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# Cytopathological study of thyroid lesions and its correlation with histopathology in a tertiary care centre of Gujarat – A retrospective study

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ABSTRACT

**Background:** Thyroid gland is one the important organs, which play a wide and vital physiological role in the body. Thyroid diseases are quite common. The incidence of thyroid diseases depends mainly depending upon iron deficiency status. Fine-needle aspiration cytology (FNAC) plays a vital role in evaluating patients with thyroid nodules. Surgical excision and histopathological evaluation are crucial to establish the diagnosis.

**Aims and Objectives:** This study mainly aims to classify the cytomorphology of palpable thyroid lesions by FNAC and correlate the results with histopathology. This study also aims to determine the spectrum of histopathological diagnosis in thyroid surgeries.

**Materials and Methods:** The present study was carried out at cytopathology and histopathology section of pathology department of GMERS Medical College, Valsad. In present study, we analysed 276 cases of palpable thyroid nodule underwent FNAC. Out of them 152 cases underwent surgical procedure like lobectomy or partial or total thyroidectomy

**Results:** Out of these 276 patient, females were 218 and males were 58 with F:M ratio of 3.76:1. Out of total 276 patients, 81 (29.3%) were between 31-40 years followed by 75 (27.2%) were between 21-30 years and 237 (85.9%) were fall into category-II. Out of these 152 patients, 88 (57.9%) having colloid goitre and 79 (89.7%) were confirmed histologically.

**Conclusion:** FNAC is an invaluable tool in management of thyroid lesions. It is a safe, simple and cost effective procedure and can be performed on outdoor patients. If the cytology report is malignant, surgery is the recommended procedure; for suspicious lesions, repeat aspiration is required and for benign lesions no further immediate diagnostic studies are required.



## 1. Introduction

Thyroid gland is one the important organs, which play a wide and vital physiological role in the body. The thyroid hormones affect all body organs and are responsible for maintenance of homeostasis and the body integrity.[1] Thyroid diseases are quite common. The incidence of thyroid diseases depends mainly depending upon iron deficiency status.[2] Thyroid nodules are a common clinical findings ranging from 4-7% of the population.[3,4] Thyroid lesions may be developmental, inflammatory, hyperplastic and neoplastic. Diseases of thyroid gland comprise from localised nodule to causing systemic disease including a tumour mass.[5]

The vast majority of thyroid nodules are non-neoplastic lesions and only <5% are malignant.[6] Thyroid cancer is relatively a rare malignancy – representing only 1.5% of all cancer, but it is the commonest endocrine cancer accounting for 92% of all endocrine malignancies. Papillary carcinoma is the most common thyroid cancer followed by follicular, medullary, anaplastic carcinoma and lymphoma.[7]

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Fine-needle aspiration cytology (FNAC) plays a vital role in evaluating patients with thyroid nodules. Thyroid cytology not only provides a definite diagnosis of malignancy but also the tumour type. Thyroid FNAC helps in reducing the rate of surgery for benign thyroid diseases. [8,9]

Mostly thyroid diseases present clinically as conditions associated with hyperthyroidism/hypothyroidism or as a mass lesions. Surgical excision and histopathological evaluation are crucial to establish the diagnosis in later scenario. [10]

## 2. Aims and Objectives

This study mainly aims to classify the cytomorphology of palpable thyroid lesions by FNAC as per The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) [11] and correlate the results with histopathology. This study also aims to determine the spectrum of histopathological diagnosis in thyroid surgeries.

## 3. Materials and Methods

### *3.1. Study design*

The present study was carried out at cytopathology and histopathology section of pathology department of GMERS Medical College, Valsad, a tertiary care centre in Gujarat, India during the period of April 2017 to December 2019. Approval has been taken from the institutional ethical committee.

### *3.2. Type of study*

Retrospective

### *3.3. Data collection procedure*

In present study, we analysed 276 cases of palpable thyroid nodule underwent FNAC. Out of them 152 cases underwent surgical procedure like lobectomy or partial or total thyroidectomy from ENT and General Surgery department.

### *3.4. Inclusion criteria*

All patients attending ENT or General Surgery OPD with palpable thyroid nodule and underwent surgical procedure like lobectomy or partial or total thyroidectomy were included in this study.

### *3.5. Exclusion criteria*

All patients attending ENT or General Surgery OPD with palpable thyroid nodule and put on conservative therapy and known cases of malignancy were excluded from the study.

All relevant demographic data as well as clinical and radiological details were collected from patients. FNAC was done in cytopathology section of central clinical laboratory or in respective ward in which the patient was admitted. The FNAC procedure was carried out using 20ml disposable syringe with 23 gauze needle attached to Franzen's aspiration handle. [12] Multiple wet smears were prepared from obtained material.Few smears were fixed in 95% ethyl alcohol and others were air dried and routinely stained with Papanicalaou (PAP) / Haemotoxylin and Eosin (H&E) stains. Findings of FNAC were recorded.

Each 10% neutral formalin fixed specimens received surgical specimen in Histopathology Section were examined grossly for its size, shape, weight, consistency and appearance. Tissue cut surface was also examined for the presence of hemorrhage, necrosis and cystic spaces etc. Presence or absence of any gross involvement of adjacent structure along with depth of the tumor was also noted. All these specimens were dissected by grossing followed by fixation, dehydration, clearing and impregnation in a automatic tissue processor. Paraffin blocks were made and sections were cut at 3 to 5 micron thickness and haematoxylin and eosin stain was done. The findings were noted and interpreted according to the WHO classification-2014 fourth edition. [13]

## 4. Results

All cytological results were categorised as per 2007 Bethesda System Classification into I-nondiagnostic or unsatisfactory, II-benign, III-Atypia of Undertermined significance (AUS), IV-Follicular neoplasm or suspicious for it, V-Suspicious for malignancy and VI-Malignant category. Aspirates yielding insufficient or low cellularity or with poor quality were considered "unsatisfactory". For thyroid FNAC specimen to be labelled as satisfactory for evaluation having at least 6 groups of benign follicular cells and each group having at least 10 cells. Aspirates classified as benign include colloid goitre, colloid nodule, hashimoto's thyroiditis, subacute thyroiditis, and thyroglossal duct cyst. Suspicious smears include follicular neoplasm, adenomatous nodule, hurthle cell proliferation and suspicious for malignancy.

The present study consist of total 276 patients having thyroid lesions. The age range were from 7 years to 72 years with mean age of 33.2 years. Out of these 276 patient, females were 218 and males were 58 with F:M ratio of 3.76:1.

Out of total 276 patients, 81 (29.3%) were between 31-40 years followed by 75 (27.2%) were between 21-30 years, 51 (18.5%) were between 41-50 years, 30 (10.9%) were between 11-20 years, 27 (9.9%) were between 51-60 years.

Out of total 276 patients, 237 (85.9%) were fall into category-II followed by 11 (4.0%) were fall into category-III, 9 (3.2%) were fall into category-IV.

Table 2 Shows cytopathological and histopathological correlation of Thyroid lesions. Out of 276 patients, only 152

**Table 1:** Age and sex wise distribution of casesas per different subtypes of Bethesda Classification

| | Cytological Category as per Bethesda System | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age Group (Years) | I | | II | | III | | IV | | V | | VI | | Total | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| <11 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| 11-20 | 0 | 0 | 2 | 26 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 28 |
| 21-30 | 0 | 0 | 25 | 43 | 0 | 3 | 1 | 1 | 0 | 1 | 0 | 1 | 26 | 49 |
| 31-40 | 0 | 1 | 14 | 57 | 2 | 2 | 0 | 3 | 0 | 2 | 0 | 0 | 16 | 65 |
| 41-50 | 0 | 1 | 5 | 38 | 0 | 1 | 0 | 3 | 1 | 1 | 0 | 1 | 6 | 45 |
| 51-60 | 1 | 2 | 1 | 19 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 4 | 23 |
| >60 | 1 | 1 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 4 | 5 |
| Total | 2 | 5 | 49 | 188 | 3 | 8 | 1 | 8 | 1 | 5 | 2 | 4 | 58 | 218 |
| | 7 | | 237 | | 11 | | 9 | | 6 | | 6 | | 276 | |
| % | 2.5 | | 85.9 | | 4.0 | | 3.2 | | 2.2 | | 2.2 | | 100 | |

**Table 2:** Cytopathological and Histopathological correlation of Thyroid lesions

| **Cytological Diagnosis** | **Histopathological Diagnosis** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Thyroglossal Cyst** | **Colloid Goitre** | **Adenomatous Goitre** | **Thyroiditis** | **Follicular Adenoma** | **Follicular Carcinoma** | **Hurthle cell Adenoma** | **Papillary Carcinoma** | **Medullar Carcinoma** | **Anaplastic Carci noma** | **Total (%)** |
| Non-Diagnostic | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 4 (2.6) |
| Thyroglossal Cyst | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 (3.3) |
| Colloid Goitre | 3 | 79 | 2 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 88 (57.9) |
| Adenomatous Goitre | 0 | 1 | 6 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 8 (5.2) |
| Thyroiditis | 0 | 2 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 18 (11.8) |
| Suspicious of Malignancy | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 4 | 0 | 3 | 9 (5.9) |
| Follicular Neoplasm | 0 | 0 | 0 | 0 | 7 | 4 | 0 | 0 | 0 | 0 | 11 (7.2) |
| Hurthle cell Neoplasm | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 3 (2.0) |
| Papillary Carcinoma | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 3 (2.0) |
| Medullary Carcinoma | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 (0.6) |
| Anaplastic Carcinoma | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 (1.2) |
| Total (%) | 8 (5.3) | 86 (56.6) | 8 (5.3) | 17 (11.2) | 11 (7.2) | 5 (3.3) | 2 (1.2) | 9 (5.9) | 1 (0.6) | 5 (3.3) | 152 |

were undergone surgical procedure like lobectomy, partial or complete thyroidectomy were subject to histopathology diagnosis. This biopsy report was correlated with pre-operative cytology report. Out of these 152 patients, 88(57.9%) having colloid goitre and 79(89.7%) were confirmed histologically followed by 18 (11.8%) having thyroiditis and 16(88.9%) were confirmed histologically, 11(7.2%) having follicular neoplasm and 7(63.6%) were confirmed as follicular adenoma and 4(36.4%) were confirmed as follicular carcinoma histologically, 9(5.9%) having suspicious of malignancy and 8(88.9%) were confirmed histologically as malignant. Out of these 152 patients, 6 patients were cytologically diagnosed malignant and same result found on histopathology.

## 5. Discussion

Both the neoplastic and non-neoplastic diseases of thyroid are common all over the world with varying frequency

**Table 3:** Comparison of results of present study with previous study.

| Study | Year | Sensitivity | Specificity | Accuracy |
|---|---|---|---|---|
| Uma H[14] | 2008 | 97.0 | 100.0 | 98.5 |
| Bukhari MH[15] | 2008 | 90.0 | 87.5 | 87.0 |
| Gupta M[8] | 2010 | 80.0 | 86.6 | 84 |
| Prakash HM[16] | 2011 | 66.7 | 98.4 | 95.7 |
| Sengupta A[17] | 2011 | 90.0 | 100.0 | 98.9 |
| Esmaili HA[18] | 2012 | 91.6 | 100.0 | 97.0 |
| Agrawal R et al[6] | 2015 | 96.7 | 100.0 | 97.0 |
| Present Study | 2020 | 94.2 | 100.0 | 98.5 |

and incidence depending upon iron deficiency status.[2] In India about 42 million people suffer from thyroid disease.[19] Diseases of thyroid are of great importance as most can be controlled by medical or surgical management.[20] Now-a-days thyroidectomy has become a routine procedure as a result of safe anaesthesia, antiseptics, fine surgical instruments, development of new techniques and is offering a chance of cure in many patients.[21]

Thyroid FNAC was initially started by Martin and Ellis in 1930. The terminology used for reporting thyroid FNAC has shown significant inter laboratory variation and creating confusion. In 2007, TBSRTC was evolved with the aim of forming a uniformity in the reporting of thyroid FNAC that would facilitate coreltion between cytopathology and histopathology.[11]

Palpable thyroid nodules are present in approximately 4-7% of adults.[3,4] and are more common in females with a F:M ration of 4.2:1.[8,9] In present study also there was a female predominance. Thyroid carcinoma accounts for less than 1% of all carcinomas and responsible for 0.5% of all cancer related death.[22] Early diagnosis of such cases is thus important for aiming at higher life expectancy. Majority of the clinically diagnosed palpable thyroid nodules are non-neoplastic.[8,9,11]

Every thyroid FNAC must be evaluated for adequacy of smears. Smears that are inadequate for reporting are categorised as non-diagnostic (ND) or unsatisfactory (UNS). Cyst fluid only (CFO) cases are considered to be a subset of ND/UNS. Specimen containing large amount of colloid is considered adequate and benign even if 6 groups of follicular cells are not identified in the smear. The risk of malignancy reported in ND/UNS category ranges from 1% to 5.5%.[18,23–25] Ultrasound guided repeat aspiration is recommended in such cases. However some nodule remain persistently ND/UNS even on repeat aspiration should be subjected to surgical excision.[24,26,27] Non-diagnostic or insufficient samples are common in nodules that are calcified, sclerotic or undergone major cystic degeneration. As per review of literature, the rate of ND/UNS ranges between 16%-20%.[18,27–29] In present study the rate of non-diagnostic test was 2.6%.

Some thyroid smears cannot be classified into benign, suspicious or malignant caategories and are reported as atypia of undetermined significance (AUS). This category includes lesions that shows morphological abnormalities of follicular cells with or without presence of nuclear atypia.

For follicular carcinoma, FNAC is considered as a screening test and these smears are reported as follicular neoplasm. To label it as a follicular carcinoma, histopathology must show vascular and/or capsular invasion. Follicular leions are categorized histopathologically as benign by some authors, while others categorize as malignant.[18,28,29]

As in the available literature, the benign lesions represented the majority of the cases. In present study, benign lesions constituted 237 (85.9%) cases. This is in accordance with previous studies. The lesions included in benign categories were thyroglossal cyst, colloid goitre, adenomatous goitre, hashimoto's thyroiditis and granulomatous thyroiditis. Cytologically all benign nodules need not be subjected to histopathology evaluation.

In the present study, sensitivity for cytological diagnosis of neoplasia was 94.2%, specificity 100% and diagnostic accuracy of 98.5%, thus showing a good positive correlation with histopathology. Our results were also comparable with the previous published data where FNAC of thyroid is reported to have sensitivity ranging from 40% to 100% and specificity ranging from 45% to 100%.[4,15]

Every diagnostic procedure has its own limitations. It includes the presence of false negative results (FNR) and false positive results (FPR) particularly in small tumours and simultaneously inflammatory aetiology. FNR usually occur following sampling errors, co-existance of benign and malignant lesions or due to overlap between benign and low grade malignant tumours. FNR can be minimised by clinical follow-up or repeat aspiration to obtain adequate aspirates. FPR are less common and were not found in any patient in our study.

No any single diagnostic method provides definite diagnosis of thyroid cancer. However FNAC is still procedure of choice, particularly if ultrasound is used as an ancillary technique for better sample collection.[27] The interpretation error can be reduced by obtaining aspirated from different sites of lesion, using ultrasound guided FNA, advanced imagimg technique, immunological analysis, electron microscopy and reviewing of slides by more than

one cytopathologists. Both cytopathologists should not be aware of each other's diagnosis thus providing a blinded method of quality control.

## 6. Conclusion

In thyroid lesions, FNAC is an invaluable tool in management of thyroid lesions with high degree of accuracy. It is a safe, simple and cost effective procedure with absence of major complications and can be performed on outdoor patients also. FNAC provides more rapid and accurate diagnosis of thyroid lesions than any other combination of clinical laboratory tests. FNAC exhibits an adequate diagnostic correlation with final histopathological examination and enables a comparison of results between different institute. If the cytology report is malignant, surgery is the recommended procedure; for suspicious lesions, repeat aspiration is required and for benign lesions no further immediate diagnostic studies are required.

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## 8. Importance of this study

This is important to know the diagnostic accuracy of FNAC and comparison with histopathology along with role of ultrasound and other imaging techniques.

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## 10. Conflicts of Interest

There are no conflicts of interest.

## References

1. Mousavi SJ, Mikaili P, Mehdioghli R. Demographic and histopathological study of thyroidopathies led to thyroid surgeries in Urmia Imam Hospital, Northwestern Iran. *Ann Biol Res*. 2011;2(5):38–43.
2. Vanderpump MP. The epidemiology of thyroid disease. *Br Med Bull*. 2011;99(1):39–51. doi:10.1093/bmb/ldr030.
3. Gita J, Orell SR, Sterrett GF. Fine needle aspiration cytology. In: 5th edn.. vol. 2012. Philadelphia: Churchil Livingstone;. p. 118–55.
4. Gharib H. Fine-Needle Aspiration Biopsy of the Thyroid: An Appraisal. *Ann Intern Med* . 1993;118(4):282–9. doi:10.7326/0003-4819-118-4-199302150-00007.
5. Ananthakrishnan N, Rao KM, Narasimhans R, Smilet SV, Jagadish S. The Single Thyroid Nodule: A South Indian Profile of 503 Patients with Special Reference to Incidence of Malignancy. *Indian J Surg*. 1993;55(10):487–92.
6. Agrawal R, Saxena M, Kumar P. A Study of Fine Needle Aspiration Cytology of Thyroid Lesions with Histopathological Correlation. *Indian J Pathol Oncol* . 2015;2(4):277–83. doi:10.5958/2394-6792.2015.00028.9.
7. Sushel C, Khanzada TW, Zulfikar I, Samad A. Histopathological pattern of Diagnosis in patients undergoing thyroid operations. *Rawal Med J*. 2009;34:14–6.
8. Gupta M, Gupta S, Gupta VB. Correlation of fine needle aspiration cytology with histopathology in the diagnosis of solitary thyroid nodule. *J Thyroid Res*. 2010;10:1–5.
9. Chandanwale S, Singh N, Kumar H, Pradhan P, Gore C, Rajpal M, et al. Clinicopathological correlation of thyroid nodule. *Int J Pharm Biomed Sci*. 2012;3(3):97–102.
10. Beigh A, Amin J, Junaid S, Wani LA, Farooq S, Farooq S, et al. Histopathological Study of Thyroid Neoplastic Lesions in a Tertiary Care Hospital - A 5 Year Study. *Int J Contemp Med Res*. 2018;5(4):4–7. doi:10.21276/ijcmr.2018.5.4.10.
11. Cibas ES, Ali SZ. The Bethesda System for Reporting Thyroid Cytopathology. *Am J Clin Pathol* . 2009;132(5):658–65. doi:10.1309/ajcpphlwmi3jv4la.
12. Firat P, Ersoz C, Uguz A, Önder S. Cystic lesions of the head and neck: cytohistological correlation in 63 cases. *Cytopathology*. 2007;18(3):184–90. doi:10.1111/j.1365-2303.2006.00400.x.
13. Gupta A, Jaipal D, Kulhari S, Gupta N. Histopathological study of thyroid lesions and correlation with ultrasonography and thyroid profile in western zone of Rajasthan, India. *Int J Res Med Sci*. 2016;4(4):1204–8. doi:10.18203/2320-6012.ijrms20160810.
14. Silverman JF, West RL, Larkin EW, Park HK, Finley JL, Swanson MS, et al. The role of fine-needle aspiration biopsy in the rapid diagnosis and management of thyroid neoplasm. *Cancer*. 1986;57(6):1164–70. doi:10.1002/1097-0142(19860315)57:6<1164::aid-cncr2820570617>3.0.co;2-s.
15. Bukhari MH, Niazi S, Hanif G, Qureshi SS, Munir M, Hasan M, et al. An updated audit of fine needle aspiration cytology procedure of solitary thyroid nodule. *Diagn Cytopathol* . 2008;36(2):104–12. doi:10.1002/dc.20731.
16. Praksh HM, Jyothi BL, Shankar SH, Kishanprasad HL, Ramswamy AS, Aravinda P, et al. Aspiration biopsy cytology of solitary thyroid nodule. *NJBMS*. 2011;1(3):150–3.
17. Pal R, Kar S, Zaman FA, Sengupta S, Pal S, Sengupta A, et al. Fine needle aspiration cytology as the primary diagnostic tool in thyroid enlargement. *J Net Sci Biol Med* . 2011;2(1):113–8. doi:10.4103/0976-9668.82308.
18. Esmaili HA, Taghipour H. Fine-Needle Aspiration in the Diagnosis of Thyroid Diseases: An Appraisal in Our Institution. *ISRN Pathology*. 2012;doi:10.5402/2012/912728.
19. Gopalakrishnan A, Unnikrishnan, Usha V. Thyroid disorders in India: An epidemiological perspective. *Indian J Endocrinol Metab*. 2011;15:78–81.
20. Mackenzie EJ, Mortimer RH. Thyroid nodules and thyroid cancer. *Med J Aust*. 2004;180(5):242–7. doi:10.5694/j.1326-5377.2004.tb05894.x.
21. Bouq Y, Fazili FM, Gaffar HA. A current pattern of surgically treated thyroid diseases in Medinah region of Soudi Arabia. *JK-Practitioner*. 2006;13:9–14.
22. Roman SA. Endocrine tumours: Evaluation of the thyroid nodule. *Curr Opin Oncol*. 2003;15:66–70.
23. Ravetto C, Colombo L, Dottorini ME. Usefulness of fine needle aspiration in the diagnosis of thyroid carcinoma: A retrospective study in 37,895 patients. *Cancer*. 2000;90:357–63.
24. Renshaw AA. Focal Features of Papillary Carcinoma of the Thyroid in Fine-Needle Aspiration Material Are Strongly Associated With Papillary Carcinoma at Resection. *Am J Clin Pathol*. 2002;118(2):208–10. doi:10.1309/qdld-fty3-m8ed-cx6u.
25. Yang J, Schnadig V, Logrono R, Wasserman PG. Fine-needle aspiration of thyroid nodules: A study of 4703 patients with histologic and clinical correlations. *Cancer*. 2007;111(5):306–15. doi:10.1002/cncr.22955.
26. Yassa L, Cibas ES, Benson CB, Frates MC, Doubilet PM, Gawande AA, et al. Long-term assessment of a multidisciplinary approach to

thyroid nodule diagnostic evaluation. *Cancer*. 2007;111(6):508–16. doi:10.1002/cncr.23116.
27. Amrikachi M, Ramzy I, Rubenfeld S, Wheeler TM. Accuracy of fine needle aspiration of thyroid: a review of 6226 cases and correlation with surgical and clinical outcome. *Arch Pathol Lab Med*. 2001;125:484–8.
28. Pandey P, Mahajan NC, Dixit A. Fine-needle aspiration of the thyroid: A cytohistologic correlation with critical evaluation of discordant cases. *Thyroid Res Pract*. 2012;9(2):32–9. doi:10.4103/0973-0354.96026.
29. Bagga PK, Mahajan NC. Fine needle aspiration cytology of thyroid swellings: How useful and accurate is it? *Indian J Cancer*. 2010;47(4):437–42. doi:10.4103/0019-509x.73564.

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