



Original article

Role of ultrasonography in the diagnosis of neck mass

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Abstract

A cross section study on diagnostic role of ultrasonography (USG) in neck swellings was done in the Department of Otorhinolaryngology of this institution. The study of ultrasonographic features of various neck swellings was done in fifty patients. The mean age of subjects was 33.04 years with a range from 1 year to 79 years and the maximum number of cases were in the age group of 31-39 years. Male and female incidence was 24% and 76% respectively. Out of 50 patients who underwent USG examination 76% had thyroid swelling. Various ultrasonographic features like echogenicity, echotextures were noted. 68% of patients had mass with solid consistency on USG while 32% had cystic nature. 72% of patients were recorded with hypoechogenic echotexture on USG. Benign nature of swelling was diagnosed on 78% of patients. 12% of neck swelling patients had features predictive of malignancy on USG. Clinical diagnosis and USG diagnosis was correlated and found to have a diagnostic accuracy of 86%. Thyroid swellings (38) 100% the diagnostic value of USG was 86% for benign lesions and 14% in malignant lesions. Fine needle aspiration cytology (FNAC) showed 76% benign lesions and 24% malignant thyroid swellings. Patients presenting with a neck mass whether benign or malignant need a methodical approach for an accurate diagnosis and appropriate treatment. USG helps in differentiating the true nature of swelling whether as solid or cystic. In the present study USG of thyroid clearly provides conformity on benign pathology and prediction regarding malignant nature. USG provides information regarding benign or malignant nature of lymph nodes. From the present study it can be concluded that for proper diagnosis of thyroid lesion, FNAC is the main diagnostic modality along with ultrasonography.

Key words: FNAC, Neck mass, Neck swelling, Ultrasonography

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Two new dimensions of medical practice pervade our vicinities; noninvasive diagnosis and cost control¹. Patients presenting with neck swellings contemporary difficulty in diagnosing the nature of swelling, extent and relation to

important anatomical structure. All patients cannot afford CT or MRI study. Consequently ultrasonography of these swellings is helpful to define these criteria and is also cost effective and radiation hazard free.

The extent of ultrasonography in the diagnostic work up is well defined². The optimal treatment is dogged by the early recognition of a mass and its further appearance in relation to size and echogenicity. Sonography cannot substitute histology. For follow up studies sonography needs to be done in cautiously defined planes. For ultrasonography to be helpful in diagnosis, a full understanding of the patient's history and clinical signs and symptoms in the head and neck region is critical. Prior to the sonography these data should therefore, be elicited by the examiner^{2,3}.

While there have been many studies reporting the use of ultrasonography in thyroid diseases, however limited data is available on its general use in diagnosis of head and neck diseases. Ultrasonography provides precise information concerning the form and content of cervical masses^{4,5}. It enables us to differentiate solid from cystic lesions. It may alert us of the probabilities of malignant versus benign nature of neck swellings¹. The aim of this research work was to assess the role of ultrasonography in the diagnosis of neck mass and to correlate it with clinical diagnosis along with confirmation of USG diagnosis by FNAC and histopathology.

Material and Methods

A cross sectional study was conducted at the department of Otorhinolaryngology of our institution located in Hyderabad during the period of November 2014 to July 2016. 50 patients coming to the OPD in department of Otorhinolaryngology were enrolled for the study. Patients of both the sexes presenting with any neck swelling more than 3 months duration were included and patients with obvious fluctuant abscess, children less than one year of age and patients not willing to undergo ultrasonography and fine needle aspiration cytology were excluded from the study.

In all patients, a detailed history regarding the occurrence of swelling was obtained. A detailed local examination of neck swelling was done to note its site, size, shape, extent, number, tenderness, margins, consistency etc and confirmed by ultrasonography.

Written informed consent was taken from all patients prior to the examination.

USG of neck was done in supine position with neck hyperextended using a 3.5MHz convex and 5MHz, 7.5 MHz and 10MHz linear probes. Transverse, longitudinal, multiple angled and oblique positions were taken to note the consistency, relationship

with the vessels or any other abnormalities like internal echos, calcification etc.

Patients' previous medical records were checked and any previous USG done were obtained. A general and detailed clinical examination pertaining to otorhinolaryngology was done in all patients. Basic blood investigations like hemoglobin, total count and differential count were done in all patients.

USG Neck was done in all cases prior to FNAC examination. FNAC were conducted in department of pathology with 24 gauge needle attached to the 10ml plastic disposable syringe. Air dried smears were stained with Haematoxylin and Eosin and maygrunwald-giemsa stain whereas 95% ethyl alcohol fixed smears were stained by papanicolou stain⁶. All patients were posted for surgical excision of neck mass after proper hematological and radiological investigations. All excised specimens were sent for histopathological examination. The cytological features of all cases were reviewed with corresponding histopathology features. Final diagnosis of the swelling was made by fine needle aspiration cytology and histopathologic examination of excision and incision biopsy.

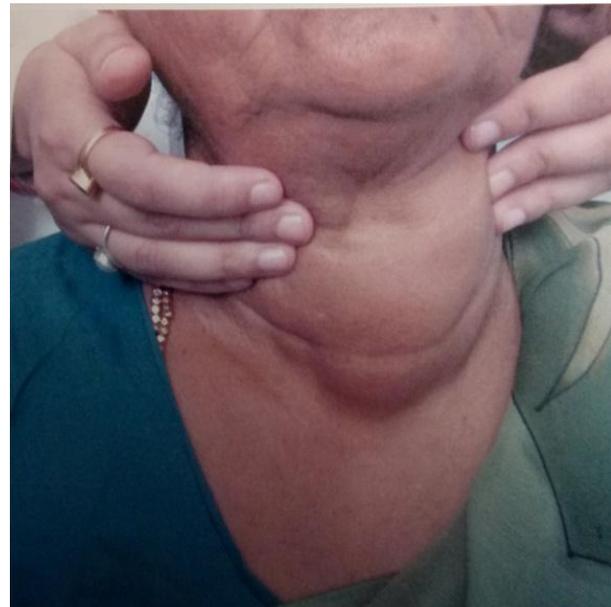


Fig 1. Neck examination

Results

In this study total numbers of male subjects were 12 (24%) and females were 38 (76%). The age of patients ranged from 1 year to 79 years, the youngest being 1 year old infant and eldest at 75 years of age. Maximum number of cases were between 30-39 year age group (30%) followed by 20-

29 year age group (20%) with a mean age of 33.04 years. Only one case each was in the age group of 0-9 years and 70-79 years (Fig 3).



Fig 2. Ultrasonographic (USG) examination

The distribution of neck swellings were seen maximum in the right side of the neck in 21 (42%) followed by left side in 14 (28%) of cases. Bilateral and midline swelling were seen in 22% and 8% cases respectively (Table 1).

Table 1: Site distribution		
Site	No. of Patients	%
Left submandibular region	2	4
Right submandibular region	3	6
Left upper deep cervical	2	4
Right upper deep cervical	2	4
Supra sternal notch	1	2
Thyroid	40	80

Maximum number of patients in the study 80% (40 patients) had swelling in the region of thyroid. 6% (3 patients) in the right sub mandibular region. 4% (2 patients) each in left sub mandibular, right upper deep cervical and left upper deep cervical region. 2% (1 patient) had swelling in the suprasternal notch.

28 patients (50%) presented with oval shape and 14 patients (28%) had round shaped swelling. 7 patients had butterfly shaped swelling. 1 patient had irregular swelling.

On performing neck examination, 32 patients (64%) had swellings which were firm in consistency, 10 patients (20%) had soft while 5 patients (10%) had hard and only 3 patients (6%) had cystic consistency.

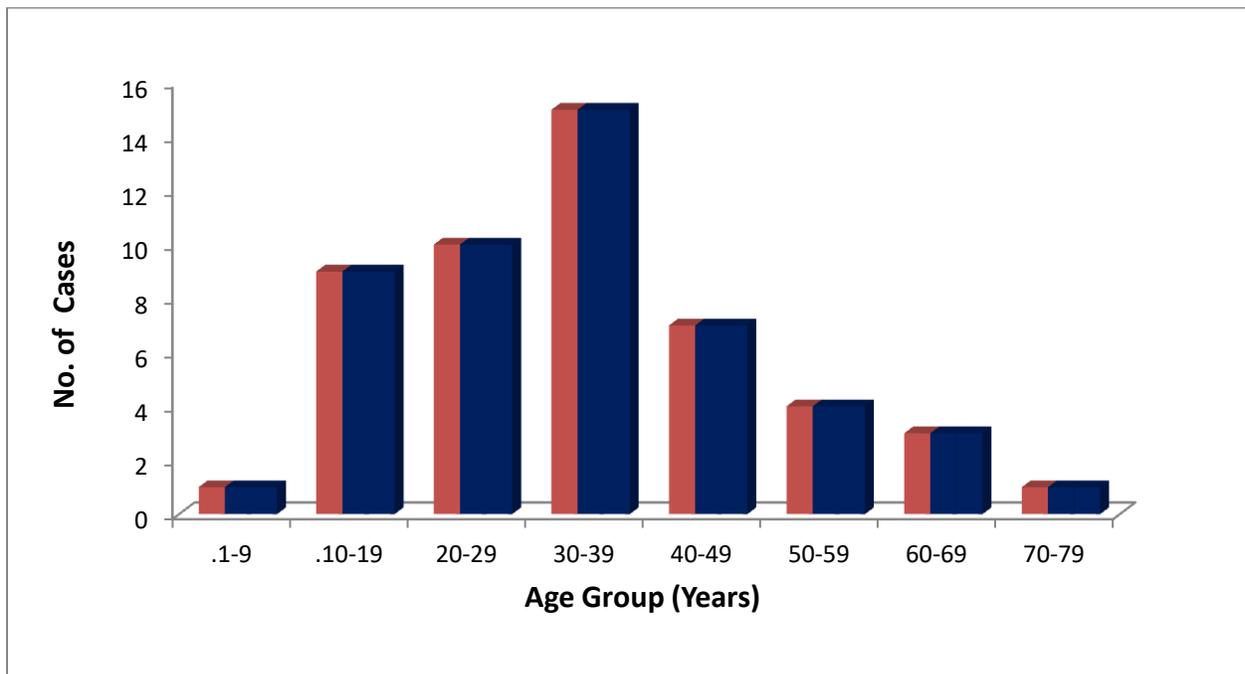


Fig 3. Age distribution of the patients

19 patients (38%) were diagnosed as solitary thyroid nodule. 8 patients (16%) were multi nodular goiter, 7 patients (14%) were goiter clinically. 3 patients (6%) were diagnosed with suspicion of malignancy of thyroid. Tubercular adenitis, left submandibular adenitis and chronic lymphadenitis in each represented 2 patients (4%) clinical diagnosis of Ludwig's angina, cystic hygroma, dermoid cyst, thyroglossal cyst, right submandibular adenitis, metastasis of unknown origin and acute right submandibular adenitis represented 1 patient (2%) in each respectively.

On USG examination, 23 patients (46%) each were found to have single and multiple swellings. Diffuse swelling was found only in 4 patients (8%) and 68% (34 patients) were found to have solid swelling and 32% (16 patients) had cystic consistency in the study.

Hypoechoogenicity was found to be the maximum and most common in the study with 36 patients (72%). 5 patients (10%) had combined hypo and hyperechoic features. 4 patients (8%) had combined hypo with anechoic features. 3 patients (6%) had hyperechoic features. Only 2 patients (4%) had anechoogenicity.

Table 2: Correlation between clinical diagnosis & USG diagnosis

Diagnosis Clinical	Ultrasound		Total
	Matching	Not Matching	
Ludwig's angina	0	1	1
TB adenitis	2	0	2
Cystic hygroma	1	0	1
Solitary thyroid nodule	15	4	19
Multi nodular goitre	7	1	8
Chronic Ludwig's angina	2	0	2
Goitre	6	1	7
Malignancy of thyroid	3	0	3
Dermoid cyst	1	0	1
Thyroglossal cyst	1	0	1
Right submandibular adenitis	1	0	1
Left submandibular adenitis	2	0	2
Metastasis of unknown origin	1	0	1
Jugulodigastric adenitis	1	0	1
Total	43	7	50
Percentage of accuracy	86%		

Homogenous pattern was the most common pattern of echo texture seen in 37 patients (74%) and heterogeneous pattern in 13 patients (26%) on USG findings.

78% (3 patients) had evidence of calcification while 22% (11 patients) lacked calcification on USG examination. Micro calcification helped in detecting 4 patients (8%) as having malignant features. On USG Examination, 90% of the examined swellings had regular margin while only 10% had irregular margins.

On neck examination, swelling was found to be single in 44 patients (88%) and multiple in 6 patients (12%) while on USG it was found to be 23 patients (46%) each in single and multiple and diffuse in 4 patients (8%).

Of 50 patients enrolled in the study, clinical diagnosis matched with USG diagnosis in 43 patients (86%) (Table 2). The patients where clinical diagnosis did not match USG diagnosis and 1 patient with clinical diagnosis of Ludwig's angina was diagnosed as bilateral internal Jugular vein thrombosis. 4 patients of solitary thyroid nodule clinically turned out to be multinodular on USG. 1 patient of multinodular goitre clinically was found as malignant adenoma on USG. 1 patient of goitre on clinical examination was found to be isthmic adenoma on USG.

Clinically, numbers of thyroid swellings were 38 (100%). Out of which 33(86%) swellings were benign and 5 (14%) were malignant on USG. While FNAC of 38 (100%) thyroid swellings showed 29 (76%) benign and 9 (24%) malignant lesions.

In case of other swellings of neck like dermoid cyst, thyroglossal cyst, TB lymphadenitis, cystic hygroma, submandibular adenitis, the features of the swellings of FNAC were in sync with features of USG (Table 3).

Discussion

Otolaryngologists frequently encounter neck masses presenting to them in all age groups. A careful history regarding the patients age, sex, location, size and duration of the mass should be obtained and a detailed clinical examination should be performed. Congenital masses such as cystic hygroma, branchial anomalies, thyroglossal duct cysts, must be considered in the differential diagnosis. Inflammatory and infectious causes of neck masses, such as cervical adenitis are common in young adults. Thyroid swellings are most likely to be present in females and neoplasms (benign and malignant) are more common in adult males who present with neck swellings.

Table 3: Correlation between clinical diagnosis, USG diagnosis and FNAC/histopathology diagnosis of neck swellings

	Clinical diagnosis		USG diagnosis		FNAC / Histopathology diagnosis		FNAC reports
	N	%	N	%	N	%	
Ludwig's angina	3	6	2	4	2	4	(2) Inflammatory lesion
TB lymphadenitis	2	4	2	4	2	4	(2) Epithelial cell granulomatous lesion
Cystic hygroma	1	2	1	2	1	2	(1) Lymphangioma
Solitary thyroid nodule	19	38	15	30	14	28	(5) Colloid nodule (4) Colloid nodule with cystic change (5) Hashimoto thyroiditis
Multi nodular goitre	8	16	11	22	10	20	(6) Colloid goiter (4) Colloid goiter with cystic change
Goitre	7	14	6	12	5	10	(4) Colloid goiter (1) Colloid goiter with cystic change
Malignancy of thyroid - Malignant adenoma of thyroid (USG)	3	6	5	10	9	18	(5) Follicular carcinoma (1) Papillary carcinoma
Isthemic adenoma of thyroid (USG)							(3) Suspicious of follicular carcinoma
Dermoid cyst	1	2	1	2	1	2	Nucleated and non-nucleated squamous epithelium with keratin debris
Thyroglossal cyst	1	2	1	2	1	2	Macrophages and polymorphonuclear neutrophils
Right submandibular adenitis	1	2	1	2	1	2	Reactive lymphoid cells
Left submandibular adenitis	2	4	2	4	1	2	lymphoid cells with neutrophils
Metastasis of unknown origin	1	2	1	2	1	2	Neoplastic etiology
Juglodiagastric adenitis	1	2	1	2	1	2	inflammatory lesion
Bilateral internal jugular vein thrombosis (USG)	0	-	1	2	0	-	-

For numerous clinical disorders sonography is the principal streak imaging modality in the evaluation of cervical soft tissue lesions. Sonography of the neck can be used for evaluations of thyroid swellings, soft tissue lesions and cervical lymph node assessment. Hence high resolution is useful in evaluation of head and neck masses where necessary and appropriate ultrasound should be done as an ideal initial examination for narrowing down the differential diagnosis.

The mean age of patients in the present study was 33.04 years (range 1 year -79 years) which is in accordance with studies by Jafri et al⁷ one day to 80 years, Rauf et al⁸ months to 50 years.

In the present study males constituted 24% and female 76% in the ratio of 1:3 which is in contrast with Goyal et al¹ 1.4:1 and Rauf et al⁸ 1:1 and Jafri et al 1.2:1⁷. The female preponderance in the present study was because of the fact that majority of

the cases were thyroid swelling and thyroid swellings were common in females. In the present study majority of the patients presented at age between 30-39 years when compared to Goyal et al¹ which was 21-30 years. This difference in the age at presentation which is more in the present study does not affect the results of the study significantly.

The ultrasound occurrences of benign thyroid lesions vary significantly with the sequence of events in their formation like colloid accumulation, necrosis, haemorrhage, fibrosis, scarring and calcification. In this study hypoechogenicity was the most common feature of benign thyroid lesion which is in accordance with Goyal et al¹.

Majority of the malignant thyroid lesions were predominantly hypoechoic in 4 out of 5 patients which was in accordance with Goyal et al¹.

Mixed echogenicity was found in 3 patients in the present study which is in accordance with correla-

tion of USG echotexture with malignancy by Kaur et al⁶ who found that percentage of malignancy with mixed echotexture on USG to be 37.9%.

One patient in the present study with the diagnosis of thyroglossal cyst was hypoechoic which was in contrast with Goyal et al¹. Hypoechoic is due to increased proteinaceous substance in thyroglossal cyst in this study.

In the present study no of thyroid swellings clinically were 38(100%). Out of which 33(86%) swellings were benign and 5(14%) were malignant on USG. While FNAC of 38(100%) thyroid swellings showed 29(76%) benign and 9(24%) malignant.

Reactive nodes tend to have an oval shape, whereas metastatic nodes are round. 'Roundness index' is obtained by dividing the longitudinal diameter by the axial diameter. The echogenicity of metastatic nodes may vary from hypoechoic to isoechoic. In the present study all lymph nodes were hypoechoic. This is in accordance with Goyal et al¹ and Vassallo et al⁹.

In the present study all lymphnode findings seen on USG were found to be same on FNAC/ Histopathology. The submandibular adenitis with sialolith had homogenous echotexture which is in accordance with Goyal et al¹. One of the fairly reliable parameter for assessing benign nature of salivary gland neoplasm is echotexture.

In the present study salivary gland findings seen on USG were found to be same on FNAC/ Histopathology. The miscellaneous neck swellings presented include cystic hygroma, dermoid cyst and bilateral internal jugular vein thrombosis. Presence of anechoic mass with internal septations is diagnostic of cystic hygroma which is in contrast with Goyal et al¹. In the present study findings of all other neck swellings seen on USG were found to be same on FNAC/ Histopathology.

The present study USG clearly establishes the swellings as solid in 34 and cystic in 16. In 26% of cases ultrasound evaluation helped in determining their cystic nature. This was in contrast with Ahmad Rauf et al⁸ 40%. But USG helped in differentiating a mass as whether solid or cystic in nature.

On correlating the results of clinical diagnosis with USG diagnosis, the percentage of accuracy was found to be 86%.study by Anand et al¹⁰ have similar results i.e. 85.9%.

In case of thyroid swellings (38) the diagnostic value of USG was 86% for benign lesions and 14% in malignant lesions. While FNAC showed 76% benign lesions and 24% malignant, these findings

found to be similar with the study done by chavan et al^{11,12}. FNAC is the most accurate and gold standard in diagnosing the malignant nature of thyroid swelling when compared with USG. In case of other neck swellings the diagnostic value of USG as confirmed by FNAC was 100%.

Conclusions

Patients presenting with a neck mass whether benign or malignant need a methodical approach for an accurate diagnosis and appropriate treatment. USG for such a neck mass has to be done as a primary investigation modality since it is non-invasive, cost effective and easily reproducible. USG also helps in differentiating the true nature of swelling whether as solid or cystic. In the present study USG of thyroid clearly provides conformity on benign pathology and prediction regarding malignant nature. From the present study it can be concluded that for proper diagnosis of thyroid lesion, FNAC is the main diagnostic modality. Along with ultrasonography and clinical examination it helps to come to the proper diagnosis.

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Conflict of interest: None

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