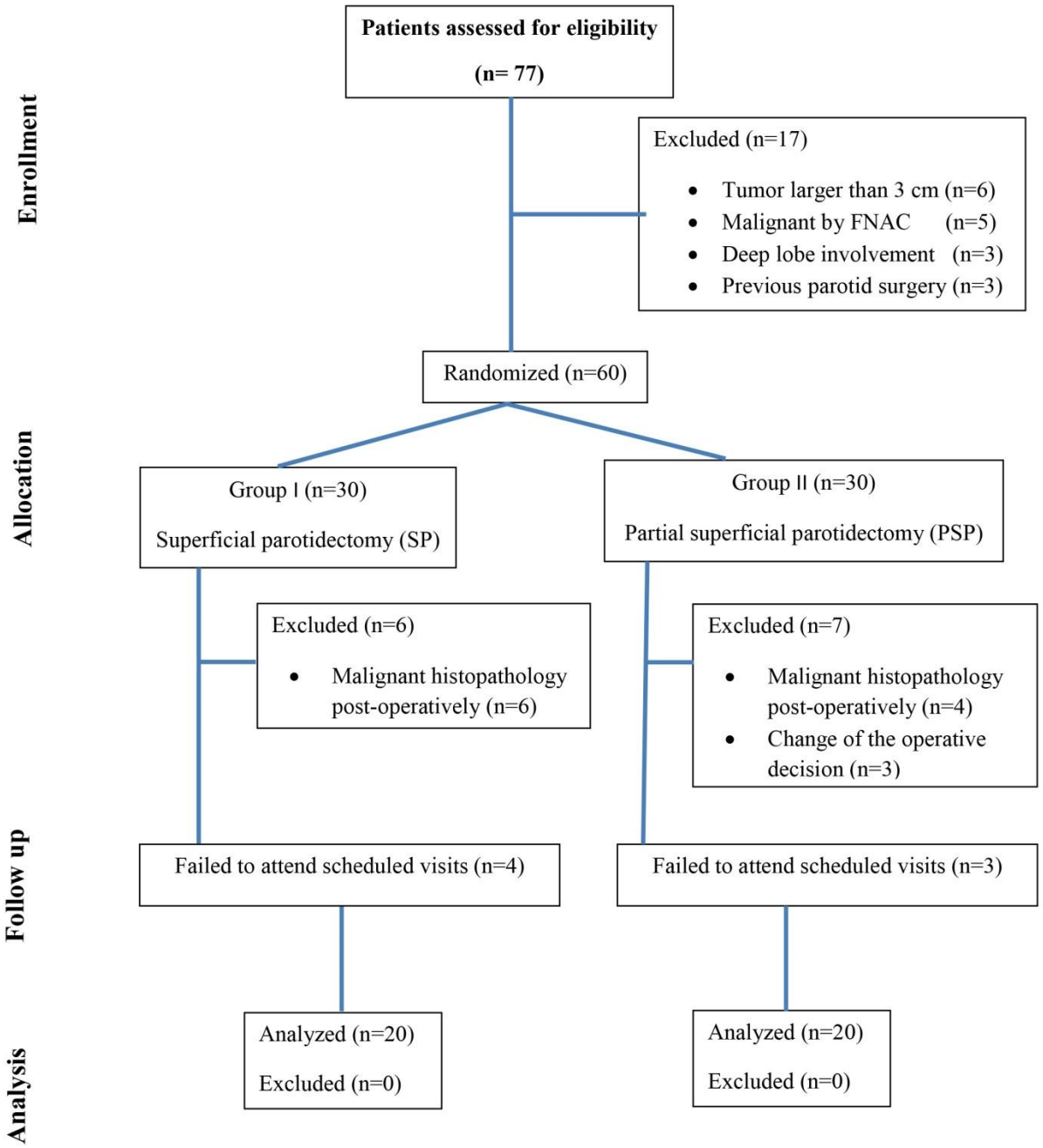
Partial superficial parotidectomy

After identification of the main trunk of facial nerve and its bifurcation as in SP, the branch or branches related to the tumor was completely identified and dissected depending on the tumor site either in the lower part (tail of parotid) or in the upper part of the gland. A small part of the superficial parotid lobe containing the tumor with at least 1cm of healthy tissue around the tumor was stripped out from the branch or branches of the facial nerve, related to the tumor (Figure 3), in contrary to SP in which all the superficial lobe was removed completely.

When the tumor was found intra-operatively to be in contact with both divisions of the facial nerve, SP was performed and the patient was excluded from the study.

In both procedures (SP and PSP) the parotid duct was identified and ligated. Careful inspection of the

Figure-1. Flow chart of patients



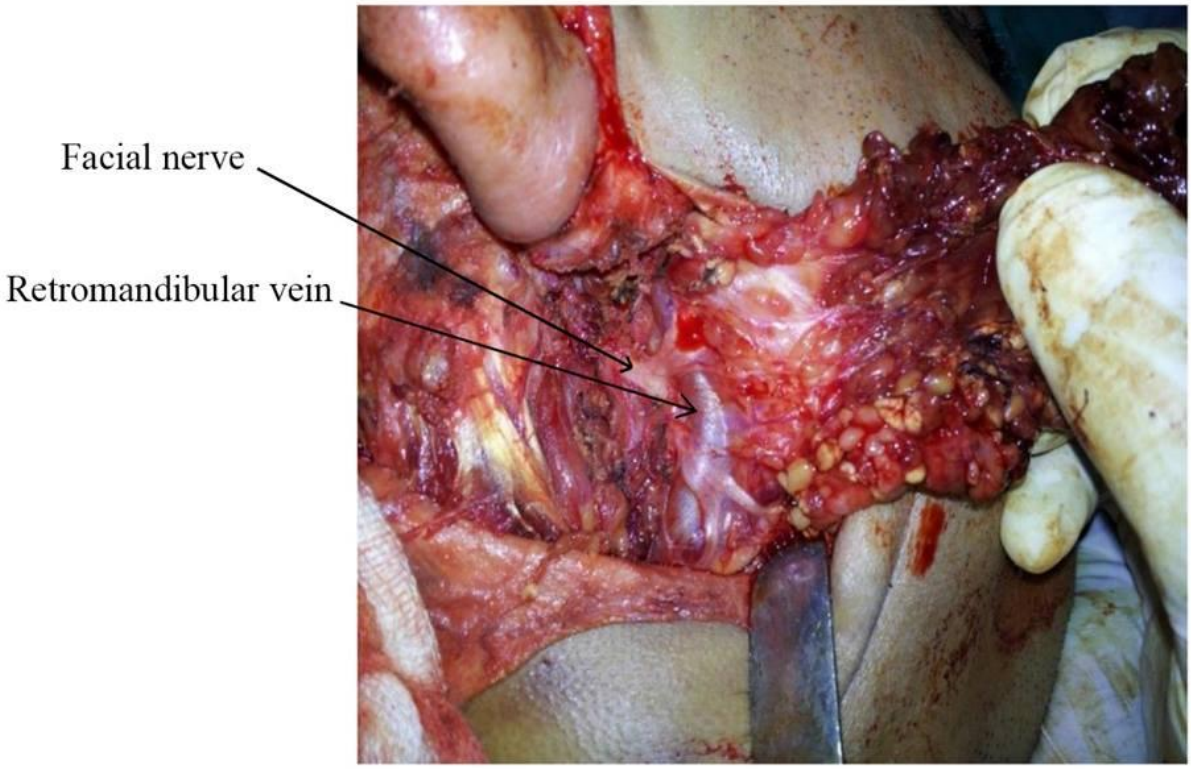
wound, irrigating the parotid bed with normal saline solution, and ligation or coagulation using bipolar diathermy of any bleeding vessel was applied. A suction drain was routinely used before closure of the surgical defect.

Estimation of the intra-operative blood loss was performed by using a scale to weigh blood-soaked items (towels and gauze) and estimation of blood in the suction machine taking into consideration if irrigation with saline was used to be subtracted from the estimated amount. The operative time was calculated from the skin incision till the final closure of the surgical wound.

Post-operative assessment

All patients stayed in the hospital overnight for observation, because undetected and expanding neck hematomas can cause life-threatening airway problems. The morning after the operation, the wound was inspected, the drain was removed, and a new dressing was applied. Patients were instructed to remove the dressing 24 hours later. At that time, they could shower and resume normal activities. Patients were instructed to

Figure-2. An intraoperative image showing SP with dissection of terminal branches of the facial nerve and identification of the retro-mandibular vein.



report any redness, hotness, hypothesia, and sweating, specially during mastication.

Follow-up

All patients included in the study were followed-up regularly at the outpatient clinic for one year. Follow-up visits were scheduled at one week, one month, six months and one year postoperatively for detection of early complications; namely, facial nerve injury, hematoma, surgical site infection (SSI), skin flap necrosis, anesthesia over the distribution of the greater auricular nerve, and late complications; namely, persistent facial nerve paresis, sialocele, salivary fistula, scarring, deepening of retro-mandibular sulcus, Frey's syndrome and recurrence of tumors. Neck US was performed during the last two visits for detection of recurrence, and nerve conduction test (Electromyography "EMG") was performed for patients showing persistent facial nerve paresis.

Statistical analysis [7]

Data were analyzed using the SPSS software package version 20.0 (Prentice Hall, Chicago, IL, USA). Qualitative data were described using number and percent. Quantitative data were compared using the student t test. Comparison between the two groups regarding categorical variables was done using the Chi-square (X^2) test. When more than 20% of the cells have expected count less than 5, correction for Chi-square was conducted using Fisher Exact test or Monte Carlo correlation (MC). A "*p*" value of <0.05 was considered to be statistically significant.

RESULTS

Demographic data

The present study included 40 patients, 21 (52.5%) were male, and 19 (47.5%) female. The mean age was 46.830±15.84 years. Both groups were comparable regarding the demographic data (Table 1).

Clinical criteria

The right parotid gland was affected more than the left in both groups. Different type of swellings' consistency was noted. The mean clinical size of the parotid swellings was smaller in Group II than in Group I without a statistically significant difference (Table 2).

Fine needle aspiration cytology (FNAC)

Pleomorphic adenoma was diagnosed pre-operatively by FNAC as the most common benign parotid tumor. It was encountered in 55% in Group II and 35 % in Group I as shown in Table 3.

Operative and post-operative data

Table-1: Comparison of demographic data between the two studied groups

Demographic data	Group I (N =20)		Group II (N =20)		Test of significance	p
	N	%	N	%		
Gender						
- Male	10	50.0	11	55.0	□└□□□□□□□	0.752
- Female	10	50.0	9	45.0		
Age (years)						
- Range	24.0 – 79.0		12.0 – 70.0		t = 0.207	0.837
- Mean ± SD	46.30±16.29		47.35 ±15.79			

Table 2: Comparison of the clinical criteria between the two studied groups

Clinical criteria	Group I (N =20)		Group II (N =20)		Test of significance	p
	N	%	N	%		
Site						
- Right side	14	70.0	13	65.0	□└□□□□□□□	0.736
- Left side	6	30.0	7	35.0		
Consistency						
- Firm	15	75.0	17	85.0		
- Tense Cystic	3	15.0	3	15.0	□└□□1.835	^{MC}p= 0.578
- Variable (Heterogeneous)	2	10.0	0	0.0		
Size (cm)						
- Range	1.0 – 3.0		1.0 – 3.0		t= 1.252	0.218
- Mean ± SD	2.55 ± 0.60		2.30 ± 0.65			

Table 3: Comparison of FNAC results between the two studied groups

FNAC	Group I (SP) (N=20)		Group II (PSP) (N =20)		□└	P
	N	%	N	%		
- Pleomorphic adenoma	7	35.0	11	55.0	1.616	0.204
- Mixed acute and chronic inflammatory changes	5	25.0	2	10.0	1.558	^{FE}p=0.407
- Lympho-proliferative lesion	4	20.0	3	15.0	0.173	^{FE}p=1.000
- Adenolymphoma	2	10.0	3	15.0	0.229	^{FE}p=1.000
- Benign smear	2	10.0	1	5.0	0.360	^{FE}p=1.000

The mean operative time was significantly shorter in the PSP group than in the SP group (100.0±15.73 min versus 116.0±13.34 min, respectively) (t=3.478, p= 0.001) and the estimated amount of intra-operative blood loss was also significantly less in the PSP group than in the SP group (107.25±17.81ml versus 122.5±19.70 ml, respectively) (t=2.560, p=0.014) (Table 4).

Transection of the upper division of the facial nerve during conventional SP was encountered in one patient (5%) and was repaired directly at the same session using a magnifying loop. Concussion (paresis) of the marginal mandibular nerve (MMN) was reported in seven patients (35%) in Group I and three patients (15%) in Group II. It was managed conservatively by neurotonics and vitamin B6 supplements and resolved completely in all patients within 3 months post-operatively. Other minor complications are summarized in Table 4.

Sailolcele was reported in one patient (5%) in the SP group, which was managed conservatively by Scopolamine (Buscopan) and resolved within six

Table-4: Comparison of operative and post-operative data between the two studied groups

	Group I (SP) (N =20)	Group II (PSP) (N =20)	Test of significance	P
Operative time (minutes)				
- Range	95.0 – 135.0	70.0 – 130.0	t=3.478	0.001*
- Mean	116 ± 13.3	100 ± 15.7		
Estimated blood loss (ml)				
- Range	100.0 – 150.0	75.0 – 150.0	t=2.560	0.014*
- Mean	122.5 ± 19.7	107.3 ± 17.8		
Complications				
- Concussion of MMN	7 (35%)	3 (15%)	□└=2.133	0.144
- Injury to the upper division	1 (5%)	0 (0%)	□└=1.026	FEp=1.000
- Flap Necrosis	2 (10%)	2 (10%)	□□□└= 0.0	FEp=1.000
- Haematoma	1 (5%)	0 (0%)	□└=1.026	FEp=1.000
- Surgical site infection	1 (5%)	0 (0%)	□└=1.026	FEp=1.000
- Sialocele	1 (5%)	0 (0%)	□└=1.026	FEp=1.000

*: Statistically significant at p <0.05
MMN: marginal mandibular nerve

Table 5: Incidence of PA and adenolymphoma among males and females

Pathology	Males (N = 21)	Females (N = 19)	□└	p
Pleomorphic adenoma	7 (33.3%)	17 (89.5%)	13.099	<0.001*
Adenolymphoma	12 (57.1%)	1 (5.3%)	12.238	<0.001*

*: Statistically significant at p <0.05

months, confirmed by the follow-up neck US at six months. Neither salivary fistula nor Frey's syndrome was encountered in both groups of the present study. No recurrence was encountered in the study after one year follow-up in either group (Table 4).

Final histo-pathology results

Pleomorphic adenoma was the commonest in both groups (60% each) (n=12 patients each) followed by adenolymphoma, which was encountered in 30% (n=6) of patients in the SP group and 35% (n=7) of patients in the PSP group.

Pleomorphic adenoma affected 89.5% (17/19) of female patients as opposed to 33.3% (7/21) of male patients with a statistically significant difference (□└=13.099, p<0.001). Conversely adenolymphoma affected males more than females (57.1% versus 5.3%, respectively) with a statistically significant difference (□└=12.238, p<0.001) as seen in Table 5. Other less common results are shown in Figure 4.

DISCUSSION

In the last two decades, PSP and ECD techniques were employed to remove the tumor along with a cuff of healthy tissue around it, while preserving more of the remaining parotid tissue.[8, 9] These techniques also aimed at shortening the operative time and minimizing the risk to the facial nerve.

The current study was applied on patients with benign parotid tumors less 3 cm in diameter. This is the maximum size generally thought to be amenable for safe partial gland resection, though a study by Witt (2002)[3] concluded that tumors up to 4 cm are treatable safely with partial (PSP) or even local (ECD) tumor excision with no preferred technique.

The matter of debate that comes with more conservative approaches is the safety margin. Webb and Eveson (2001)[10], Witt (2002)[3], Zbären and Stauffer (2007)[11], and McGurk et al (1996)[12] mentioned that the safety margin is defined by the position of the facial nerve branches in relation to the tumor so that even the most complete superficial parotidectomies will involve capsular dissection if the tumor is lying against the nerve.

Witt (2002)[3] reported that 25% of tumors that were excised showed positive margins after surgery, and he advocated that this is because of the proximity of the tumor to the facial nerve branches and not dependent on the kind of surgical technique used: SP, PSP, or ECD. However Webb and Eveson (2001)[10] claimed that there is no consensus in the literature relating to satisfactory safe margins when excising PA. In 2005, Witt concluded that 1-cm would be a safe margin for PSP without increased risk of recurrence,[13] which is

Figure-3. An intra-operative image of PSP showing dissection of the main trunk of the facial nerve and its branches only related to the tumor.

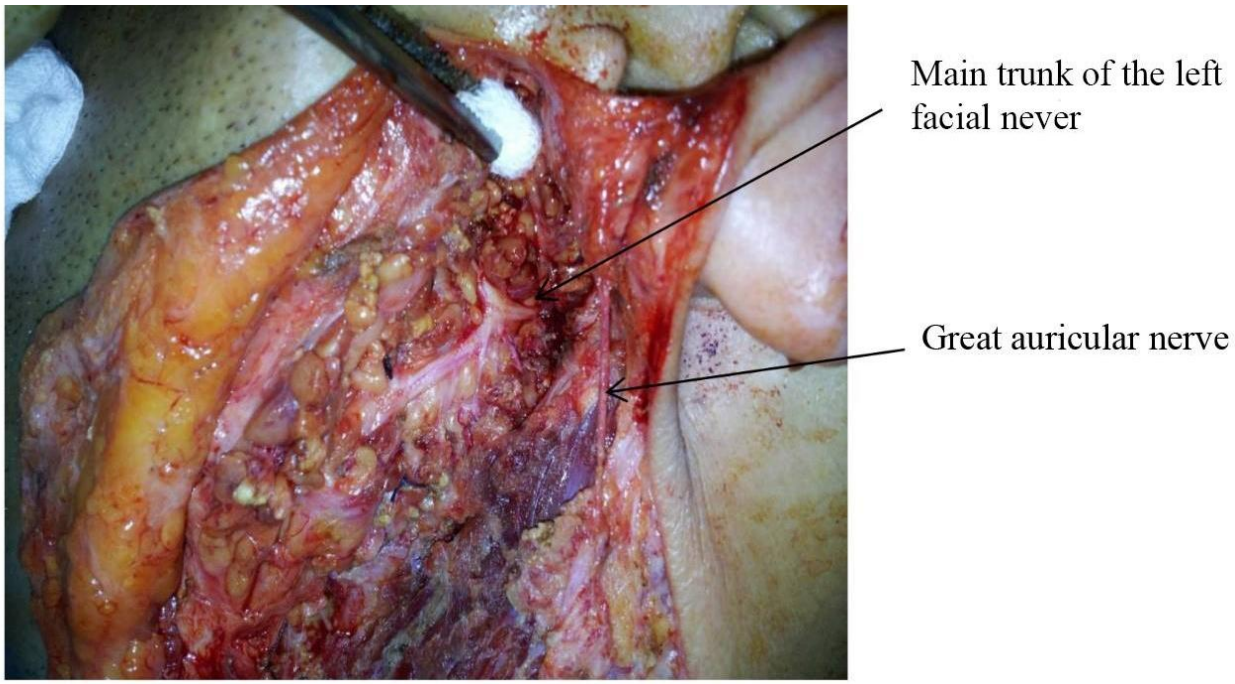
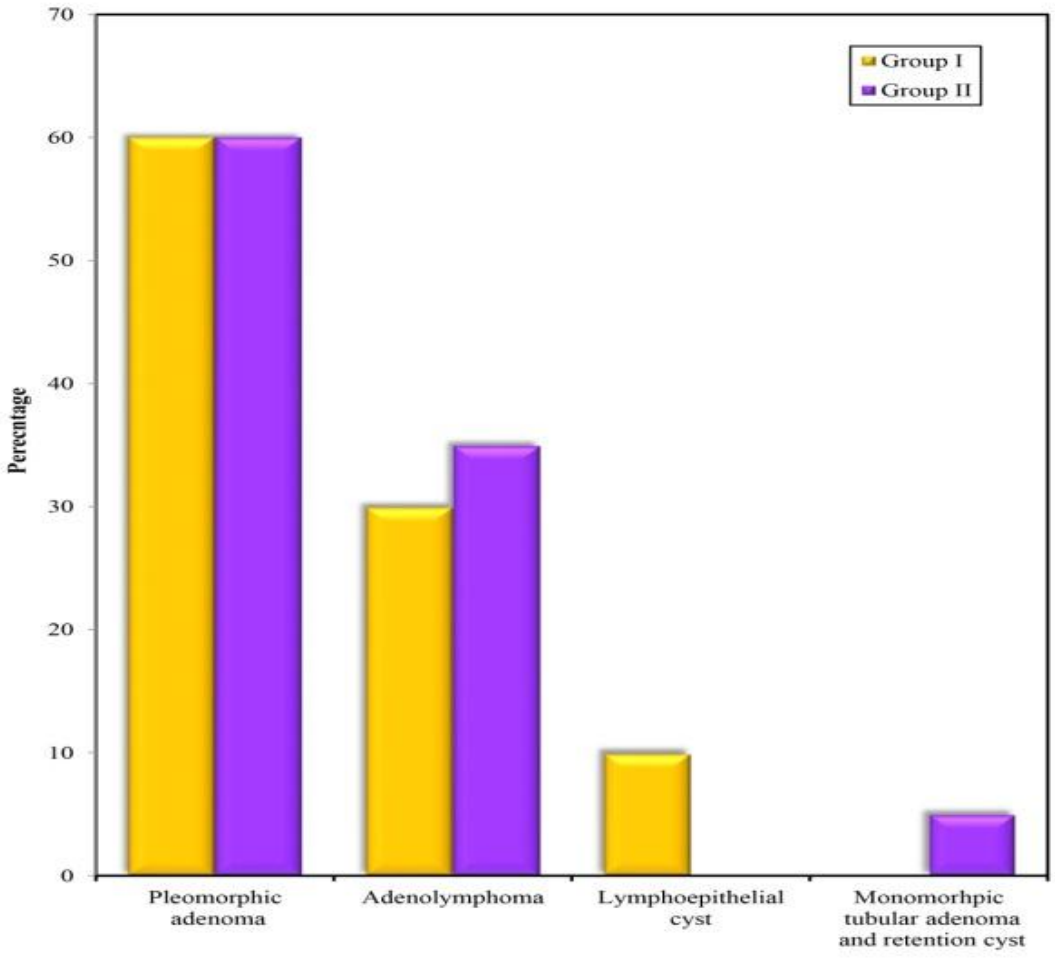


Figure 4: Comparison of the final histo-pathology results between the two studied groups



encountered after one year follow-up with safety margin more than 1-cm.

Operative time and blood loss were both significantly lower in the PSP group as compared to the SP group. This has been confirmed by several authors: Omri and colleagues (2010),[14] Chen et al (2014),[15] and Gang and colleagues (2015).[16]

The reported incidence of facial nerve paresis/paralysis is as high as 30–65% for transient weakness and 3–6% for permanent dysfunction [17] The PSP requires less resection of healthy tissues and demands less surgical time. Moreover, with this technique, fewer branches of the facial nerve are exposed and therefore less traumatic damage is caused [14]. In the present study, only one patient had facial nerve injury and he belonged to the control (SP) group.

In this study, tumor recurrence was not reported in any patient after a one year follow-up, probably due to the small population study and short follow-up period. O'Brien (2003)[17] in a study on 355 patients, concluded that treatment with PSP for benign tumors superficial to the facial nerve resulted in a low recurrence rate and a low rate of morbidity.

Witt (2005)[13] noted that recurrence after PSP/ECD was not, as might be expected, higher than after superficial/total parotidectomy. After a 10 year follow-up, he reported 0 % recurrence following PSP.

CONCLUSION

In conclusion, both techniques give satisfactory results. The PSP is an adequate and safe procedure for treatment of benign parotid tumors located in the superficial lobe without increase in post-operative morbidity. The main advantage of PSP is the significant reduction of operative time and blood loss.

Conflict of Interests

Authors declare that there is no conflict of interests regarding the publication of this paper.

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