Original article:

Clinico-radiological profile of goitre and its correlation with histopathology

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ABSTRACT

Background: Thyroid disorders are the most common endocrine diseases of great importance because most of them are amenable to medical and surgical management. Thyroid lesions become vulnerable particularly in countries where iodine intake through diet is low. Multinodular goiter is the most common endocrine disorder in the world and affects nearly 500-600 million people. It has been estimated that a 10-20 percent volume increase occurs per year. As it enlarges multiple areas of focal nodularity typically form. Some 5-10% of multi-nodular goiter with continued growth may develop hyperthyroidism over a five year period.

Aims and Objectives: To evaluate the clinical and radiological features of goitre with histopathology report.

Material and Methods: A total of 60 patients were included with more than 15 years of age presented with goiter.

Results: Fifty patients were females and 10 were males with goitre duration of 6-12 months and presented with progressive increase in the size of the goitre. After clinical evaluation majority of patients were diagnosed as STN. According to ultrasonography, 47 patients were diagnosed as benign lesions while 13 patients were diagnosed with malignant lesions. According to FNAC, maximum number of patients i.e. 33 were diagnosed with colloid goiter while 8 patients had malignant lesions. According to Bethesda classification, maximum number of patients i.e. 40 were of Type II i.e. benign. On histopathological examination, 43 patients were diagnosed with benign lesions while 8 were diagnosed with malignant lesions. USG findings were correlated with histopathology, sensitivity of the test was found to be 69.23% and specificity was 91.49%. Similarly, when FNAC was compared to histopathology, sensitivity of the test was found to be 83.33% and specificity was 89.13%.

Conclusion: USG and FNAC has been shown to be more sensitive, specific and accurate than either technique alone and is therefore, recommended in the work-up of all thyroid nodules.

Keywords: Goitre, Histopathology

INTRODUCTION

Thyroid disorders are the most common endocrine diseases of great importance because most of them are amenable to medical and surgical management. Thyroid lesions are challenging tasks to modern clinician in judging the nature, and thereby, advocating precise and adequate management. Thyroid lesions become vulnerable particularly in countries where iodine intake through diet is low. Goiter may be
epidemiologically classified into sporadic, endemic and familial goiter. Etiologically it may be broadly classified under iodine deficiency, thyroiditis, malignant, drug-induced and genetic. Based on morphology it may be multinodular and diffuse. Functionally goiters may be nontoxic and toxic. Multinodular goiter is the most common endocrine disorder in the world and affects nearly 500-600 million people. It has been estimated that a 10-20 percent volume increase occurs per year. Some 5-10% of multinodular goiter with continued growth may develop hyperthyroidism over a five year period. Growth may be accelerated with the ingestion of goiterogens, iodine deficiency, pregnancy, malignant change and the development of hyperthyroidism.

A solitary thyroid nodule is defined as a palpable single, clinically detected nodule in the thyroid. They cause more concern because of high probability of malignancy in them, which can range from 5% to 35% of all solitary thyroid nodules. Colloid nodule is the term applied to lesions in colloid goiter. Women have a higher preponderance with a female to male ratio of 8:1. There is a tendency for the goiter to enlarge during puberty and pregnancy. Thyroiditis is an inflammatory involvement that causes painful enlargement of gland but usually the condition is self limited or controllable with appropriate therapy.

Neoplasms of the thyroid are a relatively uncommon disease. They constitute only 0.7% of all cancers in the female and 0.2% in the male population. However, there has been an increase in the incidence of thyroid neoplasms in India and abroad. The incidence of clinically apparent thyroid nodules in the general population is 4-5%. The prevalence of goiter is more than 40 million in India with more than 2 billion globally. Some studies on goiters showed overall prevalence of hypothyroidism in 5.4% and hyperthyroidism 1.9%. Prevalence of autoimmune thyroiditis confirmed by fine needle aspiration cytology (FNAC) was 7.5%. Accurate diagnosis of thyroid nodules is necessary for appropriate clinical management of these patients and to avoid unnecessary surgical interventions. The diagnostic tools now available are sensitive enough to establish correct diagnosis. FNAB is essential to decision making and is able to provide highly accurate information that will ultimately determine the management of a nodule.

Currently, a variety of serologic and cytogenetic tests, diagnostic imaging studies, and histopathologic techniques exist for the evaluation of a thyroid nodule. Of these methods, fine-needle aspiration biopsy (FNAB) has become the most important tool in the assessment of solitary thyroid nodules.

Ultrasound is the most sensitive method for diagnosing intrathyroid lesions. It can depict 2-mm cystic lesions and 3-mm solid intrathyroid lesions. Despite ultrasound's ability to clearly identify nodules, no single ultrasound criterion is reliable in differentiating benign ones from malignant thyroid nodules. Although ultrasonography is an important diagnostic modality for thyroid disorders, it possesses little
discriminatory prowess in distinguishing between benign and malignant pathologies. The criteria that are suggestive of malignancy include hypoechogenecity, micro-calcifications, irregular margins, local invasion, regional lymphadenopathy and high intranodular blood flow.

Till date no study has confirmed the reliability of ultrasound in diagnosing thyroid malignancy. Although to some extent, the ultrasound and FNAC have great impact on diagnosis and therapeutic decisions but their precision in diagnosing thyroid malignancy is questionable if used alone. Hence, the present study was being taken up to study the role of ultrasound and its correlation with USG guided FNAC and its validation by surgery and biopsy.

**MATERIAL AND METHODS**

Study was conducted in the Department of Surgery, Pt. B.D. Sharma PGIMS, Rohtak. A total of 60 patients with more than 15 years of age were included.

**Procedure**

A detailed history was taken with emphasis on (1) symptoms of primary or secondary thyrotoxicosis i.e. loss of weight inspite of good appetite, heat intolerance, excessive sweating, nervous excitability, irritability, insomnia, tremors, palpitations, exophthalmos, ophthalmoplegia etc. (2) symptoms of hypothyroidism i.e. weight gain inspite of poor appetite, cold intolerance, dry skin, dull expression, muscle fatigue, lethargy, constipation, oligomenorrhea, etc. (3) Family history.

A thorough clinical examination was done with emphasis on (1) Features of swelling arising from thyroid i.e. movement with deglutition, movement with tongue protrusion, etc. (2) Signs of exophthalmos i.e. lid retraction, Von Graeffe’s sign, lid lag, Joffrey’s sign, Stellwag’s sign, etc. (3) Features of hypothyroidism- dry cold skin, myxoedema, hypotension, bradycardia. (4) Presence or absence of palpable cervical lymph nodes. Thyroid Function Tests (TFT), Ultrasonography (USG) and Fine Needle Aspiration Cytology (FNAC) were done in all the patients.

**The indications for surgical exploration were:**

1. Those having cytopathologically proven malignancy
2. Those having a nodule with an indeterminate cytopathology
3. Those having nodule greater than 5 cm in size
4. Those having large nodule with retrosternal extension
5. Those in whom there is clinical suspicion of malignancy.
6. Those requesting surgery for cosmetic reasons.

**Method of collection of Data**

- Pre tested Questionnaire was filled based on history given.
- Age sex distribution, symptomatology
- Clinical examination of patient
- Thyroid profile
- Ultrasound of the neck.
- Fine needle aspiration cytology with hypodermic needle of 21-24 gauge.
Routine investigations
Indirect laryngoscopy was done to rule out a symptomatic paralysis of vocal cords & also for medico-legal purpose.
Surgery as per the diagnosis made.
Histopathology of resected specimen.
FNAC was compared with post operative histopathology to determine the accuracy.
Indication for surgery and its complications were analysed.

Statistical methods
Data was statistically analyzed by using Student t-test and Chi-square test by using SPSS 20.0 statistical software.

OBSERVATIONS
Age distribution of patients was between 18-72 years with mean age of 41.68±13.64. 83.83% i.e. 50 patients were females and 16.66% i.e. 10 patients were males. Majority of patients presented with progressive increase of swelling in anterior part of neck (54 out of 60). Seventeen patients had some compression symptoms like discomfort in swallowing. There was sudden increase in swelling in five patients. Maximum number of patients were suffering from goitre for last 6-12 months. Eleven patients had swelling of thyroid for less than 6 months while there were 11 patients who had goitre for more than 60 months duration. On the basis of clinical examination cases of solitary thyroid nodules were 30 while multi nodular goitre were 15. Thyroiditis as diagnosis made in 1 patient and there were 14 patients who were clinically found malignant. All the patients included in the study were euthyroid.
Ultrasound suggested colloid nodule/cyst in 20 patients and STN in 5 patients. MNG in 21 patients and malignancy in 13 patients. One patient had thyroiditis on USG. Forty three patients out of 60 had benign lesions on FNAC. Among them, 55% patients were having colloid nodule and 3.33% were having lymphocytic thyroiditis. FNAC was non diagnostic in 3 patients (5%), 8 were having malignant lesions which included papillary carcinoma - 10%, medullary carcinoma - 1.66% and anaplastic carcinoma – 1.66%. Five patients had hurthle cell on FNAC and one patient had colloid with atypia. Based upon bethesda classification, majority of patients were categorised into type II i.e. n=40 followed by type VI i.e. n=7. On final diagnosis on HPER, a total of 48 patients with benign lesions which included 39 patients of colloid goitre, one with follicular adenoma, one with lymphocytic thyroiditis and seven with adenomatous goitre. Twelve patients had malignant lesions. Among malignant lesions, papillary carcinoma was found in 7 patients, hurthle cell neoplasms in 1, medullary carcinoma in 1 and 3 patients with anaplastic carcinoma. Among 3 anaplastic carcinoma patients, 2 were diagnosed on FNAC which was confirmed with trucut biopsy and referred to radiotherapy department. Third patient had colloid with atypia on FNAC (Bethesda grade III), hence operated which on HPR turned out to be anaplastic. After observing clinical findings, ultrasound findings, USG guided FNAC findings and
histopathological findings, we want to correlate the parameters with respect to each other. Correlation between sex and final diagnosis is shown in Table I. Comparison of USG diagnosis with FNAC and histopathological diagnosis is shown in Table II. Correlation of USG findings and final diagnosis is shown in Table III. Correlation of FNAC findings and final diagnosis is shown in Table IV. Sensitivity of the test was found to be 84.62% and specificity is 87.23%. Results was found to be statistically significant (p <0.05).

DISCUSSION

Nodular thyroid disease is detected in 3-7% of the adult population worldwide. They are common in females with a ratio of 5:1 and prevalence mainly depends on age, sex, iodine intake, diet (goitrogens) therapeutic, and environmental exposure. Basic use of sonography in nodular thyroid is to determine the location of palpable neck mass, characterize nodule as benign or malignant, know about extent of thyroid malignancy, and guide fine-needle aspiration of the thyroid nodule or cervical lymph node. The categorization of thyroid nodules into benign and malignant nodules by USG is very important as it helps in the further management of the patients with nodular thyroid disease.

Ultrasound has become the first line imaging modality for evaluation of the thyroid gland due to excellent visualization of the thyroid parenchyma. It is highly sensitive in detecting small nodules, calcification, septations and cysts as well as in guiding fine needle aspiration biopsies. Thyroid nodules are very common and may be observed at ultrasonography (US) in 50% of the adult population.

In the present study age of the patient ranged from 18-72 yrs with mean age of 41.68±13.64. Singh et al in 2000 studied 108 number of thyroid cases of age group 12-80 and mean age in yrs was 47. Similarly Rangaswamy et al in 2011 studied 585 cases of age range 11-70 where mean age in yrs was 40.57. Female to male ratio in our study was 5:1. It was similar to Mandal et al (2011) in which female to male ratio was also 5:1.

In this study commonest clinical presentation was the presence of swelling in front of neck and some patients had compression symptoms like discomfort in swallowing in 17(23.8%). There was progressive increase in lesion in 90% of the patients, while sudden increase was noticed in 5%. In a study done by Kurele et al where they analysed 97 patients having thyroid nodules with USG and CT scans, sudden increase in size of the lesion was seen in 8% of the patients while dysphagia was seen in 7% of the patients while local pain was present in 5% of the patients.

Eleven patients had swelling of thyroid for less than 6 months while there were 11 patients who had goitre for more than 60 months duration. Handa et al (2008) studied the thyroid swelling and maximum number of patients 62.2% were having thyroid lesion with symptoms more than one year.
Clinical diagnosis was solitary thyroid nodule in 30 patients and multinodular goiter in 15 patients. 14 patients were diagnosed as patients of possible malignancy. Jayaram et al (2012) stated that nodules less than 1 cm in diameter are not detected by palpation, but rather detected during USG thyroid examination.\(^\text{18}\)

Ultrasound suggested colloid nodule/cyst in 20 patients, solitary thyroid nodule in 5, MNG in 21 patients and malignancy in 13 patients. One patient had thyroiditis on USG. In our study on clinical examination 30 of thyroid cases which were solitary on palpation were reduced to 5 on USG evaluation. Simeone et al (1982) stated that the detection of more than one lesion with USG reduces the probability of malignancy to 1-6%.\(^\text{19}\) Walker et al (1985) have shown that the prevalence of multinodularity in clinically solitary thyroid nodules is between 20% and 40%.\(^\text{20}\)

Forty three patients were having benign lesions. Among them, 55% patients were having colloid nodule and 3.33% were having lymphocytic thyroiditis. Non diagnostic were three i.e. 5%. Out of the 60 patients, 8 were having malignant lesions in the form of papillary carcinoma-10%, medullary carcinoma - 1.66% and anaplastic carcinoma-1.66%. Five patients had hurthle cell on FNAC and one patient had colloid with atypia.

In the present study, majority of patients categorised into type II i.e. \(n=40\) followed by type VI i.e. \(n=7\). The positive point of the study that we got all the bethesda's type in the study.

Maximum cases \((n=40)\) were included under the Benign category of Bathesda system among the 60 cases, only two patient came out to be malignant. Malignancy risk was 5%. AUS (atypia of undetermined significance) were 3 cases. One came out to be adenomatous goitre and other one came out to be anaplastic carcinoma. Two out of three were malignant so malignancy risk was 66.6%. Category IV was present in 5 cases, out of which only one came out to be malignant as hurthle cell neoplasm, so malignancy risk is 20%. The category of suspicious for malignancy included only two cases both of which were malignant on histopathology with malignancy rate of 100%. The malignant category included 7 cases, out of which six were confirmed as malignant on histopathology of those cases, so malignancy risk is 85.71 %. The non-diagnostic category included three cytological cases which were benign on histopathologic study. The malignancy risk in this category was 0%. Category V included 2 cases and both were malignant so malignancy risk is 100%.

Result of our study is comparable to other studies and is closest to Mondal et al where they found out 0% in non diagnostic, 4.5% in benign, 20 % in AUS, 30.6% in neoplasm, 75% in suspicious of malignancy, and 97.8% in malignant category.\(^\text{21}\)

**Break up of cases based upon final diagnosis**

In the present study, 80% patients were having benign lesions while 20% patients were found to have malignant lesions. Similarly, in a study done by Avinash et al where they analyzed 70
cases of thyroid nodules, diagnosed by ultrasound and subjected to FNAC for confirmation of ultrasound findings and establishment of diagnosis; the percentage of benign thyroid nodules (91.43%) was higher than the malignant (8.57%) thyroid nodules.  

**Correlation between sex and final diagnosis**  
In our study, out of the 60 patients, 50 patients of the study group were having benign lesions. 10 were having malignant lesions in the form of papillary carcinoma- 10.90%, follicular carcinoma- 1.81%, medullary carcinoma- 1.81% and anaplastic carcinoma- 3.63%. In a study done by Kapali et al, they analyzed 57 patients who had thyroid nodules on imaging and the final ultrasound diagnosis was correlated with FNAC and histologic assessment on post thyroidectomy specimen when available.  

In above study, ten male patients presented with nodules out of which 40% were malignant and 47 female patients had nodules out of which malignancy was reported in 44.6% of patients.  

**FNAC correlated with final diagnosis**  
In the present study, 39 patients (70.90%) in FNAC were found to have colloid goitre while 3 patients were having features of multinodular goiter. Among malignant lesions, 1 patient showed Hurthle cell neoplasm, a variant of follicular neoplasm, 2 patients showed anaplastic carcinoma, 1 patient showed medullary carcinoma while 6 patients showed papillary carcinoma on FNAC. In a study done by Avinash et al, after cytological/histopathological evaluation, 6 (8.57%) of the 70 nodules were found to be malignant and 59 (91.43%) were benign. Five nodules, which were given as follicular neoplasms on FNAC, were diagnosed as follicular adenomas at histopathology. All the malignant nodules on FNAC were found to be papillary carcinomas.  

**Surgical procedures with final diagnosis**  
In the present study, among patients with benign lesions, 17 out of 42 were left thyroidectomy and 17 out of 42 were right thyroidectomy. Total thyroidectomy was done for 6 patients with benign (colloid/MNG) lesions. One lymphocytic thyroiditis patients were kept conservative while 1 anaplastic CA was kept conservative. Rest of the malignant cases had undergone total thyroidectomy. According to Gharib et al, surgery is generally recommended for malignant patients. Also, surgical removal may be needed for benign nodules if they are causing pressure or structural symptoms.  

**Correlation of ultrasound diagnosis, USG guided FNAC, and histopathological diagnosis**  
In our study on clinical examination 50% of thyroid cases which were solitary on palpation were reduced to 8.33% on USG evaluation.  

Simeone et al (1982) stated that the detection of more than one lesion with USG reduces the probability of malignancy to 1-6%. Walker et al (1985) have shown that the prevalence of multinodularity in clinically solitary thyroid nodule is between 20% to 40%.  

**Comparison of diagnostic parameters on the basis of ultrasound and histopathology report**  
The sensitivity and specificity of USG in detecting malignancy to be 69.23% and 91.49% respectively. Sensitivity and specificity is quite
comparable to the other studies. Cai et al (2006) study showed specificity of ultrasound to be 97.8% and sensitivity 80.5%. Watters et al (1998) interpreted an USG report as suggestive of malignancy if the nodule was solid or of a mixed solid-cystic variety and a hypoechoic and non-haloed lesion. Sensitivity of USG in his study was 74% and specificity was 83%.

Comparison of diagnostic parameters on the basis of FNAC findings and histopathology report

Sensitivity of the test found to be 83.33% and specificity is 89.13% (p <0.05). Bukhari et al (1997) study showed sensitivity and specificity of 85% and 90% respectively. High false negative rate was mainly because one case that was diagnosed as follicular neoplasm (considered benign) on cytology were found to be follicular carcinoma on histopathology.

Conclusion

USG and FNAC shown to be more sensitive, specific and accurate than either technique alone and is recommended in the work-up of all thyroid nodules. Ultrasound is useful to guide the needle for fine needle aspiration of a thyroid nodule; it improves the quality of diagnosis in pre operative assessment of thyroid nodules to select patients for surgery. After thorough clinical evaluation and before reaching to the final histopathology, the radiological and cytological examination plays a crucial role in making diagnosis in thyroid nodules. This is similar to the triple assessment of the breast lesions. Success in the surgical management of the patients can be conveniently sought when this triple assessment of thyroid lesions is done.

REFERENCES


21. Mondal SK, Sinha S, Basak B, Roy DN, Sinha SK. The Bethesda system for reporting thyroid fine needle aspirates:


Table I

Correlation between sex and final diagnosis in operated cases

<table>
<thead>
<tr>
<th>Sex</th>
<th>Colloid n(%)</th>
<th>Follicular adenoma n(%)</th>
<th>Malignant n(%)</th>
<th>Lymphocytic thyroiditis n(%)</th>
<th>Adenomatous goitre n(%)</th>
<th>Total n (%)</th>
</tr>
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<tbody>
<tr>
<td>Female</td>
<td>34(68%)</td>
<td>0(%)</td>
<td>9(18%)</td>
<td>1(2%)</td>
<td>6(12%)</td>
<td>50</td>
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<td>Male</td>
<td>5(50%)</td>
<td>1(10%)</td>
<td>3(30%)</td>
<td>0</td>
<td>1(10%)</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>39(61.66%)</td>
<td>1(1.66%)</td>
<td>12(16.66%)</td>
<td>1(3.33%)</td>
<td>7(8.33%)</td>
<td>60</td>
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Statistical analysis

*p=0.181 NS

Table II

Comparison of USG diagnosis with FNAC and histopathological diagnosis

<table>
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<th>USG diagnosis</th>
<th>Cytological diagnosis (Bathesda)</th>
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<tr>
<td></td>
<td>No. of cases</td>
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<tr>
<td>Diagnosis</td>
<td>Category</td>
<td>No. of cases</td>
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<td></td>
<td>Benign (II)</td>
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</tr>
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<td></td>
<td>AUS (III)</td>
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<td>Neoplasm (IV)</td>
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<td>Suspicious (V)</td>
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<td>Malignant (VI)</td>
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<td>Description</td>
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### Table III
**Correlation of USG findings and final diagnosis**

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<th>USG benign and Final malignant</th>
<th>USG malignant and Final malignant</th>
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<td><strong>True negative</strong></td>
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<td>4</td>
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<tr>
<td><strong>False negative</strong></td>
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*Statistical analysis p=0.000, <0.05 Significant.

### Table IV
**Correlation of FNAC findings and final diagnosis**

<table>
<thead>
<tr>
<th></th>
<th>FNAC No + Explore benign</th>
<th>FNAC No + Explore malignant</th>
<th>FNAC explore + Malignant</th>
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<td><strong>True positive</strong></td>
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<td>-</td>
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<td><strong>True negative</strong></td>
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*Statistical analysis p=0.000, <0.05 Significant.*