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Research Article

The Role of Ultrasonography and Fine Needle Aspiration Cytology in Thyroid Swellings

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Abstract

Introduction: Thyroid swellings are commonly encountered endocrine disorders. These disorders can be evaluated by thyroid function tests, ultrasonography (USG), fine needle aspiration cytology (FNAC), computed tomography (CT scan), histopathology etc. The present study was undertaken to evaluate the role of ultrasonography and fine needle aspiration cytology in the diagnosis of thyroid swellings. The sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of both ultrasonography and fine needle aspiration cytology were evaluated and correlated with the histopathology diagnosis.

Materials & Methodology: 70 consecutive patients presenting with thyroid swellings were thoroughly examined in the department of otorhinolaryngology and details were documented. The patients were subjected to an USG and FNAC of the thyroid swellings to study the lesions from sonological and cytological point of view respectively. Patients were posted for thyroidectomy surgery and the thyroid specimen was subjected to histopathological examination. Data were collected and tabulated.

Results: A total of 70 patients were enrolled in the present study. 9 (12.86%) patients were males and 61 (87.14%) were females. Male to female ratio was 1:6.78. The most common age group noted was 31-40 years with 34 patients (48.57%). Histopathology was considered as the gold standard for diagnosis. Correlation of USG and FNAC diagnosis of thyroid swellings was made with histopathology by evaluating the sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy. USG showed a sensitivity of 84.61%, specificity of 91.22%, positive predictive value of 68.75%, negative predictive value of 96.29% and accuracy 90% of in thyroid swellings. On the contrary, FNAC showed a sensitivity of 92.85%, specificity of 94.64%, positive predictive value of 81.25%, negative predictive value of 98.14% and accuracy of 94.29%.

Conclusion: USG and FNAC of thyroid swellings are simple, cost effective and yield quick results. Although histopathology is confirmatory and the gold standard for diagnosis, USG and FNAC in conjunction have reasonably good sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy for preoperative diagnosis of thyroid swellings.

Keywords: Ultrasonography; fine needle aspiration cytology; histopathology; thyroid swellings

Introduction

Thyroid gland swellings are one of the most commonly encountered endocrine disorders on a worldwide scale. According to the evaluation done by various studies on thyroid studies, an estimated 42 million people suffer from thyroid disorders in India [1]. Thyroid lesions can be evaluated preoperatively using parameters such as thyroid function tests, ultrasonography and fine needle aspiration cytology. The diagnosis of thyroid lesions using aspiration cytology was first reported by Martin and Ellis in 1930 [2]. The routine use of fine needle aspiration cytology (FNAC) in the assessment of thyroid nodules has reduced the number of patients subjected to thyroidectomy for benign diseases of the thyroid [3-5]. As a result, the incidence of malignancy at

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thyroidectomy has increased from 5-10% to 30-50% in the recent years [6]. This relatively simple procedure has assumed a dominant role in determining the management of patients with thyroid nodules [7,8]. Thyroid ultrasonography is one of the most popular radiological methods of diagnosing thyroid disease. Ultrasonography is commonly the first imaging modality after clinical examination in evaluation of thyroid swellings. Neck ultrasonography was first introduced in 1966-1967 [9]. It has been widely practiced since the 1970 and is now one of the most popular radiological methods of diagnosing neck disease [10]. It is an easily accessible, non-invasive method and helps to pinpoint a possible abnormality at an early stage. Rugu [11]and his associate Joham Vent were first to advocate surgical biopsy as an essential diagnostic tool. Currently this technique is practiced worldwide, and it is the investigation of choice in thyroid, lymph nodes and breast swellings. Histopathological evaluation is considered a vital modality in the diagnosis and management of thyroid lesions.

Aims & objectives

The present study was undertaken to evaluate the role of ultrasonography and fine needle aspiration cytology in the diagnosis of thyroid swellings. The sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of both ultrasonography and fine needle aspiration cytology were evaluated and correlated with the histopathology report.

Materials & Methods

The present study titled 'The role of Ultrasonography and Fine Needle Aspiration Cytology in thyroid swellings' was carried out in the department of Otorhinolaryngology, Bangalore Medical College & Research Centre between July 2018 and January 2020.

Mode of selection: 70 consecutive patients presenting with clinically palpable thyroid swellings were included in the present study.

Inclusion criteria: Patients consenting for the study, clinically palpable thyroid swellings, patients willing to undergo USG and FNAC and patients willing to undergo surgery for the thyroid lesions.

Exclusion criteria: Patients with clinically undetectable thyroid swellings, previous history of neck trauma or neck surgeries and patients with neck abscesses.

Study design: Prospective Observational study.

Methodology

A total of 70 consecutive patients presenting with thyroid swellings were thoroughly examined in the department of Otorhinolaryngology and details regarding history, clinical examination and clinical diagnosis were documented. The patients were subjected to an ultrasonography of the neck to study the thyroid swellings from sonological point of view. This was followed by subjecting the patients to fine needle aspiration cytology of the thyroid swellings which provided us information in terms of cytology. Patients were posted for thyroidectomy surgery and the thyroid specimen was subjected to histopathological examination. Data was collected and tabulated in an excel sheet. Results presented as percentages and proportions. A correlation of thyroid swellings using ultrasonography, fine needle aspiration cytology and histopathology was made. Statistical tests such as sensitivity, specificity and diagnostic accuracy were calculated accordingly.

Results

A total of 70 patients were enrolled in the present study. 9 (12.86%) patients were males and 61 (87.14%) were females (Table 1). The male to female ratio was 1:6.78. The most common age group noted was 31-40 years with 34 patients (Table 2). The most common clinical symptoms were swelling in the neck in midline with gradual increase in size. The thyroid swelling was most commonly noted in the right lobe in 42 (70%) patients. 10 (16.67%) patients presented with both lobes being involved. According to USG diagnosis, 57 (81.43%) patients were diagnosed with benign swellings such as solitary thyroid nodule (28 patients), multinodular goitre (13 patients), inflammatory lesions (10 patients) and benign neoplasms (6 patients). Malignant neoplasms were noted in 13 (18.57%) patients (Table 3). According to FNAC diagnosis, 56 (80%) patients were noted to have benign swellings such as solitary thyroid nodule (27 patients), multinodular goitre (12 patients), inflammatory lesions (11 patients) and benign neoplasms (6 patients). Malignant neoplasms were noted in 14 (20%) patients (Table 3). After the patients underwent thyroidectomy procedure, the specimen was subjected to histopathological diagnosis. According to it, 54 (77.14%) patients were diagnosed to have benign swellings such as solitary thyroid nodule (25 patients), multinodular goitre (13 patients), inflammatory lesions (11 patients) and benign neoplasms (5 patients). Malignant neoplasms were noted in 16 (22.86%) patients (Table 3). Histopathological diagnosis was considered as the gold standard. The correlation between USG versus histopathology and FNAC versus histopathology was made to determine the sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of USG and FNAC in thyroid swellings (Tables 4 & 5). USG showed a sensitivity of 84.61%, specificity of 91.22%, positive predictive value of 68.75%, negative predictive value of 96.29% and accuracy 90% of in thyroid swellings. On the contrary, FNAC showed a sensitivity of 92.85%, specificity of 94.64%, positive predictive value of 81.25%, negative predictive value of 98.14% and accuracy of 94.29% (Table 6).

Table 1: Gender Distribution.

Gender	Number of Patients	Percentage
Males	9	12.86
Females	61	87.14
Total	70	100

Table 2: Age Group Distribution.

Age in Years	Number of Patients	Percentage
01-10	0	0
11-20	6	8.57
21-30	11	15.72
31-40	34	48.57
41-50	12	17.14
51-60	5	7.14
>60	2	2.86
Total	70	100

Table 3: Ultrasonography, Fine Needle Aspiration Cytology and Histopathology Diagnosis of Thyroid Swellings.

Thyroid Swellings	Ultrasonography		Fine Needle Aspiration Cytology		Histopathology	
	Number of Patients	%	Number of Patients	%	Number of Patients	%
Solitary thyroid nodule	28	40	27	38.57	25	35.71
Multinodular goitre	13	18.57	12	17.15	13	18.57
Inflammatory lesions	10	14.29	11	15.71	11	15.71
Benign swellings	6	8.57	6	8.57	5	7.15
Malignant swellings	13	18.57	14	20	16	22.86
Total	70	100	70	100	70	100

Table 4: Correlation of USG with histopathology in thyroid swellings.

Histopathology	Ultrasonography (USG)		Total
	Malignant	Benign	
Malignant	11	5	16
Benign	2	52	54
Total	13	57	70

Table 5: Correlation of FNAC with histopathology in thyroid swellings.

Histopathology	Fine Needle Aspiration Cytology (FNAC)		Total
	Malignant	Benign	
Malignant	13	3	16
Benign	1	53	54
Total	14	56	70

Table 6: Sensitivity, Specificity, Positive Predictive Value, Negative Predictive Value & Accuracy of USG and FNAC in Thyroid Swellings.

	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value	Accuracy
Ultrasonography	84.61%	91.22%	68.75%	96.29%	90%
Fine Needle Aspiration Cytology	92.85%	94.64%	81.25%	98.14%	94.29%

DISCUSSION

The present study was done to correlate the ultrasonography and fine needle aspiration cytology of thyroid swellings with its histopathology. Ultrasonography is an important investigative modality in evaluating the thyroid swellings in terms of size, number, location, consistency, and morphology. It also helps in detecting impalpable thyroid swellings. FNAC helps in providing the most direct and specific information about the thyroid gland. It is a simple method of detecting thyroid swelling pathology. The present study was done to determine the role of ultrasonography and FNAC in thyroid swellings. Out of 70 patients, females (61 patients) outnumbered the males (9 patients). The most common age group affected was between 31-40 years. In a similar study done by Jain et al. [12], of the 110 patients enrolled in the study, 18 were males and 92 were females. The most common age

group affected was between 31-40 years. These findings were in accordance with our present study. In our study, on ultrasonography of the thyroid gland, 57 swellings were diagnosed as benign and 13 were diagnosed malignant. Similarly, on FNAC, 56 swellings were diagnosed benign and 14 diagnosed malignant. Histopathology of the thyroid swelling was considered gold standard in diagnosis. On histopathological diagnosis, 54 thyroid swellings were diagnosed as benign and 16 diagnosed malignant. In a similar study done by Avinash et al.[13], of the 70 patients, 59 were diagnosed benign and 11 were diagnosed malignant on ultrasonography of the thyroid gland. These observations were similar to our present study. In our study, ultrasonography showed a sensitivity of 84.61%, specificity of 91.22%, positive predictive value of 68.75%, negative predictive value of 96.29% and accuracy of 90%. FNAC showed a sensitivity of 92.85%, specificity of 94.64%, positive predictive value of 81.25%, and negative predictive value of 98.14% and accuracy of 94.29%. Similar studies [14-16] done by other authors showed results which were in accordance with the present study (Tables 7 & 8).

Table 7: Sensitivity, Specificity, Positive Predictive Value, Negative Predictive Value and Diagnostic Accuracy of Ultrasonography of other authors.

Study	Ultrasonography				
	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	DA (%)
Bhise et al. [14]	86.66	91.66	72.22	96.49	90.66
Narayanakar et al. [15]	75	86	46	95	85
Prasad CV [16]	80	87	67	93	-

Table 8: Sensitivity, Specificity, Positive Predictive Value, Negative Predictive Value and Diagnostic Accuracy of Fine Needle Aspiration Cytology of other authors.

Study	Fine Needle Aspiration Cytology				
	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	DA (%)
Bhise et al. [14]	93.3	95	82.23	98.27	94.66
Narayanakar et al. [15]	87.5	98	87.5	98	96.6
Prasad CV [16]	64	81	53	87	-

Conclusion

Ultrasonography and FNAC are simple and cost-effective investigations in diagnosing thyroid lesions. They can be performed as outpatient department procedures and yield quick results. Both the procedures are effective modalities in making preoperative diagnosis in thyroid swellings. Although histopathology is confirmatory and the gold standard for diagnosis, ultrasonography and fine needle aspiration cytology in conjunction have reasonably good sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy for preoperative diagnosis of thyroid swellings.

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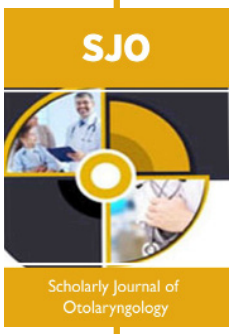

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