

Original Article

# Accuracy Of Fine Needle Aspiration Cytology Of Thyroid Swellings in Comparison of Histopathology : Experience from King Faisal Hospital, Makkah, Kingdom of Saudi Arabia.

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مدى دقة وتوافق الفحص الخلوي بارتشاف الابرة الرفيعة (العينة الخزعية) في تشخيص اورام الغدة الدرقية مقارنة بالفحص النسيجي: خبرة من مستشفى الملك فيصل، مكة المكرمة، المملكة العربية السعودية.

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## الملخص العربي:

**المقدمة:** تعد اورام الغدة الدرقية من الحالات الشائعة التي يتم فحصها بعيادات الجراحة الخارجية وهناك كثير من الفحوصات لتقييم اورام الغدة الدرقية قبل الجراحة ومن اكثرها شيوعا الفحص الخلوي بارتشاف الابرة الرفيعة (العينة الخزعية) والتي تعتبر الفحص الذهبي والمسح المبدئي لتشخيص اورام الغدة الدرقية وذلك لسهولة ورخصه ونتائجه الجيدة والذي اثبتته سلسلة من الدراسات والبحوث

**الهدف:** تهدف هذه الدراسة لمعرفة وتحديد مدى دقة وكفاءة الفحص الخلوي بارتشاف الابرة الرفيعة (العينة الخزعية) في تشخيص اورام الغدة الدرقية مقارنة بالفحص النسيجي  
**الطريقة:** لقد تمت دراسة ملفات ونتائج فحوصات 106 مريض بقسم الجراحة بمستشفى الملك فيصل، مكة المكرمة والذين اجري لهم الفحص الخلوي بارتشاف الابرة الرفيعة (العينة الخزعية) قبل العملية الجراحية لتشخيص اورام الغدة الدرقية ثم تمت مقارنة النتائج بالفحص النسيجي بعد الجراحة لكل المرضى في الفترة من يناير 2007 وديسمبر 2011

**النتائج:** اظهرت نتائج الدراسة ان الفحص الخلوي بارتشاف الابرة الرفيعة (العينة الخزعية) في تشخيص اورام الغدة الدرقية قبل الجراحة بين ان 81 (76.4%) حالة من بين 106 اورام حميدة و 8 (7.5%) اورام سرطانية و 17 حالة (16%) غير محددة بينما الفحص النسيجي اظهر ان 91 حالة (85.8%) اورام حميدة و 15 (14.2%) اورام سرطانية وقد دلت الدراسة على الحساسية العالية للعينة الخزعية لأورام الغدة الحميدة بينما الأورام السرطانية لهذا الفحص تحتاج لدعم وفحوصات أكثر دقة للتأكد.

**الخلاصة:** ان الفحص الخلوي بارتشاف الابرة الرفيعة (العينة الخزعية) في تشخيص اورام الغدة الدرقية عالي الحساسية للأورام الحميدة وغير محدد في كثير من الأورام السرطانية وقد أظهرت هذه الدراسة نسبة حساسية 53.33%، ونسبة الدقة 89.01%، والقيمة التنبؤية الايجابية 44.44% والقيمة التنبؤية السالبة 92.05%

الكلمات الدالة : اورام الغدة الدرقية - الفحص الخلوي بارتشاف الابرة الرفيعة (العينة الخزعية) - فحص النسيج الخلوي.

## ABSTRACT

**Objectives:** The aim of this study was to determine the efficacy and accuracy of FNA cytology in diagnosis of thyroid swellings versus histopathology result in our surgical unit.

**Methods:** Between January 2007 - December 2011. A total of 106 patients who underwent thyroid surgery at King Faisal Hospital, Makkah and who had preoperative FNAC were enrolled in this retrospective study. The preoperative FNAC results were compared with definitive histological diagnosis following thyroid surgery. Fine needle aspiration cytology was performed using aspirate techniques on each thyroid swelling. The cytological sample was assessed by a single centre consultants pathologist and was classified as, non-neoplastic, neoplastic, suspicious or indeterminate. The histology were classified as non-neoplastic (benign), neoplastic (malignant).

**Results:** Out of 106 patients included in this study fine needle aspiration cytology analysis revealed 81(76.4%) non-neoplastic, 8 (7.5%) neoplastic and 17 (16%) suspicious aspirates (indeterminate). Histological analysis showed 91 (85.8%) benign, 15 (14.2%) malignant specimens. Fine needle aspiration cytology had a sensitivity , specificity and accuracy rate of ?%, respectively for diagnosing thyroid malignancy. Our results indicate that FNAC is very useful in the diagnosis of thyroid pathology specially benign conditions. However, complete histopathological analysis is essential to distinguish suspicious conditions.

**Conclusion:** FNAC is safe and cost-effective diagnostic modality in the investigation of thyroid pathology pre-operatively and plays a useful role in planning the surgical management of thyroid nodules and still not decisive for suspicious / undetermined cases. However, results must be interpreted with the clinical picture in mind. The suspicious and indeterminate results prove to be an area of uncertainty often resolved by diagnostic surgical resection and tissue cytology.

**Keywords:** Thyroid swellings; FNA; Accuracy, histopathology

## INTRODUCTION

Thyroid swellings are common clinical findings among patients in surgical outpatient clinic. Have a reported prevalence of 4-8% of the adult population <sup>1,2,3</sup>. Most of the thyroid swellings turned out to be benign and approximately 5-10% are anticipated to be malignant <sup>4</sup>. The problem in clinical practice is to distinguish reliably the few malignant tumours from the many harmless nodules so that a definitive pre-

operative tissue diagnosis of malignancy allows planning of appropriate surgery and relevant patient counseling.

There are several tests, such as high resolution ultrasonography, radioisotope scanning and FNA biopsy have been used for evaluation of thyroid swellings before proceeding to thyroid surgery. Studies have demonstrated that among all these diagnostic modalities, Fine-needle

aspiration cytology (FNAC), as practiced today is an interpretive art with histopathology as its scientific base<sup>1</sup>. The FNAC was first reported by Martin and Ellis in 1930<sup>4</sup>, and then in 1960 Swedish perfected the concept and in 1970s it gained acceptance in the UK and the USA<sup>5,6</sup>. Now, FNAC is practiced worldwide and has become a critical step in the evaluation and screening test for diagnosis of thyroid swellings<sup>6,7</sup>. It is well established out-patient procedure used in the initial diagnosis of thyroid swellings. It

### Objective:

The aim of this study was to determine the efficacy and accuracy of FNAC in diagnosis of thyroid swellings in our surgical department and compare and matching, accuracy, sensitivity, specificity, positive predictive value and negative predictive value of the results in various thyroid swellings in correlation with histologic diagnosis.

### MATERIAL AND METHODS

In this study retrospectively we evaluated 106 FNA performed between January 2007-December 2011, at department of surgery, King Faisal Hospital Makkah, KSA.. FNA were performed on all patients presented with palpable thyroid swellings in the surgical outpatient clinics and subsequently underwent a thyroid surgery and concurrent postoperative histopathologic tissue diagnoses were compared to estimate the accuracy of FNAC. The data was collected from medical records. All FNACs were carried out by consultant pathologist in tertiary hospital laboratory. FNAC and histology specimens were analyzed by a consultant pathologist same centre. FNAC results were classified, *interpreted and analyzed accordingly. The lesions were categorized into benign, suspicious/indeterminate and neoplastic conditions. The cytological findings were*

is simple, cost effective screening test, readily repeated, and quick to perform in the outpatient clinics with excellent patient compliance.

The limitations include false negative results, false positive results and a proportion of FNA results that are not obviously benign or malignant and fall into the indeterminate or suspicious group. Published data showed diagnostic accuracy of FNAC varies between different series.<sup>7,8</sup>

*compared with those of histopathology wherever available. The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of FNAC in diagnosing thyroid swellings was calculated. Statistical analysis was done by using SPSS software.*

### RESULTS

From 2007-2011 a total of 106 aspirates of thyroid swellings with subsequent thyroid surgery were identified, 12 (11.3%) were male and 94 (88.7%) were females. Age of the patients ranged from 22 to 68 years characteristics of the patients were shown in Table 1, cytological and histological results is shown in table 2 for diagnosis of thyroid diseases. The study showed that FNAC most common lesion was benign 81 (76.4%), and 8 (7.5%) cases were malignant and 17 (16 %) were undetermined lesions. In comparison with histopathology of post operative tissue results, the benign lesions were 91 (85.8%), and malignant cases were 15 (14.2%). Among the 106 cases of histopathological results of FNAC correlations were available, the sensitivity, specificity, negative predictive value and positive predictive value in this study as shown sensitivity of 53.33%, specificity of 89.01%, NPV of 92.05%, PPV of 44.44%. Table3. This FNAC results have been compared with the corresponding

| Category                 | FNAC | P.O* |
|--------------------------|------|------|
| Benign                   | 81   | 91   |
| Malignant                | 8    | 15   |
| Suspicious/undeterminate | 7    | 0    |
| Adenomatous goitre       | 2    | 0    |
| Hashimoto's              | 3    | 0    |
| Follicular adenoma       | 2    | 0    |

histological diagnosis including indeterminate FNAC sample with the final results of post operative tissue examination Table2. In our study the final histopathological tissue examination revealed no suspicious/indeterminate cases and all the seven cases of indeterminate of FNAC, which has been reported as adenomatous goiter, hashimoto's and follicular adenoma has been proved in the final histopathology malignant Table2 Table4.

**Table 1 :** Patients characteristics

| Characteristics               | Total patients(n =106) |
|-------------------------------|------------------------|
| <b>Age (in years)</b>         |                        |
| 20-29                         | 9                      |
| 30-39                         | 38                     |
| 40-49                         | 43                     |
| 50-59                         | 14                     |
| > 60                          | 2                      |
| <b>Sex</b>                    |                        |
| Male                          | 12                     |
| Female                        | 94                     |
| <b>Duration of complaints</b> |                        |
| <6 months                     | 7                      |
| 6-24 months                   | 24                     |
| 2-3 years                     | 26                     |
| >3 years                      | 49                     |
| <b>Treatment history</b>      |                        |
| Yes                           | 32                     |
| No                            | 74                     |

**Table-2:**Nature of thyroid swellings in FNAC and histopathology (number of patients n =106 )

| Thyroid lesion | FNAC        | Histopathology |
|----------------|-------------|----------------|
| Begnin         | 81 (76.4 %) | 91 (85.8 %)    |
| Malignant      | 8 (7.5%)    | 15 (14.2 %)    |
| Undetermined   | 7 (6.7%)    | None ( 0 %)    |

**Table-3:** Statistical analysis for FNAC indices results

| Indecis      | FNAC    |
|--------------|---------|
| Sensitivity. | 53.33 % |
| Specificity  | 89.05 % |
| NPV          | 92.05 % |
| PPV          | 44.44%  |

**Table 4:** Benign or suspicious neoplastic lesions diagnosed by FNAC and their comparison with histopathological diagnosis

P.O. = Postoperative histopathology.

## DISCUSSION

Thyroid enlargement, whether diffuse or nodular, leads to a big range of investigations, mainly to rule out the possibility of a neoplasm or toxicity. FNAC is the first line of investigation and other investigations like ultrasonography, thyroid function test, thyroid scan and antibody levels are done subsequently for appropriate management <sup>9</sup>. The sensitivity of thyroid FNAC ranges from 78-92 % and its specificity from 74-99%.<sup>10,11,12</sup>.

In our study the sensitivity was 53.33% and specificity 89.01% . This shows that FNAC is more specific than sensitive in detecting thyroid benign cases . The diagnostic accuracy for cytologic diagnosis for malignant cases was matching and comparable with other studies.<sup>9,13</sup>.

Fine needle aspiration cytology is regarded as the gold standard initial investigation in the diagnosis of thyroid swellings. The technique is safe simple and quick with a low complication

rate. FNAC has been shown to have similar or higher sensitivity and accuracy levels than frozen section examination <sup>14,15</sup>. In our study FNAC has shown lower sensitivity and accuracy levels than post operative tissue diagnosis. There is a group of lesions which overlap benign and malignant features, 17 cases labeled as undetermined in FNAC while in histopathology were clearly distinct. Cytological diagnosis of follicular adenoma versus carcinoma is not possible on FNAC and diagnosis is dependent on histological assessment for capsular/vascular invasion. Another limitation of thyroid FNAC is the large number of inadequate aspirates. Published data suggest inadequate sample ranges between 9-31% <sup>16,17</sup>. In the published data,

the sensitivity, specificity and accuracy of thyroid FNAC in detecting malignancy ranges from 84-86%, 52-86%<sup>18,19</sup>, respectively. In our study sensitivity rate was low compared to others as three out of four (75%) 'indeterminate' FNAC results were later found to have malignancy on histological examination. Our positive and negative predictive values are comparable with published data is higherr than published data<sup>20,21</sup>.

### CONCLUSION

From this study, it can be concluded that FNAC is simple, very useful and readily available tool for evaluating thyroid swellings. It is safe and cost-effective diagnostic modality in the investigation of thyroid pathology pre-operatively and plays a useful role in planning the surgical management of thyroid nodules. However, results must be interpreted with the clinical picture in mind. The suspicious and indeterminate results prove to be an area of uncertainty often resolved by diagnostic surgical resection.

### REFERENCES

1. Oertel YC. "Fine-needle aspiration and the diagnosis of thyroid cancer," Endocrinology and metabolism ; Clinics of North America 1996; 25 ,1: 69-91
2. Ali Rizvi SA, Husain M, Khan S, Mohsin M. A comparative study of fine needle aspiration cytology versus non-aspiration technique in thyroid lesions. Surgeon 2005, 4:273-276.
3. Ylagan LR, Farkas T, Dehner L. Fine needle aspiration of the thyroid: a cytohistologic correlation and study of discrepant cases. Thyroid 2004; 14: 35-41
4. 5. Martin HE, Ellis EB. Biopsy by needle puncture and aspiration. Ann Surg 1930;92:169-81.
5. Lewis CM, Chang KP, Pitman M, Faquin WC, Randolph GW. Thyroid fine needle

aspiration biopsy: variability in reporting . Thyroid 2009; 19: 717-723

6. Wienke JR, Chong WK, Fielding JR, Zou KH, Mittelstaedt CA. Sonographic features of benign thyroid nodules. Interobserver reliability and overlap with malignancy American Institute of Ultrasound in Medicine. J Ultrasound Med 2003;22:1027-31.
7. Stojadinovic A, Peoples GE, Libutti SK, Henry LR, Eberhardt J, Howard RS. Development of a clinical decision model for thyroid nodules. BMC Surg 2009;9:12.
8. Morgan JL, Serpell JW, Cheng MS. Fine-needle aspiration cytology of thyroid nodules: how useful is it? ANZ J Surg 2003;73:480-3.
9. De Micco C, Zoro P, Garcia S et al. Thyroid peroxidase immunodetection as a tool to assist diagnosis of thyroid nodules on fine needle aspiration biopsy. Eur J Endocrinol 1994;131:474-9.
10. Ko HM, Jhu IK, Yang SH et al. Clinicopathologic analysis of fine needle aspiration cytology of the thyroid. A review of 1,613 cases and correlation with histopathologic diagnoses. Acta Cytol 2003;47:727- 32.
11. Bista M, KC Toran, Regmi D, Maharjan M, Kafle P, Shrestha S. Diagnostic accuracy of fine needle aspiration cytology in thyroid swellings. J Nepal Health Res Counc 2011;9:14-6.
12. Guhamallick M, Sengupta S, Bhattacharya NK et al. Cytodiagnosis of thyroid lesions - usefulness and pitfalls: A study of 288 cases. J Cytol 2008;25:6-9.
13. Mahar SA, Husain A, Islam N. Fine needle aspiration cytology of thyroid nodule: Diagnostic accuracy and pitfalls. J Ayub Med Coll Abbottabad 2006;18:26-9.
14. Sclabas GM, Staerkel GA, Shapiro SE, et al. Fine-needle aspiration of the thyroid

and correlation with histopathology in a contemporary series of 240 patients. *Am J Surg* 2003 ; 186: 702-10.

15. Baloch ZW, Sack MJ, Yu GH, Livolsi VA, Gupta PK. Fine needle aspiration of thyroid: an institutional experience. *Thyroid* 1998, 8:565-569.

16. Burch HB, Burman KP, Reed HL, Buckner L, Raber T, Owenbey JL. Fine needle aspiration biopsy of thyroid nodules: determinants of insufficiency rate and malignancy yield at thyroidectomy. *Acta Cyto.* 1996, 40:1176-1183.

17. Gharib H, Goellner JR, Johnson DA. Fine needle aspiration cytology of the thyroid: a 12 year experience with 11000 biopsies. *Clin Lab Med.*1993, 13:699-709.

18. Holleman f, Hoekstra JB, Ruitenberg HM. Evaluation of fine needle aspiration cytology in the diagnosis of thyroid nodules. *Cytopathology.* 1995, 6:175-186.

19. Cap J, Ryska A, Rehorkova P, Hovorkova E, Kerekes Z, Pohnetalova D. Sensitivity and specificity of the fine needle aspiration biopsy of the thyroid: clinical point of view. *Clinical endocrinology* 1999, 51:509-515.

20. SahinM, Sengul A, Berki Z, Tutuncu NB, Guvener ND. Ultrasound-guided fine-needle aspiration biopsy and ultrasonographic features of infracentimetric nodules in patients with nodular goiter: correlation with pathological findings. *Endocr Pathol*2006;17:67–74. CrossRefMedline

21. CaiXJ, Valiyaparambath N, Nixon P, Waghorn A, Giles T, Helliwell T. Ultrasound-guided fine needle aspiration cytology in the diagnosis and management of thyroid nodules. *Cytopathology*2006;17: 251–256. CrossRefMedline