

Role of Fine Needle Aspiration Cytology for Neoplastic Evaluation of Nodular Goitre

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ABSTRACT

Objective: To see the accuracy of fine needle aspiration cytology (FNAC) for neoplastic lesions in nodular goitre.

Design: A prospective comparative analytic study.

Place and Duration of Study: The study was conducted in Pathology Department, Punjab Medical College Faisalabad in association with the Department of surgery, Allied Hospital Faisalabad from September 1st, 2008 to May 31st, 2010

Patients and Methods: With an informed and explained consent, the study was conducted on 117 patients of primary euthyroid nodular goitre who underwent thyroid surgery. Preoperative diagnosis in all the patients was established by fine needle aspiration cytology and thyroid function tests. After thyroid surgery, excised tissue was sent for histopathology to confirm the diagnosis. Cytological

diagnosis was compared with histological diagnosis to see the accuracy of fine needle aspiration cytology for neoplastic lesions.

Results: Among the 117 patients, FNAC showed neoplastic and non-neoplastic lesions in 27 and 90 patients respectively. While, histological diagnosis revealed neoplastic lesions in 24 patients and non-neoplastic lesions in 93 patients. Sensitivity, specificity and accuracy of FNAC for neoplastic lesions in nodular goitre remained 79.17%, 91.4% and 88.89% respectively.

Conclusion: Fine needle aspiration cytology plays a pivotal role in pre-operative differentiation between the neoplastic and non-neoplastic lesions of nodular goitre.

Keywords: Fine needle aspiration cytology, nodular Goitre, neoplastic lesions, accuracy

INTRODUCTION

Enlargement of the thyroid gland is a common occurrence in most parts of the world especially in the iodine-deficient belt areas.¹ Several pre-operative diagnostic tests such as scintigraphy (with I¹²³ or 99mTC pertechnetate), transcutaneous ultrasonography and fine needle aspiration cytology (FNAC) have been used to differentiate benign from malignant thyroid lesions. It is the FNAC which has supplanted most other tests in pre-operative evaluation of thyroid nodules for the detection of thyroid cancer at earlier stages, resulting in better outcome of patients.² FNAC has distinct advantages over surgical and trucut biopsy as the technique causes minimal trauma to the patient and carries virtually no risk of complications.³ Keeping in view the simplicity, safety and diagnostic accuracy, FNAC is gradually replacing open biopsy and frozen section.^{4,5,6} It is being considered that FNAC is an accurate predictor of malignancy.^{7,8} Introduction of routine pre-operative FNAC in the

management of solitary thyroid nodules has reduced the number of patients requiring surgery from 67 to 43% and increased the proportion of surgically proven cancers from 14 to 29%.⁹ In recent literature, it is being recommended that FNAC should be the primary investigation in goitre to exclude malignancy, especially in those which have one or more nodules.¹⁰ However, despite the widespread use of ultrasound-guided FNA, this modality is also associated with a significant rate of initial non-diagnostic cytology approaching 20% to 25%. The patients with false positive and false negative cytology may have to face un-due or under-due resection of goitre in thyroidectomy and disturbances in endocrine functions of thyroid, later.¹¹

Like other parts of the world, nodular goitre is a common presentation in Allied Hospital Faisalabad. This study was planned to share our experience about the cytological evaluation of nodular goitre in differentiating neoplastic and non-neoplastic lesions pre-operatively. Analysis of this study will help us in

decision making policies for the management of nodular goitre by surgery or otherwise and the extent of resection in thyroidectomy. Moreover, the conclusive suggestions for improving the diagnostic accuracy of FNAC in nodular goitre will be beneficial for the patients to have a disease free better quality of life.

OBJECTIVE

To compare the cytological diagnosis with histological diagnosis in nodular goitre and to see the accuracy of FNAC for neoplastic lesions

PATIENTS AND METHODS

This prospective comparative study was carried out in the department of pathology, Punjab Medical College Faisalabad in association with surgical department, Allied Hospital Faisalabad from September 1st, 2008 to May 31st, 2010 in patients of primary euthyroid nodular goitre who underwent thyroid surgery for their treatment. Preoperatively, every patient was sent to pathology department for cytological evaluation of neoplastic lesions in nodular goitre. Patients were counseled about their cytological diagnosis and the indications of surgery. Those patients who consented for surgery, they were subjected thyroidectomy in accordance with their cytological diagnosis. After thyroid surgery, the excised specimens were sent to pathology department for final histological diagnosis. Cytological and histological assessment was done by the same team of pathologists. Pre-operative cytological diagnosis of nodular goitre was compared with final histological diagnosis.

Inclusion Criteria:

1. Patients with primary euthyroid nodular goitre having age 13 years or above.
2. Patients with both pre-operative FNAC and postoperative histological evaluation of nodular goitre for neoplastic lesions by the same team of pathologists from the pathology laboratory, Punjab Medical College Faisalabad.
3. Patients who consented to participate in study.

Exclusion Criteria:

1. Patients who had recurrent goitre or secondary metastatic lesions.
2. Patients who left after cytological evaluation or did not responded for histopathology or their cytological and histological evaluation was not by the same team of pathologists.

3. Patients who had diagnostic evaluation from any other laboratory

Statistical analysis: The data was analyzed for sensitivity, specificity and accuracy of FNAC for neoplastic lesions in nodular goitre.

RESULTS

In accordance with inclusion and exclusion criteria, total 117 patients were included in study. Female to male ratio of the patients remained 106 (90.6%) and 11(9.4%) respectively. Age of the patients ranged from 14–82 years with mean age 34.5 years. Distribution of patients in sub-groups for their age is shown in table-1.

Table 1:
Age Sub-groups of Patients

Sr. No.	Age sub-groups	Patients	
		No.	%age
1	13-20 Years	19	16.24 %
2	21-30 Years	27	23.07 %
3	31-40 Years	42	35.90 %
4	41-50 Years	16	13.68 %
5	51-60 Years	7	5.98 %
6	61-70 Years	4	3.42 %
7	71 Years & above	2	1.71 %
8	Total patients	117	100 %

Among the 117 patients, fine needle aspiration cytology showed neoplastic lesions or suspicious of neoplasia in 27 (23.08%) patients and out of them histopathology proved neoplastic lesions (Benign and malignant) only in 19 patients, while, the remaining 8 patients were found to have non- neoplastic benign lesions. Therefore, 19 patients were found to be true positive and 8 patients who had neoplasia on FNAC but non-neoplastic nodular goitre on histopathology, they were marked as false positive.

Cytological diagnosis showed non-neoplastic nodular goitre in 90 (76.92%) patients and out of them only 5 patients were found have neoplastic nodular goitre on hidtopathology. These 5 patients were marked as false negative for neoplastic nodular goitre. The major proportion, 85 (72.65%) patients, was found to have non-neoplastic nodular goitre on FNAC and histopathology as well. All these 85 patients were true

negative for neoplasia of thyroid. Statistical analysis showed sensitivity, specificity and accuracy 79.17%, 91.40% and 88.89% respectively. Details about the cytological diagnosis, histological diagnosis,

diagnostic comparison between FNAC and histopathology (Reference standard test) along with statistical analysis in shown in tables: 2, 3 and 4 respectively.

Table 2:
FNAC of Nodular Goitre

Cytological Diagnosis		Patients		
		No.		%age
Non neoplastic lesions	Nodular goitre	74	90	76.92%
	Benign cystic lesion	11		
	Ch. Lymphocytic / hashimoto's thyroiditis	5		
Neoplastic lesions	Follicular neoplasms	17	27	23.08%
	Papillary carcinoma	4		
	Hurthle cell lesion	1		
	Suspicious of neoplasia	5		
Total patients		117		100%

Table 3:
Histopathology of Nodular Goitre

Histological Diagnosis		Patients		
		No.		%age
Non neoplastic Lesions	Multinodular goitre	68	93	79.49%
	Solitary colloid nodule	13		
	Benign thyroid cyst	7		
	Ch. Lymphocytic thyroiditis	3		
	Hashimoto's thyroiditis	2		
Neoplastic lesions	Follicular adenoma	13	24	20.51%
	Colloid adenoma	2		
	Hurthle cell adenoma	1		
	Follicular carcinoma	2		
	Papillary carcinoma	5		
	Lymphoma	1		
Total patients		117		100%

Table 4:
Diagnostic comparison between FNAC and histopathology for neoplastic lesions of Nodular goitre and statistical analysis

Cytological Diagnosis	Histological diagnosis	Frequency	Remarks
Follicular neoplasms	Follicular adenoma	11	True Positive
	Follicular carcinoma	2	
Hurthle cell lesion	Hurthle cell adenoma	1	
Papillary carcinoma	Papillary carcinoma	3	
Suspicious neoplasia	Colloid adenoma	2	False Positive
Follicular neoplasms	Nodular goitre with hyperplasia	3	
	Ch. Lymphocytic thyroiditis	1	
Papillary carcinoma	Benign thyroid cyst	1	
Suspicious of neoplasia	Multinodular goitre	2	
	Hashimoto's thyroiditis	1	
Nodular goitre	Multinodular goitre	63	True Negative
	Solitary colloid nodule	13	
Benign cystic lesion of thyroid	Benign thyroid cyst	6	
Ch. Lymphocytic / hashimoto's thyroiditis	Ch. Lymphocytic thyroiditis	2	
	Hashimoto's thyroiditis	1	
Multinodular goitre	Papillary carcinoma	1	False Negative
Benign cystic lesion of thyroid	Papillary carcinoma	1	
Ch. Lymphocytic thyroiditis	Lymphoma	1	
Nodular goitre with hyperplasia	Follicular adenoma	2	
STATISTICAL RESULTS			
Sensitivity » 79.17 %	Specificity » 91.40 %	Accuracy » 88.89 %	

DISCUSSION

Thyroid nodules are common clinical findings. The prevalence of thyroid nodules ranges from 4% to 10% in the general adult population.¹² Majority of clinically diagnosed thyroid nodules are non-neoplastic; only 5%–30% are neoplastic and require surgical intervention.¹³ The main goal of evaluating these nodules is to identify nodules with malignant potential. However, distinction between non-neoplastic and malignant nodules cannot be reliably based on the clinical presentation alone. FNAC has high sensitivity and diagnostic accuracy in the evaluation of thyroid nodules for picking up malignancy. Based on the cytological findings, patients can be followed who have non-neoplastic and benign diagnosis or subjected to surgery in cases with malignant diagnosis; thereby, decreasing the rate of unnecessary surgery.¹⁴

In our study, Fine needle aspiration cytology for the evaluation of neoplastic lesions in nodular goitre expressed sensitivity, specificity and accuracy 79.17%, 91.40% and 88.89% respectively. The statistical analysis of national study which was conducted for diagnostic accuracy and pitfalls of FNAC in thyroid nodule (s) showed sensitivity 98%, specificity 70% and diagnostic accuracy 91%.² Similarly, the results of another local study conducted for relative efficacy of FNAC in nodular goitre revealed its sensitivity, specificity and accuracy 90.9%, 100% and 98.1% respectively.⁷

International literature has revealed variable observations about the role of FNAC in nodular goitre to detect the neoplasia. An Indian study for the role of FNAC in diagnosis and management of thyroid lesions showed sensitivity and specificity 97% and 100% respectively.¹⁵ A study conducted in Cytology laboratory University Hospital Zagreb, Croatia for the importance of FNAC in detection of tumours within multinodular goitre showed overall sensitivity and specificity 85% and 88% respectively.¹⁶ Experience of a Nigerian study for evaluation of FNAC and its correlation with histologic diagnosis showed sensitivity, specificity and accuracy 88.9%, 96.1% and 94.2% respectively.¹⁷ However, the sensitivity, specificity and accuracy figures of FNAC for the detection of thyroid neoplasia by Morgan; et al, remained 55.0%, 73.7% and 67.2% respectively which were found to be lower than most of the series given in literature.¹⁸

Literature has reported the sensitivity range from 65%–98% and specificity range from 72%–100% for FNAC

in thyroid nodules.¹⁹ These variations in diagnostic accuracy of FNAC in thyroid nodules have been related to free hand or ultrasound guided FNAC, sampling technique, amount and quality of aspirated material, size of nodules to be tested and experience of cytologists. The false positive and false negative results are found to be more with free hand FNAC, pitfalls in sampling, size of nodules less than 1cm or more than 4 cm, less experienced cytologists or lack of team work between cytologist, surgeon or endocrinologist and radiologist.^{20,21}

Though, our study has shown a slightly low accuracy of FNAC to pick up neoplastic lesions in nodular goitre than most of the studies in literature. But, our results are in accordance with other studies that FNAC is more specific than sensitive in the evaluation of thyroid neoplastic lesions. The main concern is firstly to minimize the missed malignant lesions on FNAC which can be overcome by ultrasound guided nodule selection, aspirate at multiple sites / directions, interpretation by a team work and repeat aspirate in doubtful or suspicious cases. Secondly, the role of FNAC is to assist in the selection of patients suitable for surgery and to confirm morphologically functional disorders like hyperthyroidism or hypothyroidism resulting from thyroiditis. However, FNAC dependent neoplastic evaluation of nodular goitre has no equivalence to histopathology. So, the patients with suspicious of malignancy or doubtful diagnosis should be either closely observed in follow up or should undergo frozen section per-operatively in order to decide the extent of goitrous lesion to be excised.²²

CONCLUSION

Among the initial less invasive but highly valuable investigations, fine needle aspiration cytology plays a pivotal role to differentiate neoplastic lesions from non-neoplastic benign pathologies in diagnostic evaluation of nodular goitre.

RECOMMENDATIONS

Surgeons and endocrinologists dealing with goitre patients in a tertiary care teaching hospital are suggested to recommend FNAC as routine initial investigation to identify the neoplastic lesions. This policy will be helpful to increase the experience of cytopathologists, to improve the accuracy of cytological evaluation and to facilitate the surgeons in their decision making plans to manage the patients with nodular goitre.

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