

# Correlation between fine needle aspiration biopsy and histologic findings in parotid masses. Personal experience

## Correlazioni tra agoaspirato ed esame istologico nelle tumefazioni della ghiandola parotide. Nostra esperienza

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### Key words

Parotid masses • Diagnosis • Fine-needle aspiration biopsy

### Parole chiave

Tumefazioni della parotide • Diagnosi • Agoaspirato

### Summary

Pre-operative fine-needle aspiration biopsy findings have been compared with those of post-operative histopathology in 146 patients with parotid masses. Post-operative histology showed 124 benign and 22 malignant lesions: pre-operative fine-needle aspiration biopsy correctly identified 118/124 (95.1%) benign masses with an accurate classification of the tumour in 111/118 cases (94%). Fine-needle aspiration biopsy identified malignancy in 12/22 cases (>50%). In the remaining 7 cases (six benign lesions and one malignant), cytology was not diagnostic. There were no false positive cases. In the present study, the accuracy, sensitivity and specificity of cytologic findings were, respectively, 94%, 57.2% and 100%. The accuracy of fine-needle aspiration biopsy was seen to be higher in benign than in malignant lesions. Fine-needle aspiration biopsy represents a first choice diagnostic tool for the study of palpable head and neck masses excluding abscesses and vascular neoplasms. However, for a correct diagnosis, great skill is required and cytology does not always reach the sensitivity and specificity of post-operative histology. Therefore, in the presence of a palpable head and neck mass, resistant to medical treatment, surgery is still strongly indicated and cytology is very useful in planning the surgical approach.

### Riassunto

I risultati dell'agobiopsia preoperatoria sono stati confrontati con l'esito dell'esame istologico postoperatorio in una casistica di 146 pazienti affetti da tumefazione parotidea. L'esame istologico ha evidenziato 124 lesioni benigne e 22 maligne; l'agoaspirato preoperatorio aveva correttamente identificato 118/124 (95,1%) lesioni benigne con una precisa definizione della neoplasia in 111/118 (94%). Nel caso delle lesioni maligne, l'agoaspirato era stato diagnostico in 12/22 casi (50%). Nei restanti 7 casi (6 lesioni benigne e 1 maligna) l'esame citologico non era stato significativo. Non si sono verificati casi di falsa positività. Nel presente studio, l'accuratezza diagnostica, la sensibilità e la specificità dell'esame citologico sono stati rispettivamente 94%, 57,2% e 100%. L'accuratezza diagnostica è risultata maggiore per le lesioni benigne, che per le maligne. L'agobiopsia preoperatoria rappresenta un esame di prima scelta per lo studio delle tumefazioni palpabili della testa e del collo, ad eccezione degli ascessi e delle neoformazioni vascolari. Tuttavia, per ottenere una diagnosi corretta con questa metodologia è necessaria una grande esperienza da parte dell'esaminatore e in ogni caso la citologia non raggiunge mai i valori di sensibilità e specificità dell'esame istologico. In conclusione in presenza di una tumefazione palpabile della testa e del collo, resistente alla terapia medica, la chirurgia è il trattamento di scelta, e la citologia rappresenta un metodo estremamente utile per la pianificazione dell'intervento chirurgico.

## Introduction

Salivary gland tumours represent approximately 3% of all head and neck tumours; 80% involve the parotid gland, and 75% are benign tumours<sup>1</sup>. Clinical examination alone does not always allow differentiation between benign and malignant, inflammatory or lymph node masses. Radiologic findings provide additional information concerning the size, the site and relationship between the mass and the salivary gland but its exact nature can not be ascertained. Open biopsies define the his-

tology of the tumour but the procedure is invasive and may complicate subsequent surgical treatment. Fine-needle aspiration biopsy (FNAB) can provide pre-operative cytologic diagnosis; it is a safe, rapid and easy diagnostic procedure, readily carried out causing little discomfort to the patients<sup>2</sup>. In the Twenties, it was performed by Hayes Martin at the Sloan Kettering Memorial Hospital, under local anaesthesia, using large-bore needles. However, it was not generally accepted, in the United States, as pathologists were reluctant to diagnose malignant tumours based on cytologic preparations<sup>3</sup>. It then spread to Europe where

it was improved, in the Fifties and Sixties, with the use of thin needles. It became popular in the Seventies<sup>4</sup>, especially for diagnostic studies of palpable head and neck masses, not being, however, uniformly accepted<sup>5</sup>. Needle-aspiration biopsy was re-introduced into the United States in the Eighties and, at the same time, it became popular in Italy<sup>6,7</sup>.

In recent years, retrospective studies have been conducted which confirmed its high sensitivity and specificity in the differentiation between malignant and benign tumours. In fact, FNAB is regarded, by some Authors, as a diagnostic procedure superior to the combination of physical and radiologic evaluation and an important support in the evaluation of salivary gland tumours<sup>7-9</sup> in their preoperative management and in the choice of the most appropriate treatment<sup>10</sup>.

## Patients and methods

From November 1987 to June 2002, 247 patients with parotid masses, were submitted at the Otolaryngology Department of the "Catholic University of the Sacred Heart", to enucleation (17.8%), enucleoresection (19.3%), lateral parotidectomy (48.5%) and total parotidectomy (14.4%), with (90%) or without (10%) facial nerve preservation, after ultrasound and radiologic studies.

Pre-operative fine-needle aspiration of the parotid mass was performed as an additional pre-operative diagnostic examination in 146 patients (60 female, 86 male, age range: 18-94 years, mean age: 55.3). Of all reviewed cytologic examinations, 116 (79.5%) were performed at the Department of Pathology of the "Catholic University of the Sacred Heart" while the remaining 30 were performed at other laboratories.

FNA cytology was performed by clinicians using a 22 gauge needle attached to a 10 ml syringe holder<sup>11</sup>. A minimum of two or three needle passes were made in each case. The specimens were expelled onto two cover glasses, one fixed in alcohol solution and subsequently stained with Papanicolaou stain, the other air-dried and stained with May-Grunwald Giemsa (MGG) stain. When immediate cover glass examination was non-specific, aspiration was repeated. For the aim of this study, needle aspiration results were classified as follows:

- non-diagnostic: no cytologic diagnosis was possible based on the material obtained;
- true-negative: correct indication of absence of malignancy;
- true-positive: correct indication of presence of malignancy;
- false-negative: incorrect indication of absence of malignancy;
- false-positive: incorrect indication of suspected malignancy.

The classification of parotid tumours was based on WHO guidelines<sup>12</sup> and, therefore, tumours were classified as benign, of intermediate malignancy and malignant.

The cytologic diagnosis was then compared with the histopathologic diagnosis and evaluated for adequacy, presence or absence of malignancy and correct tumour diagnosis.

## Results

In this study, all patients with parotid disease were included, even if they had previously undergone treatment on the gland.

Table I. Histology of parotid masses.

Benign lesions	N.	Malignant tumours	N.
Pleomorphic adenoma	71	Ca ex pleomorphic adenoma	1
Warthin tumour	36	Squamous cell Ca	2
Oncocytoma	1	Metastasis from squamous cell Ca	3
Lipoma	7	Undifferentiated Ca	3
Benign lymphoma	1	LGM lymphoma	2
Non-neoplastic lesions	8	HGM lymphoma	1
		Sarcoma	1
		Non-Hodgkin lymphoma	2
		Metastases from melanoma	2
		MALT lymphomas	3
		Adenoid cystic Ca	1
		Metastases from solid Ca	1

Ca: carcinoma; LGM: low grade malignancy; HGM: high grade malignancy.

**Table II.** Cytology and histology of parotid masses with true positive results and accurate tumour classification N=12.

Cytologic diagnosis = histologic diagnosis
Metastases from melanoma 2
Squamous cell Ca 2
Adenoid cystic Ca 1
Sarcoma 1
Undifferentiated Ca 2
Non-Hodgkin lymphoma 1
Metastasis from solid Ca 3

**Table III.** Cytology and histology of parotid masses with true negative results and accurate tumour classification N=111.

Cytologic diagnosis = histologic diagnosis
Pleomorphic adenoma 70
Warthin tumour 32
Oncocytoma 1
Lipoma 4
Non-neoplastic lesions 4

Post-operative histology showed 124 benign and 22 malignant lesions (Table I). Histology was true-negative in 118 cases (80.2%) and true-positive in 12 cas-

es (8.2%). All true-positive cases and 111/118 of the true-negative cases (94%) were accurately classified (Tables II, III). The 7 true-negative cases, with inaccurate classification are listed in Table IV. There were no false-positive cases while there were 9 false-negative cases (6.1%), of which 5 lymphomas classified as lymphadenitis and 1 as chronic non-granulomatous inflammation. One case of metastasis from carcinoma and one case of carcinoma on a pleomorphic adenoma were classified as lymphoma and pleomorphic adenoma, respectively (Table V). We observed only 7 non-diagnostic cytologic examinations (4.8%) of which 6 benign lesions (3 haemorrhagic cysts, 3 lipomas) and one malignant lesion (MALT lymphoma – mucosa-associated lymphoid tissue lymphoma).

The sensitivity and specificity were 57.3% and 100%, respectively. Positive and negative predictive values were 100% and 93%, respectively. The overall diagnostic accuracy of FNAB, in salivary gland lesions, was 94%.

No haematoma, infection, facial nerve damage, implantation of tumour cells, or other complications were observed.

## Discussion

Needle-aspiration is a safe procedure which is readily carried out, is well tolerated by patients and for which general anaesthesia is not required<sup>4</sup>. The main aim of the cytologic examination of parotid masses is

**Table IV.** Cytology and histology of parotid masses with true-negative results and inaccurate tumour classification N=7.

Cytologic diagnosis	Histologic diagnosis
Lymphoid cells 1	Benign lymphatic tumour 1
Chronic inflammation 1	Pleomorphic adenoma 1
Chronic suppurative inflammation 1	Warthin suppurative tumour 1
Chronic sialoadenitis 2	Warthin tumour 2
Salivary cyst 2	Warthin tumour 1
Lymphadenitis 1	Giant-cell lymphadenitis 1

**Table V.** False negative results N=9.

Cytologic diagnosis	Histologic diagnosis
Reactive lymphadenitis 2	HGM lymphomas 2
Lymphoma 1	Metastasis from a solid Ca 1
Low grade lymphoma 1	Undifferentiated Ca 1
Lymphadenitis 3	Non-Hodgkin lymphoma 1
Chronic non granulomatous inflammation 1	MALT 2
Pleomorphic adenoma 1	LGM lymphoma 1
	Pleomorphic adenoma 1

the differential diagnosis between benign and malignant lesions, or better, between operable lesions and lesions for which other therapy is more suitable<sup>10</sup>.

Batsakis et al., in 1992, stated that most parotid masses require surgery and that needle-aspiration plays a minor role in the therapeutic approach<sup>5</sup>. Other Authors consider the cytologic examination an important diagnostic procedure, superior to the combination of physical and radiologic examinations which are not able to definitely differentiate between benign and malignant lesions<sup>7,8</sup>.

It has been shown that, in the preoperative evaluation, FNAB of parotid masses can reduce the number of patients being treated by surgery by 1/3<sup>13-17</sup>. In the remaining cases, important information is provided which can play a significant role in the selection of the most suitable therapeutic option: conservative or limited surgery for benign lesions, radical or demolitive surgery for malignant lesions<sup>10</sup>, radiochemotherapy for inoperable tumours.

It should be stressed that the heterogeneous morphologic patterns of salivary gland tumours contrast with the small size of the needle-aspiration sample which might not be representative of the entire mass. Therefore, great professional skill and experience are required both in performing the aspiration and in the evaluation of the cytologic examination<sup>7</sup>. In spite of all the precautions adopted, the cytologic examination may not be significant. In previously published studies, the rate of inadequate needle aspirations was between 2 and 10%<sup>4,7,17-19</sup>.

In the present series, of the 146 cytologic examinations performed only 7 (4.8%) were non diagnostic. The reasons why a representative sample is not always obtained may be related to the positioning of the needle outside the target area or the presence of haemorrhagic, necrotic or cystic areas in the tumour. However, the rate of non-diagnostic needle-aspirations can be decreased with the examination of frozen sections and with an additional immediate examination when the sample is inadequate<sup>20</sup>. In a recent review on needle-aspiration biopsy, Amedee and Dhurandhar have confirmed that, based on the present findings, the accuracy of this diagnostic examination, for salivary gland pathology, exceeds 90%, even if it is more precise in the identification of benign lesions as compared to malignant lesions with 90% sensitivity and 80% specificity<sup>3</sup>.

According to the various Authors, the accuracy of needle aspiration ranges from 80.4% to 97%, sensitivity from 54% to 97.6% and specificity from 86% to 100%<sup>7,17,20-22</sup>.

In the present study, the accuracy, the sensitivity and the specificity were 94%, 57.2% and 100%, respectively. Positive and negative predictive values were 100% and 93%, respectively.

In our study, we observed a number of false negative

cases equal to 40% of all malignant tumours (9/22) as already reported by Zbaren et al.<sup>4</sup>, and comparable with values obtained by others<sup>7,21,22</sup>. However, it should be pointed out that 34% of the false negative examinations had been performed elsewhere.

Therefore, for a correct therapeutic approach, all clinically suspicious parotid masses, with negative or non-diagnostic needle-aspiration, should be re-examined by cytology or intra-operative frozen section histology.

In our study, there were no false-positive cases. This finding is in agreement with values recently reported in the literature, ranging between 0 to 7%<sup>4,7,17</sup>.

Moreover, the histologic type of 111 of the 124 benign tumours (90%) and 12 of the 22 malignant tumours (54%) was correctly identified upon histologic examination.

Al-Khafaji et al., in the classification of the various types of malignant and benign tumours, observed 84% and 92% accuracy, respectively<sup>17</sup>.

Our findings, in agreement with reports of others<sup>4,7</sup>, have underlined the higher accuracy of FNAB in the diagnosis of benign lesions as compared to malignant lesions; in the latter, the use of a triple test (clinical/radiologic/cytologic examination) is indicated, to decrease false-negative and false-positive cytologic examinations.

As mentioned above, benign lesions were correctly diagnosed in 90% of cases (111/124 patients) and, in particular, in 98.6% of all pleomorphic adenomas (70/71) and in 89% of Warthin tumours (32/36).

The only oncocytoma present in our series was correctly diagnosed on account of its readily recognisable cellularity<sup>7</sup>. Pleomorphic adenoma has an extremely variable histologic pattern and can be easily identified at cytologic examination, with correct typing ranging between 82% and 94%<sup>7,23</sup>.

Warthin tumour was correctly diagnosed in 89% of cases: in two specimens, the cytologic examination diagnosed chronic sialoadenitis with suppuration due to the presence within the cystadenolymphoma of areas of central necrosis which may undergo suppuration.

Of the 8 lymphomas present in our series, only 1 was correctly diagnosed. The other 7 were identified as: reactive lymphadenitis in 5, and 1 as chronic non-granulomatous inflammation; whilst one sample was inadequate.

In the literature, data on the identification of malignant lympho-epithelial tumours, by means of needle-aspiration, are extremely controversial. In the series described by Zbaren et al., none of the 7 lymphomas were identified on cytology; 6 samples were classified as false-negative and diagnosed as lymphadenitis while one was reported to be non-diagnostic<sup>4</sup>. In Al-Khafaji's series, all 10 lymphomas were correctly classified<sup>17</sup>, while Zurrida et al. observed 5 false-negative specimen in 7 lymphomas<sup>7</sup>.

It is worthwhile stressing that in our study two histo-

logic examinations that diagnosed metastases from squamous cell carcinoma, and an undifferentiated carcinoma, as lymphoma, were included among the false-negative cases.

This choice was made since, although lymphomas and tumours as well as epithelial metastases are malignant lesions, the therapeutic rationale is markedly different. The last false-negative case in our series refers to a carcinoma, formerly pleomorphic adenoma, diagnosed as pleomorphic adenoma: differentiation is often difficult especially if the foci of neoplastic transformation are very small and, therefore, cannot be reached with needle-aspiration.

## References

- 1 Holland JF, Bast RC, Morton DL, Frei E, Kufe DW, Weichselbaum RR. *Neoplasms of the head and neck region*, Cancer Medicine. Fourth Edition, Vol. I. Baltimore, MD: BC Decker 1997:1674-8.
- 2 Basim MA, Blake RN, Ruth LK. *Fine needle aspiration of 154 parotid masses with histologic correlation*. Cancer 1998;84:153-9.
- 3 Amedee RG, Dhurandhar NR. *Fine-needle aspiration biopsy*. Laryngoscope 2001;111:1551-7.
- 4 Zbaren P, Schar C, Hotz MA, Loosli H. *Value of fine-needle aspiration cytology of parotid gland masses*. Laryngoscope 2001;111:1989-92.
- 5 Batsakis JG, Sueige N, el-Naggar AK. *Fine needle aspiration of salivary glands: its utility and tissue effects*. Ann Otol Rhinol Laryngol 1992;101:185-8.
- 6 Layfield LJ, Tan P, Glasgow BJ. *Fine needle aspiration of salivary gland lesions: comparison with frozen sections and histologic findings*. Arch Pathol Lab Med 1987;111:346-53.
- 7 Zurrida S, Alasio L, Tradati N, Bartoli C, Chiesa F, Pilotti S. *Fine-needle aspiration of parotid masses*. Cancer 1993;72:2306-11.
- 8 Owen ER, Banerjee AK, Prichard AJ, Hudson EA, Kark AE. *Role of fine needle aspiration cytology and computed tomography in the diagnosis of parotid swellings*. Br J Surg 1989;76:1273-4.
- 9 Malata CM, Camilleri IG, McLean NR, Piggot TA, Soames JV. *Metastatic tumours of the parotid gland*. Br J Oral Maxillofac Surg 1998;36:190-5.
- 10 Cohen MB, Fisher PE, Holly EA, Ljung BM, Lowaghen T, Bottles K. *Fine needle aspiration biopsy diagnosis of mucoepidermoid carcinoma*. Acta Cytol 1990;34:43-9.
- 11 National Committee for Clinical Laboratory Standards. *Fine needle aspiration biopsy (FNAB) techniques: approved guidelines*. Villanova, PA: NCCLS, 1997. NCCLS document.
- 12 Seifert G. *Histological typing of salivary gland tumors*. In: WHO International Histological Classification of Tumours. Geneva: Springer; 1991.
- 13 Quizilbash AH, Sianos J, Young JEM, Archibald SD. *Fine needle aspiration biopsy cytology of major salivary glands*. Acta Cytol 1985;29:503-12.
- 14 Nettle WJS, Orell SR. *Fine needle aspiration in the diagnosis of salivary gland lesions*. Aust N Z J Surg 1989;59:47-51.
- 15 Layfield LJ, Glasgow BJ. *Diagnosis of salivary gland tumors by fine needle aspiration cytology: a review of clinical utility and pitfalls*. Diagn Cytopathol 1991;7:267-72.
- 16 Heller KS, Dubner S, Chess Q. *Fine needle aspiration biopsy of salivary gland mass in clinical decision making*. Am J Surg 1994;164:667-70.
- 17 Al-Khafaji BM, Nestok BR, Katz RL. *Fine needle aspiration of 154 parotid masses with histologic correlation*. Cancer 1998;84:153-9.
- 18 Guyot IP, Obradovic D, Krayenbuhl M, Zbaeren P, Lehmann R. *Fine needle aspiration in the diagnosis of head and neck growths: is it necessary?* Otolaryngol Head Neck Surg 1990;103:697-701.
- 19 Frable MAS, Frable WJ. *Fine needle aspiration biopsy of salivary glands*. Laryngoscope 1991;101:245-9.
- 20 Filipoulos E, Angeli S, Daskalopoulou D, Kelessis N, Vasilopoulos P. *Pre-operative evaluation of parotid tumors by fine-needle biopsy*. Eur J Surg Oncol 1998;24:180-3.
- 21 Pitts DB, Hilsinger RL, Karandy E, Ross JL, Caro JE. *Fine needle aspiration in the diagnosis of salivary gland disorders in the community hospital setting*. Arch Otolaryngol Head Neck Surg 1992;118:479-82.
- 22 Atula T, Grenman R, Laippala P, Klemi PJ. *Fine needle aspiration biopsy in the diagnosis of parotid gland lesions*. Diagn Cytopathol 1991;15:185-90.
- 23 Orell SR. *Diagnostic difficulties in the interpretation of fine needle aspirates of salivary gland lesion: the problem revisited*. Cytopathology 1995;6:285-300.
- 24 Carrol CMA, Nazeer U, Timon CJ. *The accuracy of fine-needle aspiration biopsy in the diagnosis of head and neck masses*. Ir J Med Sci 1998;167:149-51.
- 25 McGuirt WF. *The neck mass*. Med Clin North Am 1999;83:219-34.

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