

Complications of Parotid Surgery—10 Years' Experience

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Abstract

Background: Parotid surgery with dissection of the facial nerve branches is a technically challenging surgery. Even in experienced hands, parotidectomy has well-documented post-operative complications. We aim to evaluate complications following parotid surgery. **Methods:** We retrospectively reviewed the charts of 187 patients who underwent parotidectomy from January 2008 to January 2018 performed in surgical oncology department South Egypt Cancer Institute, Assiut University, from patients (57.3% males and 42.7% females, average age 42.96 years). **Results:** 78.4% Patients had benign tumors, the most frequent being pleomorphic adenoma 55.1% followed by Warthin's tumour 16.9%, and 21.6% malignant tumors, mucoepidermoid carcinoma being the most frequent. Superficial parotidectomy was the most common surgery 40.4% performed followed by 25.3%, total conservative parotidectomy, while 1.1%, underwent radical parotidectomy, (extended radical parotidectomy was performed 2.2%), and revision total parotidectomy (Recurrence 6.7%, and parotidectomy with modified radical neck dissection (MRND) 7.9%. The most common complication following parotidectomy was transient facial nerve palsy 21.3%. Permanent facial nerve paresis was observed in 3.9%, sensory deficit in 20.2%, sialocele in 6.7%, hematoma formation 3.4% and wound infection in 7.3%, and recurrence 7.3%. Frey's syndrome occurred in 7.3% and salivary fistula 5.1%. **Conclusion:** Parotidectomy is safe procedure causing minimal complications. Transient facial palsy is the most common post-operative complication.

Keywords

Pleomorphic Adenoma, Major Salivary Gland, Painless Swelling

1. Introduction

Salivary gland tumors represent 3% - 10% of all head and neck neoplasms. About 80% of the salivary gland tumors occur in the parotid gland. Superficial lobe is the main site where about 80% of tumours arise; 80% of these are pleomorphic adenoma followed by Warthin's tumour and monomorphic adenoma. Surgical intervention is the mainstay of treatment for parotid gland tumors [1] [2]. Today the widely accepted procedures for benign parotid gland tumours are superficial parotidectomy and extra capsular resection while for malignant disorders range from total to extended parotidectomy [3]. Pleomorphic adenoma lack a true capsule and have small protrusions, pseudopodia, that extend beyond the central tumor mass. The main reason for recurrence is incomplete surgical resection [4] rupture of the capsule of a parotid tumour [5] [6]. Revision surgery appears to be associated with more postoperative complications [7]. Parotidectomy was first introduced into the world literature by Berard in 1823. As early as 1912, Wilson Blair emphasized the importance of identifying and preserving the facial nerve (FN) functions in parotid surgeries [8]. Facial nerve injury mechanisms during parotidectomy include nerve division, stretch, compression, ligature entrapment, thermal and electrical injuries, and ischemia [9]. The complications of parotid surgery are facial nerve damaging, bleeding, hematoma, seroma, sialocele, saliva fistula, infection, keloid formation, and Frey syndrome [10]. Temporary facial nerve paresis, involving all or just one or two branches of the facial nerve and permanent facial paralysis have occurred respectively in 9.3% - 64.6% and in 0% - 8% [11]. Frey's syndrome is difficult to treat but is a preventable phenomenon [12]. Other cosmetic complications of parotidectomy are hypertrophic scar and keloid. Scar revision with steroid injections may sometimes be necessary [5].

2. Materials and Methods

This is a retrospective study performed in surgical oncology department in South Egypt Cancer Institute, Assiut University, from January 2008 to January 2018 of 187 patients. All patients with parotid tumors (benign or malignant) who underwent surgery as the primary treatment were included in the study. Cases which were medically unfit or have non-surgical management were excluded from the study. Fine needle aspiration cytology was done in some cases along with other routine pre-operative investigations: ultrasonography, computed tomography scan or magnetic resonance imaging (method of choice). MRI can also provide valuable information regarding: the position of the tumour in relation to the main trunk of the facial nerve; a small tumour in the contralateral parotid or a second small primary tumour within the ipsilateral parotid; the extent of any nodal disease, perineural tumour and extra-parotid spread (**Figures 1(A)-(D)**).

2.1. Surgical Technique

Hypotensive anesthesia was used whenever possible. Long-acting paralytic agents

are avoided to allow for facial nerve monitoring via exposure of eye and mouth angle (**Figure 2(A)**). The standard parotidectomy approach is via a preauricular incision with an extension into the neck (Blair incision) (**Figure 2(B)**). Elevation of a thick flap is desirable to reduce the occurrence of Frey's syndrome (**Figure 2(C)**). Complete exposure of superior portion of the sternomastoid muscle. Parotid was separated posteriorly and inferiorly from the sternomastoid muscle taking care to identify and preserve the posterior branch of the great auricular nerve if possible to achieve faster and more complete recovery and avoid complications such as sensitive disorders (anesthesia/hypoesthesia/dysaesthesia/paraesthesia) (**Figure 2(D)**), identifying and preserving the integrity of the facial nerve from the main trunk to the peripheral branches identified in an antegrade fashion.

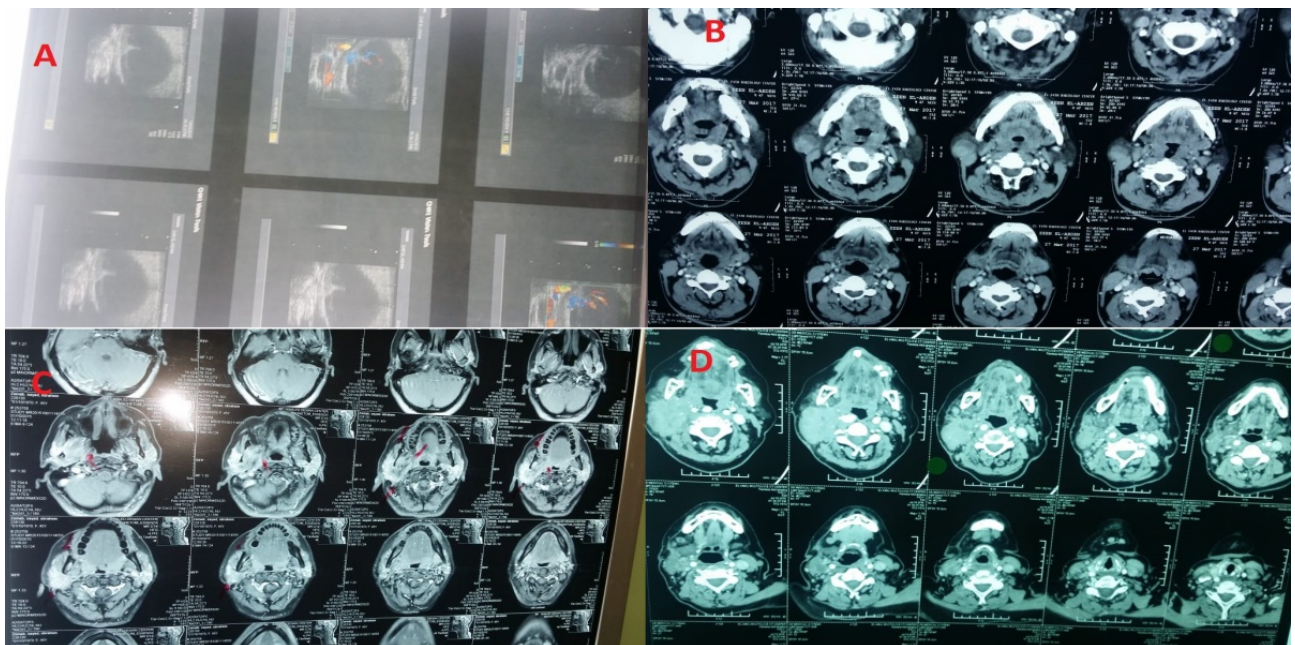


Figure 1. Imaging studies of parotid tumors (US, CT and MRI).



Figure 2. Skin incision and skin flap.

Using anatomic landmarks, which include the posterior belly of the digastric muscle, the mastoid tip, the tragal cartilage pointer, and the tympanomastoid suture the parotid gland superficial to the nerve is divided carefully. The depth from the tragal pointer to the facial nerve has been variably described as 1 to 3 cm. This was achieved by passing a fine mosquito forceps above and parallel to the nerve, spreading it open, elevating it and then, the parotid tissue above it is removed, maintain a hemostatic field by bipolar to identify the nerve accurately.

Avoid capsular rupture or nerve damage (**Figures 3(A)-(D)**). Patients were instructed to raise their eyebrows to test the temporal branch, to close their eyes tightly to test the zygomatic branch wrinkle their noses to test the buccal branch; and to, first, pucker their lips and, then, open their mouth and show their teeth to test the marginal mandibular branch of the facial nerve.

Assessments were performed preoperatively, within 24 hours after surgery, and postoperatively every month for 12 months or until complete restoration of the facial nerve function (**Figures 4(A)-(E)**).

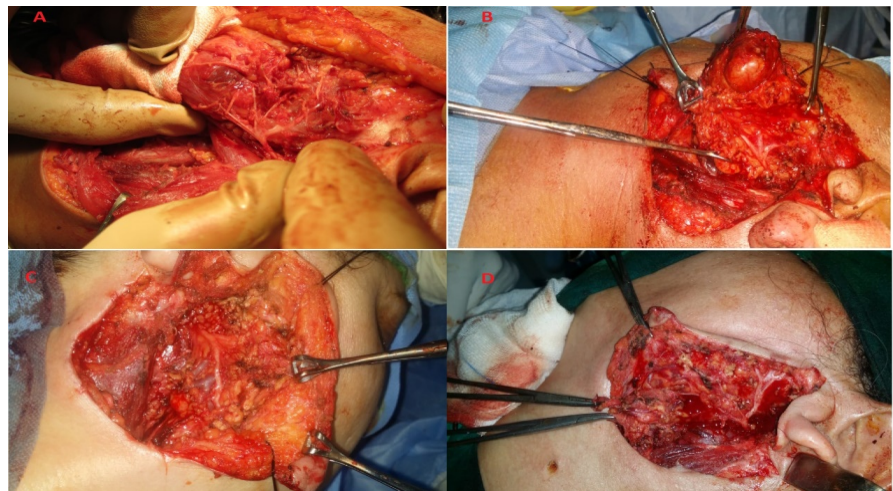


Figure 3. Dissection of facial nerve branches.



Figure 4. Assessment of facial nerve functions.

Parotid surgery requires prevention of tumor spillage or seeding that can promote recurrence. Partial parotidectomy: any procedure less extensive than superficial parotidectomy does not imply dissection of the facial nerve (**Figure 5(A)**). Superficial parotidectomy: dissection of all branches of the facial nerve removal of all parotid tissue lateral to the nerve, and resection of the entire superficial lobe was performed for all benign tumours confined to the superficial lobe (**Figure 5(B)**). Total Conservative parotidectomy: resection of the entire parotid gland, usually with preservation of the facial nerve if the deep lobe was also involved. When the tumour requires dissection both above and below the facial nerve, the treatment protocol was superficial parotidectomy for benign lesion of the superficial lobe and total conservative parotidectomy was done in case of benign lesion of deep lobe and malignant lesion of either lobe without facial nerve involvement (**Figure 5(C)**). Radical parotidectomy is defined as total removal of superficial and deep lobe of the parotid gland with sacrifice of the facial nerve used for malignant tumours invading the facial nerve usually with preoperative weakness (**Figure 5(D)**).

Extended parotidectomy was performed for T4a tumors involving resection of adjacent structures involves complete removal of the entire parotid gland, including also excision of the facial nerve, associated with resection of the adjacent structures (skin, temporal bone, mandibular bone and mandibular joint, blood vessels, and nerves) invaded by the neoplasm (**Figure 6(A)**), revision parotidectomy (**Figure 6(B)**), total conservative parotidectomy with ipsilateral neck dissection (level I - V) should be performed in all cases of parotid carcinoma with clinical or radiological neck involvement (therapeutic neck dissection) as well as in high-grade tumours or in carcinomas with increased tumour size (elective neck dissection) (**Figure 6(C)**). Bilateral tumours were performed at same times (**Figure 6(D)**).

The patients were examined for scar formation, depression of the parotidectomy bed, and facial motor weakness. Other cosmetic complications of parotidectomy

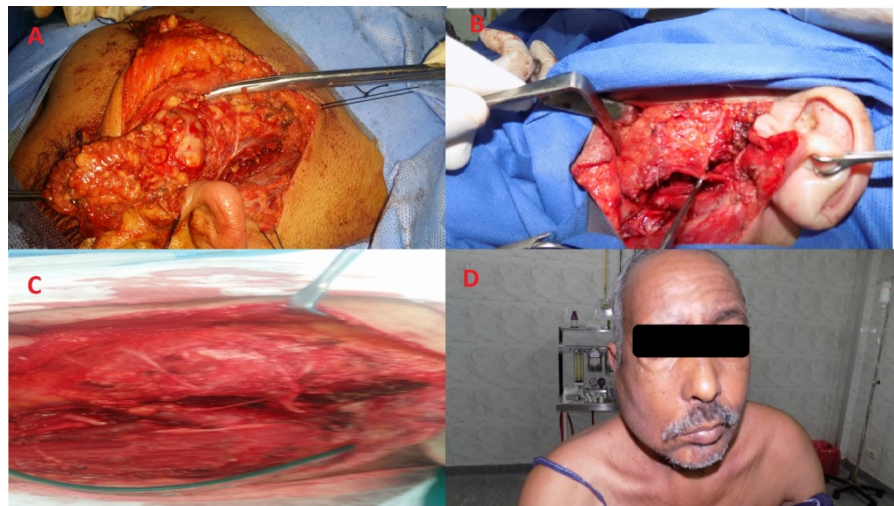


Figure 5. Different types of parotidectomy.

are hypertrophic scar and keloid. Scar revision with steroid injections may sometimes be necessary (**Figure 7(A)**). Superiorly based partial thickness sternocleidomastoid flap in the reconstruction of post-parotidectomy defects was raised to a depth of approximately one-third of the muscle and one third to one-half of its length depending on the measured distance to the defect. The muscle was left attached to the mastoid. The elevated flap was then brought to the surgical area. Caution was exercised to avoid injuring the accessory nerve during mobilization of the SCM (**Figure 7(B)**). We intended to leave no area uncovered in the surgical bed filling the defect that appears after parotidectomy, to achieve better facial contour restoration (**Figure 7(C)**) and to reduce the incidence of Frey's syndrome. A large suction drain is left for five days to make sure the skin flap is completely adherent to the parotid bed before it is removed (**Figure 7(D)**). Sialocele Post-operative collection of saliva underneath the skin flap can

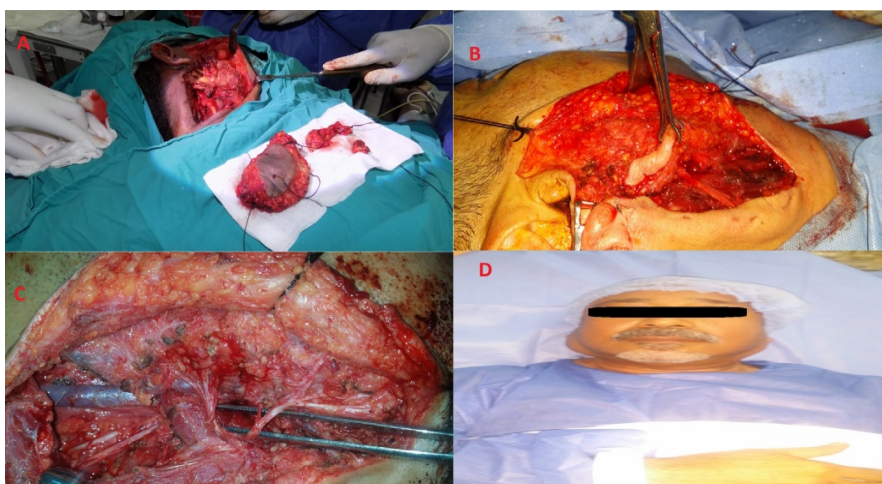


Figure 6. Surgical technique for different types of parotidectomy.

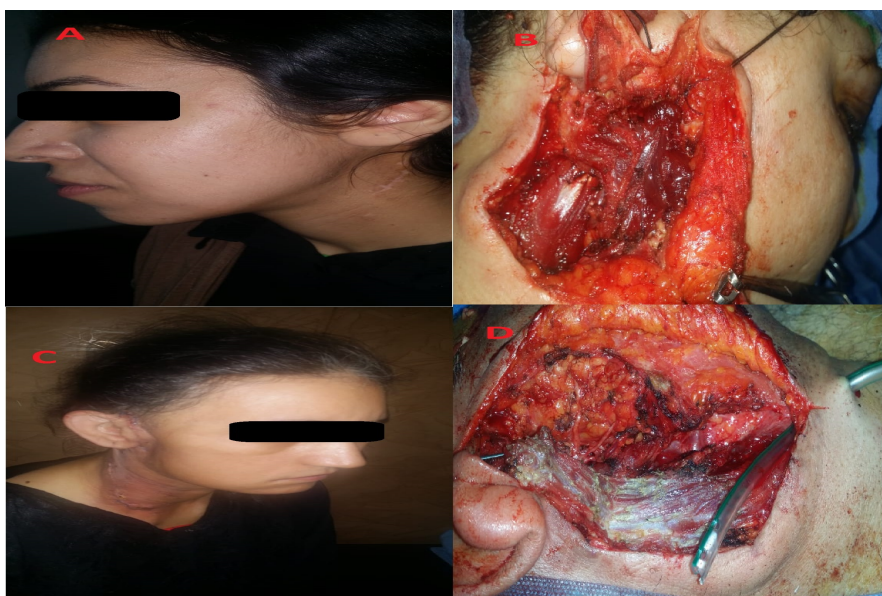


Figure 7. Scar complications and surgical tips in parotid surgery.

be a troublesome complication of this surgery considered to be due to continued leakage of saliva from the cut surface of the remaining parotid gland. Alternatively, saliva may leak through the wound onto the cervical skin, leading to a salivary fistula.

Follow-up:

Patients were routinely followed every 3 months for the first 2 years after surgery then annual visits were scheduled.

2.2. Post-Operative Radiotherapy

Clear indications for post-operative radiotherapy may include macroscopic residual tumour, high grade cancers and probably microscopic positive margins. Relative indications include perineural spread, tumour close to or infiltration the nerve and cervical node metastases. Clear evidence of a dose response is lacking in this rare disease and the dose of 60 Gy in daily 2 Gy fractions represents a practical consensus.

2.3. Statistical Methods

SPSS version 23.0 was used for data management. Numerical data were described with mean and standard deviation and categorical data with number and percentage. Chi-square/Fisher exact tests were used for testing proportion independence. Pairwise comparisons were made for proportions with Bonferroni adjustment. P value was always two tailed and significant at 0.05 level.

3. Results

A total of 187 patients were identified as having undergoing parotidectomy between January 1, 2010 and January 31, 2020. Of these patients, one patient underwent bilateral parotidectomy for Warthin's tumour. The mean age of the patients was 42.96 (range 17 - 84) years. Males 57.3% were more commonly affected than females 42.7% (Table 1).

3.1. Type of Surgery Performed

Superficial parotidectomy was the most common surgery 40.4%, performed followed by total parotidectomy 25.3%, partial superficial parotidectomy 16.3%, radical parotidectomy 1.1%, extended radical parotidectomy 2.2%, revision total parotidectomy for recurrence 6.7%, and parotidectomy with modified radical neck dissection (MRND) 7.9% (Table 2).

Table 1. Sociodemographic and clinical data of cases.

	Count
Age (mean)	42.96 (range 17 - 84) years
Gender: Males/female	107 males/80 females
Type of tumor	147 benign/40 malignant

Table 2. Types of surgical procedures in 178 parotid tumors.

	Count	%
Extended radical parotidectomy	4	2.2
Partial parotidectomy	29	16.3
Revision total parotidectomy (Recurrence)	12	6.7
Superficial parotidectomy	72	40.4
Total conservative parotidectomy	45	25.3
Total parotidectomy with modified radical neck dissection (MRND)	14	7.9
Total radical parotidectomy	2	1.1
Total	178	100.0

3.2. Histopathological Types of Parotid Neoplasms

78.4% patients had benign tumors, the most frequent being Pleomorphic adenoma 55.1% of the lesions followed by Warthin's tumour 16.9%, monomorphic adenoma 0.6%, oncocytoma 1.1%, basal cell adenoma 1.7%, adenolymphoma 0.6%, monomorphic adenomas 0.6%, myoepithelium 0.6%, inflammatory 1.1%. 21.6% were malignant tumors, mucoepidermoid carcinoma being the most frequent with 7.3%, cases, followed by, carcinoma ex pleomorphic adenoma 2.2%. Other tumors encountered were adenocarcinoma 1.7%, non-Hodgkin's lymphoma 0.6%, adenoid cystic carcinoma 1.7%, acinic cell carcinoma 1.7%, salivary duct carcinoma 0.6%, squamous cell carcinoma 1.1%, epithelial-myoepithelial carcinoma 1.1%, undifferentiated carcinomas 0.6%, malignant mixed tumour 1.1%, carcinosarcoma 0.6%, oncocytic carcinoma 1.1% (Table 3).

3.3. Complications Post Parotidectomy

The most commonly reported unwanted effect of the operation was transient facial nerve palsy occurred in 21.3% (Figure 8(A)). All recovered completely within 6 months while permanent facial nerve paralysis was observed in 3.9% (Figure 8(B)), due to transection of the nerve. Rupture of capsule/Recurrence 7.3% (Figure 8(C)), Frey's syndrome 7.3%, gradually improved with time. Hypoesthesia of the cheek or earlobe 20.2% due to scarification of the greater auricular nerve), and was most pronounced in the immediate postoperative period, after which it generally subsided markedly over a period of weeks. Wound infection 7.3% (Figure 8(D)), Sialocele 6.7%, collection of salivary secretions in sub-cutaneous tissues was present which required repeated aspiration and pressure bandage. Parotid fistula 5.1% recovered completely with parenteral feeding & pressure dressing within 3 to 4 weeks, seroma 6.7%, hematoma 3.4% which was managed by aspiration and compression with no need for exploration, hypertrophic scar or keloid 3.9%, soft tissue deficit cosmetic deformity/surgical site depression/alterations of the facial shape 15.2%, skin necrosis 0% and Greater auricular neuroma 0% (Table 4).

The incidence of the most common complications is shown in Figure 9.

Table 3. Histopathology of 178 patients with parotid tumors.

		Count	%
Histopathology	Acinic cell carcinoma	3	1.7
	Adenoid cystic carcinoma	3	1.7
	Adenolymphoma	1	0.6
	Adeocarcinoma	3	1.7
	Basal cell adenoma	3	1.7
	Benign lympho epithelial lesion	2	1.1
	Carcinoma ex pleomorphic adenoma	4	2.2
	Carcinosarcoma	1	0.6
	Epithelial-myoepithelial carcinoma	2	1.1
	Inflammatory	2	1.1
	Lymphoma	1	0.6
	malignant mixed tumour	2	1.1
	Monomorphic adenomas	1	0.6
	Mucoepidermoid carcinoma	13	7.3
	Myoepithelioma	1	0.6
	Oncocytic carcinoma	2	1.1
	Oncocytoma	2	1.1
	Pleomorphic adenoma	98	55.1
	Salivary duct carcinomas	1	0.6
	Squamous cell carcinoma	2	1.1
Undifferentiated carcinomas	1	0.6	
Warthin's tumour	30	16.9	
Total		178	100.0



Figure 8. Some complications of parotid surgery.

Total Radical parotidectomy & total conservative parotidectomy have significantly higher levels of transient facial nerve palsy (P value = 0.008).

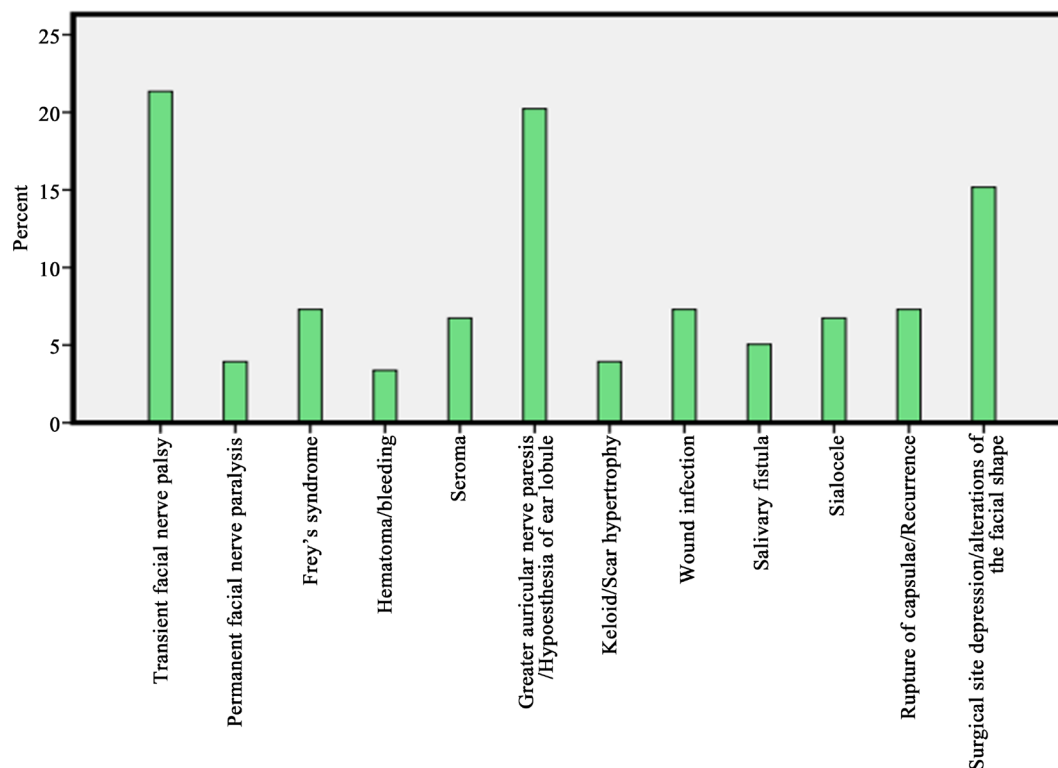


Figure 9. Complications post parotidectomy.

Table 4. Frequency of complications according to the type of surgical operation, (A) Transient facial nerve palsy; (B) Permanent facial nerve paralysis; (C) Rupture of capsule/recurrence; (D) Surgical site depression/alterations of the facial shape; (E) Sialocele incidence in different surgical procedures.

(A)

		Transient facial nerve palsy			
		No		Yes	
Surgical procedure		Count	%	Count	%
Surgical procedure	Extended radical parotidectomy	2	50.0	2	50.0
	Partial parotidectomy	26	89.7	3	10.3
	Revision total parotidectomy (Recurrence)	9	75.0	3	25.0
	Superficial parotidectomy	62	86.1	10	13.9
	Total conservative parotidectomy	30	66.7	15	33.3
	Total parotidectomy with modified radical neck dissection (MRND)	11	78.6	3	21.4
	Total radical parotidectomy	0	0.0	2	100.0
Total		140	78.7	38	21.3

Total radical parotidectomy & extended radical parotidectomy have significantly higher levels of Permanent facial nerve paralysis (P < 0.001).

(B)

		Permanent facial nerve paralysis			
		No		Yes	
		Count	Row N%	Count	Row N%
Surgical procedure	Extended radical parotidectomy	2	50.0	2	50.0
	Partial parotidectomy	29	100.0	0	0.0
	Revision total parotidectomy (Recurrence)	11	91.7	1	8.3
	Superficial parotidectomy	72	100.0	0	0.0
	Total conservative parotidectomy	44	97.8	1	2.2
	Total parotidectomy with modified radical neck dissection (MRND)	13	92.9	1	7.1
	Total Radical parotidectomy	0	0.0	2	100.0
	Total	171	96.1	7	3.9

Despite borderline significance, partial parotidectomy has highest rupture of capsulae /recurrence (P = 0.056).

(C)

		Rupture of capsule/Recurrence			
		No		Yes	
		Count	%	Count	%
Surgical procedure	Extended radical parotidectomy	4	100.0	0	0.0
	Partial parotidectomy	22	75.9	7	24.1
	Revision total parotidectomy (Recurrence)	12	100.0	0	0.0
	Superficial parotidectomy	68	94.4	4	5.6
	Total conservative parotidectomy	43	95.6	2	4.4
	Total parotidectomy with modified radical neck dissection (MRND)	14	100.0	0	0.0
	Total Radical parotidectomy	2	100.0	0	0.0
	Total	165	92.7	13	7.3

Although borderline significance, revision total parotidectomy, extended radical parotidectomy have high surgical site depression/alterations of the facial shape (P = 0.072) (NS).

(D)

		Surgical site depression/alterations of the facial shape			
		No		Yes	
		Count	%	Count	%
Surgical procedure	Extended radical parotidectomy	2	50.0	2	50.0
	Partial parotidectomy	26	89.7	3	10.3
	Revision total parotidectomy (Recurrence)	8	66.7	4	33.3
	Superficial parotidectomy	64	88.9	8	11.1
	Total conservative parotidectomy	39	86.7	6	13.3
	Total parotidectomy with modified radical neck dissection (MRND)	11	78.6	3	21.4
	Total Radical parotidectomy	1	50.0	1	50.0
	Total	151	84.8	27	15.2

Al though borderline significance, partial parotidectomy has highest sialocele (P = 0.072) (NS).

(E)

		Sialocele			
		No		Yes	
		Count	%	Count	%
Surgical procedure	Extended radical parotidectomy	4	100.0	0	0.0
	Partial parotidectomy	24	82.8	5	17.2
	Revision total parotidectomy (Recurrence)	12	100.0	0	0.0
	Superficial parotidectomy	65	90.3	7	9.7
	Total conservative parotidectomy	45	100.0	0	0.0
	Total parotidectomy with modified radical neck dissection (MRND)	14	100.0	0	0.0
	Total Radical parotidectomy	2	100.0	0	0.0
	Total	166	93.3	12	6.7

The other complications were Non Significant: Frey's syndrome P = 0.071 (NS). Hematoma /bleeding P = 0.543 (NS). Seroma P = 0.361. Greater auricular nerve paresis/Hypoesthesia of ear lobule P = 0.188 (NS). Keloid/Scar hypertrophy P = 0.088 (NS). Wound infection P = 0.527 (NS). Salivary fistula P = 0.942.

4. Discussion

Nouraei *et al.*, tumours of the parotid gland are benign in 80%. Pleomorphic adenoma is the most common tumor of the salivary glands and is most commonly located in the parotid gland represents about 80% followed by Warthin's tumour represents 10%, while the remaining 10% consists in monomorphic adenomas. Malignant tumours are comparatively rare 20% and among these the most common primary neoplasms are mucoepidermoid carcinomas, consisting of 30%, followed by adenoid-cystic carcinomas 25%, carcinomas on pleomorphic adenomas 15%, and acinic-cell carcinomas 5% - 10%. Facial nerve palsy occurred 80% cases in mucoepidermoid carcinoma and 25% cases occurred in pleomorphic adenoma. Facial nerve injury is higher in malignant cases than benign parotid disease [2] [11] [13]. In our study, 78.4% patients had benign tumors, the most frequent being pleomorphic adenoma 55.1% followed by Warthin's tumour 16.9%, monomorphic adenoma 0.6%, oncocytoma 1.1%, basal cell adenoma 1.7%, adenolymphoma 0.6%, monomorphic adenomas 0.6%, myoepithelium 0.6%, inflammatory 1.1%. 21.6% were malignant tumors, mucoepidermoid carcinoma being the most frequent with 7.3%, cases, followed by, carcinoma ex pleomorphic adenoma 2.2%. Other tumors encountered were adenocarcinoma 1.7%, non-Hodgkin's lymphoma 0.6%, adenoid cystic carcinoma 1.7%, acinic cell carcinoma 1.7%, salivary duct carcinoma 0.6%, squamous cell carcinoma 1.1%, epithelial-myoepithelial carcinoma 1.1%, undifferentiated carcinomas 0.6%, malignant mixed tumour 1.1%, carcinosarcoma 0.6%, oncocytic carcinoma 1.1%. This result corresponds with previous studies.

Ward, Woods, Aljamo, Mehle, and Valentini have reported that superficial parotidectomy SP and/or total parotidectomy TP with preservation of the facial nerve is the gold standard for excision of parotid tumors new surgical procedures such as extracapsular dissection, partial superficial parotidectomy, and enucleation, and have been proposed in the last two decades Kadletz *et al.* partial superficial parotidectomy, superficial parotidectomy, extended parotidectomy, and extracapsular parotidectomy were 41.5%, 43.8%, 53.8%, and 6.3%, respectively. Guntinas-Lichius *et al.* of which 61% were superficial and 39% total parotidectomies. Occult metastases of the neck are reported in 12% - 45%. TP is favored by some authors because of a lower risk of tumor recurrence, SP by others because of lower rates of complications and comparable recurrence rates the replacement of enucleation of tumor with superficial parotidectomy minimizing the risk of recurrence rates after SP or TP vary between 0% and 12% depending on extent of surgery and tumor high recurrence rates (4% - 40%) related with partial parotidectomies [7] [10] [14] [15]. In our series, superficial parotidectomy was the most common surgery 40.4%, performed followed by total parotidectomy 25.3%, partial superficial parotidectomy 16.3%, radical parotidectomy 1.1%, extended radical parotidectomy 2.2%, revision total parotidectomy for recurrence 6.7%, and parotidectomy with modified radical neck dissection (MRND) 7.9%.

A strong relationship exists between the surgical technique and recurrence rate. Tumor spillages due to capsular rupture during surgery, and the highest recurrence rates are yielded in enucleation, whereas superficial or total parotidectomy was associated with low recurrence rates. Overall, the recurrence rate was estimated to be between 8% and 45% after enucleation, between 2% and 5% after superficial parotidectomy, and less than 0.4% after total parotidectomy, a recurrence rate ranging between 0.8% and 5% [6] [13]. The overall recurrence rate in this series was 7.3%. Though borderline significance, partial parotidectomy has highest rupture of capsule/recurrence $P = 0.056$.

Nitzan *et al.* the incidence of temporary facial weakness in 18% to 65%, Rehman observed 26.6%, involving some or all of the branches of the nerve compared to 27% observed by Ellingson *et al.*, Ramadan observed 34%. Adeyoma *et al.* observed it in 30% of cases, Nouraei *et al.* observed in 40% of cases and Gaillard *et al.* in 42%. This may be due to mechanical trauma such as crushing, compression and stretching during surgery or due to the ischemic injury as a result of nerve dissection from its surrounding. The branch of the facial nerve most at risk for injury during parotidectomy is marginal mandibular nerve and Drivas *et al.* reported incidence of permanent facial weakness is 0% - 17%. It is associated with significant morbidity, disturbed daily activity, and impaired cosmetic appearance [2] [14]. In our study, the incidence of temporary facial weakness was 21.3%, while permanent facial nerve paralysis was observed in 3.9%.

Kadletz *et al.* concluded that extracapsular dissection of benign parotid tumors led to a significantly higher percentage of permanent facial palsy, Frey's

syndrome, recurrent disease, and positive resection margins compared to superficial parotidectomy. In a systematic review comparing the effect of total parotidectomy versus superficial parotidectomy in management of benign parotid gland tumors, they found that the rate of transitory facial nerve paresis ranged from 0% to 23% (mean 6.75%) in superficial parotidectomy, whereas it ranged from 0% to 45% (mean 15%) in total parotidectomy. However, permanent facial nerve paralysis was less common and it ranged from 0% to 3% (mean 0.8%) in superficial parotidectomy and from 0% to 17% (mean 4.4%) in total parotidectomy. A higher incidence of facial nerve palsy is expected in radical surgical approaches such as total parotidectomy than with superficial parotidectomy. Partial superficial parotidectomy, has lower rates of facial nerve dysfunction in relation to superficial parotidectomy. Revision parotidectomy or parotidectomies for parotid fistula an salvage surgery for locally recurrent tumor are generally associated with a higher incidence of facial weakness, Guntinas-Lichius *et al.* Temporary facial nerve paresis was found postoperatively in 22% and 30% of patients after superficial and total parotidectomy, respectively, Zernial *et al.* Temporary facial nerve paresis occurred in 17.9% of patients after superficial parotidectomy and in as many as 43.8% of patients after total parotidectomy, the rates of temporary and permanent facial nerve paresis are reported to be 15% to 25% and 5% to 8%, respectively, after superficial parotidectomy and as high as 20% to 50% and 5% to 10%, respectively, after total parotidectomy. Revision parotidectomy of facial paralysis is 5% to 29% [4] [5] [7] [15] [16] [17]. Our study demonstrated total radical parotidectomy & total conservative parotidectomy have significantly higher levels of Transient facial nerve palsy P value = 0.008, total radical parotidectomy & extended radical parotidectomy have significantly higher levels of Permanent facial nerve paralysis (P < 0.001).

Frey syndrome was described for the first time by Lucy Frey in 1923 is characterised by the appearance of redness, pain, sweating and heat in the parotid region following by gustatory stimulus. It is caused by an aberrant regeneration of injured postganglionic secretomotor parasympathetic nerve fibres of the auriculotemporal nerve after parotidectomy. Nitzan *et al.* reported that 57%, varies from 2% to 80%. Treatment is necessary in about 10% to 15% [14]. In our study, Frey's syndrome 7.3%, gradually improved with time So the result of this series correlate with published work.

Brown and Ord were the first who gave data in favor of preservation of posterior branch of the great auricular nerve (GAN) during parotidectomy in order to reduce the postoperative sensory disturbance of the pinna and pre-auricular skin. Min *et al.* reported that 57% of patients recovered the sensitivity at 1 year, which increased to 61% in patients who had the GAN preserved. In Christensen and Jacobsen's opinion the posterior branch could be preserved in 71% of patients, because it protracts the operating time of only about ten minutes and it also gives the possibility to have a graft to repair facial nerve injury during surgery, although a postoperative recovery occurs in more than half of the cases at 1

year, regardless of preservation of the GAN or not. Possibly the collateral branches are those that compensate this deficit, as well as the auriculotemporal and occipital nerves. Most studies give an additional time of between 5 and 15 minutes [18] [19]. In the present study, attempts were made to preserve the GAN posterior branch in each patient to achieve faster and more complete recovery in sensory function. Hypoesthesia of the cheek or earlobe 20.2% due to scarification of the greater auricular nerve, and was most pronounced in the immediate postoperative period, after which it generally subsided markedly over a period of weeks.,

Olsen mentions that skin-flap necrosis is usually rare Surgical site infection occurred most commonly, with 1.9% [9], in our study no skin necrosis or Greater auricular neuroma but Wound infection in 7.3%,

Bleeding and hematoma after parotidectomy are uncommon and are usually related to inadequate hemostasis at the time of the surgical procedure. Treatment consists of evacuation of the hematoma and control of bleeding sites incidence of 1.7% - 10.5% [17]. In our study hematoma 3.4% which was managed by aspiration and compression with no need for exploration.

Wax and Tarshis, in 1991, reported an overall post-parotidectomy fistula rate of 14%, Laskawi *et al.* described persistent parotid fistula in 4% of patients following parotidectomy, Sialocele occurs if the resected edge of the remaining parotid gland leaks saliva which collects beneath the flap. Sometimes this collected saliva drains through the wound and forms salivary fistula. Parotid salivary fistula and sialocele are relatively common complications after parotidectomy operation. There were 10% cases of sialocele. The incidence of salivary fistula is between 2% and 17% of cases of parotidectomy. The reported incidence of sialocele after parotidectomy has been reported to be between 5% and 39%. This problem is a result of leakage of saliva from remaining salivary gland tissue that collects beneath the flap or drains from the wound. This complication is usually mild and self-limited. Treatment of a sialocele consists of repeated needle aspirations. A salivary fistula is managed with local wound care. A chronic salivary fistula is rare following parotidectomy and can be effectively managed with botulinum toxin injection of the gland [4] [20], in our cases sialocele 6.7%. Parotid fistula 5.1%, recovered completely with parenteral feeding & pressure dressing within 3 to 4 weeks.

Nitzan *et al.*, 70% of patients reported a change in appearance; 60% due to scarring and 58% due to local depression. Superficial parotidectomy, especially in a large tumor, Koch *et al.* identified that the majority of patients were not fully satisfied with the cosmetic result following surgery. The findings of Ciuman *et al.* and Roh *et al.* also support this result. Marshall *et al.* 26.9%, shortly after the operation, but only 3.1% stated long-term-problems. Roh *et al.* reported scar and cosmetic appearance were significantly better after performing PSP compared to SP or TP. Hypertrophic scars of incision sites occurred in 12%. Albeit, one should be aware that, although the transposition of a sternomastoid muscle flap can,

without doubt, improve the facial contour or symmetry of the parotid region [14] [16] [21]. However, the majority of patients in the present study reported that the scar was barely noticeable only 3.9% had hypertrophic scar or keloid, soft tissue deficit cosmetic deformity/surgical site depression/alterations of the facial shape 15.2%.

Radiation therapy should be used in conjunction with surgery in high-grade malignancies, tumors of the deep lobe, positive surgical margins, multifocal recurrences, perineural invasion and in patients with clinically positive neck nodes, which may improve local control and increase survival rates for patients with high-grade tumors [16], in our study 16.9% need adjuvant radiation therapy.

5. Conclusion

Parotid surgery can be performed successfully with experiencing meticulous dissection. The use of multiple anatomic landmarks is considered for facial nerve sparing can decrease postoperative facial nerve injury which remains common and feared complication. Morbidity can be reduced further by giving minor complications more attention. Complication must be clearly explained.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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