

Accuracy Of Fine Needle Aspiration Cytology In The Diagnosis Of Different Thyroid Lesions.

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Keywords: Thyroid, FNA, Thyroid lesion, thyroid nodule, thyroidectomy.

List of abbreviations: FNA: Fine Needle Aspiration, Hashi.: Hashimoto's thyroiditis, Pap.ca: Papillary carcinoma, Yrs: years, MNG: Multi Nodular Goiter

Received (January) , **Accepted** (June).

Abstract

FNA is a non-invasive method, whose simplicity and safety justify its use for "selective" surgery and is considered the "gold standard" in the management of thyroid nodules.

The main aim of FNAC is to identify nodules that require surgery and those benign nodules that can be observed clinically and decrease the overall thyroidectomy rate in patients with benign diseases., this study was done to evaluate the diagnostic accuracy of fine needle aspiration cytology as a pre-operative screening methods, it is a prospective study which includes a total of 100 cases for patients aged 13-64 years presented with goiter during the period Jan. 2013- Jan. 2015 in Al Hussain Teaching Hospital in Kerbala. This study resulted in true negative cases were 81 (Tn), false negative case was 1 (Fn), True positive were 13 (Tp), and false positive were 5 cases (Fp). Sensitivity or true positive rate is 92%, Specificity or true negative rate is 94%, Positive predictive value is 72%, Negative predictive value is 98%, Accuracy rate is 94%. False negative FNA cytology result was found in only one of our patients which is less as compared to other studies where the values range from 1-16%. False negative cases are encountered when there are no recognizable diagnostic cells in the smear because of sampling or processing error. We concluded that FNA is the most recommended diagnostic procedure for the diagnosis of thyroid lesions except follicular tumor.

مدى دقة الرشف بالابريرة الدقيقة في تشخيص امراض الغدة الدرقية المختلفة.

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الكلمات المفتاحية: الغدة الدرقية, استئصال الغدة الدرقية, عقدة الغدة الدرقية, اضرار الغدة الدرقية, الرشف بالابريرة الدقيقة.
الخلاصة
الخلفية

الرشف بالابريرة الدقيقة هو أسلوب غير بسيط غير اختراقي، البساطة والسلامة هي من مميزات استخدامه قبل إجراء العملية جراحية "الانتقائية"، ويعتبر "المعيار الذهبي" في تشخيص عقيدات الغدة الدرقية. والهدف الرئيسي من الرشف بالابريرة الدقيقة هو تديد العقيدات التي تتطلب جراحة و العقيدات البسيطة التي يمكن

ملاظمتها سريريا وخفض معدل العمليات الجراحية لاستئصال الغدة الدرقية عموما في المرضى الذين يعانون من أمراض مديدة. **الأهداف:**

لتقييم مدى دقة التشخيص بالرشف بالابرّة الدقيقة في تشخيص امراض الغدة الدرقية في مرآلة ما قبل الجراحة. **المواد والأساليب:**

دراسة تضم ما مجموعه 100 مآلة لمرضى تتراوح أعمارهم بين 13-64 عاما يعانون من تضخم الغدة الدرقية خلال الفترة يناير 2013- يناير 2015 في مدينة مستشفى الإسين التعليمي في كربلاء. يجب أن تؤخذ عينة كافية ووافية في عملية السحب، العينات التي لا تتوي على عدد كاف من خلايا الغدة الدرقية تم استبعادها من الدراسة. **النتائج:**

من 66 مآلة تم تشخيصها كتضخم الغدة الدرقية المتعدد العقد بواسطة الرشف بالابرّة الدقيقة، 63 منها كانت كتضخم الغدة الدرقية المتعدد العقد بالفحص النسيجي المرضي، كان 1 كان مرض Grave's و 2 كان Hashimoto's.

من 10 مآلات تم تشخيصها كالعقيدات المفرطة التصنع بواسطة FNA ، 7تشخيصها على أنها مرض Grave's عن طريق فحص الخزعة النسيجية ، 2كانت تضخم الغدة الدرقية المتعدد و 1 كان الورم الميدي الجريبي. من 6 مآلات التي تم تشخيصها كالتهاب الغدة الدرقية بواسطة FNA ، تم تشخيص الأربعة كمرض Hashimoto's ، كان MNG1 ، و 1 كان مرض Grave's عن طريق فحص الأنسجة. من 10 مآلات تم تشخيصها كالورم المسامي بواسطة FNA ، من خلال فحص الأنسجة: 4 كان الورم الميدي الجريبي، 3 كان سرطان مسامي، 2 كان مرض Grave's ، و 1 كان Hashimoto's. من 5 مآلات تشخيص سرطان كما papillary بواسطة FNA ، بواسطة فحص الأنسجة: 3 كانوا سرطان ليمي، كان MNG1 ، و 1 كان مرض خطير و.

من المآلات 3 التي كانت مشكوكة بواسطة ال FNA ، من خلال فحص الأنسجة: 2 كان سرطان ليمي، و 1 كان الورم الميدي الجريبي. وفقا لدراستنا بلغ عدد المآلات السلبية الحقيقية 81 بالمائة، وكانت مآلة سلبية كاذبة 1 ، صحیح إيجابية كانوا 13 وكانت إيجابية كاذبة 5 مآلات أساسية أو معدل إيجابي الحقيقي هو 92٪، وخصوصية أو معدل سلبى الحقيقي هو 94٪، والقيمة التنبؤية الإيجابية هي 72٪، والقيمة التنبؤية السلبية هي 98٪، ومعدل الدقة 94٪.

المناقشة:

تم العثور على مآلات سلبية زائفة في فحص ال FNA من مرضانا وهو أقل بالمقارنة مع الدراسات الأخرى. يتراوح قيم 1-16٪. المآلات السلبية الكاذبة تحدث عندما لا يكون هناك خلايا كافية للتشخيص أو بسبب خطأ في العينات.

الاستنتاج

FNA هو الإجراء التشخيصي الموصى بها لتشخيص آفات الغدة الدرقية لأنه يسمح للتمييز بين الآفات المديدة والخبيثة، ويساعد على ايجاد خطط العلاج.

Introduction:

FNA is a non-invasive method, whose simplicity and safety justify its use for "selective" surgery and is considered the "gold standard" in the management of thyroid nodules.⁽¹⁾

FNA of thyroid nodules has many advantages : safe, simple, cost-effective procedure with absence of major complications and can be performed on out - patients with wide patient compliance, provides a more rapid and accurate diagnosis of the thyroid lesions than any other combination of clinical / laboratory tests. (2,3,4).

The main aim of FNAC is to identify nodules that require surgery and those benign nodules that can be observed clinically and decrease the overall thyroidectomy rate in patients with benign diseases. The present study was undertaken to correlate the FNAC findings with histopathology so that rate of unnecessary thyroidectomies in benign pathologies should be avoided⁽⁵⁾

Like any other diagnostic test FNA has some limitations. Two issues in thyroid FNA are responsible for the majority of erroneous cytology reports : inaccuracy and inadequacy of samples, inability to accurately subtype follicular neoplasms.^(3,4)

Approximately 10% of all FNA biopsies are considered indeterminate or suspicious because of overlapping cytological features.^(6,7)

In particular, FTC and Hürthle cell carcinoma (HCC) cannot be distinguished cytologically from follicular and Hürthle-cell adenomas, respectively, after FNA^(8,9,10) . These nodules are classified as carcinomas if capsular or vascular invasion are found histologically after surgery.

It has been reported that, although FNA is guided by palpation (conventional or non-US- or palpation guided FNA) in 87% of cases in North America and Europe⁽¹¹⁾. The US-FNA is becoming increasingly popular. During this procedure, US guidance is used instead of palpation, which seems to enhance the value of FNA diagnostic accuracy^(12,13,14). US helps direct the needle tip to the desired site, avoiding vessels in close vicinity to the nodule or areas of central necrosis, which often yield non diagnostic specimens⁽¹⁵⁾

Nonetheless, it is not suggested that US-FNA be routinely used, because most clinically detected and palpable thyroid nodules may be aspirated directly without US guidance, thereby contributing to lower cost^(16,17).

Although there are no specific guidelines, it is suggested that US-FNA be performed in non-palpable nodules larger than 1cm (they have the same risk of malignancy as palpable of the same size), nodules palpable but smaller than 1.5 cm, deeply located nodules, nodules in close vicinity to blood vessels, cystic or mixed nodules, especially if a previous conventional FNA was non diagnostic, nodules after a non-diagnostic conventional FNA, coexistent non palpable lymphadenopathy.^(18,19,120,21)

FNA is generally a very safe procedure. Clinically important complications after FNA have rarely been reported. Hematoma formation is rare.⁽²²⁾

Aim of the study:

To evaluate the diagnostic accuracy of fine needle aspiration cytology as a pre-operative screening methods , and to correlate the cytological findings with the histopathological observations in different thyroid lesions , and to find the frequency of different thyroid diseases.

Materials and Methods:

A prospective study which includes a total of 100 cases for patients aged 13-64 years presented with goiter during the period Jan. 2013- Jan. 2015 in Al Hussain Teaching Hospital in Kerbala and many private labs, who subsequently underwent thyroid resection . Cases selected according to available complete clinical data including age, sex, site of swelling and main complaint. The aspiration was done under aseptic conditions with 23 gauge needle fitted to a 10 ml syringe, some cases were aspirated under the guide of U/S. Several smears were prepared and then fixed in 100% ethyl alcohol. These were stained with Papanicolaou stain . Whenever fluid was obtained , it will be centrifuged, then smears were made from the sediment and then stained .

The cytology results were categorized into four categories as benign(negative), suspicious (indeterminate for malignancy), malignant and unsatisfactory / non-diagnostic. An adequate sample must be taken and adequate in amount .Aspirates with insufficient cellularity or poor quality smear due to delayed or inadequate fixation were considered unsatisfactory was excluded from our study.

Criteria proposed for adequacy of thyroid cytology is 5-6 groups of well-preserved follicular epithelial cells with ≥ 10 cell per group , the smear should be technically well prepared, the aspirate should be properly smeared to avoid clotting and lastly smears should be read in clinical

Context. ⁽³⁾

Whenever the excised specimen was received in the department, it was routinely processed to obtain paraffin sections which were stained by the routine Hematoxylin and Eosin method for staining the histopathological sections.

Results of cytological and histopathological studies were later correlated to evaluate the efficiency of FNAC.

Results:

In our study the age range was 13 – 64 yrs, with mean age of patients was 37yrs. Most of the patients were in the age group of 40 – 49 yrs.

Table 1: Age groups in thyroid diseases.

Age	No. of cases	%
10-19	2	2%
20-29	9	9%
30-39	31	31%
40-49	39	39%
50-59	16	16%
60-69	3	3%
Total	100	100%

Out of the total 100 cases, most of the patients were females 74 (74 %) , 26 (26%) were males.

Table 2: Distribution of thyroid diseases according to sex

sex	No. of cases	%
females	74	74%
males	26	26%
Total	100	100%

The most common presenting symptom was neck swelling which was found in 87%, followed by pain 10%, and spontaneous diagnosis found in 3%.

Table 3: Results of thyroid diseases according to presenting symptom

Presenting symptom	No.	%
Neck swelling	87	87%
Pain	10	10%
Spontaneous	3	3%
Total	100	100%

The most common location of thyroid lesion in our study was left lobe (60%), followed by right lobe 28%, then isthmus in 5%, and bilateral lesion was found in 7% of cases.

Table 4: Results according to the location of the lesion.

Site	No.	%
Right lobe	28	28%

Left lobe	60	60%
Isthmus	5	5%
Bilateral	7	7%
Total	100	100%

Of the total 100 cases of FNAC , (82%) were non – neoplastic, and (15%) were neoplastic lesions, and (3%) were suspicious.

Table 5: Non-neoplastic and neoplastic number of cases by FNA

FNA result	No.	%
Non-neoplastic	82	82%
neoplastic	15	15%
suspicious	3	10%
Total	100	100%

Of the total 100 cases that were examined by histopathology, (86%) were non – neoplastic, and (14%) were neoplastic lesions.

Table 6: Non-neoplastic and neoplastic number of cases by histopathology

Histopathology result	No.	%
Non-neoplastic	86	86%
neoplastic	14	14%
Total	100	100%

Aspirates classified as benign included colloid goiter, colloid or adenomatous nodule, Hashimoto’s thyroiditis, sub-acute thyroiditis. Suspicious smears included follicular neoplasms, cellular adenomatoid nodules, Hurthle cell proliferations and lesions suspicious for papillary carcinomas.

100 cases examined by FNAC 66 were diagnosed as colloid goiter (as shown in figure 1, A), 10 were hyperplastic nodule, 6 were thyroiditis, 10 follicular neoplasm (as shown in figure 2,A), 5 were papillary carcinoma (figure 3,A), and 3 were suspicious of malignancy.

Table 7: Results of diagnosis by FNA

Diagnosis	No	%
Colloid goiter	66	66%
Hyperplastic nodule	10	10%
Thyroiditis	6	6%
Follicular neoplasm	10	10%
Papillary carcinoma	5	5%

Suspicious of malign.	3	3%
Total	100	100%

Of 100 cases examined by histopathology 67 were diagnosed as colloid goiter (figure 1,B), 12 were Grave's disease, 7 were Hashimoto's Thyroiditis, 6 were follicular adenoma (figure 2,B), 3 were follicular carcinoma (figure 2,C), and 5 were papillary carcinoma (figure 3,B).

Table 8: Results of diagnosis by histopathology

Diagnosis	No	%
Multinodular Colloid goiter	67	58%
Grave's disease	12	13%
Hashimoto's Thyroiditis	7	16%
Follicular adenoma	6	6%
Follicular carcinoma	3	3%
Papillary carcinoma	5	4%
Total	100	100%

Of the 66 cases diagnosed as NCG by FNA, 63 were NCG by histopathological examination, 1 was Grave's disease and 2 were Hashimoto's thyroiditis.

Of the 10 cases diagnosed as hyperplastic nodules by FNA, 7 diagnosed as Grave's disease by histopathological examination, 2 were MNG and 1 was follicular adenoma.

Of the 6 cases diagnosed as Thyroiditis by FNA, four were diagnosed as Hashimoto's thyroiditis, 1 was MNG, and 1 was Grave's disease by histopathological examination.

Of the 10 cases diagnosed as follicular neoplasm by FNA, by histopathological examination: 4 were follicular adenoma, 3 were follicular carcinoma, 2 were Grave's disease, and 1 was Hashimoto's thyroiditis.

Of the 5 cases diagnosed as papillary carcinoma by FNA, By histopathological examination: 3 were papillary carcinoma, 1 was MNG, and 1 was Grave's disease.

Of the 3 cases that were suspicious of neoplastic condition by FNA, by histopathological examination: 2 were papillary carcinoma, and 1 was follicular adenoma.

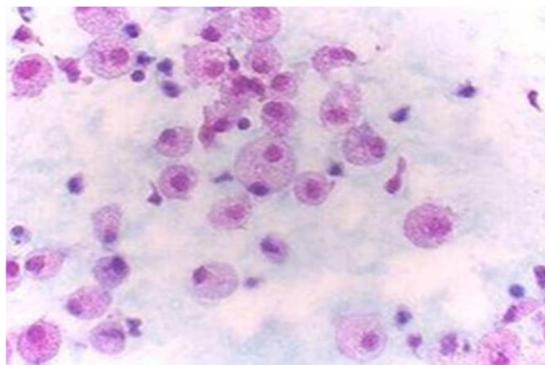
Table 9: Results of FNA compared with biopsy results

Histo/ FNA	MNG	Hyperplastic	Thyroiditis	Folli.neoplasm	Papillary ca.	suspicious	Total
MNG	63	2	1	0	1	0	67
Grave's disease	1	7	1	2	1	0	12

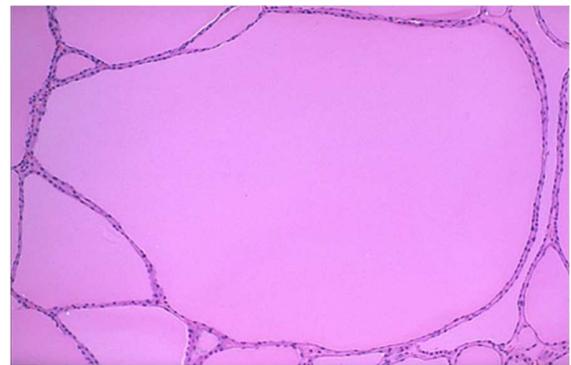
Hash.Thyroiditis	2	0	4	1	0	0	7
Folli. adenoma	0	1	0	4	0	1	6
Follicular ca	0	0	0	3	0		3
Papillary ca.	0	0	0		3	2	5
Total	66	10	6	10	5	3	100

According to our study the number of true negative cases were 81 (Tn), false negative case was 1 (Fn), True positive were 13 (Tp), and false positive were 5 cases (Fp).

Sensitivity or true positive rate is 92%, Specificity or true negative rate is 94%, Positive predictive value is 72%, Negative predictive value is 98%, Accuracy rate is 94%.

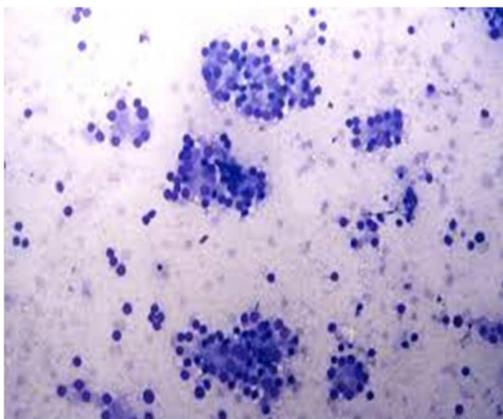


(A)

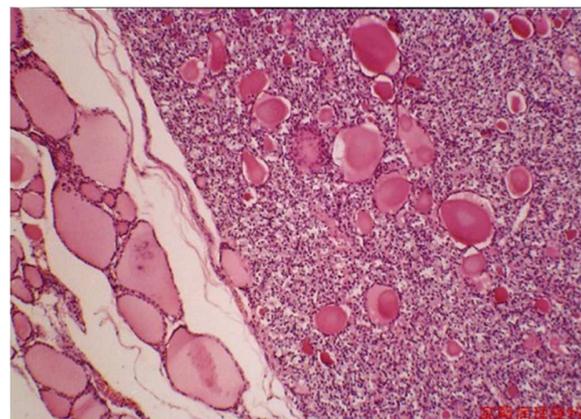


(B)

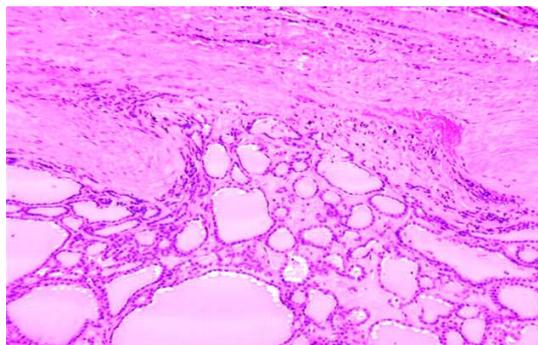
Figure 1: (A)Thyroid nodule FNA revealed cystic degeneration in colloid goiter. (B) thyroidectomy examined histopathologically revealed Multinodular goiter.



(A)

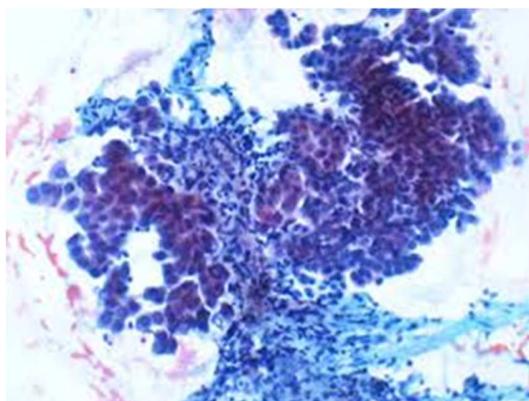


(B)

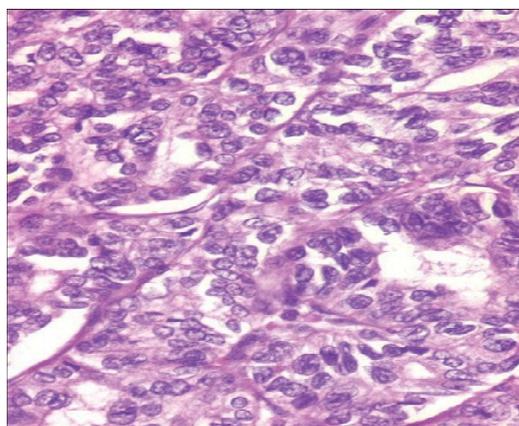


(C)

Figure 2: (A) FNA of solitary thyroid nodule revealed follicular epithelial cells suggestive of follicular neoplasm. (B) section shows follicular adenoma. (C) another section of excised thyroid nodule revealed follicular carcinoma.



(A)



(B)

Figure 3: (A)FNA of thyroid nodule revealed papillary carcinoma. (B) Histopathological examination of excised thyroid nodule revealed papillary carcinoma.

Discussion:

Several methods have been used to obtain groups of cells or tissue from thyroid nodules. The most prevalent method is FNA, which is considered to be the most accurate and cost-effective in the preoperative investigation of thyroid nodules, as it is non invasive method⁽⁸⁾

In our study the mean age of patients was 37yrs with range of 13 – 64 yrs. Most of the patients were in the age group of 40 – 49 yrs, this age range and mean incidence is slightly lower as compared with previous studies, but it is the similar findings of Dorairajan and Jayashree. ^(23,24,25,26)

We found that thyroid diseases are most common in females than males which is similar to the findings of N. Dorairajan and M. Bouvet .^(26,27)

We found that 3% of cases examined by FNA were suspicious for malignancy , others found that approximately 10% of all FNA biopsies are considered indeterminate or suspicious because of overlapping cytological features.^(28,7) In particular, FNA cannot differentiate between follicular adenoma and follicular carcinoma, but after excision these nodules are classified as carcinomas if capsular and/ or vascular invasion are found histologically.

False negative FNA cytology result was found in only one of our patients which is less as compared to other studies where the values range from 1-16%.^(29,30,31) . False negative cases are encountered when there are no recognizable diagnostic cells in the smear because of sampling or processing error. The incidence of false negative in diagnosis of thyroid aspirates may be high and is usually attributable to overlooking of malignancy in favors of follicular adenoma , cystic lesions and Hashimoto's thyroiditis.

False positive result cytology are found in five cases in our study. This finding is consistent with the other reports that cited rate less than 9%.⁽³²⁾ and disagree with the finding of Gulia et al in which the false positive was 0%.⁽³³⁾

False positive diagnosis is the result of misinterpretation of the nature of benign cell than a sampling error. False positive diagnosis are usually encountered in Hashimotos thyroiditis ,follicular /parathyroid / atypical adenoma , colloid nodule.

According to our study, the sensitivity was 92% which is lower than the findings of Ikram et al that had been reported sensitivity and specificity for malignancy as 100% which is higher than our results as they do not have false positive results in their study due to small number of patients.⁽³⁴⁾ Kessler et al , 2005 , reported 79% sensitivity , 98.5% specificity , negative predictive value 76.6% , positive predictive value 98.7% and diagnostic accuracy of 87%. Gupta et al ,2006 , reported 80% sensitivity , 86.6% specificity , 86.6% negative predictive value , positive predictive value of 80% and accuracy of 84%⁽³⁵⁾. Mahar SA et al (2006) reported a sensitivity of 98%,specificity of 70% with positive predictive value of 91%,negative predictive value of 93% and diagnostic accuracy of 91%.⁽³⁶⁾

Conclusion:

FNA is the most recommended diagnostic procedure for the diagnosis of thyroid lesions since it allows the distinction between benign and malignant lesions and helps to design the treatment plans.

A benign FNAC diagnosis should be viewed with caution as false negative results do occur and these patients should be followed up and any clinical suspicion of malignancy even in the presence of benign FNAC requires surgery.

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