

Utility of FNAC in the Clinicopathologic Evaluation of Benign Thyroid Lesions

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Abstract

Background: Thyroid swellings are common clinical presentations in the male and females, majority of them are benign in nature and do not require surgery. Fine needle aspiration cytology in the diagnosis of thyroid lesions is an easy and cost-effective method. Aim of this study was to assess the effectiveness of FNAC in the evaluation of benign thyroid lesions by clinical, histopathologic analysis and compare the consistency of the results with the literature. **Materials and Methods:** Over a period of 3 years prospective study done from January 2001 to December 2003 in the cytopathology department, Sri Venkateswara Medical College, Tirupati, Andhra Pradesh. Two hundred and fifty (250) cases of palpable and clinically benign thyroid lesions were analyzed by fine needle aspiration, preceded by thorough clinical evaluation. Out of these 250 cases only 65 patients underwent surgical excision and these were available for histopathological correlation. Staining techniques used are Haematoxylin and Eosin and May-Grunwald Giemsa stain. **Results:** out of 250 cases, 65 were available for histopathological correlation. Among which 10 had malignant, which were excluded from the present study. Out of 55 benign thyroid lesions 20(36.3%) cases were Multinodular goiter, 17(30.9%) were Follicular adenoma, 10(18.1%) were Hashimoto's thyroiditis. Sensitivity, specificity, positive predictive value, negative predictive values were 90,100,100 & 98.21 % respectively. Finally accuracy rate was 98.46%. **Conclusion:** Fine needle aspiration cytology is a simple, cost effective, rapid to perform procedure with high degree of accuracy and is recommended as first line investigation for the diagnosis of thyroid lesions.

Keywords: Benign Thyroid lesions; Fine Needle Aspiration Cytology; Clinicopathologic; Evaluation

Introduction

The term goiter is used to indicate enlargement of thyroid by any underlying pathology. The term endemic is used when goiters are present in more than 10% of the population in a given region [1]. Iodine deficient endemic goiter is prevalent in several high mountainous areas or in areas far from the sea, but the prevalence has been reported to be decreasing because of prophylactic iodination of salt [2]. The average number of thyroid lesions recorded and other Indian studies show that benign lesions predominate. Since the employment of fine needle aspiration cytology by Scandinavian workers about 3 decades ago as a first diagnostic test for the assessment of goiter, various studies have been published in the literature demonstrating its usefulness especially in the evaluation of thyroid nodules [3, 4]. Typical nodular goiters causing anxiety are more

common in women than men in the ratio of 6:1 [5]. The prevalence of thyroid nodules increases with age, prevalence ranges from 4-7% in general adult population and 0.2-1.5% in children [6]. The main purpose of thyroid fine needle aspiration is to distinguish patients with malignant and those with benign nodules that can be followed up clinically. In contrast to indirect methods like scintiscanning, ultrasonography etc., needle biopsy of thyroid nodules provides direct information on the nature of thyroid nodules. Two techniques for needle biopsy of thyroid are available. Biopsy with cutting needle obtains a core of thyroid tissue for histopathological review. Occasionally a follicular neoplasm may be complicated by secondary hyperthyroidism. Nodular goiters complicated by hyperthyroidism usually occur in older people (mean age 60 years). In the toxic nodular goiter thyroid hormone levels are usually only slightly elevated, but cardiovascular features such as atrial

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fibrillation or cardiac failure tend to predominate. In case of multinodular goiter with significant tracheal compression (or) retrosternal extension, partial thyroidectomy is indicated. Hyperthyroidism has been reported to be a common disorder with a prevalence of about 20 per 1000 in females. In it almost every system is affected. Hyperthyroidism can be due to abnormal thyroid stimulator, primary hyperthyroidism (Graves' disease) (or) intrinsic thyroid autonomy e.g.-toxic goiter. Graves' disease is the major immunologically mediated form of hyperthyroidism. Ophthalmopathy (proptosis, lid retraction etc) are present only in 50% of patients when first seen, (or) precede it by many years. Infiltrative dermopathy (pretibial myxedema) present on the leg, usually less commonly in the face and arms. TSH assays may not be usually available for all patients. Fine needle aspiration cytology enables the clinicians to some extent to diagnose and differentiate the primary thyrotoxicosis from the secondary. Thyroiditis comprises a group of disorders that include not only process of clear inflammatory nature but also lesions of uncertain significance, in which sclerosis and lymphocyte infiltrate are the most relevant pathologic findings. Acute thyroiditis is divided into suppurative and non suppurative forms. The non-infectious form acute thyroiditis results from radiation therapy. Chronic thyroiditis can be lymphocytic thyroiditis (or) autoimmune thyroiditis (Hashimoto's), Riedel's thyroiditis etc. fine needle aspiration in this situation is carried out to exclude neoplasia, needle aspiration can contribute to the primary diagnosis of Hashimoto's thyroiditis. Cystic lesions of thyroid constitute a particular problem, cysts have been reported in 20% of follicular neoplasm, 25% of papillary and follicular carcinomas [9], 60% of such neoplasms have been reported to be correctly identified by FNAC. About 80% of the follicular neoplasms have been observed to be benign that is adenomas, most tumors initially present as painless thyroid mass. Because majority of clinically detectable thyroid nodules have proved to be benign, may not even neoplastic. It becomes important to select patients for surgical excision. Fine needle aspiration can drastically reduce the number of patients undergoing unnecessary surgery. The findings of FNAC have been reported to be sensitive and specific and it is fully accepted in the diagnostic work up of patients in conjunction with more traditional methods. Some

Results & Analysis

In our present study a total of 250 patients with thyroid swelling were aspirated, out of which 6(2%) aspirates were unsatisfactory and only 65 patients underwent surgical excision. Among which 55 patients had benign lesions and 10 had malignant, which were excluded from the study. Sex incidence: the study group of 55 benign thyroid lesions comprised of

investigators have used both biopsies with the cutting needle and FNAC which they found to be complimentary. We have favored fine needle aspiration because of its patient's acceptability, minimal morbidity and ease of performance. In view of the above observations, I have made an attempt to evaluate clinicopathologically the thyroid lesions of the patients who attended the cytopathology department of S.V. Medical College, Tirupati, over a period of 3 years. The aim of present study was to assess the utility of FNAC to define diagnostic criteria in the interpretation of various benign, inflammatory and neoplastic lesions of thyroid gland.

Materials & Methods

Over a period of 3 years prospective study from Jan 2001 to Dec 2003, two hundred and fifty (250) cases of palpable and clinically benign thyroid swellings were analyzed by the fine needle aspiration cytology. The procedure of fine needle aspiration was preceded by a thorough clinical evaluation. FNAC was done routinely in all cases at the time of first presentation. The lesion is punctured with a 23 gauge disposable needle connected to a 10ml air tight disposable plastic syringe. On an average 4 smears are made and 2 of the slides properly fixed in methanol for MGG staining other 2 slides for H& E staining. Aspiration done from at least three to four different nodular area (from the centre and at the periphery) care was taken especially in cases with cystic degeneration. Ultrasound guided FNAB followed in case of non palpable nodules like fibrotic, calcific, calcified, cystic degenerative changes. All cystic fluid aspiration was centrifuged. Out of 250 cases only 65 patients who underwent surgical excision and only these were analyzed histopathologic study. Multiple representative tissue blocks (5-6) were taken from different portions of lesion after thorough grossing. The tissue was processed by routine histopathologic technique and tissue sections of 4 to 5 micron thick cut from each block of tissue, routine Haematoxylin and Eosin staining was done for all the sections. A preliminary diagnosis from the cytological smears and histopathologic correlation of the concerned sections were made. Cytological diagnosis was consistent with histopathologically in 55 cases. The final diagnosis of the 55 benign thyroid lesions was shown in table-1.

50(90%) females and 5(9%) males, with females to male ratio of 50:5(10:1). Age incidence: the age of 55 patients were taken for study ranged from 14 to 70 years. Most of the patients in the present study (75%) belong to third, fourth, and fifth decades of life with a mean age of 38-52 years. Out of 55 benign lesions, 20 (36.90%) cases were follicular adenoma, 10 (18.18%) cases were Hashimoto's thyroiditis, 7(12.72%) cases were diagnosed as simple colloid goiter, and one (1.8%) case was a Grave's disease.

Table-1: Distribution of Benign thyroid lesions (HPE)

S.No.	Benign lesions	Total no. of cases	Percentage
1.	Multinodular goiter	20	36.36%
2.	Follicular Adenoma	17	30.91%
3.	Hashimoto's thyroiditis	10	18.18%
4.	Simple colloid goiter	7	12.73%
5.	Grave's disease	1	1.82%
	Total	55	100%

Among the 17 (30.90%) follicular adenomas, 10 (58.8%) were diagnosed as microfollicular variant, 3 (17.6%) were simple, another 3 (17.6%) were macrofollicular variant and one (5.8%) case was trabecular adenoma.

Table-2: Age distribution of benign thyroid lesions (HPE)

Age range in years	Hashimoto's thyroiditis	Grave's disease	Simple colloid goiter	MNG	Follicular Adenoma Micro type	Follicular Adenoma Simple type	Follicular Adenoma Macro type	Follicular Adenoma Trabecular type	Total
11-20			1						
21-30	2		2	2	3			1	
31-40	3	1	1	5	4	2	1		
41-50	3		2	9	2	1	1		
51-60	2		1	2	1		1		
61-70				2					
Total	10	1	7	20	10	3	3	1	55

Table-3: Sex distribution of benign thyroid lesions

Sex	Hashimoto's thyroiditis	Grave's disease	Simple colloid goiter	MNG	Follicular Adenoma	Total
Male	1		1	2	1	5
Female	9	1	6	18	16	50
Tatol	10	1	7	20	17	55

Statistical analysis of predictive value results:

- False positive - zero
- False negative - 1.53%
- Sensitivity - 90%
- Specificity - 100%
- Positive predictive value - 100%
- Negative predictive value - 98.21%
- Accuracy rate - 98.46%

Discussion

Several reports in the literature have reviewed the utility and value of FNAC as one of the preliminary investigations in the diagnosis of thyroid swellings. Most of the cytopathologists used H&E and MGG staining methods. H&E staining was done by Damiani [12] they felt that H&E staining was more familiar to the pathologists and it facilitates morphological correlation between cells seen in smears and tissue sections, they also observed that alcohol fixed smears provide a sharp nuclear details, which is less evident on Romanowsky stained smears, however Romanowsky stain delineate better metachromatic substances such as connective tissue stroma and colloid material. We also felt that H&E stained smears were better for interpretation. Out of the 65 patients who underwent surgical excision, 55 with benign thyroid lesions were clinicopathologically evaluated. Benign lesions were commonly encountered in age group of 30-50 years Kumar A. et al [4]. In the present study maximum number of cases ranged between 21-50 years (83%), sirpal et al [13] and Altavilla et al [14], also observed the same. In our study multinodular goiter constituted the most prevalent benign lesion (36.36%), followed by follicular adenoma (30.90%). The reported prevalence of other Indian studies as shown in table-4

Table-4: Reported prevalence of multinodular goiter

S. No	Name of the Author	Year	Percentage of MNG
1	Rajeve- mathaw jose et al.	2002	85%
2	Jayaram et al.	1985	84%
3	Dwarakanathan et al.	1993	58.8%
4	Sirpal et al.	1996	45.3%
5	Present study	2003	36.3%

Multinodular goiter is the commonest lesion observed in fine needle aspirate Anantha Krishnan N[15]. Abundant colloid, fragments of fibrous stroma with bland follicular cells etc, aided the diagnosis of nodular goiter – Harach HR. et al [16], follicular adenoma constituted 17 cases (30.90%) of all benign thyroid lesions and second commonest lesion after MNG. Identical reports are seen on the literature Sirpal YM. et al,[13] as shown in table-5.

Table-5: Reported prevalence of Follicular adenoma

S No	Name of the Author	Year	Percentage
1	Jayaram et al	1985	4
2	Dwarakanathan et al	1993	11
3	Sirpal et al	1996	25
4	Present study	2003	30

In the present study simple colloid goiter constituted 7 (12.72%) cases. Hashimoto's thyroiditis constituted 10 cases (18.18%) of all benign lesions after MNG and follicular adenoma. The youngest patient was a female aged 24 years and oldest patient was a 60 years old female. Our reported prevalence of Hashimoto's thyroiditis was nearly identical to some extent with Sirpal et al [13]

Table-6: Reported prevalence of Hashimoto's thyroiditis

S. No	Name of the Author	Year	Percentage
1	Jayaram et al	1985	2.8
2	Rajeve Mathew jose et al	2002	8.3
3	Sirpal et al	1996	13.4
4	Present study	2003	18.1

Of the 10 cases of Hashimoto's thyroiditis only 2 patients had antimicrosomal antibody titer estimation, in both of them it is elevated. In majority cases of hashimoto's thyroiditis, the aspirate contains abundant lymphocytes, only one case showed predominantly Hurthle cells and fibrosis. We observed one (1.81%) Grave's disease with exophthalmos in the present work of all benign thyroid lesions. A similar occurrence has been reported by Rajive Methew jose et al, [20]. FNAC is a adjuvant to the diagnosis of Grave's disease along with other clinical, biochemical and serological findings. Our study has zero false positive result, and false negative rate was 1.53%. False positive are less common than false negatives, Friedman et al, [21]. Various authors Pandit & Kinare [22], explained that false negative cytological diagnosis

were due to 'failure to obtain representative samples, needle has missed the lesion tangentially, central cystic, necrotic (or) hemorrhagic areas devoid of diagnostic mass.

Our sensitivity and specificity were 90% and 100% respectively. The present study reveals an overall accuracy rate of 98.46%. Our accuracy rate nearly correlating to that other Indian workers like Rajive Mathew Jose et al,[20].

Table-7: Reported prevalence of Accuracy rate

Author name	Year	Sensitivity	Specificity	Positive predictive value	Negative predictive value	Accuracy
Rajive Mathew jose et al,	2002	50%	92.9%	53.8%	91.8%	86.7%
Altavilla et al,	1990	71.4%	100%	100%	94.4%	95.09%
Our study	2003	90%	100%	100%	98.2%	98.46%

Summary and Conclusion

The utility of FNAC was evaluated in 55 patients with benign thyroid swellings, in whom histopathology was also available. The false positive rate was zero, and false negative rate was 1.53%, an overall accuracy rate of 98.46% was observed. Thus FNAC of thyroid proved to be an ideal first line investigation due to its rapidity, safety, simplicity, accuracy, cost effectivity and repeatability.

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