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Efficacy of Fine Needle Aspiration Cytology in Diagnosis of Lesions of Thyroid and Histopathological Correlation

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Abstract

Materials & Methods:We compared adequacy and accuracy of Fine needle aspiration with histopathological correlation in a total of 142 cases.

Results: The female:male ratio being 5:1 and majority of cases were seen in between 20-50 years of age. Nodular goitre was the commonest among non-neoplastic whereas follicular adenoma was the commonest neoplasm. Cytohistological correlation was positive in 89.44% of cases in present series. Negative correlation was seen in the rest and had taken place in majority of cases with Hashimoto's thyroiditis, goitre and follicular adenoma.

Conclusion: The distinction between nodular goitre and follicular adenoma was difficult and so also the distinction between follicular adenoma and follicular carcinoma in the present series. However this study was aimed at evaluating experience of FNAC and correlating the findings with tissue biopsy in the diagnosis of thyroid lesions.

Keywords: Thyroid FNAC, Hashimoto's thyroiditis, Follicular neoplasm

Introduction

Thyroid nodules represent a common problem in endocrinology, with an estimated prevalence of 4–7% in the adult population for palpable nodules. The prevalence is higher in women (5%) than in men (1%).[1]

The majority of nodules are benign. Malignancy can be present in 5–10% of nodules[2], depending on age, gender, radiation exposure history, family history, and other factors.[1]

Thyroid nodules are a common clinical occurrence. More than 50% of the world's population harbours at least one thyroid nodule & frequency of nodular thyroid disease increases with age.[3] It is therefore no surprise that thyroid FNAC is one of the most commonly practiced areas in non-gynecologic cytopathology.[3]

FNAC of the thyroid gland is now a well established first line diagnostic test for the evaluation of diffuse thyroid lesions as well as nodular lesions of thyroid with the main purpose of confirming benign lesions and thereby reducing unnecessary surgery.[4]

FNA has been shown to be the safest and most accurate of diagnostic tools in thyroid lesions[5] with a sensitivity as high as 93.4%, a positive predictive value of malignancy of 98.6%, and a specificity of 74.9%; its use has simultaneously diminished the number of surgeries done for benign lesions and increased the proportion of malignancies in surgically resected thyroids.

Herein we report 142 cases of thyroid lesion with detailed clinical, cytological and histopathological features.

Materials and methods

Patients with neck swellings attending medical, surgical and ENT outpatient clinics and wards with thyroid lesions were sent to Department of Pathology, Basaveshwar Teaching and General Hospital and Sangameshwar Hospital, Gulbarga;

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where FNAC was done. Before aspiration, a detailed history was taken and clinical examination was done.

Case selection- A total 240 fine needle aspiration of thyroid swellings were done in over a period of 1 ½ years from May 2009 to September 2010. Histopathology report was available in 142 cases out of 240 aspirated lesions of thyroid and selected for the present study.

Clinical data including age, sex, character of swelling, cytological features and subsequent histopathological features were noted.

Cytology- Fine needle aspiration was done by using 23 gauge needles under aseptic precautions and proper technique in all the 142 cases. Smears were placed under proper fixative for 15-20 minutes and subsequently stained with giemsa and pap stains. A thorough examination of smears were done and evaluated. Non-aspiration technique was also performed in large goitres lesions which yielded good cellularity.

Repeat aspiration was done whenever smears were bloody and in cases suspicious of malignancies. It helped in arriving at diagnosis in a few cases in present study.

The FNAC was followed by surgery in 142 cases where it was necessary and Histopathological correlation was done. In cases where surgery was contraindicated the correlations was not possible.

Histology- Tissues obtained were fixed, processed and stained by routine Hematoxylin & Eosin technique followed by microscopic examination.

Results

Clinical features: 142 patients of thyroid aspiration were thoroughly examined before aspiration. Females were 118 whereas 24 were males ratio of female:male being 5:1. The age of patients was ranging from 18 years to 67 years with the mean age of 32.5 years. Majority of cases were seen between age of 20 to 50 years of age (table-1). Nodular lesion being the commonest presentation followed by cystic lesion and few cases of mixed lesion. Duration of swelling was ranges from 7 days to 2 years.

Cytological features: out of 240 aspirated thyroid

Table-1: age and sex wise distribution of cases

Age(yrs)	Females	Males	Total
<20	29	03	32
21-30	60	13	73
31-40	53	03	56
41-50	51	04	55
51-60	17	01	18
>60	06	00	6
Total	**118**	**24**	**142**

lesions, 48 were diagnosed as follicular neoplasm as it showed uniform small to medium sized clusters and mono-layered sheets of benign follicular cells and presence of bare nuclei in scant colloid background (Fig-1).

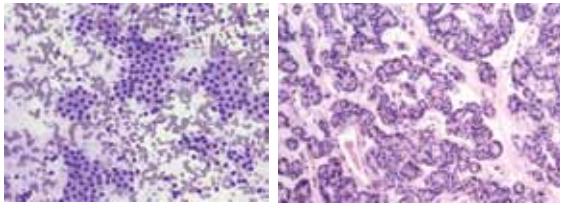

Figure- 1: A. FNAC smear revealed monolayered sheet of benign follicular epithelial cells with presence of bare nuclei and colloid absent (Giemsa, x10). B. Section study showed prominent microfollicular pattern adenoma (H&E, x10).

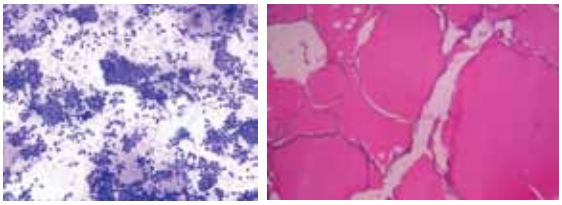

Figure-2: A. aspiration from thyroid nodule revealed follicular epithelial cells in abundant colloid background (Giemsa, x4). B. histological section showing varying size and shaped glands line by flattened epithelial cells filled with abundant colloid (H&E, x10).

46 were diagnosed as nodular colloid goitre as the presence of diffuse multi-nodular swelling with cytology revealed abundant colloid background with mono-layered sheets of follicular epithelial cells (Fig-2). Therapeutic aspiration was done in 31 cases, out of which 26 were colloid cyst and 5 were thyroglossal cyst.

24 cases of simple colloid goitre were present. There were total 48 cases of inflammatory thyroid lesions in which 22 cases were hashimoto's thyroiditis. Cytology of Hashimotos's Thyroiditis revealed scant colloid

background, clusters and groups of follicular epithelial cells with few cells showing hurthle cell change and prominent lymphoplasmacytic infiltration (Fig-3). Among malignant lesions, most common was papillary carcinoma (14 cases) followed by one case each of anaplastic and medullary carcinoma. Cases of papillary carcinoma

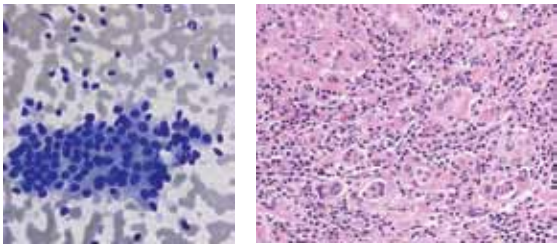

Figure 3: A. Smear revealed scant colloid with group of hurthle cells with scattered lymphocytes (Giemsa, x40). B. histology showed presence of hurthle cell change with lymphoplasmacytic infiltration (H&E, x10).

revealed syncytial aggregates and focal sheets of cells with nuclear overlapping. Papillary fragments and flat sheets of tumor cells were noted with few cells showing intranuclear cytoplasmic inclusions and nuclear grooves (Fig-4). The characteristic papillary fragments of tumor cells along with nuclear grooves were present in all 14 cases. The presence of chewing-gum colloid, atypical squamoid cells and psamomma bodies were noted in 4 cases.

One case of anaplastic carcinoma showed presence of clusters and groups of highly pleomorphic

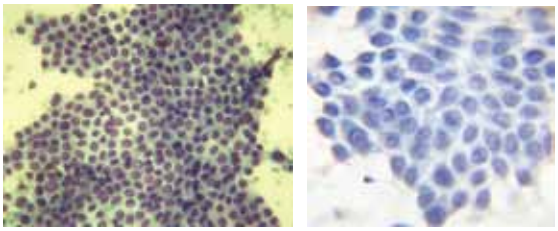

Figure-4: A. smear study showed syncytial aggregates of follicular cells with prominent intranuclear inclusions (Giemsa, x40). B. Pap stained smear showed presence of prominent nuclear grooves (x40).

malignant cells of bizarre shape mainly in necrotic background. Presence of multinucleated cells and frequent mitosis was noted (Fig-5).

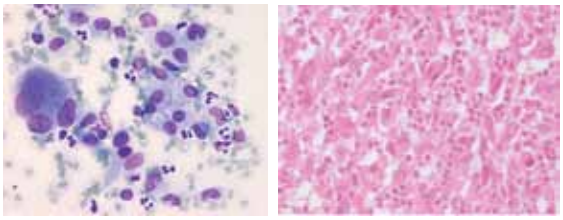

Figure-5: A. Smear showed presence of large, bizarre shaped highly pleomorphic cells (Giemsa, x40). B. Histology showed similar features (H&E, x10).

A case of medullary carcinoma showed presence of small clusters and singly dispersed cells with prominent plasmacytoid like appearance. Cells were showing moderate anisonucleosis with uniform, stippled chromatin nucleus (Fig-6).

Surgical treatment was given to 142 patients and histopathological examination of all 142 cases were done and evaluated. Correlation of cytological diagnosis with histopathological diagnosis was done (Table-2).

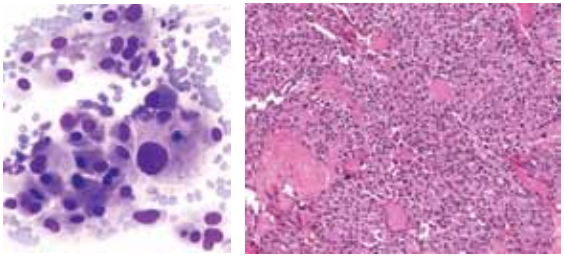

Figure-6: A. smear study showed small clusters and singly dispersed cells with prominent plasmacytoid like appearance. Cells were showing moderate anisonucleosis with uniform, stippled chromatin nucleus (Giemsa, x40). B. histologic section showed presence of amyloid in between follicular cells with moderate pleomorphism (H&E, x10).

Discussion

Histopathology is mainly concerned with tissue architecture while cytopathology is concerned with individual cell changes. These disciplines are opposite sides of the same coin and not distinct.

The percentage of failure in making cytological diagnosis in thyroid lesions is not uncommon. Present study showed failure of around 10% of cases. It makes distinct difference for surgeons to approach for treatment modalities. Present study was compared with previous reported studies by various authors (Table-3).

Four cases of nodular goitre was reported as follicular

adenoma and four cases of follicular adenoma was reported as nodular goitre which showed follicular cells in a back ground of colloid on smears. Smears with macrofollicular arrangement leads to the misdagnosis of follicular adenoma as also observed by Orell.

Present study found negative correlation in 15 out of total cases (10.5%). 6 cases were false positive and 4 cases were false negative. (4 cases diagnosed as goitre in cytology which was reported as follicular adenoma on histopathology. Likewise, 4 cases of follicular adenoma diagnosed on cytology which was goitre on histopathology. There was one case diagnosed as papillary carcinoma on cytology, which was goitre on histopathology)

Table-2: Cyto-histopathological correlation

Cyto-Diagnosis	Histopathological Diagnosis							
	Goitre	Lymphocytic Thyroiditis	Hashimoto's Thyroiditis	Follicular Adenoma	Papillary Carcinoma	Follicular Carcinoma	Anaplastic Carcinoma	Medullary Carcinoma
Goitres & Cysts	46			[4]				
Lymphocytic thyroiditis		9	[1]					
Hashimoto's thyroiditis		[2]	16					
Follicular Adenoma	[4]			42				
Papillary carcinoma	[1]				10			
Follicular Carcinoma			[1]			2		
Anaplastic carcinoma							1	
Medullary carcinoma								1
Inadequate aspiration	[1]			[1]				

Overall percentage of Positive Correlation: 89.44% (127 cases) Figures within the bracket give negative correlation.

Table-3: Comparison of value of FNAC as diagnostic tool

Study (year)	Number of study cases	Positive Correlation (%)
Kenneth SC et al (1983)[7]	304	87%
Silverman J et al (1986)[8]	309	75%
Bouvet et al (1992)[9]	78	93%
Thompson A et al (2003)[12]	160	75%
Kessler et al (2005)[10]	170	80%
Gupta et al (2006)[11]	75	84%
P Pandey et al (2012)[13]	112	81%
Present series	142	89%

Auto-immune thyroiditis occurred predominantly in female in 3rd and 4th decades. Hashimoto's thyroiditis was the commonest lesion diagnosed based on follicular cells intermingled with lymphocytes an Hurthelization with fibrotic tissue bands. The lesions showed spectrum of cytological features depending upon the stage of disease due to autoimmune process. Presence of Hurthle cells is the hall mark in the diagnosis of Hashimoto's thyroiditis. When only lymphocytes are present in the back ground of follicular cells a diagnosis of lymphocytic thyroiditis was made.

A false diagnosis of Follicular carcinoma was avoided in spite of the presence of atypia in the follicular cells, as for the cytological features expected in atypical adenoma. Hence one should be careful in making a diagnosis of malignancy. In micrometry was done on neoplastic cells, some degree of differentiation of follicular adenoma and follicular carcinoma can be made. However this facility was not available for us.

One of the cases of Hashimoto's thyroiditis show only Hurthle cells which lead to the misdiagnosis of Hurthle cell adenoma, variant of follicular adenoma. Similar experience was encountered by Orell.

Follicular adenoma was the commonest benign neoplastic lesions which showed good cyto-histological correlation.

Smears with high cellularity in a follicular pattern against haemorrhagic background were characteristically present. Follicular adenoma already discussed was diagnosed as nodular goitre in four of the case because of the high cellularity and microfollicular pattern. The similar results observed by Kim J et al in 2001.[16]

Papillary carcinoma are the commonest malignant lesions especially in women and are diagnosed by FNAC based on the

Table-4: Comparison of failure rates of cytological diagnosis in thyroid lesions

Study done by workers	No. of Cases	Needle gauge	Local anaesthesia	Position of Patient	Stain used	Failure
C.Hametkar M.D.Arch Otolaryngol Vol 109, April 11 1983 (26)	97	21 or 22 Syringe size not given	Given	Supine position	Pap smear	26.6%
Kenneth J.Clin Tetho 1983 36 (31)	304	23 gauge 20 ml	Not given	Supine position	11 & 1 Pap	5%
William R Geedle A.J.C.P Vol.82 Nov 1984 (67)	6	22 gauge	Not given	--	Pap smear	Nil
IT William Scott Graffies Laryngos	69	22 or 23 gauge 20 syringe	Not given	Semi supine in Dental chair	Pap smear	Only 2%
Hialal / Sayer B.M.J.Vol 290 18 Mar 1985 (28)	70	22 gauge 10 ml	Not given	--	Pap & MGG	14.20%
Jan F silverman 309 cancer 57-1164 To 1170 1986 (85)	309	22 gauge 20 ml	Given	Supine Position with a small pillow uner shouder	Wright stain	11.2%
* Present Study	240	22-24 gauge	Not given	Sitting & Supine Position	H & E, MGG	10.56%

presence of monolayered sheets of follicular cells, papillary arrangement, fibro vascular core, nuclear grooves and intra-nuclear cytoplasmic inclusions. Confident diagnosis was made in ten cases which was proved by histopathologically and one case which showed papillae was turned out as hyperplastic goitre. Similar experience noted by Scanlan P et al[15] and Michigishi T et al[18].

The distinction between follicular adenoma and follicular carcinoma is extremely difficult, even for the experienced pathologist. Hence smears were designated as follicular neoplasm as by others. Confident diagnosis of follicular carcinoma was made in two of the cases which showed high cellularity and nuclear pleomorphism and distinct nucleolus.

Follicular carcinoma was misinterpreted as Hashimoto's thyroiditis for the reasons of atypia. Hurthelization and lymphocytic aggregate which can occur in both conditions, hence, one should be careful in such gray areas. Such problem was experienced by Woeber KA[17] and Kanmaz B et al[19].

Cytohistological correlation was positive in 89% of cases in present series. Negative correlation was taken mostly with Hashimoto's thyroiditis, goitre and follicular adenoma. Study carried out by M. Gupta et al11 and MB Flanagan et al.[2] observed similar results with benign diseases.

Ultrasonographic studies have suggested that USG alone is not sufficiently reliable to differentiate benign from malignant nodules. Final diagnosis requires morphological examination of lesions and for this FNAC or histological examination becomes mandatory.[20]

Conclusion

However, to date, there is no single appropriate non-invasive diagnostic test in clinical medicine that can accurately and in timely and cost-effective fashion, distinguish benign from malignant nodules; except for FNAC.

No other area in diagnostic cytopathology demands more

of multidisciplinary approach than thyroid FNA.

FNAC of the thyroid gland is now a well established first line diagnostic test for the evaluation of diffuse thyroid lesions as well as nodular lesions of thyroid with the main purpose of confirming benign lesions and thereby reducing unnecessary surgery.

An accurate FNA diagnosis leading to timely and optimal patient management is highly dependent on a close or friendly interaction amongst pathologists, radiologists and medical endocrinologists/surgeon.

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