Comparison of Preoperative Fine-needle Aspiration Cytology Diagnosis and Histopathological Diagnosis of Salivary Gland Tumors

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Summary: We investigated 115 patients with salivary gland epithelial tumors who had undergone preoperative fine needle aspiration cytology (FNAC) of salivary glands and had been diagnosed by postoperative histopathological examination. We compared the findings of preoperative FNAC with their histopathological types in salivary gland tumors, and discuss the results and problems. The diagnostic accuracy, sensitivity, and specificity of preoperative FNAC of salivary glands were 98.2%, 88.2%, and 100%, respectively. The percentage of inadequate specimens was 6.1%. The rates of agreement in the diagnosis of pleomorphic adenoma, Warthin tumor, and basal cell adenoma were 96%, 92.9%, and 55.5%, respectively. The rate of agreement of histopathological types in the malignant tumors was 30%. We realized again not only that the diagnostic accuracy of preoperative FNAC for salivary gland tumors was high, but also that it was a safe, easy-to-perform, clinically very useful diagnostic procedure. However, this study exposed several problems which are the inadequate sampling rate and the difficulty in diagnosing malignant tumors. We have been making efforts to take appropriate specimens by writing comments on the cytological report indicating a re-examination, or by the presence of the clinical laboratory technician at the FNAC procedure. We consider it necessary to adequately re-aspirate the solid portion after cyst fluid aspiration, or to re-perform FNAC at a later date, and to improve the diagnostic accuracy by further experience with more patients.

Keywords: fine-needle aspiration cytology, salivary gland, histopathological diagnosis, accuracy

INTRODUCTION

Fine-needle aspiration cytology (FNAC) of salivary gland tumors has been performed at various institutions because of its high diagnostic accuracy, safety, and technical ease. However, a great variety histologic types of salivary glands and an insufficient tumor cells make their diagnosis difficult in some patients [1-3,8-10,12].

In this study, we compared the findings of preoperative FNAC with their histopathological types in salivary gland tumors, and discuss the results and problems.

MATERIALS AND METHODS

We investigated 115 patients with salivary gland epithelial tumors who had undergone preoperative FNAC of salivary glands in the 5-year period from January 2001 to December 2005, and had been diagnosed by postoperative histopathological examination.

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Abbreviation: FNAC, fine needle aspiration cytology.
FNAC was performed without anesthesia as follows. With manual immobilization or ultrasound guidance, the tumor was punctured with a 23-G needle attached to an aspiration pistol, followed by aspiration two or three times and the release of negative pressure to collect cells. The cells were expressed onto glass slides, spread, and immediately fixed with 95% ethanol and by air-drying. The ethanol-fixed cells and the air-dried cells were stained with Papanicolaou stain and May-Giemsa stain, respectively, and examined under a microscope. The cytological diagnoses were graded from 1 to 5 according to the Papanicolaou classification, and histological types were inferred as much as possible. Histological types were established by postoperative histopathological examination according to the WHO’s Histological Typing [13].

RESULTS

Diagnostic accuracy of preoperative FNAC of salivary glands (Tables 1 and 2)

<table>
<thead>
<tr>
<th>Cytology</th>
<th>Negative class I, II</th>
<th>Atypical cell class III</th>
<th>Positive class IV V</th>
<th>Inadequate specimens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Histology</td>
<td>malignant</td>
<td>2</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>benign</td>
<td>87</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
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<thead>
<tr>
<th>TABLE 2.</th>
<th>Diagnostic accuracy of preoperative FNAC of salivary glands</th>
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<tbody>
<tr>
<td>Cytology</td>
<td>Positive</td>
</tr>
<tr>
<td>Histology</td>
<td>malignant</td>
</tr>
<tr>
<td>benign</td>
<td>0(C)</td>
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<thead>
<tr>
<th>TABLE 3.</th>
<th>Histopathological types of tumors diagnosed postoperatively</th>
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<tbody>
<tr>
<td>Plasmocytic adenoma</td>
<td>Warthin tumor</td>
</tr>
<tr>
<td>Benign tumor</td>
<td>57.1%</td>
</tr>
<tr>
<td>(52/91 cases)</td>
<td>(29/91 cases)</td>
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<th>TABLE 4.</th>
<th>Histopathological types of tumors diagnosed postoperatively</th>
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<tbody>
<tr>
<td>Mucous epithelial adenoma carcinoma</td>
<td>Adenoid cystic carcinoma</td>
</tr>
<tr>
<td>Malignant tumor</td>
<td>29.2%</td>
</tr>
<tr>
<td>(7/24 cases)</td>
<td>(4/24 cases)</td>
</tr>
</tbody>
</table>
cases), 31.9% (29/91 cases), and 11% (10/91 cases) of the benign tumors, respectively. Mucoepidermoid carcinoma, adenoid cystic carcinoma, acinic cell carcinoma, and myoepithelial carcinoma accounted for 29.2% (7/24 cases), 16.7% (4/24 cases), 16.7% (4/24 cases), and 8.33% (2/24 cases) of the malignant tumors, respectively. The other malignant tumors included basal cell adenocarcinoma, epithelial-myoepithelial carcinoma, salivary duct carcinoma, adenocarcinoma, NOS, carcinoma ex pleomorphic adenoma, squamous cell carcinoma, and low-grade cribriform cystadenocarcinoma (1 case each).

Rate of agreement between preoperative FNAC diagnosis and definitive histopathological diagnosis

The rate of agreement between FNAC and histopathological diagnoses of benign tumors was 90.9% (80/88 cases). The rates of agreement in the diagnosis of pleomorphic adenoma, Warthin tumor, and basal cell adenoma were 96% (49/51 cases), 92.9% (26/28 cases), and 55.5% (5/9 cases), respectively. For the benign tumors, the atypical cell rate

![Fig. 1. A case of mucoepidermoid carcinoma with disagreement of diagnosis between FNAC and histopathology. Only a few clusters were found in cytology. Left: Cytology of a small cluster of tumor cells. The cells are small in size and have eosinophilic cytoplasm and a little nuclear atypia with distinct nucleoli (Papanicolaou stain ×400). The cytological diagnosis was benign neoplasm, and Warthin tumor was most suspected. Right: Histology of the tumor consisting of both adenocarcinoma and epidermoid carcinoma (Hematoxylin and eosin stain, ×200).](image1)

![Fig. 2. A case of acinic cell carcinoma with agreement of diagnosis between FNAC and histopathology. Left: Cytology of the tumor showing small and round nuclei with increased chromatin (Papanicolaou stain ×400). Right: Histology of the tumor consisting of granular cells arranged in acinar pattern (Hematoxylin and eosin stain, ×200).](image2)
was 1.1% (1/88 cases), and the inadequate sampling rate was 3.3% (3/91 cases).

The rate of agreement of histopathological types in the malignant tumors was 30% (6/20 cases). The rates of agreement in the diagnosis of mucoepidermoid carcinoma (Fig. 1), adenoid cystic carcinoma, acinic cell carcinoma (Fig. 2), and myoepithelial carcinoma were 16.6% (1/6 cases), 66.6% (2/3 cases), and 33.3% (1/3 cases), and 0% (0/2 cases), respectively. The FNAC diagnosis agreed with the histopathological diagnosis only in epithelial-myoeopithelial carcinoma and carcinoma ex pleomorphic adenoma (1 case each) among the remaining malignant tumors. For the malignant tumors, the atypical cell rate was 12.5% (3/24 cases), and the inadequate sampling rate was 16.7% (4/24 cases).

**DISCUSSION**

In this study, benign and malignant tumors accounted for 79.1% and 20.9% of the salivary gland tumors, respectively, and the majority of the benign tumors was pleomorphic adenoma, at 57.1%, followed by Warthin tumor and basal cell adenoma. Among the malignant tumors, mucoepidermoid carcinoma was the most common, at 29.2%, followed by adenoid cystic carcinoma and acinic cell carcinoma. These frequency were similar to those previously reported. Salivary gland tumors are commonly benign, and pleomorphic adenomas account for about half (45.2%) of both benign and malignant tumors [8].

The diagnostic accuracy, sensitivity, specificity, and inadequate sampling rate of preoperative FNAC of salivary gland tumors in this hospital were 98.2%, 88.2%, 100%, and 6.1%, respectively, indicating good results compared with those previously reported from other institutions [2-5,8,10-12]. Thus, we realized again not only that the diagnostic accuracy of preoperative FNAC for salivary gland tumors was high, but also that it was a safe, easy-to-perform, clinically very useful diagnostic procedure.

This study exposed several problems. Although the specificity of FNAC in the diagnosis of benign tumors in this hospital was as good as 100%, the rate of agreement between FNAC and histopathological diagnoses was low at 90.9%. In particular, the agreement rate for basal cell adenomas was as low as 55.5%, which was presumably due to the failure to obtain tumor cells from the cystic area of the lesion. In 2 Warthin tumors, the histopathological type could not be also determined, presumably because of sampling from the cystic area. To increase the cyto-histological agreement rate in the future, it is necessary to adequately re-aspirate the solid area after cyst fluid aspiration, or to re-perform FNAC at a later date [6,10].

The inadequate sampling rate in this hospital was relatively low, at 6.1%, as the rates at other centers vary from 5 to 10% [1,3,10,11]. We have been making efforts to take appropriate specimens by writing comments on the cytological report indicating a re-examination, or by the presence of the clinical laboratory technician at the FNAC procedure [2,3].

The sensitivity of FNAC in the diagnosis of malignant tumors was 88.2%, however, the histological type agreement rate was as low as 30%. In addition, the atypical cell rate and the inadequate sampling rate were higher in the malignant than in the benign tumors. The difficulty in diagnosing malignant tumors is also experienced in other institutions, and the results were poorer in the malignant than in the benign tumors. The diagnostic difficulty is due to the inadequate materials, the presence of low-malignancy tumors with weak cellular atypia, and the existence of various histological types [7]. We consider it necessary to attempt to collect specimens containing sufficient amounts of cells as described above, and to improve the diagnostic accuracy by further experience with more patients [3,5,11].

The resolution of these problems and cooperation of clinical physicians, pathologists, and cytotechnologists will allow further improvement in the diagnostic accuracy of preoperative FNAC [9].

**REFERENCES**