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Fine-Needle Aspiration of Parotid Masses

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Background. **There is controversy concerning the utility of fine-needle aspiration in diagnosing parotid masses. Even studies on large series of patients have compared aspiration findings with the histology in much fewer cases.**

Methods. **Preoperative fine-needle aspiration findings were compared with the histopathologic diagnoses from surgically resected specimens in 246 patients presenting with and treated for parotid mass from 1980–1990.**

Results. **Of 173 benign tumors, 159 (91.9%) were diagnosed correctly and 110 of 144 (> 60%) were typed. Of 36 malignant tumors, malignancy was recognized in 22 cases (61.1%). There were nine false-negatives, and in five cases, the specimen was unsatisfactory. The four cases of metastatic disease were correctly typed. Only two of seven lymphomas (28.6%) were identified. The cytologic and histologic diagnoses were concordant in all cases of nonneoplastic disease. Overall accuracy was 87%.**

Conclusions. **Fine-needle aspiration speeds up the diagnostic process and, with close cooperation between clinician and pathologist, the technique is a valuable adjunct to preoperative assessment in patients with parotid masses. *Cancer* 1993; 72:2306–11.**

Key words: fine-needle aspiration, parotid, diagnosis, accuracy, neoplasias.

Clinical examination of intraparotid swellings alone usually cannot distinguish between a salivary gland tumor, an inflammatory process, or an enlarged lymph node. Imaging techniques in conjunction with clinical examination provide more information about size, site, and relation between mass and salivary gland, but are unable to reveal the exact nature of the lump. Open biopsy is almost always able to provide such information, but is contraindicated by its invasive nature and because it complicates subsequent surgical management, making it less likely to succeed.[1] Fine-needle aspiration (FNA) may furnish a preoperative cytologic diagnosis; it is safe, easy to perform, and causes little discomfort to the patient.[2–4] FNA is, in fact, useful in determining whether a lump at the parotid site is of glandular or other nature.[5–8] If the sample provides an exact determination of the nature of the lump, therapeutic planning follows immediately. The technique has been in use at the Istituto Nazionale Tumori (INT), Milan, Italy, since 1980. We report here on 246 consecutive patients with parotid lumps diagnosed by preoperative FNA at INT and operated on soon after. The aim was to compare preoperative and postoperative diagnoses in this series and to assess the accuracy of FNA and its role in planning therapy for parotid diseases.

Materials and Methods

From January 1980–December 1990, FNA was performed on 692 parotid swellings at the Outpatient Surgical Department, INT. When the cytologic diagnosis was benign or nonneoplastic, the patients were not usually treated at our institution. Malignant, suspected malignant, or cases presenting therapeutic, diagnostic, or other peculiarities (e.g., willingness to be operated on as outpatients) were treated at INT. In 246 cases, surgery and subsequent histologic examination of the specimen were performed soon afterward, and these cases constitute the present series of 120 male and 126 female patients, mean age 52 and 48 years, respectively (range, 12–88 years and 13–82 years, respectively). FNA was performed by clinicians who were also responsible for preparing the slides; the aspiration was repeated in three cases (1.2%), and the cytologic diagnoses considered here are the original ones. Smears were prepared from the aspirated material in all cases. When solid particles were obtained (30% of cases), they were fixed in Bouin's solution and paraffin-embedded. The aspirated material was smeared on two to four slides. One or two smears were fixed immediately in 95% ethanol and

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Table 1. Correlation Between Cytologic and Histologic Diagnoses

Histologic diagnosis		No. of cases (%)	Cytologic findings			
			Malignant (%)	*Benign (%)*	*Nonneoplastic (%)*	*Inadequate (%)*
Malignant		50 (20)	31 (62)	14 (28)	0	5 (10)
Primary	36					
Metastasis	7					
Non-Hodgkin lymphoma	7					
Benign		173 (70)	0	159 (91)	0	14 (9)
Nonneoplastic		23 (10)	0	0	19 (83)	4 (17)
Total		246 (100)	31 (13)	173 (70)	19 (8)	23 (9)

nonneoplastic clinical diagnosis, confirmed cytologically. Other reasons for avoiding these procedures include the probably low risk that malignant tumor cells will be seeded into avascular spaces, rendering them resistant to curative radiation therapy or chemotherapy.

The complexity and variety of morphologic pattern in salivary gland tumors contrast with the smallness of the FNA specimen, which may not be representative of the whole lesion. Considerable skill is required, both in performing the aspiration and in evaluating the cytologic material. In published studies, the proportion of inadequate smears varies from 2–10%.[21,22] The low percentages are given in studies that include a high proportion of nonneoplastic lesions or those where the pathologist performing the biopsy examines the smear immediately and can take another if the first is inadequate. Additionally, many published series include cases in which FNA diagnosis was not confirmed histologically and the accuracy of the cytologic diagnosis was determined on the basis of clinical outcome (ex juvantibus).[7,21,22]

In our series, in which only one pass was performed in 98.8% of patients, E, S, Sp, PPV, and NPV were similar to those in comparable published series.[7,20–22] In particular, there were no false-positives in the benign tumor series, and the correct histologic type was suggested in 63.5% of cases. A high rate of correct typing is clinically useful, because a more precise diagnosis than benignity is required in nonmalignant cases. A mass may be due to inflammation, cyst, intraparotid lymph node, or benign tumor. Although the histologic appearance of pleomorphic adenoma ranges widely, it may be recognized cytologically. We correctly typed pleomorphic adenoma in 81.8% of cases, consistent with the literature, which ranges from 77% (Eneroth[23]) to 95% by (Persson[24]). Similarly, by virtue of its biphasic cellularity, Warthin tumor may be accurately identified in typical cases (57.5% in our series), although others[24–26] maintain that exact typing is even easier, reporting 61–83% correct typing. The remaining three types of benign tumor (Table 2) are rare and characterized by cellular monomorphism consistent with the cytologic diagnosis of monomorphic adenoma. Further subtyping is clinically irrelevant but useful for morphologic evaluation and diagnostic interpretation. Thus, oncocytoma and myoepithelioma, of both plasmacytoid and spindle cell type,[27] present unmistakable cellularity. However, to avoid misinterpretation, the smears have to be highly cellular and show an isomorphic cell population, because myoepithelioma-like and oncocytoma-like areas may constitute part of a pleomorphic adenoma and, furthermore, cytologic features similar to those of oncocytoma may be seen in oncocytosis and oncocytic hyperplasia.[28] Basal cell adenoma is also characterized by uniform cellularity and has to be distinguished from basal cell adenocarcinoma and the solid variant of adenoid cystic carcinoma.[29] High-mitotic rate is the only cytologic criterion for distinguishing basal cell adenoma from its malignant counterpart. In our experience, it is more difficult to distinguish basal cell adenoma from solid-type adenoid cystic carcinoma, mainly because of the presence of more abundant hyalinized material and, occasionally, a few globules of basement membrane material. Because of the small-

Table 2. Cytohistologic Correlation in 173 Benign Tumors

Histologic diagnosis	No. of cases	Cytologic diagnosis		
		Benign	*Typing (%)*	*Inadequate*
Pleomorphic adenoma	120	110	90/110 (81.8)	10
Myoepithelioma	10	10	10/10*	0
Basal cell adenoma	5	5	5/5*	0
Warthin tumor	37	33	19/33 (57.5)	4
Oncocytoma	1	1	1/1	0
Total (%)	173	159 (91)	—	14 (9)

* Cytologically diagnosed as monomorphic adenoma.

Table 3. Cytohistologic Correlation in 36 Malignant Tumors

Histologic diagnosis	No. of cases	Cytologic diagnosis		
		Malignant	*Benign (false-negative result)*	*Inadequate*
Mucoepidermoid carcinoma	15	10	2	3
Acinic cell carcinoma	5	2	3	0
Adenoid cystic carcinoma	6	3	2	1
Salivary duct carcinoma	4	4	0	0
Invasive carcinoma in pleomorphic adenoma	1	1	0	0
Malignant myoepithelioma	5	2	2	1
Total (%)	36	22 (61.11)	9 (25.00)	5 (13.89)

ness of the sample, no diagnostic improvement was achieved when cell blocks were available.

Primary malignant salivary tumors are a considerable diagnostic challenge. Except for the cases of salivary duct carcinoma and carcinoma arising in pleomorphic adenoma (from which the malignant component can easily be sampled, correctly diagnosed, and typed), the remaining histologic types were diagnosed with poor accuracy. There was an evident trend to underdiagnose, as already reported for mucoepidermoid[30] and adenoid cystic carcinomas.[31,32] Distinguishing between mucoepidermoid carcinoma and pleomorphic adenoma may be difficult, even on surgical biopsies.[33] The failure of FNA to identify these tumors can be ascribed to three main factors:

1. Grading: mucoepidermoid and acinic cell carcinomas may be either high- or low-grade malignancies. In the latter variant of both entities, the cytologic diagnosis of malignancy is unlikely.
2. Terminology: diagnostic interpretation of acinic cell carcinoma is complicated by use of the ambiguous term "tumor" for the low-grade subtype in the old WHO classification.[34] This has now been replaced by the term "carcinoma."
3. Invasiveness as a marker of malignancy: this principally concerns adenoid cystic carcinoma and the inability of cytologic material to demonstrate invasiveness. This type of tumor often has a cytologically bland appearance[10] despite being highly infiltrative.

The diagnostic problems of malignant myoepithelioma are different. This is a rare tumor whose myoepithelial nature is only apparent on ultrastructural study.[35] The tumor may arise de novo or develop in a pre-existing pleomorphic adenoma.[36] The relatively high number of cases of malignant myoepithelioma in our series is due to the introduction of immunocytochemistry in recent years as part of the routine classification of salivary gland tumors. In only one of our five cases was there cytologic evidence of pleomorphic adenoma component, and this was one of the two FN. The presence of abundant myxoid stromal component and

Table 4. Cytohistologic Correlation in 7 Cases of Non-Hodgkin Lymphoma

Histologic diagnosis	No. of cases	Cytologic diagnosis	
		Malignant	*Benign (false-negative result)*
Low-grade malignant lymphoma of salivary-associated lymphoid tissue	3	0	3
Centroblastic-centrocytic follicular lymphoma	2	0	2
T-lymphoblastic lymphoma (relapse)	1	1	0
High-grade lymphoma, not otherwise specified	1	1	0
Total	7	2	5

Table 5. Cytohistologic Correlation in 23 Nonneoplastic Lesions

Histologic diagnosis	No. of cases	Cytologic diagnosis		
		Nonneoplastic lesions	*Lymphoid hyperplasia*	*Inadequate*
Cysts	11	8	0	3
Inflammation	3	3	0	0
Normal tissue*	1	1	0	0
Myoepithelial scialoadenitis	2	1	0	1
Lymphoid hyperplasia (intraparotid lymph node)	6	0	6	0
Total	23	13	6	4

* Inclusion of salivary gland tissue within intraparotid lymph node.

little cellularity was responsible for underdiagnosis in the second case. Of the two cases correctly diagnosed, one was plasmacytoid and the other was predominantly spindle-celled. In the latter, the high cellularity and mitotic index suggested the cytologic diagnosis of malignancy.

The diagnosis of metastatic intraparotid tumors appears to be the least difficult, as all authors report complete agreement between FNA and postoperative diagnosis. This may be due to the known presence of a primary or a previously treated primary tumor. Our experience is consistent with the literature.[21,22] When the patient has previously been treated for a malignancy, especially of the head or neck, the cytologic diagnosis of metastatic squamous cell carcinoma or metastatic melanoma consents planning of local and regional treatment. In such cases, surgery is not intended to be radical and aims to preserve function above all of the neurofacial nerve; it may be associated with radiation therapy.[21]

With regard to non-Hodgkin lymphoma, both cases of high-grade lymphoma were typed correctly. By contrast, all low-grade lymphomas were underdiagnosed, notably low-grade lymphomas of so-called salivary-associated lymphoid tissue and centroblastic-centrocytic follicular nodal lymphomas. Although the latter two lymphomas are distinct phenotypically and genotypically, in both, the presence of a polymorphic cell population, a relatively prominent nonmalignant component, and a nodular structure (reactive in the former and malignant in the latter) conspire to make diagnosis difficult.[37] Because of crushing, no diagnostic improvements were obtained from cell block preparations.

Twenty-three cases of nonneoplastic lesions were treated surgically. In all cases, the final histologic diagnosis agreed with the FNA diagnosis and was also concordant with the clinical examination.

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