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## A clinical study of parotid tumours

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### Abstract

**Background:** Parotid gland tumours most often present as painless enlarging masses. However rapid growth, pain, nerve involvement, and ulceration are clinical predictors that suggest malignancy.

**Aim:** The study aims to find out the postoperative course of parotid tumours particularly the factors influencing postoperative facial palsy.

**Methodology:** It was a cross-sectional study. The present study is conducted over 2 years, to evaluate the age and sex incidence, clinical presentation and histopathology of parotid tumours. All the patients < 18 years age presenting to the surgical OPD with parotid region swelling are recorded. Those willing to participate in the study are included in the study. Specific investigations such as FNAC are used to confirm the diagnosis.

**Results:** Out of all 30 cases, 16 are female and 14 are male. Out of total benign lesions in 23 cases, 14 are in female and 9 are seen in males. Out of total malignant lesions of 7 cases, 5 are males and 2 are females.

This study has the advantage of using the House-Brackmann score for grading facial nerve function. The factors influencing postoperative loss of facial nerve function are also studied. The most common benign tumor is pleomorphic adenoma in the parotid gland while the most common malignant tumour is mucoepidermoid carcinoma. Benign tumours are most commonly seen in the 20-40 years age group, whereas malignancies are more common in the 40-60 years age group. The sex incidence in Warthin's tumor is more in males similar to existing literature. All the patients with cancer in the study have some form of exposure to tobacco such as smoking, reverse smoking or chewing tobacco. Out of 11 cases of total parotidectomy 9 are conservative and 2 are radical parotidectomy. The incidence of postoperative temporary palsy is 16.66% (5 cases) of benign parotid tumours. Three malignancies have postoperative paralysis, all being permanent facial palsy.

**Conclusion:** The present study suggests a strong etiological role of tobacco in these cancers. Preoperatively, the risk of nerve injury can be assessed by the tumor size, recurrence and malignancy. Thus, nerve monitoring should be considered in such tumours.

**Keywords:** Parotid tumors, pleomorphic adenoma, mucoepidermoid carcinoma, house-brackmann

### Introduction

Salivary gland tumours represent less than 5% of head and neck tumours <sup>[1]</sup>. They represent 0.5% of all malignancies in humans <sup>[2]</sup>. About 80% of all salivary gland tumours arise in the parotid gland and 80% of this are benign tumours of which 80% are pleomorphic adenomas and 80% occur in the superficial lobe.

Tumours of the parotid gland can appear at any age, the maximum incidence is in the fourth decade of life for benign lesions and in the fifth decade for malignant tumours <sup>[3]</sup>.

Parotid gland tumours most often present as painless enlarging masses <sup>[4]</sup>. However rapid growth, pain, nerve involvement, and ulceration are clinical predictors that suggest malignancy <sup>[5]</sup>. They are investigated using Ultrasonography, CT, MRI, FNAC and Trucut biopsy. There are various histopathological types, with pleomorphic adenoma being the most common benign tumour and mucoepidermoid carcinoma, the most common type of malignant tumour.

### Aim and Objectives

- 1) To study the incidence of parotid gland tumours according to age and sex distribution over a period of two years.
- 2) To study the various modes of clinical presentation and histopathological types of parotid tumours.
- 3) To evaluate the various types of surgery and outcome of surgical management of parotid gland tumours.

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**Research methodology**

**Study population:** Patients <18years age presenting to the surgical OPD in the period of 2 years.

**Sample size:** 30 ( $4pq/1^2+4x0.019x0.981/(0.05)^2=29.8224$ )

**Study setting:** Surgical OPD in KGH.

**Study duration:** 2years from August 2018 till July 2020.

**Study design:** Cross-sectional study.

**Method**

All the patients < 18 years age presenting to the surgical OPD with parotid region swelling are recorded. Those willing to participate in the study are included in the study.

A detailed history is obtained from each patient, including the onset, duration of symptoms, associated pain, and facial paralysis, similar symptoms in the past.

A thorough physical examination of the swelling and its characteristics such as borders, tenderness, mobility, and signs of facial nerve weakness is carried out along with the examination of regional lymph nodes and surrounding structures. Specific investigations such as FNAC are used to confirm the diagnosis. Other investigations are ultrasound, CT, and MRI, done for the site of origin, features of malignancy, and involvement of surrounding structures and lymph nodes.

Routine investigations such as complete blood picture, renal function tests, blood glucose levels, chest X-ray are carried out to determine the fitness of the patient for surgery. The treatment plan is decided based on the physical examination findings and the FNAC report of the individual patient after taking adequate consent. The specimen is sent for histopathological examination postoperatively. The treatment options included in this study are: Surgery, Surgery with adjuvant radiotherapy, and Palliative radiotherapy. The patient is observed for postoperative complications and followed upto 6months. The age and sex distribution, mode of presentation are evaluated and factors influencing facial nerve injury during parotidectomy are noted. The data is statistically analysed and observations noted.

**Inclusion criteria**

1. All patients above 18 years age presenting to the surgical OPD with parotid swelling.
2. All patients willing to participate in the study.

**Exclusion criteria**

1. Patients not willing to participate in this study.
2. Patients under 18 years age group.

**Results**

The present study was carried out in 24 months. A total of 30 cases of parotid region swellings who presented to the OP in this period are studied. Patients presenting to the Surgical OP with parotid swelling are included in the study and their demographic data, presenting complaints, tumor location, treatment modalities, and complications recorded.

**Table 1:** Age distribution

Age range	Number	Percentage
18-20YRS	1	3.33%
21-30YRS	7	23.33%
31-40YRS	6	20%
41-50YRS	6	20%
51-60YRS	8	26.66%
>60YRS	2	6.66%

**Table 2:** Age distribution of benign and malignant lesions

Age range	Total	Benign	Malignant
18-20yrs	1	1	-
21-30yrs	7	6	1
31-40yrs	6	5	1
41-50yrs	6	4	2
51-60yrs	8	5	3
>60yrs	2	2	-

**Sex distribution**

Out of all 30 cases, 16 are female and 14 are male.

Out of total benign lesions in 23 cases, 14 are in female and 9 are seen in males. Out of total malignant lesions of 7 cases, 5 are males and 2 are females.

In benign lesions male to female ratio is 0.6:1

In malignant lesions male to female ratio is 2.5:1

In females, 87.5% lesions are benign while 56% of lesions in males are malignant.

**Laterality of distribution**

Out of all the lesions, 14 lesions are from left parotid while 16 lesions are from right parotid gland.

**Table 3:** Laterality of distribution

Lesion	Right	Left
Benign	13	11
Malignant	3	3

**Table 4:** Presentation of parotid neoplasms

Symptom	Number	Percentage
Swelling	30	100%
Pain	11	36.6%
Facial Asymmetry	6	20%
Lymph node Enlargement	2	6.6%
Recurrence After previous surgery	7	23.3%
Facial palsy	1	3.33%

All the patients presented with swelling. 11 out of the 30 cases had both pain and swelling.

6 patients have facial asymmetry associated with larger size of swelling at presentation.

1 out of 30 had facial palsy at presentation which is a recurrent swelling. FNAC of one patient revealed mucoepidermoid carcinoma who had facial palsy at presentation.

A total of 7 cases presented with recurrent swelling in either of parotid gland after previous surgery for similar complaint.

**Pathological variants on postoperative biopsy HPE examination revealed following**

**Table 5:** Pathological variants

HPE	Number	Percentage
Pleomorphic Adenoma	19	63.33%
Monomorphic Adenoma	3	10%
Basal cell Adenoma	1	3.33%
Mucoepidermoid Carcinoma	5	16.66%
Adenocarcinoma	1	3.33%
Adenoid cystic Tumour	1	3.33%

In one case preoperative FNAC is pleomorphic adenoma which revealed to be mucoepidermoid carcinoma on postoperative biopsy.

**Table 6:** Surgical treatment

Procedure	Number of cases	Percentage
Superficial parotidectomy	19	63.33
Total conservative parotidectomy	7	23.33
TCP with neck dissection	2	6.66
Radical parotidectomy	1	3.33
Radical parotidectomy With neck dissection	1	3.33

**Table 7:** Surgical treatment

Procedure	Number of cases	Percentage
Superficial parotidectomy	19	63.33
Total conservative parotidectomy	7	23.33
TCP with neck dissection	2	6.66
Radical parotidectomy	1	3.33
Radical parotidectomy With neck dissection	1	3.33

All benign tumours confined to superficial lobe underwent superficial parotidectomy.

Benign tumours with involvement of deep lobe underwent total conservative parotidectomy.

A total conservative parotidectomy done for low grade malignancies without involvement of lymph nodes. High grade cases with lymphnode involvement underwent neck dissection.

Out of two high grade malignancies one with preoperative facial nerve involvement underwent radical parotidectomy and one with lymphnode involvement underwent radical parotidectomy with neck dissection.

Out of 30 cases 19 underwent superficial parotidectomy. Out of 11 cases of total parotidectomy 9 are conservative and 2 are radical parotidectomy.

**Complications of surgery**

Major complication of parotid surgery is facial nerve weakness. Temporary facial weakness resolves in 6months. In this study, the incidence of temporary postoperative facial nerve weakness is 16.66%.

**Table 8:** Postoperative facial palsy

Complication	Benign	Malignant
Temporary facial weakness	4	1
Permanent facial nerve paralysis	0	2
Wound infection	1	1
others	0	0

The rate of temporary weakness in benign tumours is 13.33%. Two malignant cases developed postoperatively permanent facial paralysis yielding a rate of 6.66%. Two cases developed wound infection which are successfully treated with antibiotics.

**Table 9:** Correlation between tumour size and post operative facial palsy

Postoperative facial palsy	Present	Absent	Marginal row totals
Less than 4cms	3	18	21
More than 4cms	4	5	9
Column total	7	23	30

The two-tailed P value on Fisher’s exact test equals 0.1533. The association between tumor size and facial nerve palsy is not statistically significant with the p- value <0.05.

**Table 10:** Correlation between previous surgery for parotid gland and postoperative facial palsy

Recurrence	Postoperative Facial Paralysis		Marginal row totals
	Yes	No	
Yes	4	3	7
No	3	20	23
Marginal column totals	7	23	30

The two-tailed P value on Fisher’s exact test equals 0.0331. The association between previous surgery and facial nerve palsy for present surgery is considered to be statistically significant with the p-value <0.05.

**Table 11:** Correlation between malignancy and incidence of postoperative facial palsy

Malignant	Postoperative facial nerve paralysis		Marginal row totals
	Present	Absent	
Yes	3	4	7
No	4	19	23
Marginal column totals	7	23	30

The two-tailed P value on Fisher’s exact test equals 0.3058. The association between malignant histology and facial nerve palsy is not statistically significant with the p-value <0.05.

Also other factors such as age, sex, pain at presentation, histology of tumor, and preoperative lymph node involvement are considered but none are found to be statistically significant. Preoperative palsy is present in 3.33% (1 case) of parotid malignancies. 23.3% (7 cases) of cases had postoperative facial nerve paralysis. The incidence of postoperative temporary palsy is 16.66% (5 cases) of benign parotid tumours. Three malignancies have postoperative paralysis, all being permanent facial palsy.

**Discussion**

The present study is conducted over 24 months during which patients are studied for various demographic data, the histopathology, and postoperative course. Though the incidence is low, they are not rare. They are a diverse group of neoplasms of the head and neck region. The etiopathogenesis of these tumours is yet to be understood. Surgical management of parotid tumours is challenging with the facial nerve having a close relationship to the gland. The role of facial nerve monitors and stimulators is still to be investigated. The role of chemotherapy is still experimental and thus it is not included in the study. Radiotherapy has an increasing role not only in malignancies but also in recurrent benign tumours.

Age incidence: The study only includes individuals who are 18 years or above. The mean age of presentation of parotid gland tumours in this study is 41.4 years. The peak age of incidence of parotid tumours 50-60 years.

Benign tumours have an incidence peaking at 20-30 years of age. Malignant tumours are common in older age individuals with a peak incidence of 40 – 60 years of age. The age incidence is similar to studies by Chatterger *et al.* [6] and Jude *et al.* [7].

**Sex incidence**

Females contributed to 53% of the cases, whereas males contribute 47% of cases.

The majority of female cases are benign (87.5% of all female tumours).

### **Incidence of benign versus malignant tumours**

The incidence of benign tumours is more than malignant tumours in parotid gland. Benign tumours usually present as painless swellings with a slow progression and offer a good prognosis. In the present study, the incidence of benign tumours (76.6%) is higher than malignancies, comparable with Sandhu *et al.*<sup>[8]</sup> and Kadhim *et al.*<sup>[9]</sup>.

### **Histopathology of parotid tumours**

The most common tumor of parotid gland is pleomorphic adenoma, which is the most common benign neoplasm as well. It is a slow-growing tumor with both epithelial and mesenchymal components. However, it has a high rate of recurrence postoperatively. There is a preponderance of pleomorphic adenomas in the present study, with an overall incidence of 63.33% among all tumours. It is the most commonly encountered benign neoplasm with 82.60% incidence in the current study, similar to studies by Jaafar *et al.*,<sup>[10]</sup> Sandhu *et al.*,<sup>[8]</sup> and Ito *et al.*<sup>[11]</sup>.

Warthin's tumor usually presents in males and smokers and is more common in the lower pole. It is the second most common benign tumor in this study. Sandhu *et al.*<sup>[8]</sup> observed a female predominance in pleomorphic adenomas, whereas all the Warthin's tumours occurred exclusively in males. The present study, however, has an male to female sex ratio of 2:1 in Warthin's tumor with one out of the three observed cases being female. It may be because of the habit of smoking noted increasingly even in females, the female case being habituated to smoking. Jaafari *et al.*<sup>[10]</sup> had similar findings; other benign tumours noted in this study are myoepithelioma and monomorphic adenomas.

**Malignant tumours:** The most common malignancy encountered is mucoepidermoid carcinoma, followed by adenoid cystic carcinomas. It corresponds with studies by Nakisa *et al.*<sup>[12]</sup>, and Salam *et al.*<sup>[13]</sup>. Lima *et al.*<sup>[14]</sup>, and Subhashraj *et al.*<sup>[15]</sup> reported a higher number of adenoid cystic carcinomas. There is an associated history of smoking in all the malignancies noted in the current study.

Mucoepidermoid carcinomas usually have a good prognosis with a gradual progression. It has a predilection for females in whom it has a good prognosis. Rajasekaran *et al.*<sup>[16]</sup> concluded that advancing age, high tumor grade, and positive surgical margins are associated with decreased survival in mucoepidermoid carcinoma. Christopher *et al.*<sup>[17]</sup> noted that adenoid cystic carcinoma (ACC) has a poor prognosis with an increased propensity of perineural invasion. Unlike most carcinomas of the head and neck, ACC seldom metastasizes to regional lymph nodes. They observed the up-regulation of the MYB proto-oncogene in the majority of ACC.

### **Symptoms of salivary tumours**

The patient usually presents with a slow-growing, asymptomatic swelling. In this study, all the cases presented with swelling, similar to studies conducted by Venkatesh and Ali *et al.*<sup>[18, 19]</sup>. The next common symptom is pain, similar to other studies. According to Venkatesh *et al.*<sup>[18]</sup>, pain is a symptom of malignancy. They observed that pain, fixity, deep lobe involvement, and lymph node involvement are poor prognostic features. Facial nerve palsy is an independent sign of poor prognosis.

Terhaard *et al.*,<sup>[20]</sup> noted that the pre-treatment facial nerve palsy has an impact on prognosis and postoperative disease-free survival. The preoperative facial nerve palsy in malignancy is

3.33% in the present study which is similar in comparison to the other studies, suggesting the advanced presentation of malignancies in our center. The House Brackmann classification is used to assess the facial nerve function:

About 20% of cases presented with recurrent tumours after previous surgery, the majority of cases are pleomorphic adenomas (83.3%), which are notorious for recurrence.

### **Deep lobe involvement**

Four tumours had deep lobe involvement in this study (13.33% of cases). The incidence is lower compared to the study by Venkatesh *et al.*<sup>[18]</sup>. Deep lobe location of a tumour may increase some intraoperative risks such as bleeding and facial paralysis, as studied by Kizil *et al.*<sup>[21]</sup>.

### **Histopathological variants**

The most common tumor is pleomorphic adenoma, which forms 82.06% of all cases in the study. Sando *et al.*<sup>[22]</sup> observed that parotid swellings are more common in Western studies. El-Gazayerli *et al.*<sup>[23]</sup> noticed that malnutrition altered the serous cells more than the mucous, thus decreasing the susceptibility of the parotid gland to neoplasms.

The second most common histology is the Warthin's tumor. In the present study, one case has a history of recurrence following a previous superficial parotidectomy. All the cases have a history of smoking.

The most common malignancy is high-grade mucoepidermoid carcinoma in the present study. Kizil<sup>[21]</sup> and Lukšić *et al.*<sup>[24]</sup> also report mucoepidermoid carcinoma as the most common malignancy in the parotid.

### **Treatment of salivary gland tumours**

Surgery is the mainstay of treatment in parotid tumours. Radiotherapy is an adjuvant in high-grade tumours. Radiotherapy is the treatment modality for inoperable parotid gland tumours. Some cases of benign recurrence are also treated by radiotherapy.

The present study employs surgery for all operable cases. Most of the cases of recurrent tumours that presented to us had a previous history of superficial parotidectomy. Pleomorphic adenoma has a high rate of recurrence due to pseudopod like extensions from the capsule.

Kato G *et al.*,<sup>[25]</sup> preferred extracapsular dissection over traditional superficial parotidectomy due to decreased surgery time and cost-effectiveness. Literature shows fewer complication rates with extracapsular dissections than superficial parotidectomies, such as lower rate of recurrence in pleomorphic adenoma, lower rates of temporary facial palsy, and Frey's syndrome.

All cases involving deep lobe and malignant tumours underwent total parotidectomy. Nerve sparing surgery is done in majority of the cases except where the tumor is infiltrating the nerve. Lymph node dissection is done in all cases with palpable lymphadenopathy. Prophylactic level 1b lymph node dissection is done in high grade submandibular malignancies.

### **Complications of parotidectomy**

The major morbidity associated with parotidectomy is facial nerve palsy. Temporary facial palsy resolves with or without treatment within 6 months. Permanent nerve injury doesn't resolve even after 6 months.

The mechanisms of facial nerve palsy include stretching of the nerve, compression, nerve division, cautery injury, ischemia due to excessive handling or entrapment in ligatures.



Various techniques of identification of facial nerve are described. There is still uncertainty regarding the best method to identify the nerve. The most commonly used landmark is the Conley's tragal pointer, it has the drawback of not specifying the depth at which the nerve is present. The depth varies from 1 – 3 cms in different studies. Anterograde dissection, proceeding from the main trunk to the branches is followed by majority of the surgeons. G. Saleh *et al.* [26]. Have recommended retrograde dissection, following the superficial branches up to the main trunk in 75 difficult cases (recurrence, large tumours, etc). In this study, anterograde dissection is performed for most of the cases. Retrograde dissection is reserved for select cases where the main trunk couldn't be identified initially.

As facial nerve injury is a major morbidity, reducing the patient satisfaction scores after surgery; the present study tries to identify the various preoperative factors which may predispose to facial palsy postoperatively. The factors considered are symptom of pain, tumor size, and presence of lymph nodes, malignant tumours, and previous parotid surgery. There is correlation between history of previous surgery and lymph nodes and incidence of postoperative palsy in this study.

Terhaard *et al.* [20]. Concluded that tumor localization, painful swelling, positive lymph nodes at presentation, increasing age and perineural invasion are all responsible for impaired facial nerve function preoperatively.

Seven cases have postoperative palsy in which five are temporary two are permanent facial nerve palsy. The House-Brackmann score of majority of the cases is 3 – 4 immediately after surgery which gradually improved with time. The score remained 3 even after 6 months in two cases. Malignant tumours have more propensity for permanent facial nerve damage postoperatively in this study. Two out of seven cases of malignancy developed postoperative facial nerve palsy both being persistent facial nerve palsy, the House-Brackmann score remained 3 even after 6 months. But the correlation between either malignancy or tumour size and postoperative facial palsy is not statistically significant.

The study notes an increased incidence of palsy in cases who underwent previous surgery for tumor. The facial planes are distorted in recurrent tumours and intra operative nerve identification is difficult. It may be the reason for increased incidence of facial nerve weakness postoperatively in surgeries for recurrent tumours.

Huang CC *et al.* [27]. Found a significant association between the tumor size, involvement of the deep lobe, and tumor invasion by facial nerve with the incidence of postoperative facial nerve palsy. However, histopathology of the tumor does not seem to affect nerve palsy. There is a decrease in the patient satisfaction score in cases with facial paralysis. In cases without this complication, the mean patient satisfaction score is 8.2 out of 10. In patients with nerve weakness, the mean patient satisfaction score is 6.4 out of 10. The incidence is also higher in total parotidectomy than for superficial parotidectomy.

Nerve monitoring is a useful adjunct in parotid surgery, but there is still limited data regarding its benefits. According to Stanislas *et al.*, [28] it is useful in monitoring the facial nerve during surgery and has improved outcomes in terms of postoperative facial nerve function and operating times. The risks include false positive, i.e., misrecognition of facial nerve, and false negative signals, i.e., non- recognition of facial nerve. Other disadvantages include, injuries due to electrodes such as hematomas, eye and muscle injuries, and increased cost. Their use is beneficial in recurrent cases, large tumours and malignant tumours.

Other complications noted in the study are two cases of wound infection which subsided with antibiotics. Though other studies noted Frey's syndrome as a common complication. There is no incidence of Frey's syndrome in this study due to short period of follow up.

## Limitations

### Limitations of present study include

1. The present study is conducted in a single center and is a hospital-based study.
2. It is conducted in a limited number of individuals and results may vary in a larger population.
3. As the duration of follow-up is short, all postoperative complications are not recorded. Complications such as Frey's syndrome and oro-cutaneous fistulas could not be studied.
4. As nerve monitor is not available, the role of nerve monitoring and its effect on postoperative facial palsy and total surgical time is not studied

## Conclusion

The present study is conducted over 2 years, to evaluate the age and sex incidence, clinical presentation and histopathology of parotid tumours. The study aims to find out the postoperative course of parotid tumours particularly the factors influencing postoperative facial palsy. FNAC is an easily available, minimally invasive, cost effective tool which is reliable in diagnosing both benign and malignant conditions. The immediate postoperative morbidity in patient is wound infection or facial nerve palsy. The role of extracapsular dissection in decreasing rate of recurrence and facial nerve should be evaluated by further trials. Preoperatively, the risk of nerve injury can be assessed by the tumor size, recurrence and malignancy. Thus, nerve monitoring should be considered in such tumours.

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## Conflict of Interest

None

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