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## The Utility of FNAC in Planning Parotid Gland Surgery: An Observational Study

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### ABSTRACT

The aim of the present investigation was to determine the utility of FNAC in planning parotid gland surgery. This observational study was conducted at the Pathology Department over a period of 2 years from March 2015-March 2017. A sample size of 200 patients was examined in this period. All patients had US-guided FNAC after clinical assessment. Only Institute-performed FNAC was examined for uniform and comparable data. A computerized database stored demographic and clinical data, including age, sex, prior surgery, timing of symptoms, cytological and histological findings, lesion location and volume, histological sample margin involvement, and relapses. Out of the 200 patients examined, 42 cases (21%) were non-diagnostic (Milan category I), 144 cases (72%) were reported as non-neoplastic / inflammatory (Milan category II) and 14 cases (7%) were reported as malignant (Milan category VI). Pleomorphic adenoma (Milan category IV) was reported in 90 individuals (56.25%) and Warthin's tumor (Milan category IV) was reported in 40 (25%) cases. FNAC has 82% sensitivity and 98% specificity. Overall diagnosis accuracy was 97%, with 96% accuracy for reporting malignancy and 82% for benign lesions on FNAC. FNAC malignancy PPV and NPV were 92% and 98% respectively. Our research demonstrates that FNAC is a safe and effective tool in making a preoperative diagnosis in parotid tumors and in planning

## INTRODUCTION

Parotid gland lesions include a wide range of histopathological variations. Parotid malignancies account for 3% of all cancers in the head and neck, and 0.6% of all tumors in the human body<sup>[1]</sup>. The diagnostic use of fine needle aspiration cytology (FNAC) for identifying salivary gland masses is well demonstrated. Due to the potential for tumor seeding and the danger of facial nerve injury, the conventional open biopsy is no longer considered justifiable<sup>[2]</sup>. On the contrary, FNAC is a secure and uncomplicated procedure that minimizes patient pain and eliminates the possibility of cancer cell implantation<sup>[3]</sup>.

Despite its increasing popularity, concerns about hemorrhage, facial nerve damage and doubts about diagnostic accuracy have caused doctors to question the effectiveness of FNAC in treating parotid lesions<sup>[4]</sup>. The majority of the primary tumors of the salivary glands arise from the parotid gland, accounting for 80% of cases. The parotid gland is divided into two lobes by the main trunk and branches of the facial nerve, however there is no clear boundary between the superficial and deep lobes<sup>[5]</sup>. Deep lobe tumors are quite rare, accounting for about 20% of parotid gland tumors. These tumors often develop underneath the branches of the facial nerve<sup>[6]</sup>. While the majority of these tumors are non-cancerous (80% are benign), it is crucial to do a comprehensive diagnostic evaluation to determine the characteristics of the tumor. The diagnostic work-up involves several imaging techniques such as ultrasonography, computerized tomography (CT), magnetic resonance imaging (MRI) and fine needle aspiration biopsy (FNAB). Fine-needle aspiration biopsy (FNAB) is crucial for the diagnosis of parotid tumors. The accuracy of fine-needle aspiration biopsy (FNAB) in identifying cancer varies across various trials, with reported sensitivity ranging from 45%-100% and specificity ranging from 67%-100%<sup>[7-11]</sup>. Salivary gland tumors, due to their wide range of types, still captivate the attention of surgeons and pathologists. While fine needle aspiration cytology (FNAC) is commonly used to evaluate thyroid tumors<sup>[12]</sup> and cervical lymph nodes, there is no agreement on its utility in managing salivary gland lesions. Some authors argue that it has limited sensitivity in diagnosing malignant salivary tumors<sup>[13,14]</sup>. Nevertheless, Butsakis<sup>[15]</sup> concluded that pre-surgical FNAC had no effect on the surgical management of these lesions. The objective of this study was to evaluate the diagnostic precision of FNAC (Fine Needle Aspiration Cytology) for parotid gland swellings, with the purpose of determining its use in the planning of parotid gland surgery.

## MATERIALS AND METHODS

The current investigation was carried out at the Department of Pathology including a total of 200

patients over a span of 2 years. Every patient received fine-needle aspiration cytology (FNAC) with the assistance of ultrasound (US) guidance after a clinical examination. Only FNAC procedures conducted inside the Institute were taken into account to ensure the data is uniform and can be compared.

All demographic and clinical data, such as age, sex, prior surgery, timing of symptoms, cytological and histological findings, location and volume of the lesions, involvement of histological sample margins, and relapses, were recorded in an electronic database. At our hospital, Fine Needle Aspiration Cytology (FNAC) is consistently conducted by radiologists using ultrasound guidance. Every case undergoes cytology examination by a single pathologist. As part of the preoperative evaluation at our centre, FNAC was conducted in all patients. The procedure was conducted at our pathology department using a conventional method.

A 22-gauge needle was used, which was connected to a 10ml syringe using a free hand approach. In order to provide sufficient biological material for cytological analysis, a minimum of two passes were performed in each instance. The aspirated material was evenly distributed over 2-4 slides. The slides were stained using the Papanicolaou procedure and sometimes with the May-Grunwald Giemsa method.

We conducted a comparison between the final histopathology of the surgical specimen and the preoperative cytology of the FNAC specimen. We assessed the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and overall diagnostic accuracy of FNAC in distinguishing between benign and malignant diseases using the Galen and Gambino method. A statistical analysis was performed with the SPSS version 22.

## RESULTS AND DISCUSSIONS

FNAC samples were obtained in 200 cases. FNAC results were "non-diagnostic" in 42 cases (21%), "inflammatory/ benign lesion" in 144 (72%), "malignant neoplasm" in 14 (7%).

In the present study, pleomorphic adenoma was in 90 patients (56.25%) and Warthin's tumor in 40 (25%). Adenocarcinoma (2.14%) was the most common malignancy, followed by Mucoepidermoid carcinoma (2.5%) and squamous cell carcinoma (2.14%).

The most common histopathological diagnosis was benign lesion, that occurred in 140 patients.

FNAC showed a sensitivity of 82% and a specificity of 98%. Accuracy for malignancy was 96%, accuracy for a benign lesion was 82%, overall diagnostic accuracy was 97%. The FNAC PPV for malignancy was 92% and the NPV was 98%.

Salivary gland tumors are an uncommon occurrence, representing between 3-10% of head and neck tumors and up-0.6% of all tumors in the human body<sup>[16,17]</sup>. Out

**Table 1: The FNAC results classification**

Diagnosis	FNAC No. (%)	Histopathology No. (%)
Benign / Inflammatory lesions	144 (72%)	142 (71%)
Malignant tumors	14 (7%)	18 (9%)
Non-Diagnostic	42 (21%)	40 (20%)

**Table 2: Cytodiagnosis of salivary gland tumors by aspiration biopsy**

Lesion	No. of cases	percentage
Pleomorphic adenoma	90	56.25
Warthin's tumor	40	25
Mucoepidermoid carcinoma	4	2.5
Adenocarcinoma	6	3.75
Undifferentiated carcinoma	8	5
Lymphoma	2	1.25
Adenoid cystic carcinoma	2	1.25
Ductal adenoma	2	1.25
Oncocytoma	2	1.25
Monomorphic adenoma	2	1.25
Lipoma	2	1.25
Total	160	100

**Table 3: Contingency table between cytological and histopathological diagnosis.**

Parotid FNAC	Histopathology		Total
	Benign	Malignant	
Benign FNAC	136	6	142
Malignant FNAC	4	14	18
Total	140	20	160

**Table 4: Evaluation of the usefulness of FNAC**

	value, %
Sensitivity	82
Specificity	98
Positive Predictive Value (PPV)	92
Negative Predictive Value (NPV)	98

of all salivary gland tumors, 80% specifically affect the parotid gland and within this group, 80% of the tumors are non-cancerous<sup>[18]</sup>. Parotid tumors have been categorized by the World Health Organization (WHO) as either epithelial or nonepithelial tumors. Despite its complexity, this categorization has gained global acceptance because to its advantageous implications for prognosis and treatment. This is because each tumor exhibits distinct biological behavior from one another<sup>[19]</sup>.

A total of 200 FNAC samples were collected. The FNAC findings were inconclusive in 42 instances (21%), indicating that a definitive diagnosis could not be made. In 144 cases (72%), the results showed signs of inflammation or a benign lesion. In 14 cases (7%), the results indicated the presence of a malignant tumor. The current investigation identified pleomorphic adenoma in 90 individuals, accounting for 56.25% of the cases, whereas Warthin's tumor was found in 40 patients, representing 25% of the cases. The most prevalent malignancy was adenocarcinoma, accounting for 2.14% of cases, followed by mucoepidermoid carcinoma at 2.5% and squamous cell carcinoma at 2.14%. Intrasalivary lymphoid tissue or lymph nodes are found in the parotid region. The submandibular group of lymph nodes are situated on the side of the submandibular salivary gland. Ectopic salivary gland tissue can also be found in unusual locations such as upper cervical and submandibular lymph nodes. FNAC is routinely conducted in all cases of parotid lesions, regardless of whether they are benign or malignant,

palpable or not, to ensure accurate surgical planning. The primary objective of this examination is to differentiate between a benign and a malignant tumor. Approximately 20.6% of FNAC (Fine Needle Aspiration Cytology) samples provide non-diagnostic results, which may be attributed to the intricate nature of the tissue structure. Many research studies evaluate cytological and histopathological data acquired from both the parotid and submandibular glands together. In addition, sensitivity, specificity and accuracy are sometimes computed for certain histological subtypes, such as pleomorphic adenoma or mucoepidermoid carcinoma. Some studies only performed FNAC on individuals when cancer was suspected, which significantly impacts the sensitivity, specificity and accuracy of the results.

Out of the total number of patients, 140 were diagnosed with a benign lesion, making it the most often seen histopathological diagnostic. In the retrospective investigation conducted by Atula<sup>[20]</sup>, the diagnosis of mucoepidermoid carcinoma, adenoid cystic carcinoma, lymphoma and squamous cell carcinoma was often not detected only using fine-needle aspiration cytology (FNAC). Within our series, we observed FNAC false-negative results in one instance of acinic cell carcinoma, one instance of mucoepidermoid carcinoma, and one instance of lymphoma. Warthin's tumor was the cytological diagnosis in all of these instances. Hee<sup>[21]</sup> found that FNAC had a poor accuracy rate of 56%. However, the specimens were collected by many physicians with diverse levels of skill, rather than by pathologists. The FNAC outcome is contingent upon both the operator's expertise and the diagnostic proficiency of the cytopathologist. Effective communication between the clinician and the pathologist ensures optimal outcomes.

The FNAC test demonstrated a sensitivity rate of 82% and a specificity rate of 98%. The malignancy detection rate was 96%, while the detection rate for benign lesions was 82%. The total accuracy of the diagnostic test was 97%. The FNAC Positive Predictive Value (PPV) for malignancy was 92% and the Negative Predictive Value (NPV) was 98%. Several studies have estimated the positive predictive value (PPV) and negative predictive value (NPV) of fine-needle aspiration cytology (FNAC) in relation to the parotid gland. However, these results showed significant variation across the various investigations. The NPV reported by Cohen<sup>[22]</sup> indicates that a significant proportion of the FNAC specimens, which did not include neoplastic cells, were really derived from malignant lesions, as confirmed by histopathology. Consistent with our findings, Zurrida *et al.* observed a high positive predictive value (PPV) of 100% and a high negative predictive value (NPV) of 90%<sup>[23]</sup>.

## CONCLUSION

Our research indicates that preoperative fine-needle aspiration cytology (FNAC) is helpful in accurately diagnosing parotid tumors. Parotid tumors may be diagnosed and treated safely and effectively using this diagnostic method. Fine needle aspiration cytology is a dependable, economical, well-tolerated and straightforward treatment. Furthermore, it aids in distinguishing between tumors before surgery, which might be advantageous in preparing the surgeon and patient for the most suitable surgical intervention.

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