<u>Original Research Article</u>

A Hospital-Based Assessment of the Diagnostic Accuracy of in Order to Determine its Usefulness in the Planning of Parotid Gland Surgery

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Abstract

Aim: The aim of the present investigation was to assess the diagnostic accuracy of FNAC, on parotid gland swellings, in order to determine its usefulness in the planning of parotid gland surgery.

Methods: The present study was conducted in the Department of Pathology, Nalanda Medical College and Hospital, Patna, Bihar, India and 100 patients were included in the study for the period of 2 years. All patients underwent FNAC under US guidance following clinical examination. In order to obtain homogeneous and comparable data, only FNAC performed in the Institute were considered. All details regarding demographic and clinical data, including age, sex, previous surgery, timing of symptoms, cytological and histological results, site and volume of the lesions, involvement of histological sample margins and relapses were saved in an electronic database.

Results: FNAC samples were obtained in 100 cases. FNAC results were "non-diagnostic" in 22 cases (22%), "inflammatory/ benign lesion" in 70 (70%), "malignant neoplasm" in 8 (8%). In the present study, pleomorphic adenoma was in 45 patients (56.25%) and Warthin's tumour in 20 (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 70 patients (87.5%). FNAC showed a sensitivity of 81% and a specificity of 99%. Accuracy for malignancy was 97%, accuracy for a benign lesion was 83%, overall diagnostic accuracy was 97%.

Conclusion: Our study suggests that preoperative FNAC plays a useful role in the accurate diagnosis of parotid tumors. It is a safe and effective diagnostic modality for the treatment of patients with parotid tumors. Fine needle aspiration cytology is a reliable, cost-effective, well tolerated and an easy procedure to perform.

Keywords: Salivary Glands, Parotid, FNAC, Cytology.

Introduction

Salivary gland tumors, because of their diversity, till date continue to hold the interest of the surgeons and the pathologists. Although fine needle

aspiration cytology (FNAC) is now part of routine clinical practice for the evaluation of thyroid tumors [1] and cervical lymph nodes, no consensus has been reached concerning the role of this procedure in the management of salivary glands lesions, as some authors consider that it has a low sensitivity for diagnosis of malignant salivary tumors. [2,3] FNAC is a cytodiagnostic method based on the morphological findings of individual cells, group of cells, and microparticles of tissue, acquired using a needle. The role of FNAC for the diagnosis of salivary gland masses is well documented. The traditional open biopsy is no longer justified because of the risk of tumor spillage and damage to the facial nerve. [4] The method has a high degree of sensitivity in distinguishing the tumors from non-neoplastic lesions of salivary gland. [5,6]

FNAC is an easily done procedure with minimal incidence of complication and no risk of implantation of tumor cells (<1%). The complications are rare and bleeding or inflammatory reaction in the region of the puncture. The impairment of the involved nerves has been reported as a very rare complication. [7,8] FNAC has its proponents and opponents. It is regarded as a diagnostic procedure to be superior to the combination of physical examination and radiological evaluation. [9,10] Many authors claimed that it is accurate, safe and cost effective. [11-13] It can also be performed in children older than seven years. [14]

Salivary gland tumors, because of their diversity, till date continue to hold the interest of the surgeons and the pathologists. Although fine needle aspiration cytology (FNAC) is now part of routine clinical practice for the evaluation of thyroid tumors [15] and cervical lymph nodes, no consensus has been reached concerning the role of this procedure in the management of salivary glands lesions, as some authors consider that it has a low

sensitivity for diagnosis of malignant salivary tumors. [16,17]

Nevertheless, the role of FNAC in the pre-operative evaluation is not universally established. At present, the debate focuses on the reliability of FNAC as a diagnostic tool and its usefulness in treatment planning. Although in some Hospitals, FNAC is performed in every case of salivary gland nodule, some Authors support the role of cytology only in a selected group of patients with suspected malignancy, metastatic carcinoma or lymphoma. [18] However, Butsakis et al. state that pre-surgical FNAC does not impact on the surgical handling of these lesions. [19]

The aim of the present investigation was to assess the diagnostic accuracy of FNAC, on parotid gland swellings, in order to determine its usefulness in the planning of parotid gland surgery.

Methods

The present study was conducted in the Department of Pathology, Nalanda Medical College and Hospital, Patna, Bihar, India and 100 patients were included in the study for the period of 2 years.

All patients underwent FNAC under US guidance following clinical examination. In order to obtain homogeneous and comparable data, only FNAC performed in the Institute were considered. All details regarding demographic and clinical data, including age, sex, previous surgery, timing of symptoms, cytological and histological results, site and volume of the lesions, involvement of histological sample margins and relapses were saved in an electronic database.

In our hospital, FNAC is always performed by radiologists under US-guidance. Cytology is performed in all cases by the same pathologist. In all of the patients, FNAC was performed as a part of the preoperative assessment at our center.

It was performed at our pathology department using standard technique. A 22 gauge needle attached to a 10ml syringe by a free hand technique was used. At least two passes were made in each case to obtain adequate biological material for cytological interpretation. The aspirated material was spread on between 2 and 4 slides and fixed immediately. The slides were stained with the Papanicolaou and occasionally with the May-Grunwald Giemsa methods. Keeping the final histopathology as a gold standard, we classified our FNAC results into the following categories: true-negative (absence of malignancy correctly diagnosed), true-positive (presence of malignancy correctly diagnosed), false-negative (cytological specimen failed to diagnose a malignancy) and false-positive (cytological specimen was incorrectly considered as malignant). We compared the final histopathology of the surgical specimen with the preoperative cytology of the FNAC specimen and evaluated the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and overall diagnostic accuracy of FNAC to differentiate between benign and malignant disease using the Galen and Gambino method.

A statistical analysis was performed with the specific software JMP IN 5.1 (a Business Unit of SAS Copyright ©1989 - 2003 SAS Institute Inc., Cary, NC, USA). Sensitivity, Specificity, Accuracy, Positive Predictive Value (PPV), Negative Predictive Value (NPV), Likelihood Ratio of Positive test results (LR+), Likelihood Ratio for Negative test results (LR-) and Prevalence of Malignancies were calculated for FNAC by using the post-operative histological diagnosis as the reference standard. Kappa statistics for agreement were also calculated together with the 95% confidence interval (95% CI).

Results

Table 1: The FNAC results classification

Diagnosis	FNAC no. (%)	Histology no. (%)
Benign/Inflammatory lesions	70 (70%)	70 (70%)
Malignant tumours	8 (8%)	10 (10%)
Non-Diagnostic	22 (22%)	12 (12%) benign lesions 8 (8%) malignant tumours

FNAC samples were obtained in 100 cases. FNAC results were "non-diagnostic" in 22 cases (22%), "inflammatory/ benign lesion" in 70 (70%), "malignant neoplasm" in 8 (8%).

Table 2: Cytodiagnosis of salivary gland tumours by aspiration biopsy

Lesion	N	%
Pleomorphic adenoma	45	56.25
Warthin's tumour	20	25
Mucoepidermoid carcinoma	2	2.5
Adenocarcinoma	3	3.75
Indifferentiated carcinoma	4	5
Lymphoma	1	1.25
Adenoid cystic carcinoma	1	1.25
Ductal adenoma	1	1.25
Oncocytoma	1	1.25
Monomorphic adenoma	1	1.25
Lipoma	1	1.25
Total	80	100

In the present study, pleomorphic adenoma was in 45 patients (56.25%) and Warthin's tumour in 20 (25%). Adenocarcinoma (2.14%) was the most common malignancy, followed by Mucoepidermoid carcinoma (2.5%) and squamous cell carcinoma (2.14%).

Table 3: Contingency table between cytologic and histologic diagnosis

Parotid FNAC	Benign histology	Malignant histology	Total
Benign FNAC	68	3	71
Malignant FNAC	2	7	9
Total	70	10	80

The most common histopathological diagnosis was "benign lesion", that occurred in 70 patients (87.5%).

Table 4: Evaluation of the usefulness of FNAC

	Value, %	95% Confidence Interval
Sensitivity	81	
Specificity	99	
Positive Predictive Value (PPV)	93	
Negative Predictive Value (NPV)	98	
Likelihood Ratio for Positive test results	100.3	
Likelihood Ratio for Negative test results	0.19	
Kappa 0.85	0.85	0.707 – 0.993
Prevalence of malignancies	0.1143	
Prevalence of benign findings	0.8857	
Accuracy for malignancy	97	
Accuracy for benign findings	83	

FNAC showed a sensitivity of 81% and a specificity of 99%. Accuracy for malignancy was 97%, accuracy for a benign lesion was 83%, overall diagnostic accuracy was 97%. The FNAC PPV for malignancy was 93% and the NPV was 98%. The Likelihood Ratio of Positive test results was 100.3 and the likelihood ratio of negative test results was 0.19, where "positive" was meant as "malignant". The prevalence of malignancy was 0.114.

Discussion

Salivary gland tumors are a rare entity and account for between˜ 3 and 10% of head and neck tumors and up to 0.6% of all tumors of the human body. [20,21] A total of 80% of the salivary gland tumors involve the parotid gland, and 80% of these tumors are benign. [22] The World Health Organization (WHO) has classified parotid tumors as epithelial and nonepithelial tumors. Although this classification is complex, it has been widely accepted across the world because of its advantages regarding the prognostic and therapeutic aspects as, biologically, each tumor behaves differently from another. [23]

Perisalivary or intrasalivary lymphoid tissue or lymph nodes occur in the parotid region, and the submandibular group of lymph nodes are located lateral to the submandibular salivary gland, as does ectopic salivary gland tissue in unexpected sites including upper cervical and submandibular lymph nodes. In the Department, FNAC is performed in every case of parotid lesion, benign or malignant, palpable or not, in order to correctly plan surgery. The most important goal of this examination is to distinguish a benign, from a malignant mass. 20.6% of FNAC are non-diagnostic; this could be due to the complexity of the tissue architecture. In

many papers, cytological and histological results obtained from both parotid and submandibular glands are analysed together. Moreover, sensitivity, specificity and accuracy are sometimes calculated for each single histological subtype, such as pleomorphic adenoma or mucoepidermoid carcinoma. In some studies, patients underwent FNAC only in cases of suspected malignancy and this clearly affects sensitivity, specificity and accuracy. On the contrary, in other studies, FNAC is performed routinely and the rate of malignancies is very low. [18]

In the retrospective study reported Atula et al. [24], diagnosis of mucoepidermoid carcinoma, adenoid cystic carcinoma, lymphoma and squamous cell carcinoma was frequently missed by FNAC alone. In our series, FNAC false-negative findings occurred in one case of acinic cell carcinoma, in one of mucoepidermoid carcinoma and in one of lymphoma. In all of these cases, the cytological diagnosis was Warthin's tumour. Que Hee et al. [25] reported a low accuracy of FNAC (56%), but the specimens were collected by several different clinicians with varying degrees of experience and not by pathologists. In fact, the FNAC result depends both on the operator's experience and the diagnostic skill of the cytopathologist. Good collaboration between the clinician and the pathologist guarantees the best results.

In some studies on the parotid gland, FNAC PPV and NPV have been calculated: these values varied considerably between the different studies. The low value of NPV reported by Cohen et al. [18] means that more than half of the FNAC specimens, without neoplastic cells, were actually obtained from neoplastic lesions, as assessed by histology. In agreement with our results, Zurrida et al. reported both a high PPV and a high NPV (of 100% and 90%, respectively). [26]

Whether results obtained from FNAC can play a useful role in the clinical management of patients with parotid lesion or not is the most important question to be answered by the present study. [27] The present study has demonstrated a variety of circumstances in which such data may be useful and valuable. For neoplastic lesions regardless of preoperative FNAC, surgical excision is recommended, but recognition of benign lesions beforehand may be of great benefit in avoiding inappropriate surgery and providing better counseling to the patient regarding the prognosis of the disease. [28]

Conclusion

Our study suggests that preoperative FNAC plays a useful role in the accurate diagnosis of parotid tumors. It is a safe and effective diagnostic modality for the treatment of patients with parotid tumors. Fine needle aspiration cytology is a reliable, cost-effective, well tolerated and an easy procedure to perform. Moreover, it helps in preoperative differentiation of tumors, which may provide benefit in the preparation of both the surgeon and of the patient for an appropriate surgical procedure.

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