

## ORIGINAL ARTICLE

# Determining Sonographic and Needle Aspiration (FNAC) Accuracy, in Thyroid nodules Diagnose in Patients

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### ABSTRACT

*At present in the world, thyroid FNAC method is widely used as quick diagnostic, cost-effective, less invasive and acceptable tool in thyroid nodules diagnose that needs surgery or investigates conservatively. Objective of this study is to determine accuracy of sonographic diagnose and needle aspiration simultaneously in thyroid nodules diagnose in patients before surgical operation and also to determine ability to analyze before operating thyroid nodules with sonography and FNAC and probability of presence of malignancy in thyroid nodules.*

*A number of 80 patients attended endocrinology clinic in Bo-Ali hospital Qazvin-Iran in the year 1389, were selected by census. All patients underwent sonographic and FNAC investigation. Information about age, sex, size, number and direction, history of previous thyroid disease, family history, radiation contact, thyroid functional test, type of surgery, and presence of side effects were recorded in a list. FNAC was done by endocrinologist by standard method without anesthesia by using 10<sup>cc</sup> plastic syringe capped with 23 sized needle, by mixed sampling technique. Needle movement method in and outside the nodule was done vertically 1-2mm near sample region. At last slides were fixed by papniculano method and gymsa stained. Surgical operated samples by golden standard method in diagnosing thyroid nodules for histopathological analyses were fixed in formalin. Incisions were made by 5 microns in size. Hematoxin stain was used for investigation. For lessening introobserver error cystopathologic and histopathologic investigation of all samples were done by a pathologist. In this analysis both include and exclude cases were present. Analytical-descriptive statistics were used for analyses. Sensitivity, specificity, positive and negative predictive values were calculated. ROC graph and kappa coefficient were also calculated.*

*Of 80 patients undergoing ultrasound, benign and malignant were 2.5% and 87.7% respectively. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy were, 89.6%, 100%, 100%, 65% and 91.25%, respectively. Final diagnosis in FNAC were 20% benign, 17.5% suspicious, 30% malignant, 6.3% intermediate and 2.5% negative. Sensitivity, specificity, negative predictive value, positive predictive value, and accuracy of FNAC were 100%, 87%, 95%, 100% and 96.25% respectively.*

*FNAC is an acceptable and affordable methods for rapid detection of thyroid nodules. The use of FNAC and ultrasound studies, significantly reduces unnecessary surgery.*

**Key words:** Ultra sonography, needle aspiration (FNAC), thyroid nodules

Received 26.04.2013 Accepted 18.05.2013

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### INTRODUCTION

Thyroid nodule is defined as any kind of abnormal growth that causes mass in Thyroid [1] and is more common in aged women, people with Iodine deficiency and in the people with radiations contact, and also in the people with family history of thyroid disease [2]. More over pressure due to nodule size on neighboring organs. In presence of malignant nodule and invasion to neighboring organs like trachea, larynx and esophageal recurrent nerve, pain symptoms at inferior and anterior neck region, cough or dyspnea, dysphasia, or odenophagia are developed [6,7]. Tempany et al (2008) analyzed diagnosis of thyroid nodule by ultra sonography and relation of results of needle aspiration in 124 patients. Sensitivity result, specificity and negative predictive values of ultra-sonography and FNA simultaneously in use were respectively 84.1%, 87.5%, 85.5% and 92% and diagnostic accuracy was 82.7% obtained and ultra sonography was considered necessary in thyroid nodules above 5cm in size. And ultra sonography and FANC were remembered as a method with high accuracy and high ability to diagnose thyroid nodule [9]. Gul et al (2009) on ultra-sonographic analyses of thyroid nodules in 2082 patients reported sensitivity, PPV, NPV, and FANC validity respectively 89.1%, 98.77%, 96.10%, 96/39% and 96/32%. They find ultra-sonography most

accurate test to diagnose patients having solid nodule and complex bigger than 1 cm [10]. Sijbrigje et al (2012) performed cross sectional research with objective to analyze needle aspiration in thyroid tumors, recognize related factors to sufficient amount in 1871 patients. They obtained accuracy 90.1%, sensitivity 85%, positive predictive value 91.3%, specificity 97.6% and negative predictive value 83.7%, needle aspiration method was one the most complete and most reliable method to diagnose thyroid nodule lesions [11]. Role of sonography and FNA on 24680 patients was performed sensitivity, specificity, PPV, NPV of sonography and FNA simultaneously in use were 94.1%, 77.5%, 80.5%, 93% respectively and diagnostic accuracy was 58.8% obtained [12].on analyzing diagnostic value of sonographic criteria in thyroid lesions, ultra-sonography was declared a method easily available and less expensive and radiation lacking [13-18]. On analyzing diagnostic accuracy and FNAC specificity in diagnosing thyroid lesions study was done on 230 patients. Accuracy 90.4% , sensitivity 85.7%, positive predictive value 83.3% , specificity 92.5% , and negative predictive value was 93.7% , that proved FNA was a quick method with high ability and secure method in thyroid lesions diagnose [20].

## METHOD AND MATERIALS

A number of 80 patients attended endocrinology clinic during year1389 at Bo-Ali hospital Qazvin-Iran were selected by census. They underwent sonographic investigation FNAC and finally underwent surgical operation at Shahid Rajaee hospital. Information about age, sex, size, number and nodule direction, history of previous thyroid disease, family history radiation contact, thyroid function test, and type of surgery and presence of side effects after FNAC were recorded in a list. FNAC was done by endocrinologist. By standard method without anesthesia by using 10<sup>cc</sup> plastic syringe caped with 23 sized needle, by mixed sampling technique.

Method of needle movement in and outside the nodule was done vertically 1-2mm near the sample region. This sweep movement was mixed by 360 rotational angle of needle inside the nodule. By thin small histological cuts(pieces) were provided(prepared). Needle was pulled out and holded for about 10 seconds so that free cell can find flow through capillary activity. This technique comprises of less dilation of thyroid cells. Samples were spread over glass slides and after alcohol fixation slide were send to laboratory. At last fixed slides were stained by papniculano and gysma.

Surgical operated samples by golden standard method in diagnosing thyroid nodules for histopathological investigation were fixed in Formalin. Incisions were made by 5 microns in size. Hematoxin Eosin stain was used investigation. For lessening introobserver error, cytopathologic and histopathological investigation of all samples were done pathologist. In this analysis both include and exclude cases were present. Analytical-descriptive statistics were used for analyses, sensitivity, specificity, positive and negative values were calculated. ROC graph and kappa square co-efficient were also used

## RESULTS

Out of 80 patients investigated there were 20% men and 80% women, age limit was between 16 to 18 years and mean age was  $40.21 \pm 13.1$ . 38.8%cases were having previous thyroid disease, out of them 11.3% were having positive family history of thyroid disease. 17.5% people were having symptoms of hypothyroidism and 8.8% out of them were having symptoms of hyperthyroidism. In 38.8%right sided, 72.5% left sided and 3.5% were having bilateral thyroid nodules. Nodule size on left size was  $3.7 \pm 3.7$  cm and  $3.3 \pm 3.5$  cm. In clinical differential diagnosis 6.6 % Graves disease, 47% thyroid nodule, 18.8 % people with multi nodular goiter, 8.8 % papillary cancer, 2.5% goiter, 2.5% lymphocytic thyroiditis and each kind of neoplasia, thyrotoxicosis, Hashimotos' thyroiditis and follicular adenomawere reported 3.1 %. Differential diagnosis on sonographic bases were as follows, 8.78% without definite diagnosis 8.3% with iso-echoic or hper-echoic without cystic change and 1.3% calcification with diagnostic view of goiter adenomatosis and 2.5 % cases with papillary cancer and 1.3 % with complex nodules. In FNAC result analysis 20% cases were multi nodular goiter, 17.5% with papillary cancer and 30% were negative for malignancy and 63% cases were follicular neoplasia, 2.5% were goiter nodule and each case of multi nodular goiter, parathyroid, hashimotos' and papillary cancer adenoma and thyrotoxicosis specified itself 1.3%. On histologic result analysis diagnosis were as follows, 48.8 % cases multi nodular goiter, 8.8 % cases thyroid nodules, 13.8%cases with papillary cancer, 2.5% follicular adenoma, and Hashimotos' thyroidits and each

kind of parathyroid adenoma and thyroid cancer and follicular adenoma and thyrotoxicosis specified itself 13%.

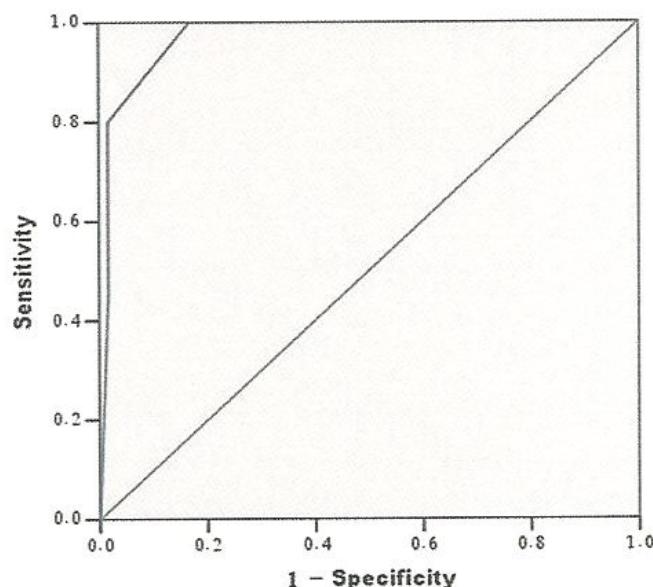
53.5% people underwent lobectomy surgical operation, 50% total thyroidectomy, 13.8% incomplete thyroidectomy and 45% underwent esmoectomy. 7.5% people were having post operational bleeding and 8.8% people were having post-operational pain and malaise. Out of 80 people that underwent ultra-sonographic coverage, 2.5% were malignant and 87.7% were benign. Sensitivity, specificity, positive predictive value and negative predictive value were respectively 89.6%, 100%, 100% and 65% and accuracy was 91.25%. In needle aspiration 20% benign and 17.5% suspicious, 30% malignant, 6.3% intermediate 2.5% unsatisfactory results. In needle aspiration sensitivity, specificity, positive predictive value and negative predictive values were respectively 100%, 87%, 95%, and 100% and accuracy was 96.25%.

9 cases were reported malignant nodule on clinical diagnosis according to the histopathological diagnose (Table 1). On clinical diagnose analyses by using ROC graph, area under curve (AUC)=97.2 that shows high sensitivity and high specificity that by certainty distance 95%. (94.5-99.9) was obtained (Figure 1). 8 cases were reported malignant nodules on ultra-sonographic diagnosis according to the histopathologic diagnosis (Table 2).

On ultra-sonographic diagnose analyses by using ROC graph area under curve AUC=88.6 and certainty distance was 95% (79.1-98.2) obtained (Figure 2). 15 cases were reported malignant nodules on FNAC, according to histopathologic diagnosis (Table 3). On FNAC diagnose analyses by using ROC graph area under curve was AUC=98.5, and certainty distance was 95% (96.2-100) obtained (Figure 3). In table 4, accuracy, sensitivity and specificity were analyzed in three methods. In FNAC positive predictive value and negative predictive values were respectively 87% and 100%. In clinical method positive and negative predictive values were respectively 94.1% and 93.7% and on ultra-sonographic method these values were respectively 100% and 59.6%. Agreement amount FNAC US-sonography 0.4, us-sonography and clinic 0.5 and also agreement measure FNAC and clinic on diagnosing thyroid nodules was 0.6.

**Table1:** Comparison between histopathologic and clinical diagnosis

Clinical diagnose Histopathological diagnose	malignant	Suspicious	Intermediate	Unsatisfactory	Benign	total
malignant	9	7	4	0	0	20
benign	1	0	9	7	43	60
total	10	7	13	7	43	80



**Fig1:** ROC graph of clinic method in diagnosing thyroid nodules

**Table 2:** Comparison between histopathologic results and ultra sonographic diagnosis

Clinical diagnose Histopathological diagnose	malignan t	Suspicious	Intermediat e	Unsatisfactor y	benign	total
malignant	8	12	5	0	0	25
benign	0	11	2	11	31	55
Total	8	23	7	11	31	80

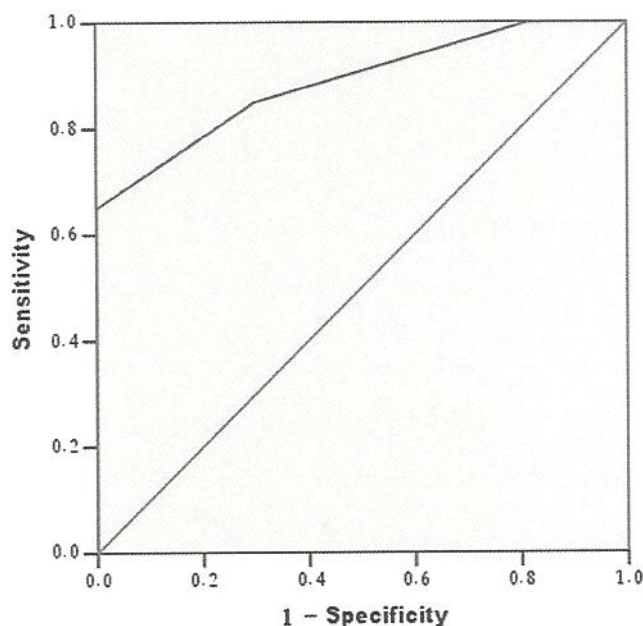


Fig. 2: ROC graph in thyroid nodules diagnose by ultra-sonographic diagnosis

**Table 3:** comparison between histopathologic and FNAC diagnosis

Clinical diagnose Histopathological diagnose	malignant	Suspicious	Intermediate	Unsatisfactory	benign	total
Malignant	15	5	0	0	0	20
Benign	1	2	0	1	56	60
Total	16	7	0	1	56	80

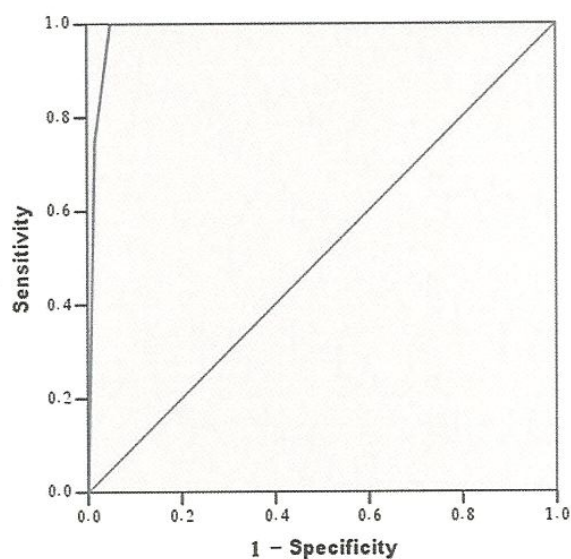


Fig. 3: ROC graph of thyroid nodules diagnosed by FNAC method.

**Table4:** Accuracy, sensitivity and specificity of FNAC, ultra-sonography and clinic in thyroid nodule analyses

Diagnosis parameters Methods	accuracy	sensitivity	specificity
FNAC	96.25%	100%	95%
Sonography	91.25%	65%	100%
clinic	93.75%	80%	98.3%

## DISCUSSION

Results obtained showed that sonography and FNAC on thyroid nodules, having high sensitivity, specificity, PPV, NPV, and accuracy [8]. In 80 samples analyzed malignancy prevalence was in 30-63 years age limit and was more common in women. These results were similar to Bakers et al analyses [3]. In Ezzat ET analyses malignancy was more prevalent in young that could be difference. Between median age groups studied in two research and also age limits analyzed in this study was not similar [4]. In this study, malignancy was more in common nodules greater than 3cm, counter to the Yul et al study malignancy was more prevalent in lesions with small in size [20]. On the other side results of the Jung et al analyses were similar to this study analyses [21]. Two cases in patients were having radiation contact that was similar to Chatna et al study [22].

Accuracy, specificity, positive predictive value and negative in comparison with Seltakorn et al was more and only sensitivity was less that this could be in related to less number of samples [19]. In Tan al research with a title of FNAC and ultra sonography role in 24680 patient analyses before operating thyroid nodule, compared to this research using Simu Hareously ultra-sonography and FNAC, sensitivity specificity, PPV, NPV, were respectively 94.1%, 77.5%, 80.5% and 93% and diagnostic accuracy was 85.8% obtained that in comparison with our study was reported high (12). In Goellnes et al study during 3 years with heading ultra sonographic evaluation of thyroid nodules, specificity PPV, NPV and FNAC validity were approximately 89.1%, 98.77%, 96.1% 96.39%, respectively reported that compared to our study positive and negative predictive value was less but specificity and FNAC validity was obtained high [5]. Khoo et al on analyzing thyroid lesions, sensitivity, PPV, NPV, respectively 87.1%, 95%, 70%, and 97.1% reported that compared to our study all cases were reported less (13.14). In Milena et al analyses over 370 patients having thyroid carcinoma showed that sensitivity specificity and accuracy 97.4% 87.6% and 94% respectively that was similar to our study. In study most accuracy and sensitivity was related to FNAC and then respectively to clinic and sonography and in specificity case most was related to sonography and then reported clinic investigation and FNAC.

## CONCLUSION

According to the results obtained from this research, FNAC is a reliable diagnostic method, in diagnosing benign tumors from malignant. At present ultra-sonography as a diagnostic tool in compared to clinical tools and FNAC is having less accuracy, Anyhow FNAC is a method that is highly related to the clinicians function.

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#### How to Cite this Article

Meraj F. A., F. S. Rad, and P. F. Abed. (2013). Determining Sonographic and Needle Aspiration (FNAC) Accuracy, in Thyroid nodules Diagnose in Patients. *Bull. Env. Pharmacol. Life Sci.*, Vol 2 (6): 45- 50.