

Original Research Article

The evaluation of 1130 fine-needle aspiration biopsy results from the thyroid glands

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Abstract

Fine-Needle Aspiration Biopsy (FNAB) is the most-widely used procedure for the pathological diagnosis of nodules of the thyroid gland. FNAB is a very practical and cheap means of understanding the nature of these nodules to help the clinician in the therapy process, whether it be medical or surgical. During this study, 1130 nodules located at the thyroid glands of 899 patients were biopsied by means of FNAB, and their pathological results were evaluated. The data which came out from this study possesses valuable clues to the understanding of the nature of these nodules, and is being presented in this article.

Keywords: Fine-Needle Aspiration Biopsy (FNAB), Fine-Needle Aspiration Cytology (FNAC), thyroid, Nodule, Diagnosis

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INTRODUCTION

Nodules in the thyroid glands have a prevalence of 4-7 % in the adult population (Roman, 2003). The incidence of these nodules got to 25-40% in Ultrasonography (US) and autopsy procedures (Tambouret *et al.*, 1999). Fortunately, only a small percentage of these nodules (less than 5%) prove to be malignant, while the remaining majority are in the non-neoplastic group (Roman, 2003).

Thyroid nodules may be examined clinically by palpation. But a more accurate examination may be done by US. This is the widest applied method in the evaluation of the thyroid gland and its nodular pathologies, especially when these nodules are small and/or deeply situated. The sensitivity of US is very high in depicting these pathological conditions of the thyroid gland. The use of US in routine practices has led to an increase in the numbers and ratios of thyroid nodules detected (Ezzat *et al.*, 1994; Cai *et al.*, 2006). The main purpose of detecting thyroid nodules is to define the potentials for malignant transformation (Zygnunt *et al.*, 2004). The fundamental interventional procedure in defining the nature of thyroid nodules is a method called Fine-Needle Aspiration Biopsy or Cytology (FNAB or FNAC) (Silverman *et al.*, 1986). FNAB is a safe, simple,

and fast method and its complication rate is very low. This is why it is considered as the gold standard in this respect (Caruso *et al.*, 1991; Amrikachi *et al.*, 2001).

In this review study, the results of 1130 thyroid FNAB procedures done in the Interventional Radiology Department of the Adana Numune Teaching and Research Hospital between 2011-2013 were studied and evaluated.

MATERIALS AND METHODS

In this review study, the results of the FNAB procedures performed at the Interventional Radiology Department of the Numune Teaching and Research Hospital, Adana, Turkey, between 2011 and 2013, were evaluated. The FNAB procedures had been performed on solid and semisolid nodules of the thyroid glands.

All FNAB procedures were performed according to the declaration of Helsinki. The patients were fully informed about the procedure, and all patients gave their full consents prior to the performances. The study was approved by the ethical committee of the hospital. The

Table 1. The male/female ratio of the patients

Males	Females	Total
105 (%11.7)	794 (%88.3)	100 (%100)

Table 2. The categorization of the nodules according to their FNAB results

Benign	Malignant	Suspicious	Insufficient	Total
907 (%80.3)	32 (%2.8)	79 (%7.0)	112 (%9.9)	1130 (%100)

FNAB procedures were performed by the same interventional radiologist, by the utilization of a 5.0-7.5MHz linear transducer of a Mindray DC-7, Schenzen-China, US machine.

The FNAB procedures were performed with the patients in the supine position and their necks in extension. The biopsy site was cleansed with povidone-iodine. No local anesthetics were used. The FNAB procedures were accomplished by means of a 22-gauge needle attached to a 5 or 10cc syringe. In case of semi-solid nodules, the cystic components were sometimes aspirated, according to the needs. No serious complications were encountered during the procedures.

Smears were prepared on glass slides, half of which were dried in air and the other half fixed with 95% alcohol. The air-dried glass slides were stained by May-Grunwald-Giemsa stains, while the Papanicolaou (Pap) stain was used for the staining of the remaining glasses fixed with alcohol. Cytologic examination was performed by evaluating the presence of colloid, the amount and size of cells, the state of pleomorphism, nucleus/cytoplasm ratio, nucleus properties, staining properties of the cytoplasm, the presence of necrotic materials, and the presence of inflammatory cells. The results of the FNAB procedures were categorized as (a) insufficient material (b) benign (c) suspicious and (d) malignant. The criterion for "sufficient aspirate material" was set as the presence of at least 5 groups of thyroid follicles, each containing more than 10 cells. Any preparates containing less amounts of these cells were defined as "insufficient".

RESULTS

The ages of the patients ranged between 17 and 77 years, the mean age being 44.8 years. 105 males and 794 females made up the study group (Table 1). FNAB materials obtained from 1130 thyroid nodules of 899 patients were evaluated.

The nodules were categorized as being hyperechoic, hypoechoic, isoechoic, and heterogeneous, in accordance with their parenchymal echogeneities. Nodules with cystic components were evaluated in the heterogeneous group. The nodules were also classified

as being smaller than 1cm, between 1 and 1.5cm, between 1.5-2.0 cm, and bigger than 2 cm, in size, according to their dimensions.

The pathological results of the 1130 nodules biopsied came as benign in 907, malignant in 32, suspicious for malignancy in 79, and insufficient material in the remaining 112, nodules (Table 2).

Of the 1130 nodules studied, 51 were smaller than 1cm in size, while 295 were between 1.0-1.5cm, 251 between 1.5-2.0cm, and 533 bigger than 2cm.

Concerning the 51 nodules smaller than 1cm, 29 were found to be benign, 4 malignant, and 3 suspicious for malignancy. Aspirates from 15 of the nodules came as insufficient for pathological evaluation.

Of the 295 nodules of sizes between 1.0-1.5 cm, 243 were benign, 7 malignant, and 8 suspicious for malignancy. 37 of these nodules had "insufficient material" definings for their aspirates.

There were 251 nodules of sizes between 1.5-2.0cm. 211 of these nodules were found to be benign, whereas 6 were malignant, and 15 were defined as suspicious for malignancy. In 19 of these nodules, the aspirates were reported to be insufficient for pathological evaluation, by the Pathology department.

533 nodules were found to be bigger than 2cm in size. Of these, 424 were benign, 15 malignant, and 53 suspicious for malignancy. In 41 of these nodules, the aspiration preparations were found to be insufficient for pathological evaluation. All of these results and definings are given in details (Table 3).

Of all the 1130 nodules, 265 were hypoechoic, 52 hyperechoic, 118 isoechoic, and 595 heterogeneous, in terms of US characteristics.

Of the 265 hypoechoic nodules, 196 were benign, 20 malignant, and 24 suspicious for malignancy. The aspirates from the remaining 25 nodules were reported to contain materials insufficient for pathological evaluation.

52 nodules were hyperechoic in US terms. After pathological evaluation, the results for 40 of these came as benign, 1 malignant, and 8 suspicious for malignancy. The aspiration materials from the remaining 3 were found to be insufficient for pathological evaluation.

Of the 118 isoechoic nodules, 99 were found to be benign, and 7 suspicious for malignancy. The remaining 12 brought "insufficient material" results from

Table 3. The comparison of the FNAC results according to nodule sizes

	<1 cm	1-1,5 cm	1,5-2 cm	>2 cm
Benign	29 (%56.9)	243 (%82.4)	211 (%84.1)	424 (%80)
Malignant	4 (%7.8)	7 (%2.4)	6 (%2.4)	15 (%2.8)
Suspicious	3 (%5.9)	8 (%2.7)	15 (%6)	53 (%9.9)
Insufficient	15 (%29.4)	37 (%12.5)	19 (%7.5)	41 (%7.7)
Total	51 (%100)	295 (%100)	251 (%100)	533 (%100)

Table 4. The comparison of the FNAB results of the nodules according to their parenchymal echogeneities

	Hypoechoic	Hyperechoic	Isoechoic	Heterogeneous
Benign	196 (%74)	40 (%77)	99 (%83.9)	572 (%82.3)
Malignant	20 (%7.5)	1 (%1.9)	0 (%0.0)	11 (%1.6)
Suspicious for Malignancy	24 (%9.1)	8 (%15.3)	7 (%5.9)	40 (%5.7)
Insufficient	25 (%9.4)	3 (%5.8)	12 (%10.2)	72 (%10.4)
Total	265 (%100)	52 (%100)	118 (%100)	695 (%100)

Table 5. The ratios in malignant cases

Papillary cancer	Hurtle cell cancer	Medullary cancer	Total
23 (%71.9)	8(%25)	1(%3.1)	32(%100)

the pathology department.

572 of the 695 heterogeneous nodules were found to be benign, whereas 11 were malignant, and 40 were defined as suspicious for malignancy. The aspirates from the remaining 72 of these nodules were categorized as insufficient for a proper pathological evaluation. These results and definings are given in detail in **Table 4**.

A total of 32 nodules were diagnosed as malignant. 23 of these were defined as papillary cancer, whereas 8 were diagnosed as hurtle cell cancer, and 1 as medullary cancer. Hyperplastic and adenomatous alterations were defined as suspicious for malignancy. On the other hand, those nodules that were defined as follicular neoplasms, too, were categorized as suspiciously malignant, due to the fact that a differentiation cannot be made between follicular adenoma and follicular carcinoma, on the basis of FNAB findings alone (**Table 5**).

DISCUSSION

Thyroid nodules are frequently-encountered endocrinologic entitites (Rifat *et al.*, 1994). A study done in Turkey points out that the ratio for detectability of these nodules by manual examination is 2-6%, whereas this ratio rises to 18% for examinations done by US (Emral *et al.*, 2003). Other various studies done abroad put these ratios as 5-10% for manual, and around 25% for US, examinations (Tambouret *et al.*, 1999).

Thyroid cancer constitutes approximately 1% of all malignant neoplasms (Rojeski *et al.*, 1985). It is

encountered 3 times more frequently in females in comparison to males (Welker *et al.*, 2003). Radiation delivered to the head and neck region, environmental toxins, and some hereditary situations such as Multiple Endocrine Neoplasms (MEN), are among the factors which aggregate the risk of thyroid malignancy (Roman, 2003).

The choice of imaging modality in the examination of the thyroid gland is US (Hegedus, 2004). The sensitivity of US is high in the demonstration of deeply situated or small nodules that cannot be detected by palpation alone (Cai *et al.*, 2006). Microcalcifications, the presence of nodules which are solid or rich in solid components, contour irregularities, and hypoechoic internal structure, are among the sonographic malignancy criteria (Koike *et al.*, 2001). The most specific US finding for thyroid malignancies is the presence of microcalcifications. Microcalcifications are seen in 29-59% of primary thyroid carcinomas, especially the papillary carcinomas (Iannuccilli *et al.*, 2004).

FNAB is a cheap, easy, comfortable, and reliable method in the detection of thyroid malignancies (La Rosa *et al.*, 1991). The sensitivity and specificity of FNAB in this manner are reported to be 58.3-98% and 72-100%, respectively (Gharib *et al.*, 1993). The most valuable method in the discrimination of benign from malignant thyroid nodules is FNAB (Iannuccilli *et al.*, 2004). Various studies have shown that the efficiency of FNAB in the detection of thyroid malignancy is between 1.31-12.3% (Gharib *et al.*, 1993; Altavilla *et al.*, 1990). In our study too, the malignancy rate was found to be 2.8%, and this

is a compatible ratio with the literature. The benign thyroid nodule ratio is reported to be 46-83% in the literature (Cai *et al.*, 2006). In our study too, the ratio for benign nodules was found to be 80.3%, and this, too, was in congruence with the literature. The ratio for “suspicious for malignancy” results was found to be 7 % in our study, and this ratio too, was in harmony with those data from the literature which put this number between 2.6-27 % (Jeh *et al.*, 2007). The ratio for the term “insufficient material” was 9.9 % in our study, and this was also in accordance with the literature findings which put this number between 3-20% (Peper *et al.*, 1989).

One of the prominent outcomes of our study was the finding that the highest malignancy rate, which was 7.5%, belonged to the hypoechoic nodules. Literature data point to the fact that the risk of malignancy increases with hypoechoic nodules, especially when these nodules contain microcalcifications (Lee *et al.*, 2013). Another important finding was that the “insufficient material” results were highest in nodules smaller than 1cm, with a rate of 29.4%. This clearly indicates that obtaining sufficient aspirates from nodules smaller than 1cm in size is more difficult than those bigger than 1 cm.

But we know that nodules smaller than 1 cm in diameter, too, possess the risk of bearing cancer growth. This is why these nodules, too, when they arouse suspicion for malignancy, must be biopsied. Papini *et al.* have shown in their study that limiting the indication for FNAB with a nodule size of a minimum of 1cm leads to missing cancer diagnoses (Papini *et al.*, 2002). One similar striking result which came out of our study was that the ratio of malignancies detected in nodules smaller than 1cm in size (7.8%) was bigger than the one for bigger nodules. This is a very meaningful and important end result, and clearly demonstrates the importance of biopsying these small nodules in the presence of a clinical and/or sonographic suspicion.

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