

## **DIAGNOSIS OF THYROID NODULES USING FNA**

تشخيص عقد الغدة الدرقية عن طريق الرشف الخلوي بالإبر الدقيقة دراسة تطلعية تحليلية

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### **ABSTRACT**

**BACKGROUND :-** Thyroid gland differs from other endocrinal organs in its heaviness and early working in embryonic period (1).The main reason for intense interest of thyroid research is the outbreak of thyroid cancer after disaster of Chernobel nuclear energy plant leaks in 1986(2). Most common clinical findings in the thyroid gland is different pictures of neck swellings which defined as Any disorders of growth of thyroid cells changes into a swelling in thyroid. Nodule—means knot or knob. Benign nodules can be caused by

1-Adenomas

2-Colloid nodules

3-Cysts

4-Infectious nodules

5-Lymphocytic nodules

6-Hyperplastic nodules.

7-Thyroiditis .

8-Congenital anomalies.

Malignant nodules are classified as

1-Differentiated tumors

a-Papillary adenocarcinoma

b-Follicular adenocarcinoma

2-Medullary carcinoma

3-Undifferentiated tumors like : anaplastic

4-Others :- a-Lymphoma b-sarcoma c-squamous cell carcinoma d-Metastatic tumors. (3)

FNAC plays an important role in diagnosis of thyroid nodules.

**AIMS OF STUDY:-** To test suitability of fine needle aspiration cytology & avoid morbidity and complications of unwise thyroid operative decisions.

**PATIENTS MATERIALS& METHODS:-** This study was carried out in Al-Hussein Teaching Hospital in Karbala city during the period from 1st January 2011 to 31st December 2012=2years. ( 120 ) patients were included in this study; designed as a prospective study.

**RESULTS :-**The results studied were compared with pathological and importance of FNAC was tested by finding of

Sensitivity(83.3%),Specificity(95.3)PositivePredictiveValue=PPV(78.1%) and Negative Predictive Value=NPV(48.6%)Accuracy ratio=95% . Out of 120 patients FNAC showed 98 patients as benign and 22 patients as malignant while pathological examination revealed 96 patients had benign and 24 patients had malignant lesions . FNAC was able to correctly diagnose (94/98) as benign lesions while (4/98) cases of benign lesions appeared to be malignant on pathological examination (False negative) . Out of (24) cases which appeared to be malignant on pathological examination. FNAC confirmed 22 cases while (2/24) benign lesion was misdiagnosed as malignant (False positive).

**Conclusions:-** This study showed a sensitivity of( 83.3 )%, specificity( 95.3%)and accuracy ratio=95% of FNAC in diagnosis of thyroid cancer in thyroid swelling lesions.

**Key words:-** FNAC , Biopsy, Thyroid nodules .

## الخلاصة

عقدة الغدة الدرقية حالة سريريته شائعة قد تصل إلى 50% عند كبار السن معظم هذه الحالات حميدة . معظم هذه الحالات حميدة حيث أن سرطان الغدة الدرقية يمثل حالة سريريته غير شائعة الحصول . إذا كانت إفرازات الغدة الدرقية طبيعية فإن استخدام خزعة الرشف الخلوي بالإبر الدقيقة يوفر معلومات مباشرة حول نوعية الوضع الخلوي لعقدة الغدة الدرقية المنفردة. أهداف هذه الدراسة هي لتقييم دقة طريقة الرشف الخلوي في تشخيص العقدة المنفردة للغدة الدرقية وتجنب العمليات الجراحية غير الضرورية للغدة الدرقية. هذه الدراسة أجريت على 120 مريضاً في قسم الجراحة في مستشفى الحسين (ع) التعليمي في كربلاء المقدسة للفترة من 2010/1/1 لغاية 2011/12/31 وهي دراسة تطلعية تحليلية. وهي أول دراسة من نوعها في العراق. نتائج هذه الدراسة قورنت مع الفحص النسيجي كما إن كفاءة الفحص الخلوي بالرشف بالإبر الدقيقة قد قيست بالحساسية – النوعية الأحصائية كما تم قياس القيمة التوقعية الايجابية والسلبية. من 120 مريضاً اظهر الفحص الخلوي 98 حالة حميدة و 22 حالة سرطانية بينما الفحص النسيج اظهر 96 حالة حميدة و 24 حالة سرطانية. الفحص الخلوي كان قادراً على التقاط 94 حالة حميدة بينما هناك 4 حالات حميدات (بالفحص الخلوي بالرشف بالإبر الدقيقة) بينما اثبت الفحص النسيجي أنها خبيثة وهذا يسمى (السلبية الكاذبة) 0 من 24 مجموع حالة شخصت نسيجياً على كونها خبيثة تم تشخيص 22 حالة بالفحص الخلوي (مطابق للفحص النسيجي) بينما تم الاشتباه بحالتين حميدتان على أنهما سرطان بينما اثبت الفحص النسيجي أنهما حميدتان وهذا يسمى (الاجابية الكاذبة) 0 نتائج تحليل هذه الدراسة يظهر الحساسية = 8,33% والنوعية = 95,3% استنتجت هذه الدراسة أن الفحص الخلوي للرشف بالإبر الدقيقة مفيدة جداً في تشخيص السرطان في عقد للغدة الدرقية.

## INTRODUCTION:-

Thyroid incidence of clinically detected thyroid nodule in USA is 4—7% and the annual incidence is about 0.1%. The estimated life time risk of developing a palpable thyroid nodule is about 10% (4). Approximately 275,000 thyroid nodules are detected per year only about 1400 are thyroid cancers (5). Although thyroid nodules are commonly seen in females thyroid nodules in males are more likely to be malignant than in the females (6). Nodules are more likely to malignant in patients younger than 20 years of age and older than 60 years of age (7). Thyroid carcinoma roughly estimates 1% of all new malignant disease and about 0.5% of cancer in men and 1.5% in females (8). Most of malignancies presented as cold nodules.. Fine Needle Aspiration Cytology (FNAC) starts in the diagnosis of thyroid diseases for first time in Scandinavia 1950s . FNAC is a simple can be repeated in out-patient department and not invasion procedure as an early the diagnostic test of thyroid swelling. FNAC is helpful in diagnosis of majority of cases (9) . Thyroid swellings are seen in up to 40% of the elderly population especially in women. Most of them are benign with rare cases of thyroid cancer. If thyroid function tests are normal then fine needle biopsy offers excellent picture about the cellular feature of thyroid swellings from which the tissues state can be inferred (10) . FNAC as a procedure has an important role in the management of thyroid swelling and is used as a good screening tool for thyroid swelling (11). Most of thyroid nodules are benign the incidence of malignancy varies from (5—20% in different societies ) of surgically excised thyroid swellings on pathological examination. In the management of solitary thyroid the primary challenge is to separate benign nodules (the majority) from malignant lesions (the minority). About 60% clinically palpable as solitary thyroid swellings turn out to be dominant nodule of multi-nodular goiter. Solitary toxic nodules account for 4-7% of all solitary thyroid nodules. Cancer is very rare in hot nodule . Malignant hot nodules carry a small risk to change to cancer (0.2 %-- 2%). Incidence of solitary thyroid nodule increased with age along with increased prevalence of malignancy in fourth and fifth decades of life. Thyroid tumors are more prevalent in females and papillary followed by follicular carcinoma, anaplastic , medullary carcinoma , non-Hodgkins lymphoma and in order of frequency. Main advances in the diagnosis of thyroid nodule has been reached with the popularity of FNAC which can prevent a lot of operations in thyroid lesions (12). FNAC is now believed to be most effective test for differentiation between benign and cancer of thyroid gland. It is done when suspicion of cancer is very high because fore knowledge of cancer cell type aids in the

planning of surgical procedure (13) .FNAC is easily performed accepted by the patients and has low cost benefit .If the sample is not diagnostic , It can be easily repeated (14). Moreover FNAC is a safe and accurate in the evaluation of thyroid nodules in children(15). The main aim of this study was to know the results of FNAC in evaluating the thyroid swellings in Al-Hussein Teaching Hospital where cyto & histopathological examination was done by specialist histopathologist in the laboratory department. The main result was to prevent missing malignant lesions and to be more conservative in selecting patients with thyroid swellings for surgical treatment.

### **AIM OF STUDY:-**

To determine the role of(FNAC) in diagnosis of thyroid nodules in IRAQ and to avoid death and complications of wrong operative decision .

### **PATIENTS MATERIALS AND METHODS:-**

This paper was conducted in the department of surgery in Al-Hussein Teaching Hospital in Karballa city from first January 2011 - thirty-first December 2012.(120) patients were studied in this Prospective study. Patients attended surgical outpatient department having a thyroid swellings from either sex and all ages were included in this study . After full history and complete physical examination a detailed clinical and investigative data defined and analyzed . Then FNAC was done after patient counseling and with closed communication with specialist histopathologist according to following technique:-Skin was cleaned with antiseptic solution . After careful palpation nodule was stabilized with one hand and 22-gauge needle mounted on 20 c.c sterilized plastic syringe was inserted into the swelling . Local anesthesia was necessary in some patients. When the tip of the needle was in the center of the lesion to be sampled, suction was applied to the syringe and tip of needle was moved within the mass. The suction on the syringe was then released and needle removed from the gland. After the needle was removed from the lesion the syringe was detached and filled with air and reattached with needle using the air to express small specimen on slide. A second glass slide was dipped in 95%alcohol solution and wet slide was placed on the top of the specimen on the first slide and with slight pressure the two slides were separated. The alcohol in 2<sup>nd</sup> slide assists in both spreading the specimen and fixing it. Both slides were stained according to of Papanicolou smear way (16).

Identification informations clinical complaints physical examination and investigation variables were described by simple manners e.g. mean, S.D, operational variables were describe by percentage. Diagnostic value of the FNAC was checked by calculating the sensitivity ,specificity and positive predictive value , negative predictive value and accuracy ratio results .The histopathology of the biopsy was taken as gold standard and results of FNAC which were matching with the histopathology were taken as positive cases. Analysis was done by2x2 tables for sensitivity and specificity. Kappa statistic is used to measure the agreement between FNAC and histopathology .

### **RESULTS:-**

In this study of 120 cases there were 90 females and 30 males. Age range was 10—70 years and mean age(30.6) years standard deviation (plus minus) 15.8 years. Majority of patients belonged to age group 20-50 years as in (Table 1). Table(2) showed that a Painless swelling in the neck (50%) was the commonest complaint and patients presented due to cosmetic reason. Another common presentation was neck swelling and cancer phobia(40%) . Table(3) showed the sites of thyroid swellings. In most of cases the right lobe(50%).2<sup>nd</sup> site was left lobe (30%) . Table(4) FNAC diagnosed total benign cases (98=81.33%)while malignant cases were (22=18.66%). On histopathology majority of cases was benign pathology

(96=80%)while malignant lesions consisted (24=20%) of cases . Out of malignant lesions papillary carcinoma was commonest common .(Table-5). Table( 6) showed interpretation errors of FNAC 4 cases were false negative 2 cases were thyroid cysts while hisopathological examination confirmed papillary carcinoma ,2 cases were follicular lesions by FNAC diagnosed as follicular carcinoma and 2 cases was false positive as medullary carcinoma by FNAC while histopathological examination revealed benign nodular goiter. Table ( 7) gives summary of statistical results of 120 cases of FNAC . It showed a sensitivity of 83.3%and specificity 95.3% of FNAC in detecting malignancy in thyroid swellings . There is a satisfactory strong agreement between the results of FNAC with histopathology (Kappa=0.765 ,, p-value less than 0.001) shown in (table-8). Majority of patients underwent surgery lobectomy was done in(65%) patients, subtotal thyroidectomy in (15%) patients ,total thyroidectomy in (15%) patients and nodular excision was done in (5%) patients (Table-9).

## **DISCUSSION:-**

Thyroid aspiration is a technique for investigation before surgical treatment of thyroid nodules. The technique is almost quick low cost effective and an efficient method of differentiating between benign and malignant thyroid cancers. Several studies have proved that FNAC is the single most sensitive ,specific and cost-effective in the investigation of thyroid nodules . FNAC is a sensitive and highly specific method of evaluating thyroid nodules for malignancy .FNAC OF thyroid nodule is reported to have sensitivity ranges from 65%-98% and a specificity of 72%-100%. while Morgan study found that overall sensitivity of FNAC in detecting thyroid neoplasia was 55% specificity 73.7% (17).

The importance of diagnostic procedures mainly depends on three values :-Sensitivity ,Specificity and Accuracy . Sensitivity means ability of procedure to detect disease when it is present .Specificity means the ability of procedure to rule out the disease when it is absent . The Accuracy Ratio=No. of true diagnoses by FNAC both benign and cancer cases from total studied cases . The success factors included the production of satisfactory materials enough for diagnosis ,ease in carrying out the procedure , patients acceptability and cost . This study was carried out to evaluate the efficiency of FNAC in detecting malignancy in thyroid swellings .The results obtained from this study revealed that FNAC is highly useful in detecting thyroid malignancies in thyroid swellings with sensitivity 83.3% and specificity 95.3%. When analyzed by Kappa test there was statistically satisfactory strong agreement between FNAC and histopathology in detecting malignancy in thyroid swellings (P-value less than 0.05). The comparison with the previous studies showed similar results regarding the efficacy regarding the efficacy of FNAC in detecting malignancy in thyroid nodules. In another study FNAC of thyroid nodules is reported to have sensitivity range from 65% to 98% and specificity of 72% to 100% ( 18 ). Out of cases of thyroid in our study FNAC was able to 98 cases of benign lesion correctly while 4 cases of benign discovered to be malignant on histopathology . Most of the malignant lesions recorded by FNAC in our study were papillary. . The type of operative procedure performed was based on the clinical manifestations and cytological report of FNAC .Out of different diagnostic parameters like clinical examination ultrasound and thyroid function tests FNAC was found to be simple—cost effective and reliable in differentiating between benign and malignant and type of malignant lesion in case of thyroid swellings So the addition of clinical examination to FNAC results remain the cornerstone in selecting patients for thyroid surgery .The procedure was found to be simple as compared to other available means for establishing histological diagnosis .Little equipment and experience was needed for FNAC .The only equipment needed was ordinary 20 cc plastic syringe with( 22)gauge needle .During this procedure little preparation was needed as compared to the open biopsy where surgical instruments and suitable anesthesia are needed. In the present study no difficulty was found in localizing the site for aspiration in majority first attempt was successful . Only in few

cases second attempt was made to obtain the material. However complications such as excessive bleeding or hematoma were not found in this study. This procedure was simple, quick and patient does not need to undergo preoperative investigation or hospitalization. Apart from that this procedure was found to be cost—effective and efficient method of differentiating benign and malignant nodules. In this way hospital theatre anesthesia and medical efforts and expenses are saved. As far as patients were concerned there was easy to take their consent. This procedure was well accepted because it did not require any hospitalization or psychological trauma. On other hand the open biopsy needs a mental preparation selection of surgeon and postoperative complications. Hence all these render the procedure risky. Another advantage of the procedure is that it can be done in patients unfit for general anesthesia. Application of FNAC depends on the performing person of the procedure and on the practice of the pathologist. FNAC is also valuable methods for follow-up of patients waiting or not willing for surgery. It is also useful in cancer patients to be treated by chemotherapy or radiotherapy. FNAC may be of great help in differentiating a recurrent carcinoma from inflammation postoperative hematoma and foreign body granuloma. Currently FNAC is viewed as the gold standard for diagnosis in most cases and it plays a crucial role in the selection of patients for surgery. There are few complications and drawbacks of FNAC. It has been suggested that tumor may grow along the needle tract. A search of literature has revealed that FNAC is both diagnostic and therapeutic in a cystic swelling and there is no evidence of spread of tumor through the skin track (19). The other limitations of FNAC were errors of diagnosis in the form of false negative and false positive reporting of tumor which can be overcome by improving the technique of aspiration and experience in interpretation.

### **CONCLUSIONS :-**

This paper proved that FNAC is an excellent aid to the proper physical examination and evaluation of patients with thyroid swellings. It enables clinician to pick in cases with quick cost—effective manner leading to prevent fruitless thyroid operations. It requires a minimal amount of practice to learn the FNAC technique and skill to define the cellular changes. FNAC is highly useful in detecting thyroid malignancies in thyroid swellings with sensitivity (83.3%), specificity (95.3%) and accuracy ratio (95%). Although a good communication is essential between surgeon and pathologist. It can lead to an accurate diagnosis. We encourage our surgeons to depend on FNAC with good cooperation and rigorous study of clinical and laboratory results.

**REFERENCES**

- 1- Dawber TR, Gaston EA. The significance of non-toxic thyroid nodule :final report of a 15 years study of thyroid cancer. *Ann Int Med* 1969;79:537.
- 2- Ghraib H. FNAB of thyroid: An appraisal. *Ann Int Med* 1993;118:282.
- 3- Rojeski MT. Nodular thyroid disease. *New England j Med* 1985;313:428.
- 4- Nikiforov YE, Fagin J. Risk factors for thyroid cancers. *Trend in Endocrinology and metabolism.* 1997;8:20-25.
- 5- Robbins J, Merino MJ. Thyroid cancer A lethal endocrine neoplasm. *Ann Intern Med* 199;115(2):133-47.
- 6- Mohammed M. Incidence of carcinoma in nodular goiter. *Med forum* 2000;11(3):65.
- 7- Figgi J. Epidemiology of thyroid cancer. *Humana press*1999;515-520
- 8- Wartkofsky L. A comprehensive guide to clinical management Totowa USA. 1999;530-535.
- 9- Cappli C etal. Thyroid gland shape suggest malignancy. *Eur J Endocrinol* ,2006;155:27-31.
- 10- Tabqchali MA. Thyroid aspiration cytology in Newcastle. *Amr Coll Sur E* 2009;82:149.
- 11- Suen KC. Atlas and text of aspiration biopsy cytology. Williams and Wilkins, London 1990
- 12- Silverman JF. Role of FNAC in rapid diagnosis & management of thyroid neoplasm . *Cancer* 1986;57:1164-1170.
- 13- Orell S, Walter D. Introduction: historical perspective. In :*Manual & atlas of FNAC . New York: Churchil Livingstone* 1986 ,1-5.
- 14- Hamburger JI. Diagnosis of thyroid masses by FNAC :use and abuse. *J Clin Endocrinol Mtab* 1994 ;79:335-339.
15. Morgan JL. FNAC of thyroid swelling :how useful is it? *A J of Surg* 2003;73(7):480-483.
- 16- Day TA, Richardson MS, Sharma AK. Analysis of differentiated thyroid tumors. *Curr Tret Options Oncol.* 2005;6:47-57.
- 17- Slow JK. Thyroid surgery -The otolaryngology experience. *Ann Acad Med Singapoer* 2003 ;31:158-64.
- 18- Banagala A, Gamage K .Use FNAC on thyroid lumps. Galle M 13-Hagemburr JI. Diagnosis of STN by FNAC :Indications and and limitations. *J Clin Endocrine CC01Metab* 1994;79:335-339.
- 19- Watkinson JC ,Franklin K. The management of STN: A Review. *Clin Otolaryngol Allied Sci* 1999;24:388-97

**Questionare ( Data collecting ) paper :-**

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Case No  
Date  
Patient s Name  
Age  
Sex  
Occupation  
Address  
Presenting Complaints  
General clihical examination  
Investigations  
Thyroid Profile  
Thyroid Scan  
Ultrasound  
Chest X-ray  
Surgical Procedure  
Histopathology Reports  
Complications  
Follow Up  
One Month  
Two Month  
Three Month  
Remarks

**Statistical Summary :-**

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In this study there were:-  
True Positive(TP)= 20  
True Negative(TN)=94  
False Positive(FP)= 2  
False Negative (FN)=4  
  
Sensitivity=83.3%  
Specificity=95.3%  
Accuracy = 95 %  
False positive rate =100%-specificity=4.7%  
False negative rate =100%-sensitivity=16,7%  
P-value <0.05 Kappa test=0.765

Table 1:- Age & Sex distribution

Age(y)	Male	Female	Total	%
10-20	4	12	16	13.3
21-30	8	32	40	33.3
31-40	6	18	24	20
41-50	8	20	28	23.3
51-60	2	4	6	3
61-70	2	4	6	3
Total	30	90	120	100%

Table 2 :-Complaints of thyroid swellings

Presenting complaints	No.	%
Neck swelling without pain & cosmetic	60	50
Neck swelling and cancer phobia	48	40
Neck swelling and obstruction	6	5
Symptoms of hyperthyroidism	6	5
Total	120	100

Table 3 Location of thyroid swellings

Site of thyroid swelling	No. of patients	%
Isthmus	24	20
Left lobe	36	30
Right lobe	60	50
Total	120	100

Table- 4 FNAC results

Result	No.	%
Colloid nodules	30	25
Follicular lesion(adenoma)	24	20
Nodular goiter	18	15
Thyroiditis	14	16.66
Thyroid cysts	12	10
Papillary carcinoma	10	8.33
Follicular carcinoma	6	5
Medullary carcinoma	4	3.33
Anaplastic cancer	1	0.83
Lymphoma	1	0.83
Total	120	100



Table 5- Histopathology results:-

Results	No.	%
Colloid goiter	30	25
Follicular adenoma	22	18.33
Nodular goiter	20	16.66
Thyroiditis	14	13.66
Thyroid cysts	10	8.33
Papillary carcinoma	12	10
Follicular carcinoma	8	6.66
Medullary carcinoma	2	1.66
Anaplastic	1	0.83
Lymphoma	1	0.83
Total	120	100

Table 6- Interpretation errors of FNAC :-

FNAC Diagnosis	Histopathological Diag.	No.	Interpr
Thyroid cyst	Papillary carcinoma	2	False-ve
Follicular lesion	Follicular carcinoma	2	False -ve
Medullary ca	Nodular goiter	2	False +ve

Table 7- Summary of statistical results of FNAC :-

Sensitivity	83.3%
Specificity	95.3%
Overall accuracy	95%
Positive Predictive Value	85.7%
Negative Predictive Value	95.3%
False Positive Rate	2.1%
False Negative Rate	16.7%
Percentage of carcinoma	18.33%

Table 8-Summary of FNAC and Histopathology:-

Result	Benign (Not-Disease)	Malig.(Disease)	Total
FNAC+	2	20	22
FNAC-	94	4	98
Histopathology	96	24	120

P value < 0.05      Kappa test=0.765

Table 9-Surgical Procedures:-

Procedure	No. of cases	%
Right lobectomy	48	40
Left lobectomy	30	25
Subtotal thyroidectomy	18	15
Total thyroidectomy	18	15
Excision	6	5
Total	120	100