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Diagnostic Value of Fine Needle Aspiration Cytology in the Diagnosis of Solitary Thyroid Nodule

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ABSTRACT

Objectives: To determine the diagnostic value of fine needle aspiration cytology in the diagnosis of solid solitary thyroid nodules. **Patients and Methods:** This study was conducted at the department of Ear, Nose, Throat, Head and Neck surgery at Postgraduate Medical Institute Lady Reading Hospital Peshawar. This was cross-sectional comparative study. The duration of the study was one year from June 17, 2010 to June 16, 2011. The sample size was 82 patients with solid solitary thyroid nodule, fulfilling the inclusion criteria. Fine needle aspirations were performed in all cases and compared with open biopsies taking as gold standard. **Results:** Our study included 82 cases consisting of 57 (69.51%) female and 25 (30.48 %) male, with female: male ratio of 2.28: 1. The age of the patients was ranged from 16-65 years with mean age of 42.56 $\pm$ S.D 11.60 years. Most of the patients presented in 3rd and 4th decade followed by the 5th and 2nd decade. The diagnostic yield of fine needle aspiration cytology (FNAC) in this study was accuracy 82.92%, sensitivity 88.09%, specificity 77.50% and positive predictive value was 80.43% that supported our hypothesis. **Conclusion:** FNAC is a primary diagnostic tool for solitary thyroid nodule because it is simple, safe, quick, reliable, minimally invasive, and cost effective.

Key Words: Fine Needle Aspiration Cytology, FNAC, histopathology, solid solitary thyroid nodule.

INTRODUCTION

Frequency of thyroid disease is common in Pakistan and solitary thyroid nodule presents a significant diagnostic dilemma for the treating surgeon.[1] Thyroid nodule occurs in 4-7% of the population.[2] Malignant tumors of thyroid gland represent less than 0.5% of all cancers in England and wales.[3] In Southern Sweden, there are roughly two cases per 100,000 populations per annum and in the USA the equivalent figure is slightly less then four.[2] Although solitary thyroid nodules are common in females, solitary thyroid nodules in males are more likely to be malignant than in females.[4]

Different imaging techniques are now used for pre operative diagnosis of solitary thyroid nodule like radio nucleotide scanning, high resolution ultrasonography etc but FNAC is regarded as the single most and cost effective procedure.[5] FNAC of thyroid gland is now a well established, first line diagnostic test for the evaluation of diffuse thyroid lesion as well as of solitary thyroid nodule with main purpose of confirming benign lesion and by reducing unnecessary surgery.[6]

The first attempt at aspiration of head and neck masses were made by Marles and Ellis at the memorial Sloan-ketring hospital in 1930.[7] Solderstorm and Franzen used FNAC in the diagnosis of thyroid diseases for the first time in 1950s and 1960s.[8] Many investigations have shown

that FNAC is the single most sensitive, specific and cost effective method in the investigations of solitary thyroid nodule.[9] FNAC of malignant thyroid nodules reported to have sensitivity ranges from 65-98% and specificity of 72-100%.[10] Although there is a large body of world literature claiming the accuracy and usefulness of thyroid cytology, there is also evidence of showing possible limitations and pitfalls of this procedure.[11,12] The best outcome of FNAC can be achieved by clinical assessment prior to the procedure, observation made by the performer during the procedure, quality of smear prepared, final microscopic evaluation and reports.[7,8]

MATERIAL AND METHODS

It was a cross-sectional study conducted at the department of Ear, Nose, Throat, Head and Neck Surgery, Postgraduate Medical Institute, Lady Reading Hospital Peshawar. The study duration was one year from June 17, 2010 to June 16, 2011. This study included 82 cases of solid solitary thyroid nodule which were enrolled by non-probability convenient sampling.

Included were patients of all age groups and both genders presenting with solitary thyroid nodule. All FNACs were performed by the same person and specimens were analyzed by same cytopathologist. All the patients underwent thyroid surgery and the thyroid gland specimen was examined by same histopathologist.

RESULTS

This research included 82 cases of solitary thyroid nodule fulfilling inclusion and diagnostic criteria. There were 57 female and 25 male, with female: male ratio of 2.28: 1 (Fig. 1). The age of the patients was ranged from 16-65 years with mean age of 42.56 $\pm$ S.D 11.60 years. Most of the patients presented in 3rd and 4th decade followed by the 5th and 2ndecade (Fig. 2). These patients were from low, middle and high socioeconomic strata of society. The main complaint of these patients was neck swelling (100%), vocal cord palsy (6.09%), breathing difficulty (4.87%) and dysphagia. The size of the thyroid nodule ranged from 2-7.2 cm with mean 4.40 +/- S.D 1.93 cm. The solitary nodule was

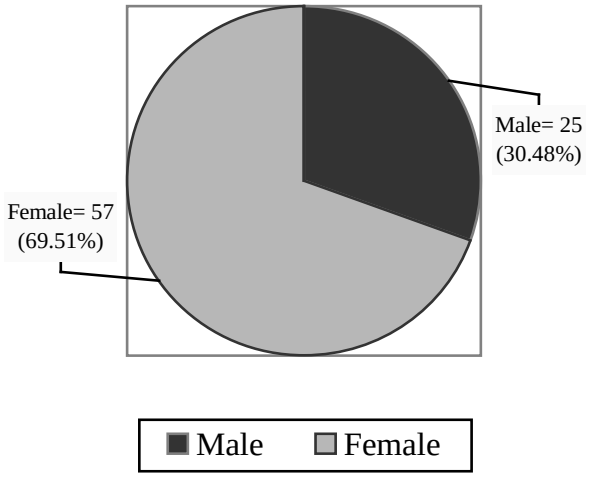

Fig. 1: Gender wise distribution of patients.

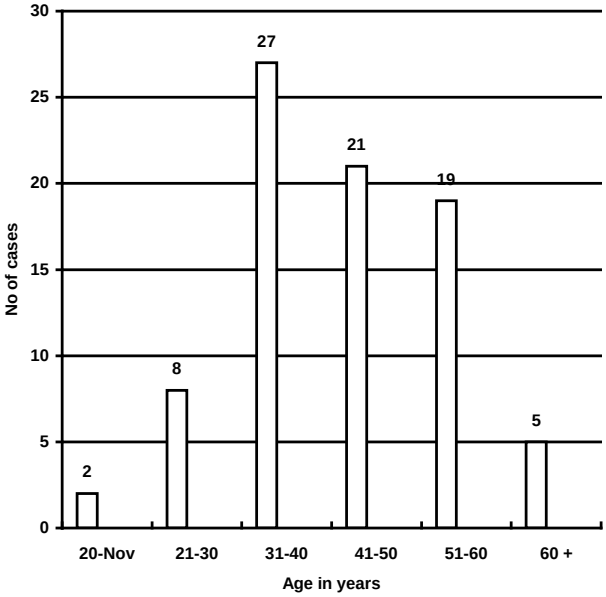

Fig. 2: Age-wise distribution of patients.

found mainly in right lobe of thyroid (64.63%) and the least involvement was of thyroid isthmus. The clinical characteristics of solitary thyroid nodule were that shape of the nodule was rounded in 80.48% and elongated 16%. Edges were regular in 87.80% cases and irregular in 12.19% cases. Swelling was mobile in 79.26% patients but mobility was absent in 20.73% cases. On palpation

of the nodule, 68 cases (82.92%) were firm and 14 cases (17.07%) were hard. In only 3.6% cases the nodule was fixed and in 96.34% cases fixity was absent. In this study FNAC of solitary thyroid nodule revealed that 42 cases (51.21%) were nodular goitre, 13 cases (15.85%) benign nodules among benign lesions while 13 cases (15.85%) were follicular carcinoma, 8 cases (9.75) papillary carcinoma and 2 cases were suspicious of neoplasm. In our study histopathological finding of thyroid nodule were as 40 cases (48.78%) of colloid nodule, 10 cases (12.19) benign thyroid cyst and one case of Hashimoto's thyroiditis among benign conditions while neoplastic lesions were 13 cases (15.85%) follicular adenoma, 10 cases (12.19%) colloid adenoma followed by papillary carcinoma 3 cases(3.65%) and 2 cases of follicular carcinoma (Tables 1, 2).The diagnostic value of FNAC in this study was that 37 cases (45.12%) were true positive, while 31 cases (37.80%) were true negative. In this study false positive cases were 9 (10.97%), 5 cases were follicular neoplasm on FNAC and on histopathology turned out benign thyroid diseases, 3 cases were papillary carcinoma which was diagnosed benign thyroid cyst on biopsy. In our study 5 cases (6.09%) were false negative, 3 cases were benign thyroid diseases which are diagnosed papillary carcinoma on histopathology, 2 cases (2.43%) were diagnosed as lymphoma and follicular adenoma on histopathology. The diagnostic yield of FNAC in this study is accuracy 82.92%, sensitivity 88.09%, specificity 77.50% and positive predictive value was 80.43%. To see the correlation between the FNAC and biopsy results, chi square test was applied on the data and result showed that there was no correlation between FNAC and biopsy results (Chi square = 0.000, DF = 1, P value = 1.00).

Table 1: FNAC of thyroid nodule (n=82).

Diagnosis of FNAC		No. of cases	Percent
Non Neoplastic Lesions	Nodular Goitre	42	
	Benign Nodule	13	
	Lymphocytic Thyroiditis	3	
	Total	58	70.73%
Neoplastic Lesions	Follicular Carcinoma	13	
	Papillary Carcinoma	8	
	Hurthle Cell Lesion	1	
	Suspicious of Neoplasm	2	
	Total	24	29.26%

Table 2: Histopathology of thyroid nodule.

Diagnosis of FNAC		No. of cases	Percent
Non Neoplastic Lesions	Solitary colloid nodule	40	
	Benign thyroid cyst	10	
	Ch. Lymphocytic thyroiditis	2	
	Total	53	64.63%
Neoplastic Lesions	Hashimoto's thyroiditis	1	
	Follicular adenoma	13	
	Colloid adenoma	10	
	Hurthle cell adenoma	1	
	Follicular carcinoma	2	
	Papillary carcinoma	3	
	Total	29	35.36%

DISCUSSION

FNAC-based detection of solitary thyroid lesions remains challenging, despite tireless efforts to establish cytologic and clinical criteria for diagnosing follicular neoplasms and distinguishing between benign and malignant lesions.[1] Majority of clinically diagnosed thyroid nodules are non-neoplastic; only 5%–30% are neoplastic and require surgical intervention.[13] 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.[1] Thyroid nodule is more common in females and in this study there were 57 female and 25 male, with female: male ratio of 2.28: 1, which is comparable to the studies conducted nationally and internationally. In this study most of the patients presented in 3rd and 4th decade which is also in accordance to the study of Bukhari and collegues.[14] Patients in this study belonged to different category of life but solitary thyroid nodule was more common in low socioeconomic group simulating to the study conducted by Mehmood Q and collegues.[15]

These patients presented mainly with neck

swelling (100%) and some of the patients had vocal cord palsy (6.09%), breathing difficulty (4.87%) and dysphagia which is in accordance to the study of Thompson and colleague reporting neck swelling in all patients (100%).[16] The size of the thyroid nodule ranged from 2 - 7.2 cm with mean 4.40 ± SD 1.93 cm simulating the study of Borget I who reported that the mean ± SD diameter of the largest nodule was 2.68 (± 1.15) cm while the mean ± SD for size of thyroid nodule was 4.60 ± 1.63cm in Basharat R study. [17,18] In our study the solitary nodule was found mainly in right lobe of thyroid (64.63%) and the least involvement was of thyroid isthmus and similar finding is also observed by Torre EM and collegues.[19] In this study the FNAC finding was 58 cases (70.73%) had non neoplastic lesions which in accordance to study of Korah T reporting benign lesions 69%.[20]

Nodular goitre was the commonest finding among the benign lesions (51.21%) which is in keeping with studies of Gupta M et al revealed 39 cases (52%) as colloid nodular goitre and Saddique M reported thirty cases (50%) as nodular goiter.[21,1] The next common FNAC finding among benign lesions was benign cyst in 13 cases (15.85%) which was at variance from study of Abu-salem had thyroid cysts in 43 cases (8.3%).[22] The malignant diseases in this study were 29.26% which is comparable to the study of Gupta having malignant lesion 26% and Baloch MN study having malignant lesions 29% (n-110). [21,23] Among the malignant diseases follicular carcinoma was on top accounting 15.85% which is different from study of Pai BS where malignancy was found in 15 of the cases (23%).[24] Papillary carcinoma was the commonest malignancy. In our study papillary carcinoma was diagnosed on FNAC in 9.75% patients. On histopathology non neoplastic lesions were findings were 64.63% and neoplastic lesions were 35.36% while in Mehmood Q study histopathology revealed non neoplastic lesions 79.49% and neoplastic lesions were 20.51%.[25] On histopathology diagnosis among non neoplastic lesions colloid nodule was the common finding 48.78% (40 cases) which is comparable to study of Gupta showed 42 (56%) cases as colloid nodular goitre and other studies. [26] Among the neoplastic lesions on histopathology follicular adenoma was found in 13 patients (15.85%) while in Tabaqchali MA study follicular adenoma in 60 patients (25.10%) which is higher than my study, the reason could be that his sample size was greater (239 cases). [27]

On FNAC 8 cases (9.75%) were diagnosed as malignant and on histopathology they were confirmed benign nodular goitre and one case was suspicious on FNAC and was confirmed as Hashimoto's thyroiditis on histopathology which is comparable to the study of Gharib H who reported a false-negative rate of 1% to 11%, a false-positive rate of 1% to 8%.[28] In Moosa FA study the yield of FNAC was that sensitivity was calculated 77.7%, specificity 98.9%, and with a positive and negative predictive value of 87.5% and 97.8% respectively. [29] Similarly Abu Salem studied specificity of 99% and a sensitivity of 93% while Tariq M reported sensitivity of 75% and specificity 97.6% PPV, NPV 85.71%, 95.34% respectively. [22] The outcome of FNAC in Mehmood Q study was sensitivity 79.17 % and specificity 91.40 %.[15] Our results are lesser than the study of Korah T who reported 88%, 98%, 100% and 100%, for sensitivity, NPV, specificity and PPV respectively.[20]

CONCLUSION

FNAC is a primary diagnostic tool for solitary thyroid nodule because it is simple, safe, quick, reliable, minimally invasive, and cost effective. It can differentiate non neoplastic conditions from neoplastic one and can be performed as an outpatients' procedure. It is easily repeatable and is having good patient compliance.

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