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Comparison of ultrasound and fine needle aspiration biopsy in terms of determining of preoperative malignancy in thyroid nodules

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Abstract

To reveal the diagnostic efficacy and accuracy, compared with postoperative histopathological diagnosis, preoperative ultrasonography (US) and fine needle aspiration biopsy (FNAB) in determining benign and malignant disease in patients undergoing thyroidectomy in our clinic. Materials and methods: The research was designed with records of 95 patients who were examined thyroidectomy at our hospital Ear, Nose and Throat Clinic for five years. Preoperative ultrasound findings, FNAB results, postoperative histopathological findings, blood groups, age and sex were recorded. These data were each compared with the histopathological results in order to determine which technique was superior in distinguishing malignant from benign thyroid nodules. Ninety-five patients, aged between 21 and 76, 27 male and 68 female, were included. Mean age of male patients was 51.11±13.54 and mean age of female patients 49.18±11.92. Total thyroidectomy was performed in 82 (86.3%) cases, left lobectomy in 3 (3.2%), right lobectomy in 4 (4.2%) and total thyroidectomy plus neck dissection in 6 (6.3%). Of the cases thought to be benign at US, 76.4% were actually benign, and 83.33% of the cases thought to be malignant were actually malignant. The level of cases incorrectly identified as benign or malignant was 23.16%. Validity (test power) of US on the basis of postoperative diagnosis was 76.84%. In terms of FNAB findings, 27.78% of cases suspected of being malignant were malignant, and 72.73% of the group assessed as having benign cytology was actually benign. The level of cases incorrectly identified as being malignant or benign was 35.79%. FNAB test reliability (test power) on the basis of postoperative diagnosis was 56.1%. In addition, only US findings were significant when compared with histopathological findings in preoperative determination of malignant or benign disease ($p=0.001$), all other data being not significant ($p>0.05$). The use of US findings in differentiating malignant from benign thyroid nodules and in accordingly planning treatment is more effective than use of FNAB.

Keywords: Ultrasonography, fine needle aspiration biopsy, histopathology, benign, malignant

Introduction

Most thyroid nodules follow an asymptomatic course, however malignity must be excluded when thyroid nodule is encountered [1]. Thyroid nodules have been reported to be detected in 4-8% of adults through palpation, in 19-41% using ultrasonography (US) and through pathological examination in 50% of cases at autopsy [2]. The level of detection of non-palpable thyroid nodules has risen as head and neck imaging techniques have improved [3].

Since fine needle aspiration biopsy (FNAB) is simple and reliable, despite being invasive, it represents the gold standard technique in the evaluation of thyroid nodule[4]. However, it requires good aspiration and an experienced cytopathologist for successful results[5]. The probability of obtaining biopsy material of high diagnostic value is lower in cystic or mixed nodules [4,5]. The level of cancer in cases undergoing FNAB ranges between 9.2% and 13% [2].

In addition to visualization, thyroid US examination is used in the differentiation of benign and malignant nodules and for guiding FNAB of nodules with suspected malignity [2]. Differentiation and early diagnosis of benign and malignant thyroid nodules is important in terms of avoiding unnecessary surgical procedures and the performance of FNAB for benign nodules [6]. US findings such as solid structure, calcification, hypoechogenicity, irregular margins and presence of peripheral halo have been described in the differentiation of benign and malignant thyroid nodules. Some studies have reported that presence of more than one of these findings increases diagnostic accuracy [7].

The purpose of this study was to reveal the diagnostic and effectiveness and accuracy of pre-operative USG and FNAB, compared with postoperative histopathological diagnosis, in determining benign and malignant disease in patients undergoing thyroidectomy in our clinic.

Material and Methods

The study was designed with records of 95 patients who were examined thyroidectomy at our hospital Ear, Nose and Throat Clinic for five years. The study was conducted with the approval of the Ethics Committee of the Medical Faculty of Atatürk University,

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Erzurum, Turkey (09.06.2017-B.30.2.ATA.0.01.00/74). Informed consent was obtained from the patients. Preoperative ultrasound findings, FNAB results, postoperative histopathological findings, blood groups, age and sex were recorded.

In evaluating thyroid nodules in favor of malignancy at US, the possibility of preoperative ultrasonographic malignant disease was only considered in the presence of at least two of solid structure, microcalcification, hypoechogenicity, irregular margins and peripheral halo. Accordingly, estimated US results, FNAB findings, blood groups, age and gender were compared separately with histopathological findings in order to determine which were superior in differentiating preoperative malignity and benignity.

Statistical Analysis

Descriptive statistics and categoric data were expressed as number and percentage, and numerical data as mean plus standard deviation. Distribution of numerical variables was investigated using a complete blood count diagram with Student's t test. Categoric variables were analyzed using the chi square test. P<0.05 was regarded as significant.

Results

Ninety-five patients, aged between 21 and 76, 27(28.4%) male and 68(71.6%) female, were included in this study. Mean age of male patients was 51.11±13.54 and mean age of female patients 49.18±11.92. Total thyroidectomy was performed in 82 (86.3%) cases, left lobectomy in 3 (3.2%), right lobectomy in 4 (4.2%) and total thyroidectomy plus neck dissection in 6 (6.3%).

In terms of patient histopathologies, mean age in malignant cases was 49.10±11.87, and mean age in benign cases 51.38±13.68. No statistically significant correlation was determined between histopathological results and age (p=0.425) (Table 1).

Table 1 Histopathological Result * Age Cross Tabulation

	Histopathological result	N	Mean	Std. Deviation	P
Age	**Benign**	69(72.6%)	49.10	11.877	0.425
	Malignant	26(27.4%)	51.38	13.682	

Note: Std.; Standard

According to the histopathological results, benign disease was present in 22 (81.5%) male patients and malignant disease in 5 (18.5%). Benign disease was present in 47 (69.1%) female patients and malignant disease in 21 (30.9%). Statistical analysis revealed no significant correlation between histopathological results and gender (P=0.223) (Table 2).

Table 2. Histopathological Result * Gender Cross Tabulation

		Gender		P
		Male	Female	
Histopathological result	Benign	22	47	0.223
	Malignant	5	21	
Total	27	68		

The most common blood group in both benign and malignant cases was A(+). Histopathological results and blood groups were compared, but no statistically significant correlation was determined (p=0.614) (Table 3).

Table 3. Histopathological Result * Blood Group Cross Tabulation

		Blood group						P
		A(+)	A(-)	B(+)	AB(+)	0(+)	0(-)	
Histopathological result	Benign	27	5	11	2	22	2	0.614
	Malignant	12	3	1	1	8	1	
Total		39	8	12	3	30	3	

thyroid nodules were benign in 81.1% (n=77) of patients evaluated using FNAB and malignant in 18.9% (n=18). However, no significant correlation was determined between FNAB and true histopathological results (p=0.965) (Table 4).

Table 4. Histopathological Result * FNAB Cross Tabulation

		FNAB		P
		Benign	Malign	
Histopathological result	**Benign**	56(72.73%)	13(72.22%)	0.965
	Malignant	21(27.27%)	5(27.78%)	
Total		77(100%)	18(100%)	

Note: FNAB; Fine needle aspiration biopsy

The number of patients preoperatively estimated to have benign disease through evaluation of thyroid nodules using US was 89 (93.7%), while presence of malignant disease was estimated in 6 (6.3%) patients. The true histopathological findings and estimated pathological data based on US were compared, and a statistically significant difference was determined between them (p=0.001) (Table 5).

Table 5. Histopathological Result * Estimated Pathology According to US Cross Tabulation

		Estimated pathology according to US		P
		Benign	Malign	
Histopathological result	**Benign**	68(76.40%)	1(16.67%)	0.001
	Malignant	21(23.60%)	5(83.33%)	
Total		89(100%)	6(100%)	

Note: US; Ultrasonography

Of the cases thought to be benign at US, 76.4% were actually benign, and 83.33% of the cases thought to be malignant were actually malignant. The level of cases incorrectly identified as benign or malign was 23.16%. Validity (test power) of US on the basis of postoperative diagnosis was 76.84%. In terms of FNAB findings, 27.78% of cases suspected of being malignant were malignant, and 72.73% of the group assessed as having benign cytology were actually benign. The level of cases incorrectly identified as being malignant or benign was 35.79%. FNAB test reliability (test power) on the basis of postoperative diagnosis was 56.1%.

In addition, compared with histopathological results in the preoperative determination of malignant or benign disease, only US findings were significant at statistical analysis (P=0.001), all other data being non-significant (P>0.05).

Discussion

Non-palpable thyroid nodules can also be detected using high resolution US devices [3]. US is a simple, reliable, commonly used technique with high sensitivity (90%) and specificity (85%) for thyroid nodules [8]. While most thyroid nodules are benign, identification of non-palpable nodules leads to concerns regarding possible malignancy [9]. Benign thyroid nodules are known to remain benign for a long time [10], while thyroid cancers grow slowly, for which reason they possess low morbidity and mortality, while thyroid carcinoma series leading to lymph node and distant organ metastasis with extracapsular spread have also been reported [7].

Risk factors increasing the probability (two-fold) of malignity in thyroid nodules include age below 30 or above 60 and male gender [11]. Another study reported that age below 25 and male gender were correlated with malignant nodules, but were not sufficient in treatment planning [12]. In our study, however, when parameters such as age, gender and blood group were compared with the histopathological results, no statistically significant correlation with malignant nodules was determined (P>0.05).

FNAB is the first and most common method used for the histological characterization of thyroid nodules [13]. An approximately two-fold increase has been observed in the diagnosis of thyroid cancer using FNAB, and a significant decrease has occurred in surgical procedures [14]. Cytological examination results of specimens taken using FNAB are assessed under four categories, benign, malignant, indeterminate and insufficient material [1,4]. Nondiagnostic results have been reported in up to 20% of cases [15]. Management of nondiagnostic thyroid nodules is important because the incidence of malignancy among these is between 5% and 10% [16]. The causes of these inadequate results including technical errors and palpation-guided FNAB, cystic changes [16], small nodule size, position of the nodule within the thyroid, and patient age and body structure [15,17]. The other hand, US can help guide fine needle aspiration, determine thyroid nodule size, and detect small nodules that are not palpable[18]. The success rate has increased with recent advances in US-guided FNAB [15].

Even if cytological findings from thyroid nodules are benign, surgical treatment is still recommended if clinical suspicion of malignity is high [4]. Even if non-diagnostic results are obtained from FNAB, surgical treatment is again advised if clinical suspicion of malignity is high [1,4]. Clinical conditions suggestive of malignity include a palpable nodule exceeding 4 cm in size, increasing nodule growth, the nodule being hard and irregular, presence of lymphadenopathy in the neck, distant metastasis, cord paralysis, dysphagia, dyspnea, local pain and presence of Horner's syndrome [19]. US parameters (such as echogenecity, margin structure, calcification and lymph node metastasis) have also been reported to be useful in clinical decision-making [19]. Ultrasonographic morphologic characteristics of thyroid nodules suggestive of malignancy include solid structure, hypoechogenicity, microcalcification, irregular margins and regional lymph node metastasis [18]. At US examination we considered that thyroid pathologies in which at least two of these parameters were present might be malignant, and we compared these with the postoperative histopathological results. We also compared postoperative histopathological results with preoperative FNAB findings, a known reliable diagnostic technique. We compared the effectiveness and accuracy of US and FNAB diagnostic techniques in diagnosing benign and malignant pathologies. Statistical analysis of the results revealed that predicting the benign or malignant nature of thyroid nodules using US (P=0.001) was more accurate than the results from FNAB (P>0.05).

Conclusion

Assessment of malignity parameters using US is more effective than FNAB in discriminating between benign and malignant thyroid nodules. We think that in patient approach and treatment, US malignancy parameters should be evaluated together with the thyroid nodule clinical picture, and that in the light of these findings, results obtained from US-guided FNAB should be analyzed together with clinical and US findings.

Competing interests
The authors declare that they have no competing interest.

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