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Fine needle aspiration cytology and frozen section in the diagnosis of malignant parotid tumours

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Abstract. The aim of this study was to determine the value of fine needle aspiration cytology (FNAC) and frozen section (FS) in the diagnosis of malignant parotid tumours. One hundred and thirty-eight patients who underwent FNAC and FS of a parotid tumour between 2006 and 2011 were analyzed retrospectively. The sensitivity, specificity, and positive and negative predictive values of FNAC and FS were determined using final histological diagnosis as the gold standard. Of the 138 tumours assessed in our study, 30 were malignant and 108 benign. For FNAC, the sensitivity was 73%, specificity 87%, positive predictive value 61%, and negative predictive value 90%. For FS, the sensitivity was 80%, specificity 98%, positive predictive value 92%, and negative predictive value 94%. Four false-negative results by FNAC were corrected by FS, and surgery was completed. Two false-positive results were identified by both FNAC and FS. FNAC is an important examination that provides valuable information for the preoperative diagnostic work-up and alerts the surgeon to the possible presence of malignancy. However, FNAC cannot be used alone, and FS has a very important place in the intraoperative management of parotid tumours.

Keywords: salivary glands; parotid gland; head and neck tumour; surgery.

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Parotid tumours are malignant in 26–32% of all reported cases. Specific symptoms of malignancy are absent in two-thirds of cases, which makes the clinical diagnosis of a malignant parotid tumour difficult.[1] The preoperative investigation of a parotid tumour is based on clinical and paraclinical evaluations. Magnetic resonance imaging (MRI) is the standard imaging method used for the diagnosis of parotid tumours. Fine needle aspiration cytology (FNAC) is another potential paraclinical examination. These two methods are used to confirm the presence of malignancy in the preoperative stage and allow the surgeon to perform a parotidectomy with an accurate preoperative diagnosis.[1–3] Frozen section (FS) is used by surgeons to obtain information on the nature of the tumour during the parotidectomy.

The aim of this study was to determine the value of FNAC and FS in the diagnosis of malignant parotid tumours in order to evaluate the use of these examinations in the care of patients with parotid tumours.

Materials and methods

Between January 2006 and March 2011, 300 parotidectomies were performed at

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the study institution. All patients underwent radiological (MRI) and histological (FS and final histological analysis) examinations. FNAC, with a contributory result, was performed in 138 patients (46%). These 138 patients were included in the study.

Fine needle aspiration cytology (FNAC)

All patients had a palpable parotid mass, allowing palpation-guided FNAC. A 25-gauge needle was introduced into the mass, and rotation movements associated with to-and-fro vertical movements were applied to the needle. The histological material was collected by capillarity without aspiration. A syringe containing 5 ml of air was then attached to the needle and the collected material was expelled onto three glass slides by placing the tip of the syringe on the slide. The material was then smeared and dried in air before being sent to the cytology laboratory. Three aspirations were performed for each tumour in order to optimize the cytological examination and reduce the number of non-contributory slides due to insufficient material. All examinations were performed and interpreted by the same experienced pathologist. Data were obtained from the pathology reports.

Frozen section (FS)

Just after removal, the tumour specimen was sent to the pathology laboratory for macroscopic examination (with annotated schema) and the FS procedure. The surgical specimen was placed on a metal chuck and frozen rapidly to about −20 to −30 °C. The specimen was embedded in a gel-like medium. After it had become frozen it was cut with the microtome portion of the cryostat. The section was then placed on a glass slide and stained (usually with haematoxylin and eosin, H&E stain). The report delivered by the pathologist was usually limited to a diagnosis of 'benign' or 'malignant', with the most probable histological diagnosis, and communicated to the operating surgeon via intercom with a maximum delay of 30 min.

All results (cytological diagnosis and FS diagnosis) were analyzed and labelled as 'positive' or 'negative' in order to determine the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of each technique. Malignant diagnoses were considered as positive. Benign diagnoses were considered negative. All cases of a suspicious diagnosis were considered as positive because they did not exclude the possibility of malignancy. A comparison to the definitive histological examination was done to determine statistical values.

Results

Of the 138 tumours assessed, 30 were malignant (22%) and 108 were benign (78%). The final diagnosis for the benign tumours was pleomorphic adenoma in 52, Warthin's tumour in 26, benign cyst/inflammatory process in 14, adenoma in nine, and reactive lymphoid tissue in seven. The final diagnosis for the malignant tumours was mucoepidermoid carcinoma in 11, adenoid cystic carcinoma in five, acinic cell carcinoma in four, malignant pleomorphic adenoma in two, lymphoma in four, and metastasis in four cases.

No complication of FNAC was observed. Among the 138 FNAC samples analyzed, a correct diagnosis was obtained for 116 cases (84%). A false-negative result was obtained in eight cases (6%) and a false-positive result was obtained in 14 cases (10%). The calculated sensitivity for the diagnosis of malignancy was 73%, with a specificity of 87%. The PPV was 61% and NPV was 90%. Results are shown in Tables 1–3.

For FS, a correct diagnosis was obtained in 130 cases (94%). The calculated sensitivity for the diagnosis of malignancy was 80%, with a specificity of 98%. The PPV was 92% and NPV was 94%. Results are

Table 1. Value of fine needle aspiration cytology and frozen section.

	FNAC (%)	FS (%)
Sensitivity	73	80
Specificity	87	98
Positive predictive value	61	92
Negative predictive value	90	94

FNAC, fine needle aspiration cytology; FS, frozen section.

Table 2. False-positive results from fine needle aspiration cytology ($n = 14$).

Cytological diagnosis	Final histological diagnosis
Squamous cell carcinoma ($n = 3$)	Necrotizing sialometaplasia
Squamous cell carcinoma ($n = 1$)	Warthin's tumour
Mucoepidermoid carcinoma ($n = 1$)	Canalicular adenoma
Mucoepidermoid carcinoma ($n = 2$)	Warthin's tumour
Adenoid cystic carcinoma ($n = 3$)	Basal cell adenoma
Acinic cell carcinomas ($n = 2$)	Warthin's tumour
Acinic cell carcinomas ($n = 1$)	Oncocytoma
Acinic cell carcinomas ($n = 1$)	Lymphoid hyperplasia

Table 3. False-negative results from fine needle aspiration cytology ($n = 8$).

Cytological diagnosis	Final histological diagnosis
Warthin's tumour ($n = 1$)	Lymphoma
Warthin's tumour ($n = 1$)	Malignant pleomorphic adenoma
Warthin's tumour ($n = 1$)	Acinic cell carcinoma
Warthin's tumour ($n = 1$)	Mucoepidermoid carcinoma
Lymphoid hyperplasia ($n = 2$)	Lymphomas
Adenomas ($n = 2$)	Acinic cell carcinoma

Table 4. False-positive results from frozen section ($n = 2$).

Frozen section diagnosis	Final histological diagnosis
Squamous cell carcinoma ($n = 1$)	Necrotizing sialometaplasia
Adenoid cystic carcinoma ($n = 1$)	Basal cell adenoma

Table 5. False-negative results from frozen section ($n = 6$).

Frozen section diagnosis	Final histological diagnosis
Pleomorphic adenoma ($n = 1$)	Malignant pleomorphic adenoma
Lymphoid hyperplasia ($n = 3$)	Lymphomas
Benign cyst ($n = 1$)	Mucoepidermoid carcinoma
Fibrosis ($n = 1$)	Malignant pleomorphic adenoma