

USING IMPRINT AND FROZEN SECTION IN DETERMINING THE SURGICAL STRATEGIES FOR THYROID PATHOLOGIES

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Objective. To compare the diagnosis of thyroid pathological findings by using frozen section and preoperative imprint.

Methods. From January 1998 to December 1999, one hundred and three consecutive patients admitted to Department of Surgery, Gazi University Medical Faculty for thyroid operation, were prospectively included into the study. In all patients, imprint and frozen section were carried out from their suspected nodules and the results were compared with the permanent biopsy. Those findings used to find out sensitivity, specificity, negative predictive value (NPV) and positive predictive value (PPV) of frozen section and imprint. Because of the definitive differentiation of malignant or benign lesions could not be done, three patient were excluded from the study.

Results. In our study; sensitivity, specificity, PPV, NPV and accuracy for imprints was found as 83.3%, 97.7%, 83.3%, 97.7% and 96% (respectively), while respective corresponding data for frozen section were 81.8%, 96.6%, 75%, 97.7% and 95%. In one patient, the pathological finding of follicular carcinoma as found by permanent section was accurately diagnosed by imprint, but missed by frozen section. Both the imprint and frozen section failed to diagnose two papillary carcinoma. Overall cancer rate among 103 patients was 12 % (nine papillary carcinoma, one Hürthle cell carcinoma and two follicular carcinoma).

Conclusion. Both the frozen sections and imprints showed high sensitivity rate and similar accuracy rates. So, if there is no opportunity for frozen section, the imprints could be used. Furthermore, the use of imprints is less time consuming and less expensive than that of frozen sections.

Key Words: Thyroid surgery – imprint cytology – frozen sections – diagnostic validity

It has been reported that clinically detectable thyroid nodules are present in 4 to 7% of adult patients and approximately 5% of them are malignant (GHARIB et al. 1994; CHEN et al. 1994; BOYD et al. 1998; LIN et al. 1999). Although thyroid function tests, scintigraphy and ultrasonography (US) are used routinely for diagnostic purposes in cases of thyroid nodules, the discrimination between benign and malignant lesions cannot be made exactly with these tests (MAZAFERRI 1993). It has been reported that preoperative fine needle aspiration biopsy (FNA), peroperative frozen section (FS) and imprint cytology, when evaluated together with other

diagnostic tests, may have significant validity in the determination of the nature of the thyroid pathologies due to its high accuracy (KOPALD et al. 1989; VOJVODICH et al. 1994; CHEN et al. 1995; TANERI 1998; BOYD et al. 1998; LIN et al. 1999; ERSOY 1999).

At present, for the cytological evaluation of thyroid nodules, FNA biopsy is widely used (GHARIB et al. 1994; VOJVODICH et al. 1994; BOYD et al. 1998; TANERI et al. 1999). Unfortunately FNA biopsy has been found to be insufficient in the discrimination of benign and malignant follicular lesions, since by this technique it is not possible to demonstrate vas-

Table 1
Histopathologic results of FS and imprint cytology

Imprint	FS	PS	Patients
Benign	Benign	Benign	86
Benign	Benign	Malign	2
Malign	Malign	Benign	2
Malign	Malign	Malign	9
Malign	Benign	Malign	1
Total			100

Table 2
Comparative analysis of FS and imprint cytology

	FS	Imprint
Accuracy	95%	96%
Sensitivity	81.8%	83.3%
Specifity	96.6%	97.7%
Positive predictive value	75%	83.3%
Negative predictive value	97.7%	97.7%

cular and capsular invasion which are the markers of well-differentiated follicular carcinoma (ACHCRAFT et al. 1981; KINGSTON et al. 1992; CHEN et al. 1995).

Furthermore, yet there is no concensus about the management of the patients who are clinically likely to have cancer but with suspect or inappropriate FNA results. In many studies, frozen section has been recommended for these patients (HAMBURGER et al. 1985; KOPALD 1989; CROWE et al. 1993; CHEN et al. 1995). FNA biopsy has been accepted as a routine standart diagnostic tool (MAZAFERRI 1995; CHEN et al. 1993) but the value of FS in thyroid surgery is still not definitely established (KOPALD et al. 1989; CHEN et al. 1995). The arguments related to FS technique have been focused to its low discrimination value in the demonstration of capsular and vascular invasion, to the requirement of longer operation time and lack of superiority of FS over FNA in the differentiation between follicular carcinoma and adenoma (4). In addition, there are some studies showing the superiority of intraoperative imprint cytology especially in the accurate diagnosis of benign and malignant nodules when compared with FS and FNA biopsy (15, 16).

In this study, the validity of frozen section and imprint cytology on the determination of the diagnostic and therapeutic strategies in the treatment of thyroid nodules were evaluated with regard to various of aspects discussed above.

Subjects and Methods

Patients. One hundred consecutive patients who had surgery for thyroid nodules between 1998-1999 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 (81 women and 19 men;

mean age 47 ± 2.18 , range 24-67 years) had imprint, frozen section (FS) and final pathological diagnosis using permanent section (PS). All imprint 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.

Imprint. All thyroectomies sent frozen section were cut parallel longitudinal slices into 5 mm. After examination of cut surfaces, at least one or two sections were taken including rim and adjacent thyroid tissue from index nodule or suspicious area. We prepared touch preparation (Imprint) from this sections followed one minute alcohol fixation and stained with hematoxylin- eosin.

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 in Turkey.

Imprint and FS determinations were done by different pathologists whitout any knowledge of the results of other examination.

Results

Permanent sections (PS). Out of 100 patients with final pathological diagnosis by permanent section, 12 (12%) of nodules were malignant and 88 (88%) were benign. All diagnoses are shown in Table 1.

Frozen sections (FS). FS examinations revealed malignant nodules in twelve patients (12 %) while these in 88 (88 %) patients were benign. Thus, as compared to PS, the FS diagnosis of benign disorders was correct in 86 of 88 (97.7 %) cases, while the findings of malignity were correct in 9 of 12 cases (75 %) thus showing 2 false negative findings. Among the eight malignant FS findings were 2 occult papillary carcinomas, 4 papillary carcinomas, 1 Hürthle cell carci-

noma and 1 unclassified malignancy. Among two false negative FS diagnoses, PS showed 1 occult papillary carcinoma, 1 papillary carcinoma.

Imprints. Imprint examination showed malignant lesion in twelve patients (12 %), but PS revealed that only ten of them were malignant. Thus, the findings of malignancy were correct in 10 of 12 cases (83.3 %) when showing 2 false negative findings. Benign imprint lesions were found in 88 (88 %) patients, but PS revealed that 2 of them were malignant thus being false negative. Thus, imprint diagnosis of benign conditions was correct in 86 of 88 (97.7 %) patients. True positive imprint diagnoses were 2 occult papillary carcinoma, 5 papillary carcinoma, 1 Hürthle cell carcinoma, 1 follicular carcinoma and 1 undifferentiated carcinoma.

Discussion

Although physical examination, scintigraphy and ultrasound give some preoperative information about the nature of nodules, they fail in the discrimination between benign and malignant nodules, since preoperative FNA biopsy, intraoperative FS and imprint cytology are required for this purpose. At present, preoperative FNA and intraoperative FS are used routinely in both the diagnosis and management of the thyroid nodules. The value of cytological tests (FNA biopsy and imprint cytology) and FS in the accurate diagnosis of benign or malignant nodules does not yet seem to be definitely assessed. Because of vascular and capsular invasions cannot be identified by FNA, this test is not accepted as useful especially in the diagnosis of follicular neoplasia (ACHCRAFT et al. 1981; KINGSTON et al. 1992; CHEN et al. 1995; BOYD et al. 1998; LIN et al. 1999). In addition, also the quality of material obtained by aspiration causes some diagnostical difficulties, namely if it contains only a few number of cells.

On the other hand, intraoperative imprint cytology is rich for cells and thus has been assumed a more suitable cytological examination technique by pathologists, in spite of that vascular and capsular invasion could not be demonstrated. In the study by PLUOT et al. (1989) it has been demonstrated that the samples obtained by imprint technique contained more cells than those obtained by FNA biopsy and thus the imprint cytology was found more valuable for the differentiation of benign and malignant thy-

roid nodules. In the same study the imprint cytology which is rich in terms of cells has been found to be more valuable even in the diagnosis of follicular carcinoma, since the higher amount of cells resulted in easier evaluation of cytologic criteria. In the study by MASUDA et al. (1988), the findings obtained by imprint cytology such as folding of the nuclear contour, increased density of cytoplasmic matrix and the frequent appearance of cell clusters of larger size have been accepted to be features of malignancy and the authors concluded that imprint cytology may be of use in the prompt intra-operative evaluation. Moreover, FAROUX et al. (1990) compared 171 patients with cold thyroid nodules examined by intra-operative imprint cytology with 257 patients evaluated by pre-operative FNA with regard to 31 cytological criteria to exclude benign from malign lesions. They could not find any significant difference between those two methods. In another study, NOVIK et al. (1997), evaluated the 1129 patients with thyroid nodules and they found the sensitivity of FNA biopsy and/or imprint cytology to be 92.3 % and the specificity to be 75 % in regard of demonstrating malignancy. These results suggested an important role of cytological examinations in the management of thyroid nodules by showing that imprint cytology is more efficient and reliable because of its cellularity.

With the use of FS technique the intra-operative evaluation of tissue samples is available even in the cases which have suspicious or benign FNA biopsy result but show clinically malignant findings. Like FNA biopsy, FS technique is also inadequate for the diagnosis of follicular neoplasia in spite of that the demonstration of vascular and capsular invasion is possible because of obtaining appropriate tissue samples (GHARIB et al. 1994; CHEN et al., 1995). On the other hand, there are some studies indicating more successful demonstration of malignancy in thyroid nodules, especially in follicular neoplasia by imprint cytology rather than by FNA cytology and FS (PLUOT et al. 1989; NOVIK et al. 1997). In the study comparing FS and imprint cytology regarding to the accurate diagnosis of malignancy of 149 patients with thyroid nodules, LUKACS et al. (1983), found that the accuracy of FS was 90 % with false positivity in 4 and false negativity in 1 cases. The intra-operative accuracy of imprint cytology was found to be 95 % of 309 examinations, with 12 false positive and four false nega-

tive results. The misjudgements with both FS and imprint cytology methods derived mainly from the correct diagnosis of the nature of follicular tumor types. In 305 patients with similar results reported by CHANG et al. (1993), it has been demonstrated that the sensitivity was 94.9% and specificity was 95.6% with intra-operative imprint cytology. Moreover, even when combined with the findings obtained by FS, the overall sensitivity and specificity was found to be 96% and 96% (respectively) thus supporting our findings of not significant difference between FS and imprint cytology regarding to the determination of malignancy.

For the correct diagnosis of the pathological nature and appropriate management of thyroid nodules, FS method requires more intra-operative time and is more expensive than imprint cytology. Thus, in the light of this study we suggest that imprint cytology can provide a useful adjunct to the frozen-section diagnosis and for cytopathology and may be used safely in both the diagnosis and management of thyroid nodules, especially in the case when the FS cannot be performed.

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