

FINE NEEDLE ASPIRATION BIOPSY OF THYROID NODULES: CYTOHISTOLOGICAL CORRELATION

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ABSTRACT

OBJECTIVE: Fine-needle aspiration biopsy (FNAB) currently is the main procedure for distinguishing benign from malignant thyroid nodules. The aim of our study was to assess the accuracy of FNABs in our hospital by comparing the cytological and histological diagnosis. **METHODS:** We performed a prospective study including 321 patients with thyroid nodules admitted to "St. Marina" Hospital from January 2004 to December 2006. Clinical and US data, TSH, FT3, FT4, anti-TPO, cytological and histological findings were evaluated. **RESULTS:** FNABs were performed in all 321 cases, 290 of them were women and 31 men; mean age 52,9 years. Cytological evaluation considered 67,3% of FNABs as benign, 15,6% as suspicious, 4,7% as malignant and 12,4% as inadequate sample. 88 of the patients underwent thyroid surgery. The comparison between cytological and histological findings showed that 99,1% of cytologically benign nodules were histologically confirmed, as well as 100% of the malignant lesions. 89,5% of the cases classified as suspicious on FNAB turned out to be benign on histology and 10,5% were malignant. The discrepant cases were 2 false-negative results, which had a cytological diagnosis of nodular hyperplasia and turned out to be a medullary carcinoma. Our results showed a sensitivity of 88,2% and a specificity of 100%. **CONCLUSION:** Thyroid FNAB is an accurate and cost-effective preoperative tool for selection of patients who would benefit from surgery.

Keywords: thyroid nodules, FNAB, malignancy, surgery

INTRODUCTION

Nodular thyroid disease is found in approximately 5% of the population at palpation screening and is almost ten-fold more frequent at ultrasound screening. Malignant nodules are rare and account for 5% of all nodules. Fine-needle aspiration biopsy (FNAB) has now gained wide acceptance as the most accurate diagnostic procedure for distinguishing benign from malignant nodules.

The aim of this study was to assess the accuracy of FNABs in our hospital by comparing the cytological and histological diagnosis and to identify the limitations of FNAB in the management of thyroid nodule disease in North-Eastern Bulgaria.

MATERIALS AND METHODS

We performed a prospective study including 321 patients with thyroid nodules admitted to "St. Marina" Hospital from January 2004 to December 2006. We evaluated the clinical and US

data (9 MHz; Color Doppler), scintigraphy, TSH, FT3, FT4, anti-TPO. US-guided FNABs with cytological examination were performed in all 321 cases of nodular thyroid disease. All malignant and indeterminate (suspicious) lesions, as well as hot benign nodules and larger than 3 cm nontoxic benign nodules were referred to surgery with histological evaluation by two independent pathologists.

Statistical analysis was carried out using SPSS ver.11.0 and MS Excel software programs.

Sensitivity, specificity, positive and negative predictive value, and diagnostic accuracy of FNAB were assessed as follows. Histological diagnosis was considered the gold standard. Sensitivity was defined on the basis of thyroid malignant lesions detected by FNAB and confirmed by histology (true positive/ true positive + false negative). Specificity was defined on the basis of benign nodules detection (true negative/ true negative + false positive). Diagnostic accuracy was calculated as (true positive + true negative)/ (true positive + false positive + true negative + false negative).

RESULTS

FNABs were performed in all 321 cases included in our study, 290 (90,3%) of them were women and 31 (9,7%)

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men; mean age $52,9 \pm 14,1$ years (fig.1). The mean nodule volume was 4,3ml. The majority of nodules were smaller than 2 ml (58%) and were either solid hypoechoogenic or mixed with areas of cystic degeneration (fig.2 and fig.3).

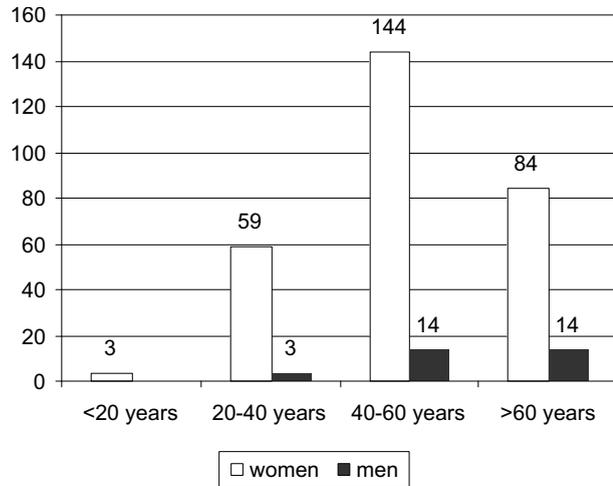


Fig.1 Distribution of thyroid nodules in different age groups among women and men

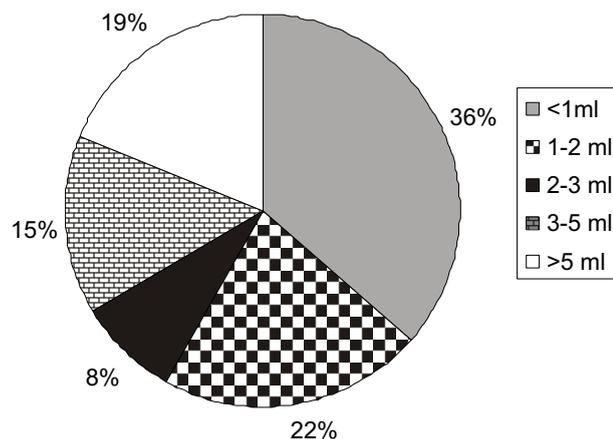


Fig. 2 Thyroid nodule volume

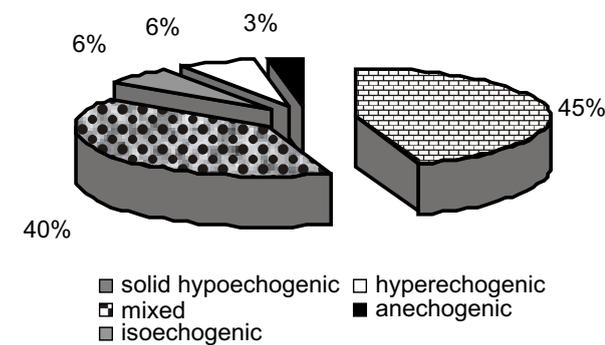


Fig.3 Distribution of thyroid nodules according to US characteristics

Cytological evaluation considered 67,3% of FNABs as benign - nodular goiter 39,9%, adenomatoid nodules 18,1%, lymphocytic thyroiditis 8,7% and granulomatous thyroiditis 0,6%. Indeterminate or suspicious were 15,6% of the nodules

- follicular neoplasma 11,2%, Hurtle cell neoplasma 3,5%, suspicious medullary neoplasma 0,3% and others 0,6%. Cytology assessed 4,7% of the nodules as malignant - papillary carcinoma 1,6%, follicular carcinoma 0,7%, anaplastic carcinoma 0,6%, malignant lymphoma 0,6%, Hurtle cell carcinoma 0,3%, metastatic carcinoma 0,9%. Inadequate samples comprised 12,4% of the FNABs. (fig.4).

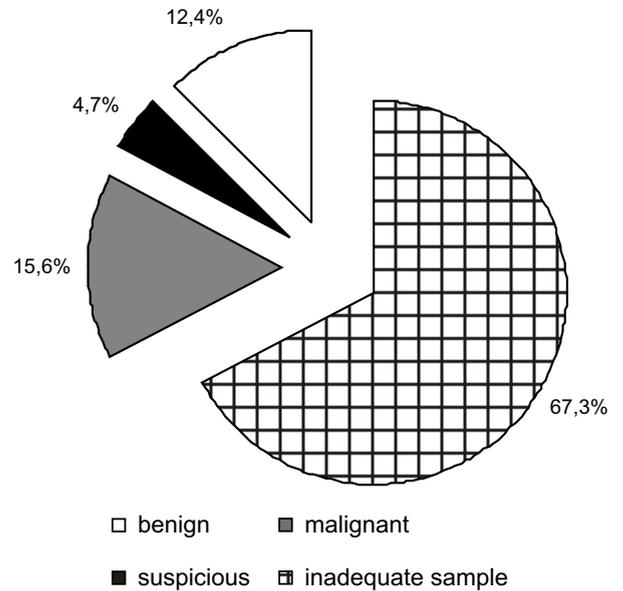


Fig. 4 Results from cytological evaluation of nodules after FNAB

Correlation between nodule echogenicity and cytological result after FNAB confirmed that most of the malignant and suspicious nodules are hypoechoogenic, whereas anechoogenic lesions belong to the benign group (fig.5).

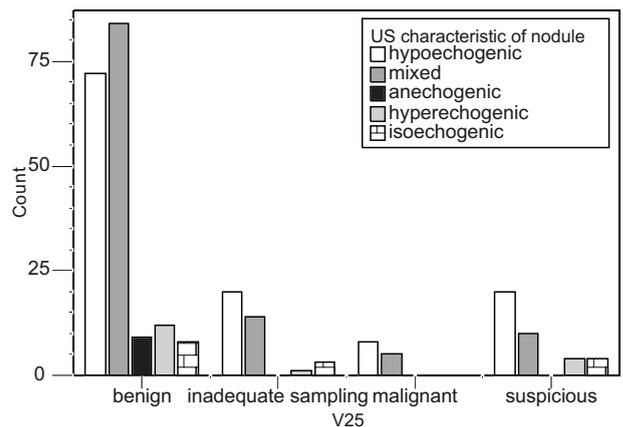


Fig. 5 Correlation between nodule echogenicity and cytological results

Table 1 illustrates the predictive value of some ultrasound characteristics. Hypoechoogenicity, irregular margins, microcalcifications, intranodular vascularity and enlarged lymph nodes were defined as ultrasound criteria for malignancy and in 69,2% of the histologically proven malignancy

nodules three or more criteria were found (only a combination of these criteria is useful to predict malignancy - fig. 6). As shown on fig. 7 incidence of thyroid cancer was similar in solitary nodules (4,96%) and in multinodular goiter (4,37%).

Table 1. Ultrasound criteria for malignancy in different cytological groups of nodules

US criteria for malignancy	Benign lesions	Suspicious lesions	Malignant nodules
Solid hypoechoogenic pattern	33,5%	52,6%	61,5%
Irregular (blurred) margins	7,0%	18,4%	69,1%
Microcalcifications	15,1%	34,2%	61,5%
Intranodular blood flow	12,9%	10,5%	50,8%
Enlarged lymph nodes	1,08%	13,1%	61,5%

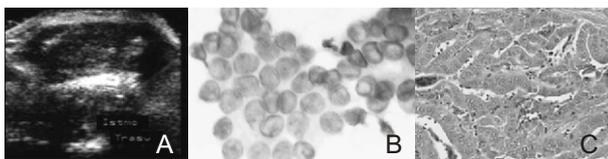


Fig. 6 (A – US, B – cytology, C – histology) illustrates a case of 60 years old man with a hard, rapidly growing nodule, hypoechoogenic, with irregular margins and microcalcification. Cytology revealed papillary carcinoma. Histomorphological assessment confirmed the diagnosis.

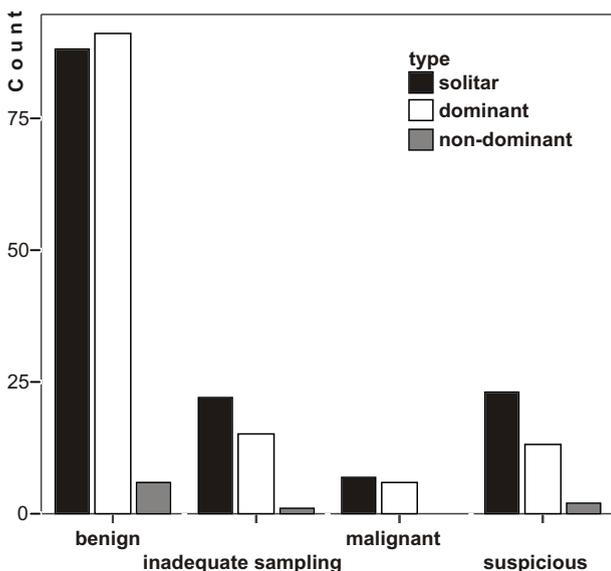


Fig.7 Incidence of thyroid malignancy in solitary nodules and in dominant or non-dominant nodules of multinodular goiter

There was no correlation between nodule shape - oval or spherical and cytologically diagnosed malignant lesions

(fig.8). According to our results the nodule shape may not serve as a predictor for malignancy.

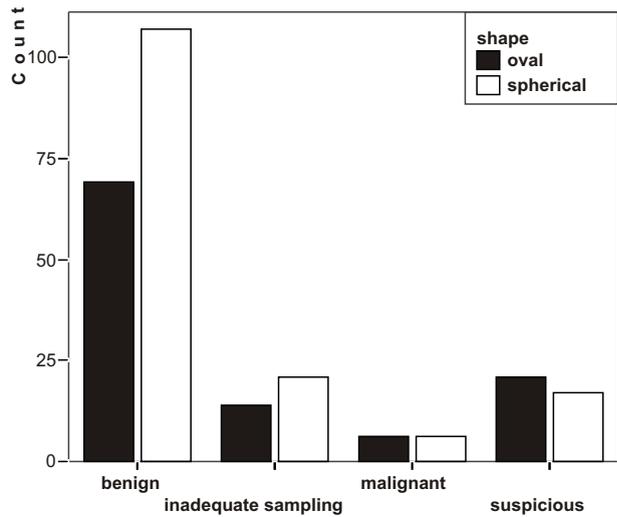


Fig.8 Correlation between nodule shape (oval or spherical) and cytology

88 of the patients underwent thyroid surgery with histological examination. The comparison between cytological and histological findings showed that 99,1% of cytologically benign nodules were histologically confirmed, as well as 100% of the malignant lesions. 89,5% of the cases classified as suspicious on FNAB turned out to be benign on histology and 10,5% were malignant. The discrepant cases were 2 false-negative results, which had a cytological diagnosis of nodular hyperplasia and turned out to be a medullary carcinoma.

DISCUSSION

Our results showed a sensitivity of 88,2% and a specificity of 100%, positive predictive value 100%, negative predictive value 91,3%, accuracy 94,7%. Limitations of FNAB are the inadequate samples and "indeterminate" diagnosis. We performed different techniques (US-guidance, FNAB without aspiration, multiple passes) in order to improve adequacy. It is important to avoid making a cytological diagnosis on a suboptimal sample. This was the reason for our two false negative cases - cytology of "nodular goiter", which turned out to be medullary carcinomas. Serum calcitonin is often elevated in cases of medullary carcinoma and should be measured in all patients with an "indeterminate" cytological diagnosis. The use of new, ancillary techniques, such as immunocytochemistry and RT-PCR may refine the diagnosis in "indeterminate" cases and improve the accuracy of FNAB.

CONCLUSION

The incidence of histologically proven thyroid cancer among all nodules is 4,7%, whereas among the suspicious

FNABs it is 10,5%, which confirms the need for surgery in the latter group. Thyroid FNAB is an accurate and cost-effective preoperative tool for selection of patients who would benefit from surgery.

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