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Original Research Article

The accuracy of ultrasonography and fine needle aspiration cytology in the diagnosis of nodular goitre: A prospective analysis of fourty two cases

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Abstract

Aims: The aim of the present study is to evaluate the accuracy of ultrasonography and fine needle aspiration cytology (FNAC) in diagnosis of thyroid nodules in comparison with other diagnostic modalities and to make early and accurate differentiation of benign and malignant thyroid nodules with incidence of malignancy in thyroid nodules. There is 4-5 % incidence of clinically apparent thyroid nodules in the general population. The majority (90%) of thyroid nodules are benign as malignancy occurs in only 1 in 10 thyroid nodules. The overall incidence of malignancy in solitary thyroid nodule ranges between 10% and 30%.

Material and Methods: A prospective study was carried out on 42 cases with nodular goitre attending the surgery OPD, NKP Salve Institute of Medical Science & Research Centre and Lata Mangeshkar Hospital, Digdoh Hills, Hingna Road, Nagpur from October 2010 to October 2012. All patients were subjected to USG and FNAC.

Results: In this prospective study of 42 cases with nodular goitre, clinically 29 patients had solitary thyroid nodule and 13 patients had multinodular goitre. Out of these 42 patients 35 (83.33%) were female and 7 (16.67%) were male with ratio of 5:1, the age of the patients ranged from 18 years to 65 years. Out of these 29 patients of solitary thyroid nodule, 5 patients had malignancy on histopathological examination. So the incidence of malignancy in clinically solitary thyroid nodule was found to be 17.24%.It was observed that USG was 71.43% sensitive and 90.62% specific in detection of malignancy in nodular goitre whereas FNAC was 75% sensitive and 100% specific in the same regard.

Conclusion: The sensitivity and specificity of these diagnostic modalities were evaluated and it was found that USG and FNAC have a high specificity. No investigation was found to be 100% accurate in diagnosing malignancy in nodular goitre but a combination of various diagnostic modalities (ultrasonography and FNAC) rather than any single modality will give optimal results and avoid unnecessary surgery in a great number of patients without missing any malignancy.

Keywords: Solitary thyroid nodule (STN), Fine needle aspiration cytology (FNAC), Ultrasonography (USG), Histopathological examination (HPE).

1.Introduction

Thyroid gland is unique among endocrine organs as it is the largest endocrine gland in the body and the first to develop in fetal life. There is approximately 4-5% incidence of clinically apparent thyroid nodules in the general population.[1] Thyroid nodules are about four times more common in females than in males. The majority (90%) of thyroid nodules are benign as malignancy occurs in only 1 in 10 thyroid nodules.[2] The overall incidence of malignancy in solitary thyroid nodule ranges between 10% and 30%.[1][3]

The goal of diagnostic work up now is to select those patients for surgery who have a high likelihood of harboring malignancy in the nodule.[4] Among these diagnostic workup, ultrasonography (USG) and fine needle aspiration cytology (FNAC) are commonly used but there are drawbacks of each technique and the final answer to the problem is still elusive.[5]

Ultrasonography (USG) is the single-most valuable imaging modality in the evaluation of the thyroid gland. Indications for thyroid USG include evaluation for a palpable thyroid nodule or suspected thyroid enlargement and workup of thyroid nodules discovered incidentally.[6] In patients with a thyroid nodule, gray-scale and colour Doppler USG are used to evaluate its sonographic features, including size, shape, echogenicity (hypoechoic or hyperechoic), and composition (cystic, solid, or mixed), and to determine the presence of coarse or fine calcifications, a halo and margins, and internal blood flow.[7] 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.

FNAC provides the most direct and specific information about a thyroid nodule. The use of FNAC reduces the number of thyroidectomies byapproximately 50%[8][9], roughly doubles the surgical yield of carcinoma andreduces the overall cost of medical care in these patients by 25%.[9]

The present study was undertaken to evaluate the utility of FNAC in preoperative diagnosis of nodular goitre and to evaluate the efficacy of in USG and FNAC differentiating between benign and malignant nodules.

2.Material and Methods

A prospective study was carried out on 42 cases with nodular goitre attending the surgery OPD, NKP Salve Institute of Medical Science & Research Centre and Lata Mangeshkar Hospital, Digdoh Hills, Hingna Road, Nagpur from October 2010 to October 2012. All patients were subjected to USG and FNAC.

Sonographically the nodules were evaluated for size, location, echo texture, margins and presence of halo, calcification, and accessory nodules and associated cervical lymphadenopathy in order to differentiate between benign and malignant nodules. The results of FNAC were interpreted as benign, malignant, suspicious malignant and inadequate aspirate.

All the patients were subjected to surgery and histopathological examination (HPE) of the specimens. Finally, the histopathology reports were correlated with the findings of USG and FNAC in order to evaluate their sensitivity and specificity.

3.Results

In this prospective study of 42 cases with nodular goitre, clinically 29 patients had solitary thyroid nodule and 13 patients had multinodular goitre. Out of these 42 patients 35 (83.33%) were female and 7 (16.67%) were male with ratio of 5:1, the age of the patients ranged from 18 years to 65 years.

All patients were subjected to USG and FNAC. The results were correlated with the findings of histopathology report. Taking into consideration the various ultrasonographical features, cases were classified into benign, suspicious and malignant.(**Table 1**)

Table 1: Distribution of lesions on USG

Category	Lesion	No. of Cases	Total
Benign	Colloid cyst	01	31
	Colloid Goitre	16	
	MNG	14	
Suspicious	Suspicious MNG	03	03
Malignant	Mixed Echogenic nodule	08	08

All patients were subjected to FNAC; however in 2 patients FNAC material was difficult to interpretate. Out of 42 patients, malignancy was detected by FNAC in 3 patients and all of were papillary carcinoma. Benign lesions were present in 37 patients out of whom 17(40.48%) patients had nodular goitre, 11(26.19%) patients had colloid goitre, 2 (4.76%) patients had colloid cyst and 7(16.67%) patients had follicular neoplasm. The results of FNAC are shown in **Table 2**.

Table 2: Distribution of patients according to results of FNAC

Classification	FNAC	No. of Patients	Percentage (%)
Benign	Nodular Goitre	17	40.48 %
	Colloid Goitre	11	26.19 %
	Colloid Cyst	2	4.76 %
Suspicious	Follicular Neoplasm	7	16.67 %
Malignant	Papillary carcinoma	3	7.14 %
Inadequate Aspirate	Hemorrhagic aspirate	2	4.76 %

The specimens were sent for histopathological diagnosis and reports obtained. 7 patients had FNAC report of follicular neoplasm. But on histopathology out of these 7 patients, 1 patient had MNG with dominant nodule, 1 patient had colloid goitre, 2 patients had follicular adenoma and 3 patients had follicular variant of papillary carcinoma. Distribution of patients according to histopathological examination is shown in **Table 3**.

Table 3: distribution of patients according to histopathology

Histopathology		No. of Patients	Percentage (%)
Multi Nodular Goitre		20	46.62 %
Colloid Goitre		8	19.04 %
Colloid Cyst		1	2.38 %
Hashimoto's Thyroiditis	With MNG	2	4.76 %
	Without MNG	1	2.38 %
Follicular Adenoma		3	7.14 %
Follicular variant of papillary carcinoma		3	7.14 %
Papillary carcinoma		4	9.52 %

The USG diagnosis of benign nodules was confirmed by histopathological examination (HPE) in 29 (93.54%) out of 31 cases and 2 (6.4%) cases turned out to be malignant. In 3 ultrasonographic suspects, HPE revealed benign lesion in all 3 cases. The USG diagnosis of malignant nodules were confirmed in 5 (62.5%) out of 8 cases and was benign on HPE in 3 (37.5%) cases. (**Table 4**)

Table 4: Correlation of USG with histopathological diagnosis

USG Diagnosis		Histopathology Diagnosis	
Diagnosis	**No. of Cases**	**Benign**	**Malignant**
Benign	31	29	02
Suspicious	03	03	00
Malignant	08	03	05
Total	42	35	07

The cytological diagnosis of benign nodule was confirmed in 29 (96.67%) of the 30 patients and was malignant in 1 case (3.33%). In 7 cytological suspicious cases (follicular neoplasm), HPE revealed benign lesion in 4 cases and malignant lesion in 3 cases (follicular variant of papillary carcinoma). All 3 malignant interpretations on cytology were confirmed by HPE. 2 inadequate specimens on cytology were confirmed to be benign on HPE (**Table 5**).

Table 5: Accuracy of FNAC for diagnosis of nodular goitre

FNAC		Histopathology	
Diagnosis	**Total No. of Patients**	**Benign**	**Malignant**
Benign	30	29	01
Malignant	03	00	03
Total	33	29	04

On clinical examination 29 patients had solitary thyroid nodule and 13 patients had multinodular goitre. Out of these 29 patients, 5 patients had malignancy on histopathological examination. So the incidence of malignancy in clinically solitary thyroid nodule was found to be 17.24%.

It was observed that USG was 71.43% sensitive and 90.62% specific in detection of malignancy in nodular goitre whereas FNAC was 75% sensitive and 100% specific in the same regard. (**Table 6**)

Table 6: Sensitivity, specificity of various diagnostic modalities

Diagnostic Modality	Sensitivity	Spcificity	Accuracy
USG	71.43%	90.62%	87.18%
FNAC	75%	100%	96.97%

4.Discussion

In our study, we found the sensitivity and specificity of USG as 71.45% and 90.62% respectively for differentiation between the benign and malignant nodules. Watters et al. (1992) found that the sensitivity and specificity of USG in suggesting a malignant lesion were 74% and 83% respectively.[5] They interpreted an USG report as suggestive of malignancy if the nodule was solid or of a mixed solid-cystic variety and a hypoechoic and

nonhaloed lesion. They emphasized that the USG has added advantage of allowing the whole gland to be examined rather than the dominant nodule but was limited by the fact that no features were pathognomonic for malignancy so that it should be regarded as a complementary rather than an alternative investigation to FNAC in the management of solitary thyroid nodules. Jones et al. found that the sensitivity and specificity were 75% and 61%.[10] It has been observed that for a thyroid nodule to be detected by palpation, it must be at least 1 cm in diameter while USG can detect nodules as small as 3 mm in diameter.[11]

The sensitivity of FNAC in our study was 75% while the specificity was 100% as all malignancies reported on FNAC were confirmed by final HPE. The sensitivity and specificity of FNAC were 71.43% and 100% respectively according to Altavilla et al.[1], 78% and 100% respectively according to Al-rikabi et al[12], 98% and 99% according to Goellner et al[13].

The accuracy of FNAC was 96.97 % in our study, whereas in various other studies it varied from 79% to 98%, depending on the experience of the person performing FNAC and the experience of the cytologist interpreting the cytology findings.[1] FNAC has certain limitations because of scanty sample and suspicious diagnosis. In our series, 4.76% of the specimens were inadequate and 16.67% were found to be suspicious. Out of 7 suspicious cases, 3 (42.7%) were found to be malignant on final HPE. Because of this high incidence of malignancy in suspicious lesions, surgical removal of these nodules should be strongly considered in these cases.

The incidence of malignancy in clinically solitary thyroid nodule was (12.6%) in study conducted by Taylor S[14]. In our study the incidence of malignancy in clinically solitary thyroid nodule was 17.24%.

5.Conclusion

i) The present study was undertaken to evaluate the usefulness of USG and FNAC in the management of nodular goitre. The sensitivity and specificity of these diagnostic modalities were evaluated and it was found that USG and FNAC have a high specificity. In our study the sensitivity and specificity of USG was 71.43% and 90.62% respectively and sensitivity and specificity of FNAC was 75% and 100% respectively.

ii) The reasons for low sensitivity may be –
   a) Small sample size.
   b) Experience of sonologist.
   c) Use of conventional method of FNAC.
   d) Experience of pathologist.

iii) No investigation was found to be 100% accurate in diagnosing malignancy in nodular goitre but a combination of various diagnostic modalities (ultrasonography and FNAC) rather than any single modality will give optimal results and avoid unnecessary surgery in a great number of patients without missing any malignancy.

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