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Original Research Article

Evaluation of thyroid lesions by FNAC among youth and children: A hospital based observational study

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Abstract

Introduction: Thyroid lesions are rare in children and youth. Compared to adults, they show high malignancy rate. Peak incidence is between 20 to 24 years of age.

Objectives: To evaluate the utility of Fine Needle Aspiration Cytology (FNAC) of thyroid lesions in children and youth by "The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC)".

Materials and Methods: A prospective study was conducted over a period of 18 months. FNAC was performed on 106 children and youth of 1 year to 24 years age and classified according to TBSRTC.

Results: Median age was 18.9 years. Majority (57.5%) were females in 20 years to 24 years age group. Out of 106 patients, 4.7%, 85.8%, 4.7%, 1.9%, 0.9% and 2% were distributed among diagnostic categories I, II, III, IV, V and VI of TBSRTC respectively. Six (5.6%) patients underwent surgery and histopathological study was done. The sensitivity, specificity and accuracy rates were 100%, 97.8% and 98% respectively.

Conclusion: TBSRTC for FNAC of thyroid is a definitive diagnostic test to triage patients on the requirement of surgery and to differentiate malignant from non-malignant lesions in children and youth.

Key words

Thyroid lesions, FNAC, Children, Youth, TBSRTC.

Introduction

Thyroid gland is a major endocrine gland situated in front of the neck and has the largest store of hormones among all endocrine organs and has the capacity to adapt too many physiological stimuli like stress, puberty,

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pregnancy etc. It is prone to develop many pathological lesions at a younger age in addition to the lesions due to inflammatory and neoplastic processes [1]. Compared to adults, the thyroid lesions in children and youth are less frequent but more malignant which ranges from 5% to 33% of all thyroid nodules in various studies conducted on children and youth as against the reported incidence of less than 1% in adults and elderly individuals [2].

The Child Labour (Prohibition and Regulation) Act, 1986 of India, defined "Children" as the individuals below the age of 14 years. World Health Organization defined "Youth" as individuals between 15 years to 24 years age group [3].

Fine Needle Aspiration Cytology (FNAC) is one of the best methods of all available modalities in evaluating thyroid lesions in children and youth. It is safe, inexpensive, easily performed with minimal patient discomfort with similar results as in adults.

Thyroid FNAC was first described by Greig and Grey in 1904 and was first applied to tumor diagnosis in 1930 by Martin. The Bethesda System for Reporting Thyroid Cytopathology (TBSRTC) was published in January 2010 by the National Cancer Institute, Bethesda, Maryland, USA. It was created to unify the terminology for results of FNAC to facilitate a better and more effective communication among the pathologists, endocrinologists, radiologists, surgeons and other health care providers in terms of better cyto-histopatholgical correlation, epidemiology, molecular biology and diagnosis of thyroid disease. FNAC has high diagnostic accuracy of 90% to 100%, false positive rates of <1% and false negative rates of 1% to 11%. Hence, TBSRTC is widely practiced in recent years to overcome ambiguities in reporting FNAC of thyroid lesions.

TBSRTC is organized in six diagnostic categories from Bethesda I to VI as given below.

Recommended diagnostic categories in TBSRTC [4]

I. **Non diagnostic or unsatisfactory**
- Cyst fluid only
- Virtually acellular specimen
- Other (obscuring blood, clotting artifact, etc.

II. **Benign**
- Consistent with benign follicular nodule (includes adenomatoid nodule, colloid nodule, etc.)
- Consistent with lymphocytic (Hashimoto's) thyroiditis in proper clinical context
- Consistent with granulomatous (subacute) thyroiditis
- Other

III. **Atypia of undetermined significance or follicular lesion of undetermined significance (AFLUS)**

IV. **Follicular neoplasm or suspicious for follicular neoplasm specify if Hurthle cell type (FN or SFN)**

V. **Suspicious for malignancy (SM)**
- Suspicious for papillary carcinoma
- Suspicious for medullary carcinoma
- Suspicious for metastatic carcinoma
- Suspicious for lymphoma
- Other

VI. **Malignant**
- Papillary thyroid carcinoma
- Poorly differentiated carcinoma
- Medullary thyroid carcinoma
- Undifferentiated (anaplastic) thyroid carcinoma
- Squamous cell carcinoma
- Carcinoma with mixed features

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- Metastatic carcinoma
- Non Hodgkin lymphoma
- Other

This classification establishes correlation between the cytology of FNA contents and the different thyroid diseases, mainly in terms of malignancy associated risk [5].

In this context, the present study was conducted and analysis of the cytomorphology of thyroid lesions in children and youth was done.

Objective

The present study was undertaken to evaluate utility of thyroid FNAC in children and youth using TBSRTC, to evaluate the distribution of various thyroid lesions among children and youth and to correlate the results of FNAC with histopathological findings in patients where ever surgery was performed.

Material and methods

The present study was a prospective study under taken in the Department of Pathology, Mandya Institute of Medical Sciences, Mandya, for 18 months duration from January 2013 to June 2014. Patients with thyroid swelling having clinical indication for FNAC were examined and after taking consent, they were subjected to FNAC in the Department of Pathology. Histopathological correlation was done on thyroid surgery specimen received from the Department of Surgery at Mandya Institute of Medical Sciences, Mandya. In this study, total 106 patients that were referred for FNAC study were included.

Inclusion criteria

- All subjects between the age group of 1 year to 24 years presenting with thyroid lesions that were referred for thyroid FNA by the treating physician.

Exclusion criteria

- Subjects with recurrence after treatment of primary thyroid malignancy.
- Subjects having bleeding diathesis.
- Subjects below the age group of one year and above the age group of 24 years.
- Subjects less than 24 years who are pregnant.
- Subjects with serious illness.

Procedure

Consent was taken from all the patients who were more than or equal to 18 years of age and consent from both patients and their parents where the age was less than 18 years. All the patients were examined clinically in detail according to the prescribed proforma and were given an explanation on the FNAC procedure in their own language. The thyroid gland was palpated to select a site for FNAC. The patients were put in supine lying down position with neck extended by placing a pillow below the shoulder to make the thyroid gland lesion more prominent. Patients were instructed not to swallow during the procedure. Under aseptic precautions, a sterile 23 gauge needle attached to 10 cc syringe was inserted into the lesion. Negative pressure was applied wherever required by pulling the plunger of the syringe and multiple passes were done quickly and gently at different angles from the point of entry. After releasing the negative pressure, needle was withdrawn immediately and material appeared at hub of the needle. Non aspiration technique was applied where ever aspiration was not required. The needle was then attached to an air-filled syringe, and material deposited and smeared were prepared using clean glass slides. Half of the smears were wet fixed in 70% ethyl alcohol and stained with Haematoxylin and Eosin, and the remaining half of the smears were air dried and stained with

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MGG stain before studying under light microscope. Where ever fluid was aspirated, the fluid was centrifuged and smears were prepared from sediment and stained as described above.

Where ever surgery was done, the specimen was fixed in 10% formalin for 24 hours. The tissue was then processed, embedded in paraffin. Haematoxylin and Eosin stained sections were studied under light microscope. Cytological diagnosis was correlated with the histopathology.

The efficacy of FNAC was estimated by using the following methodology.

Statistical analysis

- Data was collected in tables and expressed as rates, ratios and percentages.
- TBSRTC system was used to evaluate the distribution of various thyroid lesions among children and youth.
- The correlation of FNAC diagnosis with Histopathological finding was analyzed by calculating sensitivity, specificity, positive predictive value and negative predictive value as below.
  - Sensitivity = TP/(TP+FN)x100
  - Specificity = TN/(FP+TN)x100
  - Positive predictive value = TP/(TP+FP)x100
  - Negative predictive value = TN/(FN+TN)x100
  - Efficacy = (TP+TN)/(TP+FP+FN+TN)x100
    (TP = True Positive, TN = True Negative, FP = False Positive, FN = False Negative)

Results

During this prospective study, a total number of 387 thyroid lesions of patients of all age group were subjected to FNAC procedure in the Pathology Department. There were 106 (28.9%) patients in the age group of 1 year to 24 years. Out of 106 patients, 15 (14.15%) were children and 91 (85.85%) were youth with Male to Female ratio was 1.0: 10.8. Patient's age in this study ranged from 7 years to 24 years. The majority (57.5%) of thyroid lesions were seen in the age group between 20 to 24 years, followed by the age group between 15 to 19 years (28.3%). The youngest age in our study was 7 years. The incidence of thyroid lesions was increasing with the age. The Mean age of distribution is 18.5±1.5 years. The present study had shown that the majority (14.2%) of the patients were diagnosed at the age of 20 years, followed by 21 years (13.3%), 24 years (12.3%) and 22 years (11.3%). No patients were diagnosed from 1 year to 6 years and from 8 year to 9 years. The study showed that 85.85% thyroid lesions were seen in youths and 14.15% were seen in children.

The most common presenting complaint was painless swelling in front of the neck which was seen in all 106 patients. Out of 106 patients, 10 patients presented with difficulty in swallowing, 30 patients presented with palpitation and anxiety, 6 patients presented with difficulty in breathing and 1 patient presented with hoarseness of voice. Clinically, 82 patients were in euthyroid state, 18 patients were in hypothyroid state and 6 patients were in hyperthyroid state.

The present study had shown that benign lesions constituted 85.8%, AUS/AFUS 4.7%, Non diagnostic/Not satisfactory 4.7%, Malignancy 2%, SFN 1.9% and suspicious for malignancy 0.9% as per **Graph - 1**. Among benign conditions, goitre constituted the most common lesion (n=49), followed by Lymphocytic/Hashimoto's thyroiditis (n=42). Five patients were in Atypia category, out of which 3 were in AUS category

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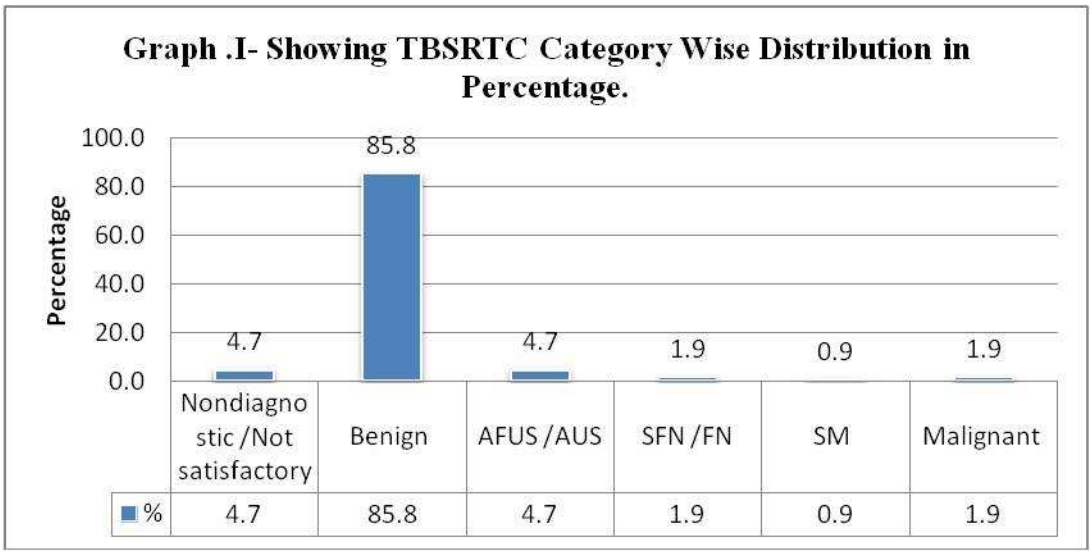
and 2 were AFUS category. In malignant category, 2 out of 2 were papillary carcinoma.

Graph – 1: TBSRTC category wise distribution in percentage.



The male to female ratio of frequency distribution of lesions are 0: 5, 1: 10.5, 0: 5, 0: 2, 0: 1 and 1: 1 in Non-Diagnostic, Benign, AUS/FLUS, and SFN/FN, SM and Malignant categories respectively. The study showed that in all diagnostic categories majority of the lesions were seen in females. In malignant category, the distribution is equal in both sexes. The children to youth ratio of frequency distribution of lesions are 0:5, 1:5.5, 1:4, 0:2, 0:1 and 0:2 in Non-Diagnostic, Benign, AUS/FLUS, SFN/FN, SM and Malignant categories respectively. The study showed that in all diagnostic categories, majority of lesions were seen in the youth.

The sensitivity, specificity and diagnostic accuracy were calculated. FNA specimens interpreted as DC II were considered to be true negative samples, and categories DC IV, DC V and DC VI were considered to be true-positive samples because they led to a definitive recommendation of the need for surgical intervention. The false-positive category included patients that were diagnosed as follicular neoplasm, suspicious for malignancy and malignant but were finally confirmed by histopathological study as benign. The false-negative patients included those diagnosed as benign on FNA, but confirmed as malignant upon surgical excision and histopathology. The use of the term 'positive' is for statistical purposes only and does not indicate 'malignant'. The DC I category was excluded from the statistical analysis because these diagnoses usually led to a repeat FNA rather than to surgical excision [5].

Out of 106 patients, 6 (5.6%) patients underwent thyroid surgery and histopathological study. Among the benign category, two patients were diagnosed as Colloid goiter (33.3%), one as Multi nodular goiter and one as Hashimoto's thyroiditis by histopathology. Among the SFN/FN category, both patients were diagnosed as Follicular adenoma (33.3%) by histopathology. The histological diagnosis correlated well with TBSRTC diagnosis in all the patients.

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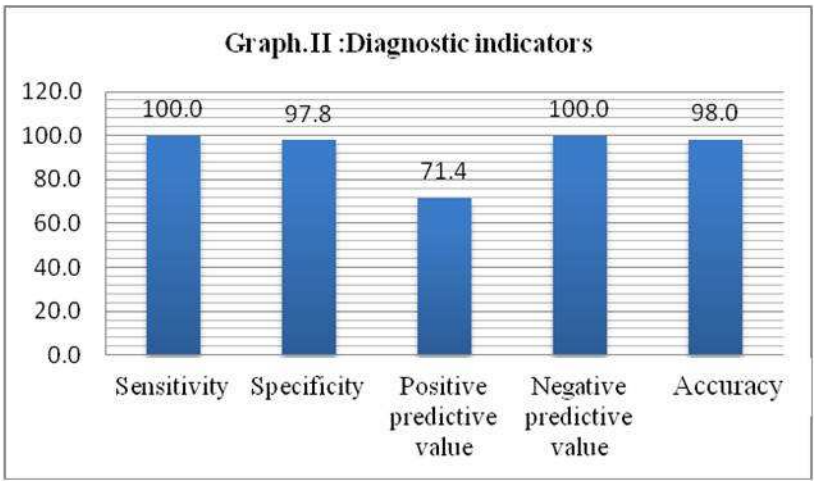
The sensitivity and specificity of FNAC in predicting diagnosis are 100% and 97.8% respectively. Similarly the positive predictive value and negative predictive value are 71.4% and 100% respectively. The accuracy value was 98% as per **Graph - 2**.

Graph – 2: Diagnostic indicators.



Discussion

Fine Needle Aspiration Cytology is the single most sensitive, specific, and cost-effective method of investigation, which distinguish neoplastic from non neoplastic lesions of the thyroid and can effectively triage patients. In adults, the application of FNAC using TBSRTC has reduced the number of patients who have undergone surgery for benign thyroid disease and increased the yield of malignancy in surgical specimens from 5% to 10% to as much as 30% to 50%. But FNAC of the thyroid gland has not been used extensively in children, even though it is as safe and can be as effectively used in the assessment of thyroid nodules as in adults [6].

In a study during the year 2008 by Constantine G.A. Theoharis, et al., a total of 3207 thyroid nodules in 2468 patients underwent FNA. The distribution of lesions from these 3207 evaluated nodules was 11.1% unsatisfactory, 73.8% benign, 3.0% indeterminate, 5.5% FN, 1.3% suspicious, and 5.2% malignant. Out of the 2468 sampled patients, 378 (15%) underwent thyroidectomy. The distribution of diagnoses of patients who underwent surgery was 10% unsatisfactory, 4.6% benign, 30.3% indeterminate, 61.4% FN, 76.9% suspicious, and 77.2% malignant. The study concluded that there was excellent correlation between the categories and in predicting benign versus malignant thyroid nodules ($p < 0.0001$) [7].

In year 2009, Jo VY, Stelow EB, Dustin SM, and Hanley KZ of the University of Virginia Health System, Charlottesville reviewed 3,080 thyroid FNA samples and recorded interpretations according to the proposed standardized 6-tier nomenclature of TBSRTC, and follow-up cytology with histology. The risk of malignancy reported in this study was also in accordance with those reported by others using TBSRTC [8]. Cibas and Baloch in the year 2009 documented the diagnostic accuracy of the NCI classification of TBSRTC. They concluded that this classification had high diagnostic utility. Bongiovanni and Cibas concluded that implementation of the TBSRTC standardized the reporting system of

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the Thyroid FNA thereby improving reproducibility and predictive value of thyroid FNA.

Adnan Al-Shaikh, et al. reviewed the utility of FNA in the management of thyroid nodules in 41 children and adolescents. Cytological findings were benign in 30, malignant in 2, suspicious in 6, and insufficient in 3. The malignancy rate was 5%, with no false-negative results. Diagnostic accuracy for FNA was 87% and inter-observer reliability was 88%. They concluded that FNA is safe and highly accurate in the evaluation of thyroid nodules in childhood [9]. In a 16 year period study conducted between January 1993 to December 2008 by Kapila K, et al., the cytology reports of 792 FNA performed on children and adolescents at Mubarak Al-Kabeer Hospital, Kuwait, they concluded that FNA of children's and adolescents' thyroid nodules is feasible and reliable. In this study, majority of the thyroid nodules were benign, and FNA helped to prevent unnecessary surgeries on these patients [10].

During the study period, a total number of 387 thyroid lesions of patients of all age group were subjected to FNAC procedure in the Department of Pathology. In this study there were 106 (28.9%) patients in the age group of 1year to 24 years. Out of 106 patients, 15 (14.15%) were children and 91 (85.85%) were youth.

The present study included patients of thyroid lesion of age group from 1 year to 24 years, for following reasons. Thyroid carcinoma is uncommon, but usually found in the adolescent and young adult population [11]. A study conducted in the USA between the years 1975 to 2000 showed that the thyroid carcinoma was approximately 7.8% of all cancers diagnosed in the 15 year to 19 year age group, 11.5% in patients 20 year to 24 year old, and 10.1% in individuals from ages 25 year to 29 year, and it is very rare in children younger than 15 years of age [11]. Long-term prognosis and outcome is excellent for most children and young adults diagnosed with thyroid carcinoma [11]. Thyroid carcinoma is a poorly studied in the adolescent and young adult group due to a limited number of patients diagnosed [11]. The tumor biology and clinical presentation of this condition in younger patients is different from older adult patients [11]. Thyroid cancer is one of the most curable of all malignancies if identified early and treated appropriately. The mortality rate for those between 15 year and 24 year of age is 0.1 per year per million and 5-year survival rates is 99% [11].

The present study showed that females are more affected than males. The incidence was 8.5% in males and 91.5% in females with M: F ratio of 1: 18.8, which is comparable with the studies of Kapila, et al and Vidya Vasudev, et al. as per **Table - 1**.

Category I - Non Diagnostic/ Unsatisfactory category (ND/UNS)

An UNS specimen is always ND but some technically satisfactory specimens may also be considered ‘‘non-diagnostic’’ i.e., showing nonspecific features not conclusively diagnostic of a particular entity. TBSRTC recommends certain criteria for adequacy, such as a minimum of six groups of well visualized thyroid follicular cells with at least 10 cells per group, preferably on a single slide. Most patients showed only acellular fluid. Exceptions in this category are solid nodules with cytologic atypia, solid nodules with inflammation and colloid nodules. ND/UNS results occur in 2–20% of patients, but ideally should be limited to no more than 10% of thyroid FNAs [22, 23].

In present study, Non Diagnostic category was 4.7%, which is almost similar (5%) to the findings of study conducted by Nayar and Ivanovic.

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Table - 1: Comparative analysis of various study results of FNAC in children and youth

Series	No of Cases	Sex		Sex Ratio	Mean age (Years)	Age range
		Male (%)	Female (%)			
Arda, et al. (2001) [16]	46	9 (19)	37 (81)	01:04	9	5 to 16
Al-Shaikh, et al. (2001) [12]	41	35 (85)	6 (15)	06:01	13	0.3 to 13
Khurana, et al. (1999) [17]	57	11 (19)	46 (81)	01:04	17	9 to 20
Lugo-Vicente, et al. (1998) [18]	24	4 (17)	20 (83)	01:05	15	9 to 18
Degnan, et al. (1996) [19]	18	4 (22)	14 (78)	01:03.5	14	8 to 18
Raab, et al. (1995) [20]	57	8 (14)	49 (86)	01:06	13	1 to 18
Chang, et al. (2006) [14]	51	13 (25)	38 (75)	01:03	17	2 to 21
Hosler, et al. (2006) [21]	82	19 (23)	63 (77)	01:05	15	8 to 18
Amrikachi, et al. (2005) [15]	218	23 (12)	162 (88)	01:07	17	10 to 21
Kapila, et al. (2010) [13]	792	68 (9)	724 (91)	01:11	17	4 to 21
Vidya, et al. (2014) [6]	284	25 (9)	259 (91)	01:10	17	7 to 21
Present study	106	9 (8.5)	97 (91.5)	01:10.8	19	7 to 24

Category II - Benign

This category includes Benign follicular nodule (adenomatoid nodule, colloid nodule), Lymphocytic (Hashimoto's) thyroiditis and Granulomatous (subacute) thyroiditis. The term Benign follicular nodule is applied to the most common benign pattern where an adequate specimen is composed of varying proportion of colloid and benign follicular cells arranged as macro follicles. Percentage of FNA patients falling in this category ranges from 40% to 60% [24, 25].

Among 91 patients in Category II, 49 were Benign follicular nodules (BFN), the most commonly encountered entity in thyroid cytopathology and encompasses a group of benign lesions with similar cytological features that were classified cytologicaly as nodules in nodular goitre (9), hyper plastic (adenomatoid) nodules (4), colloid nodules (34), Graves' disease (1), colloid cyst (1) with plenty of colloid laden macrophages in the background and a subset of Follicular adenomas (those of macro follicular type). Hashimoto's thyroiditis accounted for 42 patients.

In the present study, Benign category was 85.8%, which is nearer (87.5%) to the findings of study conducted by S K Mondal et al. [26]. Clinical follow up has been advised for these patients.

Category III - Atypia of Undetermined Significance or Follicular Lesion of Undetermined Significance (AUS/FLUS)

Thyroid FNAs that do not fit into benign, suspicious or malignant categories are included here. AUS/FLUS is reserved for specimens that contain cells (follicular, lymphoid) with architectural atypia that isn't sufficient to be classified as suspicious for a follicular neoplasm (FN) or malignant, and on the other hand, atypia is more marked than benign change. According to TBSRTC, AUS/FLUS are category of last resort and should not be used indiscriminately. The proportion of patients in AUS/FLUS category is between 3% and 20% with an average of 10% [24].

In our study, 5 patients belonged to this category, of which 3 are in AUS category and 2

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are in FLUS category. In the present study, AUS/FLUS category accounted for 4.7% of the patients, which is nearer (4 %) to the findings in the study conducted by Yassa, et al. [20].

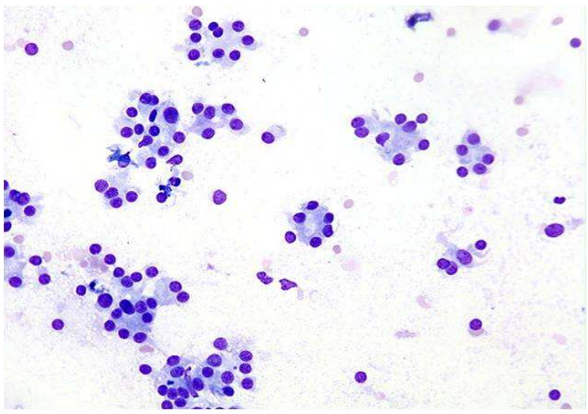
Category IV- FN or suspicious for a FN (FN/SFN)

The criteria for Category IV are significant alteration in the follicular cell architecture, characterized by cell crowding, micro follicles, and dispersed isolated cells and scant or absent colloid. The criteria for FN Hurthle cell type/suspicious for a FN Hurthle cell type FNHCT/SFNHC (subcategory of TBSRTC IV) are a sample consisting exclusively of Hurthle cells, with usually little or no colloid or virtually no lymphocytes or plasma cells. About 15% to 30% of these patients prove to be malignant.

The present study showed 2 patients in this category. Both the showed cellular aspirate of follicular cells with a predominant micro follicular architecture, scattered isolated cells with nuclear atypia and scant colloid.

Percentage of FNA patients falling in this category were approximately 10%. TBSRTC recommends lobectomy for this category [24]. In the present study, 1.9 % was from this category which is less compared to other studies. **(Photo – 1)**

Photo - 1: Category IV - showing features Follicular Neoplasm. (MGG, 40X)



Category V - Suspicious for Malignancy (SM)

A specimen is Suspicious for Malignancy (SM) when some cytological features (mainly PTC in this context) raise a strong suspicion of malignancy, but the findings are not sufficient for a conclusive diagnosis. Specimens that are suspicious for a Follicular or Hurthle cell neoplasm are excluded from this category. This category includes patients diagnosed as suspicious of malignancy and typically falls into two groups:

- **Qualitative:** cellular aspirates in which the cytological features are insufficient to make a definite diagnosis of malignancy.
- **Quantitative:** highly atypical cells, but insufficient in number for a definite diagnosis of malignancy.

Percentage of FNA patients falling in this category is between 2% to 3% [24]. In the present study, SM category is 0.9 % (1 case) which is nearer (1.4 %) to the findings of study conducted by S K Mondal, et al. [10].TBSRTC recommends near-total thyroidectomy or surgical lobectomy for patients in this category.

Category VI - Malignant

The category Malignant is used whenever the cytomorphologic features are conclusive for malignancy.

The criteria for reporting Papillary Carcinoma are follicular cells arranged in papillae/syncytial like, monolayered, altered follicular cells exhibiting characteristic nuclear features like enlarged oval or irregular moulded nuclei, longitudinal nuclear grooves, intra nuclear cytoplasmic pseudo inclusions, pale nuclei with powdery chromatin and psammoma bodies. **(Photo – 2)**

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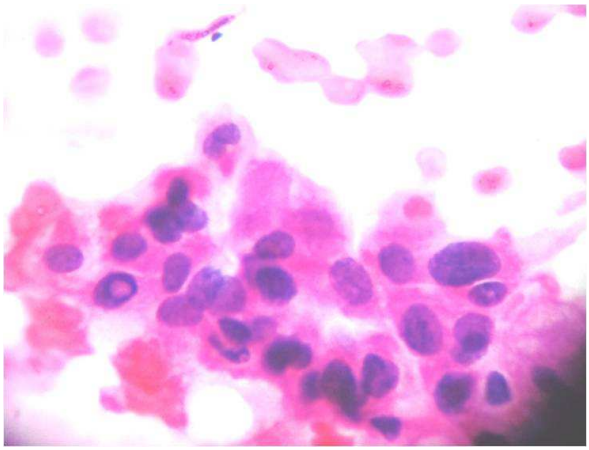
Photo - 2: Category VI - black arrow showing intra nuclear inclusion and white arrow showing the nuclear groove in Papillary Carcinoma. (H&E, 40X)



The criteria for reporting Medullary Carcinoma are moderate to markedly cellular smears, with plasmacytoid, polygonal, round or spindle shaped cells. Amyloid is often present and appears as dense amorphous material.

The criteria for reporting anaplastic thyroid carcinoma are neoplastic cells arranged in groups or discretely. Individual cells are epithelioid, spindled, plasmacytoid or rhabdoid in shape. Nuclear pleomorphism, multi nucleation and neutrophilic infiltration of tumour cell cytoplasm are other features. Mitotic activity will be numerous and abnormal.

The criteria for reporting a lymphoma are markedly cellular smears composed of non cohesive round to slightly oval cells with vesicular chromatin and prominent nucleoli.

TBSRTC recommends near-total thyroidectomy for these patients of malignancy. Percentage of FNA patients falling in this category is 3% to 4% and the estimated likelihood of malignancy is very high (99% to 100%).

Pediatric thyroid cancer is a rare entity accounting for less than 5% of all thyroid cancers. They are treatable with an excellent prognosis. Most thyroid cancers in children are papillary (PTC), followed by follicular (FTC) and, more rarely, medullary carcinoma [25].

Among Indian studies, Samuel, et al. found pediatric DTC (Differentiated Thyroid Carcinoma) at a frequency of 30% PTC (Papillary Thyroid Carcinoma) and 30% mixed papillary and follicular variants, whereas Kumar and Bal reported PTC in 85% of the patients [25].

The most common presentation for paediatric DTC is that of a palpable thyroid nodule. PTC also frequently presents as neck nodes with or without a palpable thyroid lesion. Even in the presence of metastatic disease, 30 year survival rates are as high as 90% to 99% [25, 27].

In the present study, malignant category accounted for 1.9 % and included 2 patients of papillary carcinoma, one each in a male and a female patient in the age group of 20 to 24 years. Both patients had cervical lymph node metastasis and painless thyroid swelling at the time of diagnosis. Both the patients showed neoplastic cells which were typically arranged in small groups, papillary fronds. The cells displayed enlarged, oval to irregular shaped nuclei with prominent nuclear grooves and intra nuclear inclusions. Background showed varying numbers of macrophages and thick colloid. Aspirate from the cervical lymph nodes displayed similar findings.

Correlation of FNAC diagnosis with histopathological diagnosis

In the present study, 10 out of 106 patients required thyroid surgery as per TBSRTC recommendations and included 2 patients categorised as malignant, 1 case categorised as suspicious of malignant, 2 patients categorised as follicular neoplasm and 5 patients categorised as AUS/FLUS and but none of these

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patients underwent surgery during the study period. However, 6 (5.6%) patients out of 106 patients, belonging to benign category had undergone thyroid surgery followed by paraffin embedded, Haematoxylin and Eosin stained light microscopic histopathological studies. The present study is comparable with various studies and show that the Sensitivity (100%) is comparable with that of Arda, et al. (100%), Specificity (97.8%) is comparable with that of R. A. Hegazy, et al. (97.2%). Accuracy (98%) is comparable with that of Sureshkumar, et al. (97%), Positive predictive value (71.4%) is comparable to the study of Likhar, et al., (70.58%), and negative predictive value (100%) is comparable with that of Al-Shaikh, et al. (100%) and Arda, et al. (100%). The p value of the present study is significant and is less than 0.01.

Conclusion

FNAC of thyroid is a simple, cost effective, outpatient procedure with negligible complications, having high rates of sensitivity, specificity and accuracy. It is also applicable in children and youth with the same outcome as in adults. TBSRTC provides a six tiered, internationally accepted reporting system for FNAC of thyroid which provides definitive clinical management guidelines for each diagnostic category and helps in avoiding unnecessary surgeries for thyroid lesions. Thyroid lesions are rare in children and youth compared to adults, but are more likely to be malignant in nature. Hence they need early evaluation. In conclusion, FNAC interpreted by TBSTRC is a most important diagnostic test to differentiate malignant lesions from non malignant lesions compared to other modalities of diagnostic tests not only in adults but also in Children and Youth. Apart from giving a definitive cutting edge in preoperative differentiation of malignant from non malignant thyroid lesions, it also helps to achieve early non-surgical intervention and minimise unnecessary thyroid surgeries in children and youth.

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