

## EXPERIMENTAL STUDY

## Fine-needle aspiration biopsy in the diagnostic of the tumors and non-neoplastic lesions of salivary glands

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### Abstract

**Objectives:** Fine-needle aspiration biopsy (FNAB) has not been part of the basic algorithm of preoperative evaluation of tumors of the major salivary glands in the Czech Republic. Most opponents of salivary gland FNAB consider it unnecessary. This paper documents the utility of the puncture aspiration biopsy in the diagnosis of these lesions.

**Methods:** Between January 1998, and December 2003, 136 patients with clinically significant masses of the salivary glands were evaluated using FNAB. The parotid gland was involved in 68 patients, the submandibular gland in 58 patients and the region of the sublingual gland in 10 cases. In the retrospective analysis, the preoperative cytological findings were correlated with the postoperative histopathological evaluation.

**Results:** Histopathological evaluation revealed 107 benign lesions (79 %), of which 68 were non-neoplastic, and 39 were benign neoplasms, and 19 malignant tumors (21 %). The cytological specimens were found to be non-diagnostic in 15 (11 %) cases, true-positive in 68 (50 %), true-negative in 40 (29.4 %), false-positive in 1 (0.73 %) and false-negative in 12 (8.8 %) cases in detecting tumors. The sensitivity, specificity and diagnostic accuracy of aspiration cytology were 85.0 %, 97.5 % and 89.2 %, respectively. We recorded complications in only one case (0.7 %), a subcutaneous haematoma.

**Conclusion:** Our results document the utility of the FNAB in the diagnosis of salivary gland masses. FNAB does not substitute other diagnostic methods or as an adjunct to sound clinical judgement. Together with the clinical and ultrasonographical evaluations it should belong to the basic algorithm of diagnosis in salivary gland lesions (Tab. 3, Ref. 18).

**Key words:** fine-needle aspiration biopsy, salivary gland, tumorous lesion, cytology.

A mass in the salivary gland region often presents a diagnostic challenge with regard to its site of origin, benign or malignant nature. Adequate diagnostic analysis represents a promising precondition for optimized therapy. The present study describes the utility of fine-needle aspiration biopsy (FNAB) in the diagnosis of these lesions. FNAB is a cytodiagnostic method based on the morphological findings of individual cells, groups of cells, and microparticles of tissue, acquired using a needle of intramuscular caliber. The aspiration is performed under an ultrasonographic control (USG) and the sample is evaluated by an experienced cytopathologist. The method has a high degree of sensitivity in distinguishing the tumors from non-neoplastic lesions of salivary glands (1-3). FNAB is an easy done, therefore an easily repeated method, and is safe with minimal incidence of complications (<1 %). It is, convenient particularly in outpatient practice. It has no contraindications, and the complications are rare,

and they include only incidental bleeding or inflammatory reaction in the region of the puncture. The impairment of major nerves has been reported as a very rare complication (4, 5).

Currently fine-needle aspiration biopsy (FNAB) does not belong to the routine preoperative evaluations of salivary glands

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**Tab. 1. Diagnoses of benign lesions.**

Diagnosis	n	%
Pleomorphic adenoma	21	19.6
Lipoma	8	7.5
Warthin's tumor	8	7.5
Lymphangioma	2	1.7
Lymphoepithelial cyst	25	23.4
Chronic sialoadenitis with or without lithiasis	37	34.6
Hyperplasia of lymph nodes	6	5.6
Total	107	100

lesions in the Czech Republic. Because of advantages presented in the foreign literature (5, 6), we have introduced this method in the diagnosis of lesions of the major salivary glands five years ago. In this paper we report our experience.

### Methods

During a 5-year period (January 1998 to December 2003), 136 patients with clinically apparent salivary gland masses were evaluated using FNAB. The mean age of patients was 49.6 years, (range 14-88 years) and the male to female ratio was 1.06:1. In this retrospective study, the preoperative cytologic findings were analyzed and compared with the postoperative corresponding histopathological diagnoses. The aspiration biopsies were performed in both outpatient and inpatient clinical settings. The masses were located in the parotid gland in 68 patients (50 %) and in the submandibular gland in 58 patients (42.6 %). Ten aspirates (7.3 %) were performed in the region of the sublingual gland. The puncture aspiration biopsy was performed using a 18-gauge needle attached a 20-ml disposable plastic syringe. The drop of the aspirated fluid was evacuated from the syringe to the margin of the underlying slide and coated using the edge of another underlying slide. After drying the material was covered with glass. If the fluid contained even imperceptible minute particles, they were fixed using 10 % formol and processed using the cytoblock method. The smears were air dried and stained using the hematoxylin-eosin staining (HE) and the May-Grünwald-Giemsa (MGG).

### Results

The postoperative histopathological evaluation revealed 107 benign lesions (79 %), among which 68 cases represented non-neoplastic lesions and 139 cases were diagnosed as benign tumors of salivary glands. The results are summarized in Table 1.

In 29 patients (21 %), histological evaluation found primary malignant salivary gland tumors or a metastatic infiltration of salivary gland or lymph node. The list of the malignant tumors is given in Table 2.

FNAB allowed a final cytologic diagnosis in 121 patients (89 %), while cytological findings in 15 cases (11 %) were non-diagnostic. In 12 cases (8.8 %), the results were false-negative

**Tab. 2. Diagnoses of malignant tumors.**

Diagnosis	n	%
Carcinoma	13	44.8
Malignant lymphoma	8	27.6
Metastasis of carcinoma	7	24.1
Metastasis of melanoma	1	3.4
Total	29	100

**Tab. 3. Comparison of cytology and histology diagnosis.**

True-positive (TP)	68	(50.0 %)
True-negative (TN)	40	(29.4 %)
False-positive (FP)	1	(0.73 %)
False-negative (FN)	12	(8.8 %)
Sensitivity of the FNAB	85.0 %	
Specificity	97.5 %	
Diagnostic accuracy	89.2 %	
Probability		
Positive predictive value (PPV)	98.5 %	
Negative predictive value (NPV)	76.9 %	

and in 1 case (0.7 %) false-positive. Regarding benign lesions, the diagnosis using the aspiration biopsy was false-negative (FN) in 4 cases. Warthin's tumor was presented in 2 cases as a normal serous salivary gland and in one case as a lymphoepithelial cyst. In one case a lymphoepithelial cyst presented as hyperplasia of lymph node.

A false-positive (FP) finding was referred using the aspiration cytology in a benign lesion, where a pleomorphic adenoma was presented as an adenoid cystic carcinoma and the urgent histological exploration was recommended. Except for this case, there was not any false-positive diagnosis of a malignancy recorded in the study.

Regarding malignant tumors, there were false-negative diagnoses (FN) in 8 patients with malignant tumors, that were presented using the aspiration cytology as lymphocytic parotitis or chronic sialoadenitis. Of these, in five cases the final diagnosis was malignant lymphoma. After revision of the sanguine coats in two cases, one of authors (JD) came to the conclusion, that some of the lymphoid elements could be a reason to retain the haemoblastosis in the differential diagnosis despite the limitedly preserved morphology of the cells during the revision.

Further false-positive diagnoses were found using the FNAB in two primary carcinomas of a salivary gland (myoepithelial carcinoma and adenocarcinoma) and one metastatic poorly differentiated carcinoma.

Complications following FNAB were rare. We recorded only one subcutaneous hematoma.

The correlation of the results of the preoperative cytological evaluation with the postoperative histological findings is summarized in Table 3.

In the diagnosis of tumorous lesions of the major salivary glands, the ultrasonography (USG) follows the clinical history and the clinical evaluation of the patient. Using the ultrasonography it is possible to determine relatively accurately the size of a salivary gland and the size and localisation of the lesion, to distinguish a diffuse focal disorder, to distinguish a cystic lesions from the solid ones, to assess vascularity and adjacent vascular structures, and to evaluate adjacent periglandular structures including regional lymph nodes (7, 8, 9).

The puncture aspiration biopsy is a minimally invasive diagnostic method, convenient for repeat evaluations including the follow-up of oncological patients (10).

The preoperative cytology contributes to the differential diagnosis between benign and malignant tumors of salivary glands, and one enables to determine if the pathological process is located within the gland or is of extra-glandular origin (11). Moreover, FNAB cytology may discriminate between benign and malignant salivary gland tumors, and thus the extent of the surgery can be modified. Some benign tumors can be removed without total parotidectomy or extirpation of the submandibular gland (12).

The majority of the malignant tumors of head and neck metastasize to the lymph nodes of the submandibular region. In the cytological diagnosis of the malignant tumors of submandibular region, one can expect difficulties in distinguishing chronic fibroproductive sialoadenitis (Küttner's tumor), which is characterized by chronic sclerosing inflammation with an atrophy of the parenchyma and massive lymphocytic infiltration with the formation of germinal centres (13, 14).

The diagnosis of the malignant lymphoma using the aspiration cytology is possible according to the experience of several authors (10). However, it requires from the very beginning a different approach. The material must be collected into a strictly isotonic medium, processed immediately using extensive panel immunocytochemical stainings (15). The cytologist must be experienced not only in cytology assessment but have detailed knowledge of the differential diagnosis of malignant lymphomas. High-grade lymphoma can be diagnosed with more confidence, because of the apparent blastic morphology of the cells and the clinical course. In contrast distinguishing the low-grade lymphoma from the reactive lymphadenopathies is difficult using FNAB alone (16). Shaha et al (10) appreciated the role of the FNAB in the diagnosis of malignant lymphoma, metastases of the carcinoma or sialoadenitis.

Most authors exclude the possibility of implantation of the malignant tumors or its recurrence caused by FNAB (16). The only relative contraindication of the performing the FNAB could be the haemorrhagic diseases.

Otherwise is the puncture aspiration biopsy using a fine-needle again a safe method with a minimal occurrence of complications. Shaha et al (10) did not observe complications, such as haematomas, nerve damages, or infection in 160 patients in their study. The major pitfall of the FNAB of the salivary gland lesions is the occurrence of non-diagnostic collection, which occurs in 5-15 %. In our study, only fifteen aspirates were found

to be insufficient for diagnosis. Moreover cytologically overlapping and variable features of sialomas, with oncocytic, spinocellular and other metaplasias, and particularly the occurrence of a lymphoid component in some salivary gland tumors make the cytologic diagnosis very difficult (1, 13).

Because of overlapping histological features the diagnosis of pleomorphic, monomorphic adenoma, and adenoid cystic carcinoma can be sometimes very problematic. In our study one patient with pleomorphic adenoma was suspected to have adenoid cystic carcinoma. It can also be problematic to distinguish Warthin's tumor (adenolymphoma) from lymphoepithelial cyst or from acinic cell and low-grade mucoepidermoid carcinoma because all of these entities may be accompanied by dense lymphoid stroma (17, 18).

The specificity and the sensitivity in our study is lower if compared with the literature (5, 9, 13, 16, 18), most likely due to our limited experience with the FNAB method. However, we believe that the acquired results support the utility of FNAB in the diagnosis of tumors of the salivary glands. In our opinion, the FNAB accelerates the diagnosis and thus it may influence rapid selection of the therapeutic approach.

## References

1. **Costas A, Castro P, Martin-Granizo R, Monje F et al.** Fine needle aspiration biopsy (FNAB) for lesions of the salivary glands. *Brit J Oral Maxillofac Surg* 2000; 38: 539–542.
2. **Enaroth CM, Franzen C, Zajicek J.** Cytologic diagnosis on aspirates from 1000 salivary gland tumorous. *Acta Otolaryngol* 1967; 224 (Suppl 11): 168–171.
3. **Stewart CJ, MacKenzie K, McGarry GW et al.** Fine needle cytology of salivary gland: A review of 341 cases. *Diagn Cytopathol* 2000; 22: 139–146.
4. **Allen EA, Ali SZ, Methew S.** Lymphoid lesions of the parotid. *Diagn Cytopathol* 1999; 21: 170–173.
5. **Schroder U, Eckel HE, Rasche V et al.** The value of fine needle aspiration biopsy in the diagnosis of the parotid gland neoplasms. *HNO* 2000; 48: 421–429.
6. **Pitts DB, Hilsinger RL, Karandy E et al.** Fine needle aspiration in the diagnosis of salivary gland disorders in the community hospital setting. *Arch Otolaryngol Head Neck Surg* 1992; 118: 479–482.
7. **Ivanová S, Slobodnikova J, Jozefakova J et al.** Fine needle aspiration biopsy in a diagnostic workup algorithm of salivary gland tumors. *Neoplasma* 2003; 50: 144–147.
8. **Salaffi F, Argalia G, Carotti M et al.** Salivary gland ultrasonography in the evaluation of primary Sjögren's syndrome. Comparison with minor salivary gland biopsy. *J Rheumatol* 2000; 27: 1229–1236.
9. **Starek I, Cerny L, Simpson RWH.** Diagnosis of diseases salivary glands. 29-61. In: Starek I, Cerny L, Simpson RWH (Eds). Praha, Grada Publishing 2000.
10. **Shaha AR, Webber C, Di Maio T et al.** Needle aspiration biopsy in salivary gland lesions. *Amer J Surg* 1990; 160: 373–376.
11. **Orell SR.** Diagnostic difficulties in the interpretation of fine needle aspirates of salivary gland lesions: the problem revisited. *Cytopathology* 1995; 6: 285–300.

- 12. Heller KS, Dubner S, Chess Q et al.** Value of fine needle aspiration biopsy of salivary gland masses in clinical decision-making. *Amer J Surg* 1992; 164: 667—670.
- 13. Cheuk W, Chan JK.** Kuttner tumor of the submandibular gland: fine needle aspiration cytologic findings of seven cases. *Amer J Clin Pathol* 2002; 117: 103—108.
- 14. Kljanienko J, Vielh P.** Fine needle sampling of salivary gland lesions. IV. Review of 50 cases of mucoepidermoid carcinoma with histologic correlation. *Diagn Cytopathol* 1997; 17: 92—98.
- 15. Tani EM, Christensson B, Porwit A et al.** Immunocytochemical analysis and cytomorphoproliferative disease. *Acta Cytol* 1988; 32: 209—215.
- 16. Glant MD.** Cytopathology of lymph nodes in nonspecific reactive hyperplasia. *Pathol Patterns* 1997; 108 (Suppl 1): 31—66.
- 17. Verma K, Kapila K.** Salivary gland tumors with a prominent oncocytic component. Cytologic findings and differential diagnosis of oncocytomas and Warthin's tumor on fine needle aspirates. *Acta Cytol* 2003; 47: 221—226.
- 18. Filopoulos E, Angeli S, Daskalopoulos D et al.** Pre-operative evaluation of parotid tumorous by fine needle biopsy. *Europ J Surg Oncol* 1998; 24: 180—183.

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