

CLINICO-PATHOLOGICAL AND ULTRASONOLOGICAL STUDY OF NECK  
MASSES

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**Introduction:**

Presence of head and neck masses proposes a diagnostic dilemma for the clinician. Any method that can lead to an early and accurate diagnosis of head and neck mass would be most desirable for the clinician. Neck has an extensive network of lymphoid tissue besides a variety of structure beneath the skin viz. fascia, adipose tissue, tendons, vessels, nerves, and glands. The various soft tissue masses arising from these structures may be benign or malignant. In addition to head and neck malignancy, the lymph nodes in this region may be involved by primary lymphoid malignancies, from malignancies below the neck and inflammatory disorders.<sup>1</sup> Assessment of the cervical metastatic disease is of paramount importance as the treatment protocol and prognosis depend upon the nodal involvement. The site and level of nodal involvement can give a clue to the diagnosis of an occult primary and predict the prognosis. In children, persistent chronic lymphadenopathy is seen most often due to chronic nonspecific infections or specific ones like tuberculosis. Improved

equipment and technique of ultrasonography permits higher accuracy for evaluation of neck areas and has better sensitivity as compared to clinical examination (96.8% versus 73.3%) especially in head and neck cancer.<sup>2</sup> High-resolution ultrasound of neck using high-frequency transducers (5-10 MHz) to depict lymph node has a reported sensitivity of over 90%.<sup>3</sup> Ultrasound has proved to be useful for detection of subclinical nodes for staging and follow-up of various head and neck malignancies. In ultrasonography, some criteria are being used to assess the presence of neoplastic involvement of cervical lymph nodes including echogenicity, border, size, necrosis, shape, matting and length/width ratio. In view of the fact that nodes less than 1cm may also harbor malignant deposits in up to 42% of patients, it is imperative to image the neck to detect these nodes which often go undetected clinically.<sup>4</sup>

Vascular involvement by metastatic cervical nodes has a strong bearing on the treatment protocol and prognosis of the patients. Clinical examination is inadequate to assess

the vascular invasion. CT and MRI overestimate vascular invasion (false positive 94%) as compared to ultrasound (false positive 40%) however negative predictive value of ultrasound in detecting vascular invasion is 100%.<sup>5</sup> Extranodal spread is associated with poor prognosis and is associated with 50% decrease in survival rate.<sup>6</sup>

With the advent of fine needle aspiration cytology, results obtained are very quick and the majority of the diagnoses are made preoperatively. In head and neck region, masses are easily accessible for cytological examination and masses in this region including salivary gland, thyroid gland, and lymphoid tissue origin can be easily diagnosed preoperatively by using this technique.<sup>7</sup>

### Aims & Objectives:

1. To evaluate the utility of ultrasound as a diagnostic tool in neck masses for characterization and differential diagnosis in accordance with their anatomic location and size.
2. Comparative evaluation of ultrasound versus fine needle aspiration biopsy.

### Observations:

In the present study, 50 cases of both sexes and 9-60 years of age group, presenting with soft tissue neck masses excluding thyroid masses were selected randomly in the department of ENT, HNS IGMC Shimla. All cases were subjected to thorough clinical examination followed by ultrasonographic evaluation. FNAC/biopsy was taken in these cases and sent for cytological/histopathological examination. All these cases were fully evaluated and following observations were made.

### Clinical Observations:

#### 1) Presenting Symptoms: table 1

Sr. No.	Symptoms	Number of patients	Percentage
1	Pain	14	28%
2	Dysphagia	11	22%
3	Hoarseness	09	18%
4	Loss of appetite & weight	04	08%
5	More than one symptom	12	24%

2) **The site of swelling:** Out of 50 patients with soft tissue swelling of the neck, 7 cases (14%) presented swelling in the midline of neck and 43 cases (86%) had to swell in the lateral aspect of the neck. On further compartmentalizing it was

observed that 33 cases (66%) have to swell in an anterior triangle, 10 cases (20%) in posterior triangle and 7 cases (14%) presented in the midline of the neck.

#### 3) Features of swellings: Table – 2

Sr. No.	Signs	Number of patients	Percentage (%)
1	Size (in cms)		
	i) 1-3	18	36%
	ii) 3-6	58	56%
	iii) >6	04	08%

2	Consistency i) firm ii) Hard iii) Cystic iv) Soft	29 14 05 02	58% 28% 10% 04%
3	Mobility i) Mobile ii) Fixed	43 07	86% 14%
4	Tenderness i) Non-Tender ii) Tender	47 03	94% 06%
5	Matting Present Absent	18 32	36% 64%

4) **Clinical Diagnosis:** Table-3

Sr. No	Diagnosis	No. of pts.	(%age)
1	Metastatic from CA Larynx	10	20%
2	Tubercular Lymph adenopathy	18	36%
3	Thyroglossal Cyst	05	10%
4	CA Submandibular salivary gland	02	04%
5	Metastasis from base of tongue	01	02%
6	Metastatic from CA Nasopharynx	01	02%
7	Metastatic from CA parotid	01	02%
8	Inconclusive	12	24%

5) **Ultrasonography observations:**

**Echogenicity:** Out of 50 cases of swelling in the neck, 5 cases (10%) was homogenous isoechoic, 30 cases (60%) were homogenous hypoechoic, 8 cases (16%) were heterogeneous and 7 cases (14%) were cystic.

**Outline:** In 46 (92%) cases the outline was regular and in 4 cases (8%) the outline was irregular.

**Matting:** Matting was present in 15 cases (30%).

**Central Echogenicity:** In 2 cases (4%) the central echogenicity could be demonstrated signifying normal lymph nodes and it was

absent in 48(96%) of the cases indicating the lymph node to be pathological. Out of the 48 cases without central echogenicity 26 cases (54%) were malignant and 22(46%) were benign indicating that central echogenicity cannot differentiate benign from the malignant mass.

**Shape:** Twenty-two cases (44%) of the neck masses were found to be round in shape and 28 cases (56%) were oval in shape.

**L/T ratio:** We divided the group into two parts depending on the ratio to be < 2 or > 2 and it was observed that 28(56%) of the cases had L/T ratio < 2 and 22(44%) of the cases had L/T ratio >2. Out of 28 masses

with L/T ratio < 2, 23(82.1%) were found to be malignant and 5 cases (18%) were benign. Of the total 22 cases with L/T ratio >2, 4 cases (18.1%) were malignant and 18 cases (81.8%) were benign. This indicates the tendency of benign nodes to have L/T ratio of > 2 and malignant nodes L/T ratio of < 2.

**6) Ultrasound diagnosis:** In the present study, specific ultrasound diagnosis

could be made in 5 cases (10%) of thyroglossal cyst, 18 cases (36%) of tubercular lymphadenopathy and 20 cases (40%) of metastatic lymph nodes of larynx, there were 2 (4%) cystic (non-midline) swellings in the neck. In the rest 5 cases (10%) diagnosis was inconclusive and the only diagnosis of non-specific soft tissue mass was made.

**Table-4** (Ultrasound diagnosis)

Sr. No	Ultrasound diagnosis	No. of Patients	% age
1	Tubercular Lymph adenopathy	18	36%
2	Metastatic Lymph adenopathy	20	40%
3	Thyroglossal cyst	05	10%
4	Other Cystic Mass	02	04%
5	Inconclusive	05	10%

**7) FNAC diagnosis:**

FNAC was performed in all the 50 cases of which in 8 cases (16%) were ultrasound-guided FNAC was performed. After doing FNAC of all the 50 cases, the final diagnosis was possible in 36 cases (72%) and was not

possible in 14 cases (28%) (inconclusive in 4 cases and hemorrhagic/cystic in 10 cases). In 14 inconclusive cases, further biopsy/surgical excision was performed and the diagnosis was possible in all the cases.

**Table-5** (FNAC Diagnosis)

S. No	FNAC Diagnosis	No. of Patients	Percentage (%)
1	Tubercular Lymphadenopathy	21	42%
2	Metastatic CA Larynx	12	24%
3	Pleomorphic Adenoma	01	02%
4	Metastatic CA nasopharynx	01	02%
5	Metastatic CA base of tongue	01	02%

**8) Tissue diagnosis: table-6**

S. No	Diagnosis	No. of Patients	Percentage (%)
1	Tubercular Lymphadenopathy	21	42%
2	Metastatic CA larynx	14	28%
3	Thyroglossal cyst	05	10%
4	Branchial cyst	02	04%

5	Pleomorphic Adenoma	02	04%
6	CA Base of tongue	01	02%
7	Adenocarcinoma	01	02%
8	Carotid body tumor	01	02%
9	Schwanoma	01	02%
10	Nasopharyngeal CA	01	02%
11	Metastatic CA thyroid	01	02%
	Total	50	100%

**Table-7** (Percentage wise cases finally diagnosed by different)

S. No	Final Diagnosis based on	No. of Patients	Percentage (%)
1	FNAC alone	30	60%
2	FNAC and Biopsy with CT Angiography	01	02%
3	US-Guided FNAC	06	12%
4	Biopsy alone	13	26%
	Total	50	100%

**Discussion:**

Although different types of neck masses are common in occurrence in patients attending ENT and HNS clinic yet a vast majority of these neck masses come out to be lymph nodes associated with inflammatory or malignant lesions. The role of palpation, FNAC and biopsy are well documented but the modern imaging techniques have revolutionized the diagnostic criteria. The role of ultrasound in the assessment of neck masses has opened new horizons for visualization and adding in the diagnosis of neck masses.

In the present study out of 50 patients with soft tissue masses of the neck 7 cases (14%) presented with swelling in the midline of neck and 43 cases (86%) had lateral swelling.

On Clinical examination, 10 masses (20%) were secondary to malignancy of larynx, 18

masses (36%) were diagnosed as tubercular, 1 case (2%) malignancy of parotid and 2cases (4%) malignancy adenoma of the submandibular salivary gland. one case (2%) each was of metastatic carcinoma base of tongue and carcinoma nasopharynx with secondaries in the neck.

Most of the malignant primaries of the head and neck with secondaries in the neck could most of the time be diagnosed clinically as most of the cases had reported late but there may be some nodes in the neck with secondary deposit which may either be deep-seated or may not be palpable especially during early malignancies and these are the cases in which ultrasound may be of clinical diagnostic importance.

Regarding cystic and soft swelling of the neck, there were 7 masses (14%) in all which were cystic in 10% and soft in 4%. The clinical diagnosis of the thyroglossal

cyst could be made in 5(10%) of the cases with certainty and these cases exhibited typical diagnostic sign and symptom of the thyroglossal cyst.

Clinically matting was present in 18 cases (36%) and 15 cases (30%) of them later turned out to be tubercular. Similar findings were reported by Bajaj et al in 1989.<sup>8</sup>

#### **Ultrasonographic observation:**

Features with respect to ultrasound were noted including outline, shape, length/width ratio, ultrasound pattern (homogenous, heterogeneous), cystic, center hilus and matting.

From the present study, it is apparent that out of 22 (44%) round masses, 15(68%) were malignant on ultrasound and 7(32%) were benign. Of the total 28(56%) cases with oval shape 22 cases (78.7%) were benign and 6 cases (21.3%) were malignant. So roundness of lymph nodes on ultrasonography appears to be a diagnostic feature for malignant nodes. This is consistent with the findings of P.Vassallo et al who found the tendency of malignant nodes to be round (L/T<2).<sup>9</sup>

L/T ratio is another parameter on ultrasound suggested that L/T ratio of < 2 is diagnostic of malignant metastasis in the neck. Similar observations have made by Rene H. Krut et al who evaluated 489 malignant nodes and found the length to be > 10.9mm in 48% of malignant nodes and width to be > 10.9mm in 72% of the cases. They observed L/T ratio to be < 2 in 61% of malignant nodes. We observed in the present study that ultrasound pattern of hypoechogenicity is a good parameter for diagnosing malignant masses especially if other features like shape, outline and L/T ratio also point to a probable malignant diagnosis.<sup>10</sup>

Out of the 7(14%) cystic masses on ultrasonography, it was observed that five cases were that of the thyroglossal cyst and 2 cases where a branchial cyst. It was

observed that 2 cases (4%) of the branchial cyst and thyroglossal cyst each had an irregular outline. The irregularity of the wall appears to be diagnostic criteria of the branchial cyst. Badami et al in a sonographic study of branchial cyst observed anechoic lesion with the irregularity of the wall in cases of the branchial cyst. They opine that it is difficult to differentiate between an abscess and a branchial cyst especially if it is a tubercular abscess in the usual position of the branchial cyst.<sup>11</sup>

The presence of a negative central hilus should be regarded with suspicion for the possibility of malignancy. In our series, negative hilus turned out to be malignant to the tune of 54.1%. P. Vassallo et al observed the absence of the hilus in malignant disease in 44% cases and 8% in benign nodes. They found absence of hilus a strong criterion for malignancy.<sup>9</sup>

We analyzed the masses formatting on ultrasonography and observed that 18 masses (36%) showed matting out of which 15 cases (83.1%) turned out to be tubercular lymph nodes on histopathologically. Matting on ultrasound appears to be a good index for diagnosing tubercular lymphadenitis. However, another three cases (16.6%) having to mat on ultrasonography turned out to be malignant. So matting on ultrasound needs to be confirmed histopathologically to arrive at a definitive diagnosis. Multiplicity, matting, and caseation necrosis are three important findings of tubercular lymphadenitis.<sup>12</sup>

For the evaluation of neck masses, a large number of which are constituted by lymph nodes, ultrasound scanning has particular advantage over all other axial imaging methods in that it allows free rotation of the scanning plane and easy identification of the dimensions of the mass. The dimensions of the mass, especially in case of lymph nodes, has been suggested to be an objective criterion for characterizing

lymphadenopathy.<sup>13</sup> Our observation and results showed no significant differences between benign and malignant nodes in terms of their largest diameter but there was marked difference in terms of their shape, outline and L/T ratio. L/T ratio can decisively arrive at ultrasonographically. The L/T ratio on ultrasonographically is a valuable criterion for differentiating benign from malignant nodes.

Two cases presented with swelling in the submandibular region and were firm in consistency with regular margins. Ultrasound was performed which showed a well-defined hypoechoic mass with regular margins within the submandibular gland yet clearly separated from normal tissue. The mass showed no calcification or cystic areas. Sonographic diagnosis of pleomorphic adenoma was made which was subsequently confirmed on FNAC. Findings are consistent with Gecland R Wittiach et al, according to whom pleomorphic adenomas typically are hypo echoic, slightly inhomogeneous, solid lesions with a smooth outline and frequently had a lobulated contour.<sup>14</sup>

One case presented with hard, nontender mobile mass on the left side of the neck in the anterior triangle. Ultrasound was performed which showed hypoechoic mass with regular margins. The mass homogenous and showed numerous microcalcifications. There were no cystic areas within it. Sonographic diagnosis of the metastatic lymph node was made. On subsequent FNAC definitive diagnosis of papillary metastasis from thyroid was made. The findings are consistent with Solbiati et al according to whom the characteristic of metastatic involvement from thyroid cancers are the microcalcifications and complete cystic nodal degeneration.<sup>15</sup>

One case presents with swelling in right carotid triangle which was well defined and mobile side to side and had transmitted pulsations. Ultrasound was performed and

had shown well-defined hypo echoic lesion. The aspirate was hemorrhagic on needle aspiration cytology. On further imaging (CECT scan and MRI), diagnosis of carotid body tumor was made.

#### Summary

On ultrasonographic examination, neck masses revealed homogenous echo pattern in 30(60%) of cases, isoechoic in 5(10%), cases, heterogeneous echo pattern in 8(16%) cases and 7 cases (14%) were cystic. The outline was regular in 46(92%) cases out of which 24(52.1 %) were malignant. Ultrasonographically 28(56%) cases were oval and 22(44%) were round in shape. 22(78%) of oval-shaped masses were benign and 5(68%) of round masses were malignant on histopathological examination. Ultrasonographically L/T ratio, 28(56%) of the cases had L/T ratio of less than 2 and out of these 23(82.1%) were malignant. L/T ratio of more than 2 was found in 22(44%) and out of these 18 cases (81.8%) were benign indicating masses with L/T ratio of less than 2 were mostly malignant and L/T ratio of more than 2 were benign. Forty-eight (96%) cases were without central echogenicity and of these 26(54%) cases were malignant and 22(46%) were benign indicating the absence of central echogenicity is an indicator of pathological nodes. Fine needle aspiration cytology was found to be a good histopathological diagnostic tool in a majority of neck masses, however in 8 cases (16%) nodes were very small and in these cases, an ultrasound-guided FNAC was done. 6 cases (75%) were conclusive and 2 cases were inconclusive. In cases with inconclusive FNAC, excision biopsy clinched the diagnosis.

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