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ORIGINAL ARTICLE

Diagnostic accuracy of fine-needle aspiration cytology of salivary gland lesions: A 6-year retrospective review

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KEYWORDS
Fine needle aspirate;
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Introduction The aim of this study was to evaluate the diagnostic accuracy of salivary gland fine-needle aspiration (FNA) in comparison to histologic examination and to recognize possible pitfalls in diagnosis.
Materials and methods The diagnoses and demographics of all cases of salivary gland FNAs with concurrent or subsequent histologic correlation at our institution over a 6-year period (2006-2011) were retrospectively reviewed and compared for discrepancies. Discrepancies were categorized as either major or minor and due to sampling or interpretive variance.
Results Overall, the following values were calculated: sensitivity 80.6%, specificity 97.5%, positive predictive value 92.6%, negative predictive value 92.8%, accuracy 92.7%, and concordance rate 90.9%. In addition, concordance rates were calculated for the 2 most common diagnoses: pleomorphic adenoma (97.1%, n = 35) and Warthin tumor (88.9%, n = 9). Five major and 5 minor discrepancies were found. Most of the major discrepancies and all of the minor discrepancies were due to sampling and interpretive variances, respectively. Sampling issues occurred in FNAs with and without ultrasound guidance. The interpretive variance included interpretative discrepancies in monomorphic cellular lesions, abundant inflammation and reactive atypia, cystic changes, abundant matrix deposition or fibrosis, and difficulty in diagnosing mucoepidermoid carcinoma or lymphoma on cytology.
Conclusions FNA of salivary gland lesions is a procedure with high specificity, positive predictive value, negative predictive value, accuracy, and concordance with histologic examination; however, discrepancies do exist. Recognizing potential pitfalls is key to avoiding discrepancies.
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Introduction

Enlargement or masses of the salivary gland have a wide differential diagnosis, as they can result from inflammatory responses, infectious lesions, or neoplasms. Most neoplasms are benign, but approximately 15% are malignant.[1,2] Salivary gland fine-needle aspiration (FNA) has been used for many years as an initial diagnostic tool, often in conjunction with radiology.[3,4] It is safe, cost-effective, and well-tolerated by most patients, and it allows for quick, often unequivocal diagnosis. Salivary gland cytology helps differentiate non-neoplastic, benign, and malignant lesions. Therefore cytology plays a role in determining whether surgery is required, as in the case of non-neoplastic lesions, but also the type of surgery indicated: whether partial or total resection, and whether neck dissection is needed.[2,3,5,6]

Previous studies have advocated the use of salivary cytology as an important diagnostic tool, with high sensitivity and specificity when used in conjunction with clinical evaluation and radiology.[5,7-11] Others have reported mixed results, with sensitivities ranging from 55% to 98%,[1,5,7-11] and specificity ranging from 92% to 100%.[9,11] Some studies report that it is less useful for malignant lesions than for benign due to the varied histology and complexity of malignant salivary gland lesions that result in lower diagnostic accuracy.[5,12]

One study conducted by Wu et al[13] investigated the differences in diagnostic yield between cytopathologists versus noncytopathologists performing the FNA. The study showed that cytopathologists (94% of cases performed) achieved significantly better results in terms of agreement with the final surgical pathology diagnosis than did non-cytopathologists (67%). Several possible reasons were given for the increased diagnostic accuracy, including specific training in FNA procedure in a cytopathology fellowship, appropriate selection of needle size, and ability to make triaging decisions at the time of the procedure, such as the need for additional passes, how to prepare slides, and what media to use for excess samples. The same group went on to assess the effectiveness of the use of ultrasonography (US) guidance for FNAs of the head and neck by a single cytopathologist. They reported significantly better specificity (86% versus 50%) and negative predictive value (NPV; 100% versus 33%) in US-guided FNAs than in palpation-guided FNAs, respectively, with excellent sensitivity and positive predictable value preserved.[14] Based on these results, Wu[14] advocates for cytopathologist-performed FNA with US guidance as the best option if the cytopathologist has adequate training and resources to learn sonographic procedures. Other investigators also support US-guided FNA for lesions of the salivary glands and adjacent lymph nodes; it represents a diagnostically adequate method for sampling, with accuracy similar to that of US-guided core needle biopsy.[15] The purpose of this study was to examine data from our hospital with regard to sensitivity and specificity of FNA cytology of salivary gland tumors and to identify the reasons for discrepant lesions in order to highlight potential pitfalls in cytopathologic diagnosis.

Materials and methods

The pathology reports of all cases of salivary gland FNAs at Houston Methodist Hospital (Houston, Tex) from a 6-year period (2006-2011) were reviewed for a total of 261 FNAs from 254 patients. Of these cases, 113 FNAs (110 patients) also had follow-up diagnostic histology at our institution. The 3 FNAs interpreted as unsatisfactory (due to acellularity/low cellularity) were excluded from this study. Included in the study were those cases with both adequate FNA specimens and corresponding diagnostic surgical specimens (core or excision), for a total of 110 FNAs (107 patients). Patients ranged in age from 18 to 87 years, with a mean of 54.5 years. Male-female ratio was roughly 1:1 (50 men, 57 women).

The following demographics were reviewed and noted: cytology diagnosis, cytology findings, specimen adequacy, who performed the FNA (cytopathologist or radiologist), whether US was used, surgical diagnosis, location of the lesion, type of surgical specimen, and whether a cell block was performed.

Both cytologic and histologic specimens were examined, and for those cases in which a discrepancy was found, it was assessed whether the discrepancy was major or minor and whether it was an interpretive or sampling discrepancy. A major discrepancy was defined as a discrepancy in which clinical management and potential clinical outcome differed greatly between the 2 diagnoses that could potentially affect patient outcome. A minor discrepancy was defined as a discrepancy in which there was no significant adverse clinical outcome between the 2 diagnoses.

Sensitivity, specificity, positive predictive value (PPV), NPV, accuracy, and concordance rate for FNA were all calculated with histology as the gold standard. In addition, concordance rates were calculated for the 2 most common diagnoses: pleomorphic adenoma and Warthin tumor. This study was approved by the Institutional Review Board of the Houston Methodist Research Institute (#Pro00000653).

Results

Of the 110 satisfactory FNAs with corresponding surgical samples, 31 were called malignant and 79 were called benign on final histology. The distribution of the various diagnoses is shown in Fig. 1. Five major discrepancies (cases 1-5) and 5 minor discrepancies (cases 6-10) were found and are summarized in Tables 1 and 2, respectively. The discrepant lesions were located in the parotid gland (8 cases) and in submandibular/sublingual gland(s) (2 cases). Four major discrepancies were due to sampling, and 1 was

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