ULTRASOUND EVALUATION OF NONTHYROIDAL NECK MASSES

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ABSTRACT

Ultrasound evaluation of neck masses is a noninvasive method with good diagnostic accuracy. A proper knowledge of anatomy of neck with confident anatomical localisation of the masses and the understanding of ultrasound features of each disease entity can help in the diagnosis and at times narrow the differential diagnosis of the various neck masses.

AIMS AND OBJECTIVES

To document and study the role of ultrasound in patients with nonthyroidal neck masses. To evaluate the various neck masses and differentiate benign and malignant masses based on their sonomorphology and correlate these with histopathology.

MATERIALS AND METHODS

In our study, during a period of 2 yrs. (May 2013 to April 2015) 56 patients admitted in the General Surgery and E.N.T. wards with neck masses other than thyroidal masses were evaluated with ultrasound examination of neck. Our study included patients of age groups 6 months to 67 years with 37 male and 19 female patients. High resolution ultrasound examination of neck was done by 7.5 MHz linear array transducer on Esaote MyLab Classic C.

OBSERVATIONS AND RESULTS

Out of 56 pts., the most common age of presentation was 21-40 yrs. There were 37 male and 19 female patients. All the 56 patients had neck masses and the common associated symptom was pressure effect due to the mass. On ultrasound, the nature of lesions ranged from solid, cystic to mixed (25). Most of the cases were unilateral neck masses. Out of 56 cases, solitary neck masses (31) were predominant. In this study, the most common neck mass was metastatic lymphadenopathy. The anatomic location and known ultrasound features of the various masses was very helpful in the diagnosis of these lesions.

CONCLUSION

Ultrasound is a safe noninvasive modality in the diagnosis of neck masses with good diagnostic accuracy.

KEYWORDS

Neck Masses, Ultrasound, Lymphadenopathy.

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INTRODUCTION

The diagnosis of neck masses has long been a challenge to radiologists. Many small, but critical structures pass from the head to the thorax through a region that is compact, yet remarkably flexible. A thorough understanding of the gross anatomy of the neck is needed to communicate findings precisely and generate meaningful differential diagnosis¹. High resolution B-mode sonography has improved and has become a very valuable tool in the diagnosis of neck masses. Sonography is commonly the first imaging modality after clinical examination. It is cost effective procedure. It provides valuable diagnostic information with high degree of diagnostic accuracy. It is preferred to guide needle aspirations of all types of lesions of neck. The noninvasiveness of ultrasound makes this an ideal modality for evaluating neck masses in children and infants².

On the basis of sonographic findings, selection of additional imaging modalities including CT and MR can be applied more judiciously. CT and MRI provide essential information about deep extensions of neck masses and may delineate additional clinically unsuspected lesions.

AIM OF THE STUDY

1. To document and study the role of ultrasound in patients with nonthyroidal neck masses.
2. To evaluate the various neck masses and differentiate benign and malignant masses based on their sonomorphology.
3. To correlate the ultrasound findings with FNAC and/or histopathology.
4. To correlate the sonographic findings with additional imaging modalities like CT and MRI.

MATERIALS AND METHODS

In this institutional review board approved study, after informed consent, 56 patients admitted in the General Surgery and E.N.T. wards with nonthyroidal neck masses were evaluated with ultrasound examination of neck during a period of 2 yrs. (May 2013 to April 2015). Our study included patients of age groups 6 months to 67 years with 37 male and

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19 female patients. Patients were initially evaluated with routine investigations. Some patients were sent for radiographs of neck both AP and lateral views. High resolution ultrasound examination of neck was done by 7.5 MHz linear array transducer on Esaote MyLab Classic C.

On ultrasound examination, the patients were thoroughly examined to localise the mass and confirm the nature of mass, either solid, cystic, or mixed. The size, shape of the lesion, and its relation to adjacent structures noted. Note of normal structures and any other non-palpable lesions is done. Presence of calcification, areas of necrosis in solid lesions, and any septations or debris or solid areas in cystic lesions is documented. All 56 patients underwent FNAC/excision biopsy. The findings of ultrasound were compared with FNAC/histopathology. Further evaluation with other investigations was done in 10 patients (CT and MRI) and findings of these investigations were recorded.

TECHNIQUE OF ULTRASOUND EXAMINATION

Pt. examined in supine position with neck mildly hyperextended. Neck examine with a high frequency linear array transducer ranging from 7.5 to 10 MHz. It begins with the examination of thyroid gland where the instrument is adjusted and frequency and gain are optimised. Depending on the indication, particular attention should be given to certain regions of neck. Level I evaluated in coronal plane and level II-V evaluated longitudinally and in axial plane³.

Thyroid should be imaged entirely in both transverse and longitudinal planes. Potential enlargement of parathyroid glands must be evaluated. Parotid glands examined in axial plane. Enlarged L.N. should be looked for in all regions and if present measured in axial plane (Minimal axial diameter).⁴

RESULTS

Sl. No.	Age Group	No. of Patients
1	<1 year	01
2	01-20	12
3	21-40	22
4	41-60	14
5	61-80	17
	Total	56

Table 1: Age Incidence

Out of 56 patients, most common age group was 21-40 yrs. and next common age group was 61-80 year old. One patient was from <1 year age group.

Sl. No.	Sex	No. of Patients
1	Male	37
2	Female	19
	Total	56

Table 2: Sex Incidence

In our study, 37 patients were male and 19 patients were female.

Sl. No.	Symptoms	No. of Patients
1	Pain	6
2	Fever	4
3	Pressure symptoms	
	(Hoarseness of voice, dysphagia, dyspnoea)	7

Table 3: Clinical Symptoms

All 56 patients had swelling in the neck and the most common associated symptom was pressure effect due to the neck swelling.

Sl. No.	Site of Swelling	No. of Patients
1	Mid line	4
2	Lateral	52
	Total	56

Table 4: Site of Swelling

Most of the patients (52) had lateral neck masses and out of 4 midline masses and had thyroglossal duct cysts.

Sl. No.	Site Involved	No. of Patients
1	Primary head and neck carcinoma	10
2	Non-head and neck carcinoma	3
3	As a part of diffuse disease	7
	Total	20

Table 5: Involvement of Other Sites in the Body

Neck masses secondary to head and neck carcinoma⁵ was seen in 10 patients and 3 patients (1 ca. stomach, 1 ca. bronchus, and 1 ca. testis) presented with left supraclavicular neck masses. 7 patients had neck masses as a part of diffuse disease. Out of this, 4 patients had lymphoma, 2 patients had tuberculosis, and 1 patient had cystic hygroma of the neck extending into the axilla.

Sl. No.	X-ray Findings	No. of Patients
1	Calcification	4
2	Tracheal compression and displacement	4

Table 6: X-Ray Findings

8 patients had x-ray neck, both AP and lateral views. 4 patients had calcification and 4 patients had tracheal compression and displacement.

Sl. No.	Nature of the Lesion	No. of Patients
1	Solid	18
2	Cystic	13
3	Mixed	25
	Total	56

Table 7: Ultrasound Findings

Sl. No.	Site of the Lesion	No. of Patients
1	Unilateral	44
2	Bilateral	9
3	Midline	4
	Total	56

Table 8

Predominantly, most of the neck masses were unilateral (44) and only 9 were bilateral neck lesions.

Sl. No.	Number of Lesions	No. of Patients
1	Solitary	31
2	Multiple	25
	Total	56

Table 9

31 patients had solitary neck lesions whereas 25 had multiple lesions.

Sl. No.	Type of Lesion	No. of Patients
1	Thyroglossal duct cyst ⁶	3
2	Branchial cleft cyst ⁷	4
3	Lymphangioma ^{8,9}	10
4	Abscess	4
5	Tuberculous lymph nodes	10
6	Salivary gland tumour	3
7	Lymphoma	4
8	Metastases	18
	Total	56

Table 10: Individual Lesions on Ultrasound

Most common neck masses were metastases seen in 18 patients. Next most common lesion was tuberculosis and lymphangioma.

Sl. No.	Type of Lesion	No. of patients
1	Nonspecific lymphadenitis	1
2	Tuberculous lymph nodes	5
3	Lymphomatous nodes	4
4	Metastatic nodes	18
	Total	28

Table 11: Lymph Nodal Masses on Ultrasound

Sl. No.	Ultrasound Feature		Nonspecific L.N.	Tuberculous L.N	Lymphomatous L.N	Metastatic L.N
1	shape	round	-	3	4	18
		oval	1	2	-	-
2	echogenic hilum	present	1	-	-	-
		absent	-	5	4	18
3	calcification	present	-	-	-	-
		absent	1	5	4	18
4	necrosis	present	-	3	-	18
		absent	1	2	4	-

Table 13: Ultrasound Features of Metastatic and Non-Metastatic Lymph Nodes

Nonspecific lymphadenopathy showed an echogenic hilum and an oval-shaped tuberculous nodes^{12,13} were rounded in 3 cases without echogenic hilum and no calcification. Lymphomatous nodes were rounded with no areas of necrosis/calcification/echogenic hilum. Metastatic nodes were rounded without echogenic hilum/calcification. They had areas of intranodal necrosis.^{14,15}

Sl. No.	Other Investigation	No. of Patients
1	CT	8
2	MRI	2
	Total	10

Table 14: Other Investigations

Of the 8 pts. with CT scan of neck, 7 cases had metastases and showed features of rounded shape intranodal necrosis give the accurate level of lymphadenopathy, which helped in staging the disease. CT helped to localise the primary site of involvement in 5 patients. One case had branchial cleft cyst and CT showed a cystic lesion with good delineation of the extent of the lesion.

Of the 2 pts. with MRI, 1 pt. had cervical and mediastinal adenopathy, which were hypointense on T1WI and

Out of 56 patients, 28 had lymph node enlargement. Most common type was metastatic nodes (18).

Sl. No.	US Feature		Tuberculous Nodes	Metastatic Nodes
1	Shape	round	3	18
		oval	2	-
2	Soft tissue oedema	present	5	-
		absent	-	18
3	Intranodal necrosis	present	3	18
		absent	2	-
4	Matting	present	5	-
		absent	-	18

Table 12: Differentiation of Tuberculous and Metastatic Nodes on Ultrasound

In our study, 18 patients of metastatic lymphadenopathy and 5 patient of tuberculous lymphadenopathy were noted. Metastatic lymph nodes¹⁰ had rounded shape and showed intranodal necrosis. In TB nodes, shape was not always rounded and intranodal necrosis¹¹ was seen in 3 patients out of 5. Soft tissue oedema and matting was seen in all cases of TB.

hyperintense on T2WI confirming that they are of tuberculous origin and also gave the extent of disease. Other pt. had lymphangioma and MRI was done to delineate the extent of disease.

Fig. 1: US Neck Showing Cystic Lesion Noted in the Midline above Thyroid s/o Thyroglossal Duct Cyst

Fig. 2: Photograph of 45-Year-Old Male with Large swelling on Left Side of Neck and US Neck shows a Large Cystic Lesion Anterior to Carotid Vessels on the Left Side of Neck with Internal Echoes and Septations s/o II Branchial Cleft Cyst

Fig. 3: A 19 Years Old Female with Swelling on Right Side of Neck and US of Neck Shows Cystic Lesion in the Rt. Cervical Region with Thin Internal Septations s/o Lymphangioma

Fig. 4: A 35 Years Old Male Presented with Swelling in Rt. Submandibular Region 3 Weeks. US Neck shows Hypoechoic Lesion of in Rt. Submandibular Triangle with Central Anechoic Areas. Submandibular Gland Normal s/o abscess

Fig. 5: A 52-Year-Old Male Presented with Generalised Lymphadenopathy, Hoarseness of Voice, Dysphagia, and US Neck showed Bilateral Multiple, Round Hypoechoic Masses of Varying Sizes with Positive Facet Sign s/o Bilateral Level 1 Lymphadenopathy s/o Lymphoma

Fig. 6: A 22-Year-Old Female Presented with Mass in the Left Nasal Cavity and Swelling on Both Sides of Neck. US Neck Revealed Multiple, Bilateral, Round, Hypoechoic Mass Lesions in the Submandibular Region with Intranodal Necrosis s/o Bilateral Level 1 Metastatic Lymphadenopathy and FNAC Reported as Small Round Cell Tumour

Fig. 7: A 30-Year-Old Male Presented with Swelling of Both Testes - 3 Months and Swelling on the Left Side of Neck - 2 Months. US of Neck Revealed Heterogeneous Mass with Multiple Anechoic Areas in Left Supraclavicular Region s/o Metastatic Lymph Nodes

Fig. 8: A 29-Year-Old Female Presented with Swelling on Right of Neck-1 Year. US Neck shows Hypoechoic Solid Mass in the Right Submandibular Gland s/o Pleomorphic Adenoma of Right Submandibular Gland

Fig. 9: A 60-Year-Old Male Presented with Swelling on Both Sides of Neck, Axillae, and Groin - 6 months. US Neck Revealed Multiple Rounded Hypoechoic Masses Involving the Entire Neck with Positive Facet Sign s/o Bilateral Level 1, 2, 3, 4, and 5 Lymphadenopathy s/o Lymphoma. US Abdomen shows Lymphomatous Involvement of Spleen.

DISCUSSION

Neck masses can be best diagnosed by anatomic localisation of the mass. This can be done by dividing the neck either into triangles or into spaces. Spaces of the neck is more useful for cross-sectional imaging. Neck masses can arise either from

thyroid, parathyroid, or salivary glands or from other soft tissues, which can be cystic, solid, or mixed lesions. Thyroid masses account for majority of neck masses. However, in this study, we concentrated on extrathyroidal neck masses.

Radiological evaluation of neck masses can be done by x-rays, ultrasound, CT, MRI, and scintigraphy. Among these investigations, radiograph is a basic investigation, which is advised in a patient with pressure effects to know the tracheal compression or displacement and also to look for calcification. Ultrasound can confirm the nature of lesion,¹⁶ pickup, unsuspected, non-palpable lesions can diagnose whether the lesion is benign or malignant.^{17,18} It can also confirm the anatomic localisation of the mass and give a good diagnosis. Doppler evaluation can also be helpful in confirming the nature of the lesion.¹⁹ Ultrasound-guided FNAC can also be done.^{20,21}

In this study, 56 patients with neck masses within age group of 6 months-67 yrs. were evaluated by ultrasound and correlation of ultrasound findings with FNAC was done. Ten patients were further evaluated with CT and MRI. Out of 56 pts., the most common age of presentation was 21-40 yrs. and 37 patients were male pts. All the 56 patients had neck masses and the common associated symptom was pressure effect due to the mass.

On ultrasound, the nature of lesions ranged from solid, cystic to mixed (25). Most of the cases were unilateral neck masses. Out of 56 cases, solitary neck masses (31) were predominant. In this study, the most common neck mass was metastatic lymphadenopathy. Out of 56, 18 pts. had metastases. The feature of metastatic lymphadenopathy on ultrasound are rounded-shaped sharp borders with central areas of necrosis.

Ying M et al (1998) worked on cervical TB nodes and metastases in 47 pts. of TB and 27 cases of metastases and concluded that US features that helped to differentiate TB and metastases were shape, soft tissue oedema, intranodal necrosis, and matting. However, in this study, metastases had features of rounded shape and showed intranodal necrosis. TB nodes showed features of soft tissue oedema and matting in all 5 cases. Features like round shape and intranodal necrosis were seen in only 3 cases.

Pedrowesly et al (2005) studied the US features of lymph nodes in 112 pts. and concluded that oval shape and echogenic hilum are seen in benign lesions and presence of calcification and intranodal necrosis indicate metastases.

In this study, round shape and intranodal necrosis was seen in metastases whereas echogenic hilum and calcification was not seen in metastases. Next most common lesion was TB lymphadenopathy. US features of tuberculous lymph nodes were roundedness with areas of necrosis.

The margins of lesions were ill-defined and hazy. Associated soft tissue oedema is common.

All the 56 patients had FNAC/histopathological examination. In 55 patients, ultrasound findings correlated with FNAC/histopathological findings. One patient was diagnosed as lymphangioma and FNAC was inconclusive. The patient was not subjected to surgery and hence the followup is not available. 8 patients had further evaluation with CT and 2 patients had evaluation with MRI. Ultrasound evaluation of neck masses is a simple procedure with good diagnostic accuracy.

Advantages of Ultrasound Evaluation of Neck Masses

1. It is a quick and simple procedure.
2. It has a good diagnostic accuracy.
3. It helps to do followup examinations of neck masses.
4. Ultrasound-guided FNAC is useful in confirming the diagnosis.

Hence, we conclude that ultrasound with high resolution probe and FNAC is highly accurate and sufficient to diagnose and manage neck masses and suggest CT and MRI only in selected difficult cases for staging purpose.

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