PEROPERATIVE FINE-NEEDLE ASPIRATION CYTOLOGY VERSUS FROZEN SECTION IN THYROID SURGERY

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Objective. In a double blind prospective clinical study to evaluate the diagnostic potential of peroperative fine needle aspiration cytology as compared to peroperative frozen section in thyroid surgery.

Methods. The diagnostic value of one hundred consecutive preoperative (FNA) and peroperative fine needle aspiration (p-FNA), frozen section (FS) and permanent section (PS) examination for thyroid nodules were studied prospectively in order to assess and compare the accuracy, sensitivity and specificity.

Results. Out of 100 patients PS showed 11 % of malignancies, while p-FNA showed 5 % and FS showed 6% of malignant cases with no false positive, but with 6 and 5 false negative results, respectively. Thus, as compared with FS, one false negative finding was obtained by p-FNA in a case of malignant tumor which could be definitely ascertained by frozen section technique. However, concerning the benign nodules no differences were found between p-FNA and FS.

Conclusions. Peroperative fine needle aspiration seems to be a useful method which can be properly performed because the nodule can be easily seen during the surgical procedure. However, further clinical observations of large numbers of patients are needed.

Key Words: Thyroid surgery – Peroperative FNA – Frozen sections – Diagnostic validity

The thyroid gland is affected by pathological lesions which either show a diffuse pattern or produce nodules. While diffuse lesions are associated with nonneoplastic conditions, nodular lesions comprise the disorders which either consist of nonneoplastic hyperplasia or of bening or malignant tumors. Thus, the problem of appropriate management of thyroid nodules arises because about 5 percent of clinically evident thyroid nodules are malignant (Caruso et al. 1991; Gharyb et al. 1993).

Preoperative fine needle aspiration (FNA), is widely preferred rather than radionuclide scanning or ultrasonography as initial diagnostic test in all patients with thyroid nodules and contributed to the improved selection of patients for thyroid surgery (Mazzaferi 1993; Grand et al. 1989). It is considered as accurate, safe, well tolerated and easily applied (Kopald et al. 1989). However, it has also some drawbacks such as false positive or false negative results and it is mostly useless for the correct diagnosis of follicular and Huertle cell lesions. So, frozen section determination of the thyroid lesions is necessary in most cases of thyroid surgery which is beneficial in determining the extent of surgery, but frozen section is time consuming, expensive, needs special instruments and shows some limitations, since fresh tissue is more difficult to diagnose than the formol fixed specimens (Kopald et al. 1989). After the nodule or preferably the thyroid lobe is excised, a representative portion is prepared for frozen section and intraoperative interpretation by a pathologist which takes a relatively long waiting period. FNA appeared to be and important diagnostic tool which should be used routinely for thyroid nodules as a preparatory screening test (Taneri et al. 1998).

When we considered all these problems, we decided to carry out a new diagnostic method which is the peroperative fine needle aspiration and compare this method with preoperative fine needle aspiration and frozen section in a double blind, prospective clinical study.

Subjects and Methods

Patients. One hundred consecutive patients who had surgery for thyroid nodules between 1996-1998 in the Department of General Surgery, Gazi University Medical Faculty were included in this prospective study which has been approved by the local Ethical Committee. All patients (78 women and 22 men; mean age 46, range 24-66 years) had preoperative (FNA) and peroperative fine needle aspiration (p-FNA), frozen section (FS) and final pathological diagnosis using permanent section (PS). All FNA, p-FNA and FS diagnoses were compared with the final pathology report on the PS specimen. From these results the accuracy, sensitivity, specificity, positive predictive value and negative predictive value were calculated.

Preoperative FNA was performed as described by Loewhagen et al. (1981) with a 20 gauge needle and approximately six to eight slides were used for each aspiration, which were stained by heamotoxyline-eosine.

Peroperative FNA. During thyroid surgery without devascularization of the lobe, we searched for all the suspicious nodules and, as soon as the nodule became perfectly palpable, p-FNA was performed. We used 20-gauge needle which was attached to a 10 ml disposable syringe. For circumferential sampling the needle was inserted at the periphery of the nodule where viable thyroid parenchyma is nearly always present. Once the needle was inserted into the nodule, some disruption of the tissue was induced by in-and-out movements plus the rotation of the needle within the nodule through 360° to dislodge a specimen for aspiration. As soon as blood-tinged fluid appeared in the hub of the needle, the suction was released before the needle was withdrawn from the nodule. The needle was than detached from the syringe, and three to four ml of air was taken into the syringe and forced out through the reattached needle to express the specimen on to the glass slides. A second slide dipped in 95 % ethanol was used to both smear and fix the specimen. Approximately six to eight slides were used for each aspiration which were stained by hemotoxyline-eosine. This procedure was done in all suspicious nodules. After the p-FNA is obtained, it takes 10-15 min to get the cytological result. p-FNA costs six dollars in Turkey.

After the thyroidectomy was completed, the specimen was send to pathology department for FS and following PS examination.

Frozen sections. After freezing, the specimen was cut into appropriate slices and stained with hematoxyline-eosin which took approximately 15-22 min. This procedure costs 12 dollars.

p-FNA and FS determinations were done by different pathologists without any knowledge of the results of previous examination by FNA.

Results

Permanent sections (PS). Out of 100 patients with final pathological diagnosis by permanent section, 11 (11 %) of nodules were malignant and 89 (89 %) were benign. All diagnoses are shown in Tab. 1.

Frozen sections (FS). FS examinations revealed malignant nodules in six patients (6 %), while these in 94 (94 %) patients were benign. Thus, as compared to PS, the FS diagnosis of benign disorders was correct in 89 of 94 (94.7 %) cases, while the findings of malignity were correct in 6 of 11 cases (54.5 %) thus showing 5 false negative findings. Among the six malignant FS findings were 4 papillary carcinoma, one Huerthle cell carcinoma and one follicular carcinoma. Among five false negative FS diagnoses, PS showed 2 occult papillary carcinomas, one papillary carcinoma, one follicular carcinoma and one Huerthle cell carcinoma.

Fine needle aspiration (FNA) cytology. FNA diagnoses showed malignant lesion in one and suspi-

Table I. Histopathologic results of FNA, p-FNA, FS and PS.

FNA	FS	P-FNA	PS	Patients
Benign	Benign	Benign	Benign	87
Benign	Malignant	Malignant	Malignant	4
Malignant	Malignant	Malignant	Malignant	1
Suspicious	Benign	Benign	Benign	2
Benign	Benign	Benign	Malignant	5
Benign	Malignant	Benign	Malignant	1
Total				100

Table II. Comparative analysis of FNA, p-FNA, FS.

	Pre operative FNA	Frozen Section	Peroperative FNA
Accuracy	88 %	95 %	94 %
Sensitivity	27 %	54 %	45 %
Specifity	97 %	100 %	100 %
Positive predictive value	33 %	100 %	100 %
Negative predictive value	89 %	94 %	93 %

cious in two patients (3 %), but PS revealed that only one of them was malignant. Benign FNA disorders were found in 97 (97 %) patients, but PS revealed that 10 of them were malignant thus being false negative. Thus, FNA diagnosis of benign conditions was correct in 87 of 97 (89.7 %) patients. The only true positive FNA diagnosis was papillary carcinoma.

Peroperative fine needle aspiration (p-FNA). p-FNA diagnoses revealed malignant findings in five patients (5 %) which was supported by PS in all cases. Among them were 4 papillary carcinomas and one Huertle cell carcinoma. In 95 (95 %) patients p-FNA revealed benign lesions which was, however, correct in only 89 cases (93.7 %) leaving 5 cases with false negative diagnosis.

FNA, p-FNA and FS sensitivity, accuracy, positive predictive value, negative predictive value, and specifity rates are shown in Tab. 2.

When the results of p-FNA and FS were compared, there were no difference for benign results, while in a case of malignant findings p-FNA could not diagnose one malignant tumor that FS diagnosed as a follicular carcinoma.

Discussion

Today, the most problematic area of the thyroid surgery is the differentiation of malignant nodules from benign ones. No preoperative test, including physical examination, scintigraphy and ultrasound can definitively solve this problem and all these tests have some drawbacks (Kopald et al. 1989; Silverman et al. 1986). A reasonable estimate shows between 10 % and 20 % of cold nodules and 5% of warm nodules prove to be malignant (Beckers 1987; Zanella et al. 1998). FNA of the thyroid nodules is an accurate, safe, inexpensive, well tolerated and easily applied method, but it also has some limitations. First of all, it is operator dependent and follicular lesions have been responsible for the majority of incorrect diagnoses (Kopald et al. 1989; Monschensan et al. 1994). On the other hand, FS is no more accurate in the differentiation of atypical adenoma from follicular carcinoma at the time of surgery (Silverman et al. 1986). With the use of FNA, the cost of medical care decreases by 25 percent, the percentage of patients who had thyroid surgery decreases and the percentage of diagnosed carcinomas increases (Kopland et al. 1989; Ghan et al. 1984; Cussak et al. 1990). FNA provides an accurate and cost effective method to identify patients requiring surgery, it is useful in the treatment of patients with pure cystic nodules and provides the guidance for surgical planning (Silverman et al. 1986; Hamming et al. 1990; Boey et al. 1986; Hamburger and Hamburger 1986). It is generaly accepted that FNA is not any conclusive diagnostic test and, in particular, that negative findings do not exclude neoplastic disease. Also, the reported accuracy of cytological analysis varies according to the experience of physician performing the biopsy and interpreting the findings obtained from aspirates. FNA may be inaccurate either due to the sampling error in a case of pure cystic lesion when the fluid removed does not contain epithelial cells or to the lesions smaller than one centimeter because it is technically difficult to place the needle properly (Rojeski and Gharyb 1985).

In our study there was only one case of malignant finding obtained directly by FNA, but among other 97 benign and two suspicious results the permanent section revealed 10 additional malignancies. These data show that frozen section appears not necessary when the FNA finding is positive for malignancy, but FS is useful in determining the extent of surgery when the FNA report is either suspicious for malignancy or negative (Gubb and Posieka 1997).

In our patients permanent sections showed 11 % of malignancies, while peroperative FNA showed 5 %

and frozen sections 6% of positive case with no false positive results. Concerning the accuracy, there was 7 % difference between FNA and FS, while it was only 1 % between FS and p-FNA. The difference between FNA and PS was 12 %, while such difference was 5 % between PS and FS and 6 % between PS and p-FNA. Similarly to frozen sections, the specificity and positive predictive values of p-FNA was 100 %. Only the sensitivity of p-FNA in our investigation was clearly inferior when compared to FS, but even this figure was clearly superior when compared to FNA. As found in our study, p-FNA showed the results comparable to FS. It should be added that p-FNA needs less instrumentation, can be done even in such clinics which do not have equipments for frozen sections and is also less time consuming and economic.

In conclusion, p-FNA seems to be a useful method which can be managed properly because the nodule is not only palpable but is also easily seen during the surgical procedure. When compared with FS, it is inexpensive, less time consuming and easy to perform. However, further clinical observations of large numbers of patients are needed to support our data.

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