



Ultrasound Study of Tubercular Lymphadenopathy

Tüberküler Lenfadenopatide Ultrasound Çalışması

Sushil Ghanshyam Kachewar¹, Smita Balwant Sankaye¹

¹Rural Medical College, PIMS(DU), Loni, Maharashtra, INDIA;

Çukurova Üniversitesi Tıp Fakültesi Dergisi (Cukurova Medical Journal) 2013; 38 (2):189-195

ABSTRACT

Tubercular lymphadenopathy is a common entity. Etiologically it can be divided into primary tubercular lymphadenopathy and secondary tubercular lymphadenopathy. Ultrasound can satisfactorily demonstrate the involved lymph nodes. Hence we reviewed the ultrasound findings in all fine needle aspiration cytology proven cases of tubercular lymphadenopathy that presented in the imaging department in the last 12 months. Nine different criteria on Grey Scale ultrasound imaging and three different criteria on Color Doppler ultrasound imaging were used to differentiate tubercular nodes from metastatic lymphadenopathy. Matting, presence of intranodal necrosis-caseation, intranodal calcifications, minimal vascularity and reduced Doppler Pulsatility and Resistivity Indices were the hallmarks of tubercular lymphadenopathy which enabled correct diagnosis with a sensitivity of 85.25% and a specificity of 98.36 %. Thus ultrasound can satisfactorily differentiate between tubercular and metastatic lymphadenopathy.

Key words: Lymph node Tuberculosis; Ultrasound; B mode, Colour Doppler, Imaging.

ÖZET

Tüberküler lenfadenopati yaygın bir antitedir. Etiyolojik olarak primer ve sekonder olmak üzere iki gruba ayrılabilir. Ultrasound ile tutulan lenf nodu demonstre edilebilir. Biz son 12 ay süresince iğne aspirasyon biyopsisi ile tüberküloz lenfadenopati olarak tanınan olguların ultrasound bulgularını gözden geçirdik. Gri skalada 9 farklı kriter, renkli Doppler ultrasonunda ise 3 farklı kriter tüberküler lenfadenopatiji metastatik lenfadenopatiden ayırt edilmede kullanılmıştır. Intranodal nekroz-kazeifikasyon, intranodal kalsifikasyon, minimal vaskülarite ve azalmış Doppler pulsatilite ve resistivite endeksleri tüberküloz lenfadenopati tanısı için 85.25% duyarlılık ve 98.36% özgüllük ile doğru tanının konulmasına yardımcı olmaktadır. Bu nedenle ultrasound tüberküloz lenfadenopatiji metastatik lenfadenopatiden ayırt etmede tatmin edeivi bir yöntemdir.

Anahtar kelimeler: Lenf nodu, tüberküloz, ultrasound B mode, Renkli Doppler, görüntüleme

INTRODUCTION

Elaborate evaluation of the lymph nodes represents one of the most challenging and stimulating problems that a Sonologist can face¹. They mainly serve as filters of lymph and sites for generation of immune response^{2,3,4}. Hence they are commonly involved in a variety of benign and malignant conditions. Tuberculosis is one such benign condition that is seen worldwide.

Tubercular as well as metastatic affections of the nodes are often difficult to differentiate clinically^{5,6,7}. As the prognosis and management of these two conditions is quite different, a prompt accurate diagnosis is essential⁸. Hence in this review we aim at using ultrasound as a noninvasive imaging modality to identify tubercular nodes accurately, for timely diagnosis, treatment and follow up.

MATERIALS and METHODS

Ultrasound features of enlarged lymph nodes proved to be tubercular on fine needle aspiration cytology (FNAC) were reviewed for the last 12 months. On FNAC these nodes showed caseating granulomas and demonstrated acid fast bacilli.

Following ultrasound features were used:

A) Grey scale criteria:

- Long by Short axis ratio or the Roundness Index – in which the maximum lymph node diameter is bisected by the perpendicular transverse diameter.
- Gross appearance - Whether they looked homogenous or heterogeneous.
- Hilus - whether present or absent.
- Necrosis - Inside the node is seen as anechoic, irregular areas. Its presence or absence was noted.
- Calcification - Seen as echogenic areas in the node. Its presence or absence was noted.
- Borders- Whether they are sharp or not is noted. If sharp, there is well-defined boundary between lymph node and surrounding soft tissue.

- Matting - is the clumping of nodes or adherence to each other such that there is no normal echogenic connective tissue in between. Its presence or absence was noted.
- Edema - of the surrounding tissue is seen as diffuse decrease in the echogenicity of adjacent tissues, with loss of fascial planes and thickening of skin. Its presence or absence was noted.
- Posterior enhancement- Structures posterior to the node are more echogenic than neighboring structures.

B) Perfusion pattern:-

Nodes were assessed for the pattern of vascular perfusion using the color Doppler mode.

C) Perfusion Intensity: Using color Doppler was assessed and subjectively classified as -

1. Hypo perfusion -Minimal perfusion compared to adjacent fat and soft tissue.
2. Isoperfusion -Perfusion similar to adjacent fat and soft tissue.
3. Hyper perfusion -Perfusion more than adjacent fat and soft tissue.

D) Resistance to Perfusion: Assessed by calculating Resistivity (RI) and Pulsatility (PI) indices which are given as:

$$\text{Pourcelot's Resistivity Index}^9 = \frac{\text{Peak systolic velocity} - \text{End diastolic velocity}}{\text{Peak systolic velocity}}$$

$$\text{Gosling's Pulsatility Index}^9 = \frac{\text{Peak systolic velocity} - \text{End diastolic velocity}}{\text{Time averaged maximum velocity}}$$

RESULTS

On FNAC, total 121 patients were diagnosed to have Tubercular Lymphadenitis (TL).

Assessment by Gray Scale criteria: The Roundness Index was more than two in 117 patients (96.69%) and less than two in only 4 patients (3.30% of the total). On gross appearance, 43 patients (35.53%) of TL showed

homogenous appearance of the nodes and 78

patients (64.46%) showed heterogeneous appearance. Hilus was absent in 45 (37.19%) of cases of TL, and was present in 52 patients (42.97%) and was displaced or distorted in 24 (19.83%). Intranodal necrosis was present in 63 (52.06%), Intranodal calcification was seen in 17 (14.04%), posterior enhancement was seen in 63

(52.06%), sharp borders were present in 102(84.29%), surrounding edema was seen in 7(5.78%) and matting was seen in 71 (58.67%) cases of TL.

Assessment by Color Doppler criteria: Out of 121 patients (39.67% of the total) who were diagnosed to have TL, majority of 72 patients (59.50%) were having only hilar perfusion and it was hypointense with that of the surroundings (90.83%), 64 patients (52.80%) had Pulsatility

Index less than 1.4 and Resistance Index in majority of 110 patients (90.90%) was less than 0.7.

The sensitivity and specificity of each parameter is shown in Table 1. Gray Scale criteria: The Roundness Index was 86.89% sensitive and 97.13% specific in diagnosing TL. Similarly the Color Doppler criteria of Resistance to Perfusion (i.e. RI< 0.7 and PI< 1.4) was 83.61% sensitive and 99.18% specific in diagnosing TL.

Table 1- Sensitivity and Specificity of Grey Scale & Color Doppler Parameters to differentiate TL from metastatic lymphadenopathy

Serial No.	Criterion	% Sensitivity	% Specificity
01	Roundness Index >2	86.89	97.13
02	Heterogeneous on gross	42.62	62.30
03	Abnormal /Absent Hilus	86.89	54.51
04	Necrosis	39.34	31.97
05	Calcification	04.92	93.30
06	Posterior enhancement	52.46	66.39
07	Sharp Borders	14.75	90.16
08	Surrounding edema	01.64	96.31
09	Matting	22.95	64.26
10	Perfusion Pattern	93.44	66.80
11	Perfusion Intensity	75.41	80.33
12	Resistance to Perfusion	83.61	99.18

collects important data about the vascularity¹¹. In

DISCUSSION

Sonography is commonly the first imaging modality after clinical examination for evaluation of cervical lymphadenopathy. It provides valuable diagnostic information with a high degree of diagnostic accuracy. High resolution B-Mode Sonography is a valuable tool in the diagnosis of diseases of head and neck¹⁰. The introduction of Color Doppler Sonography has multiplied the amount of information that can be obtained during an ultrasound examination, since this technique

this study the ultrasound features of enlarged nodes in FNAC proved 121 patients of TL were compiled to come out with the statistical data on the utility of ultrasound in TL.

The roundness index has been the most important Grey Scale criteria in our study. Generally tubercular nodes are oval, although they can sometimes be round in upto 3% as in our study. Other studies have found the index to be

less than two ranging from 41% of TL [11], to 79%⁷.

Nodes may appear homogenous in acute phase of tuberculosis but later they become inhomogeneous. In our study, 64.46% of TL was heterogenous. In other studies [7] this was found in 36% of TL cases. The central hilum has been

reported to be absent in 76.4% - 86% of cases of TL^{7,8,11}.

Intranodal necrosis has been described in 53% - 60% cases of TL [7, 8]. In our study it was seen in 31.96% of TL cases as shown in Figure 1.

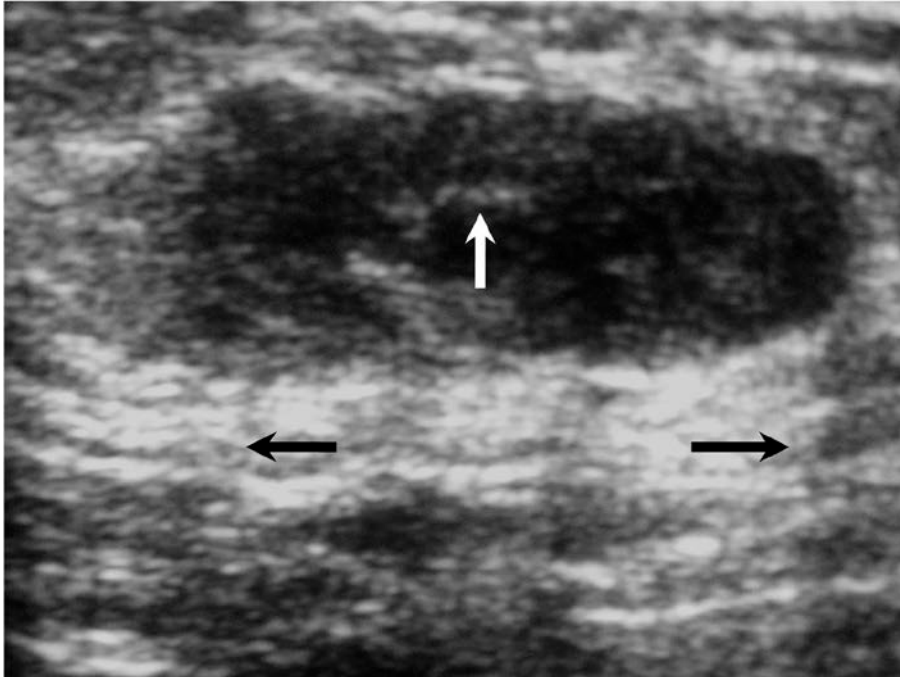


Figure 1. Ultrasound image showing Enlarged Oval Caseating Tubercular Lymph Node

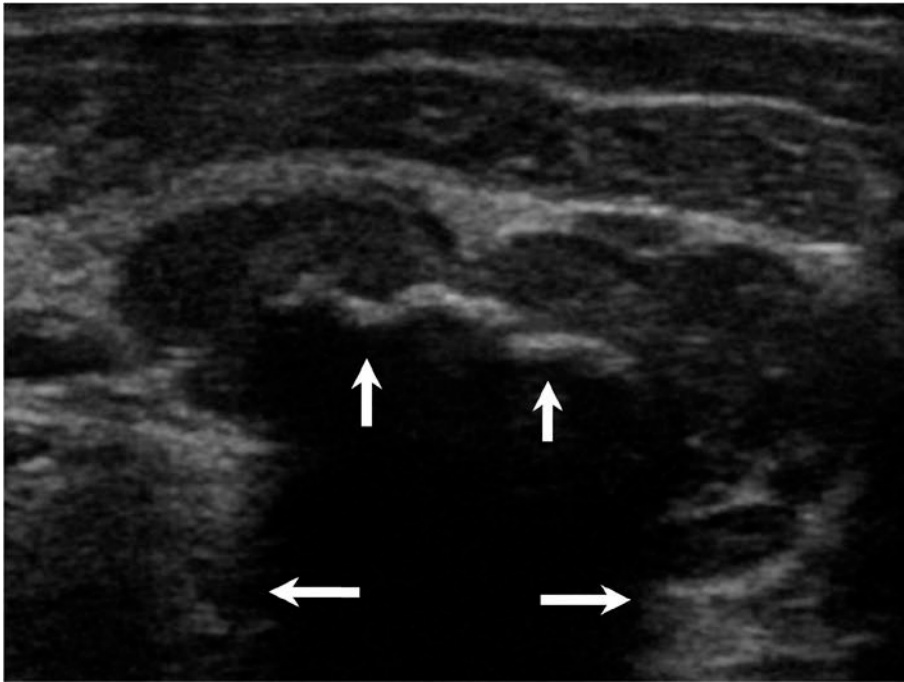


Figure 2. Ultrasound image showing Tubercular Lymph Node with Intranodal calcifications

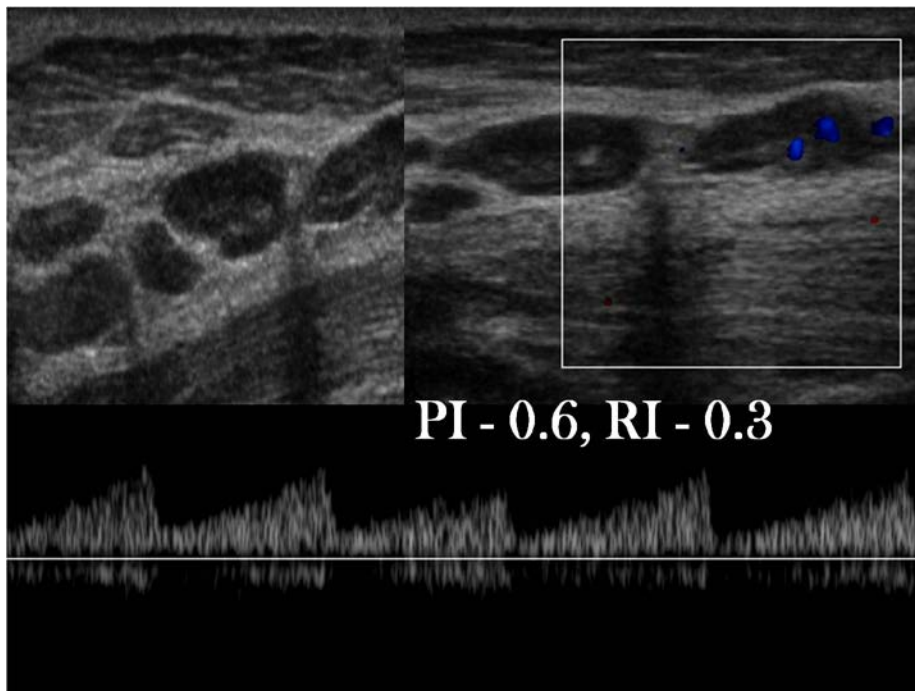


Figure 3. Ultrasound image showing Matted Tubercular Minimally Vascular Lymphadenopathy

Intranodal calcific deposits are seen with old granulomatous disease^{1,12} and in only 1% of TL⁷ cases. In our study it was seen in 6.9% of TL cases (Figure 2). Nodal calcification may also be seen in other granulomatous diseases like sarcoidosis, fungal diseases and inflammatory disorders like rheumatoid arthritis, Scleroderma and amyloidosis.

Posterior enhancement has been reported in 20-22% of TL cases^{6,7}. In our study it was seen in 33.60 % of cases. Although 38.9% of TL have been reported to have sharp borders^{6,8}, it was seen in only 9.83% of TL cases. Acutely inflamed nodes are smooth bordered and are well differentiated from surrounding soft tissues. Tuberculous nodes may have blurred borders due to edema in the surrounding soft tissues. It has been found that reactive lymph nodes, nodes in acute stage of tuberculosis and inflammatory nodes are smoothly margined¹³.

Surrounding edema was seen in 3.6% of TL cases in our study and it has been opined that adjacent soft tissue edema can be seen in nodes affected by tuberculosis⁸. Edema of surrounding soft tissues was seen in 49% of cases of TL⁷. Tuberculous nodes may have blurred borders, due to edema in the surrounding soft tissues. Inflamed surrounding soft tissues with fistula formation may be seen¹⁰.

The Perfusion Pattern: In our study - Tubercular nodes mainly showed only hilar (59.50 %) and only peripheral pattern of vascularity (20.66%) as shown in Figure 3. About 18.5 -72% of TL, revealed avascular pattern [6, 8, 14].

The Perfusion Intensity: In the present study - Tubercular nodes showed vascularity which was in most cases hypointense to the surrounding (90%).

The Resistance to Perfusion: In our study most of the tubercular nodes had the mean pulsatility index value of 0.7 (22.31%), and the mean resistivity index value of the 0.5 (16.52%) as shown in Figure 3. It has been found that with a

PI<1.6 and RI <0.8, TL could be differentiated from metastases with an accuracy of 91 %¹⁵.

Thus a systematic evaluation of enlarged lymph nodes with the above described ultrasound criteria can correctly diagnose TL. The above described criteria are particularly useful in raising the flag of suspicion in unexpected cases and in following response to treatment as well as complication if any. The advantage of ultrasound is that it is non invasive, there is no radiation risk and can be used for bedside purposes as well with acceptable results in an experts hands.

REFERENCES

1. Som P. Lymph Nodes of the Neck. *Radiology*. 1987; 165: 593-600.
2. Stevens A, Lowe J. *Human Histology-Immune System*. 1997; 2: 117-135.
3. Arey LB. *Human Histology-The Lymph Nodes*. 1974; 41: 148-151.
4. Ross MM, Romrell LJ, Kaye GI. *Histology –A text and Atlas-Lymph Nodes*. 1995; 3: 342-346.
5. DePena CA, Tassel PV, Lee YA. Lymphoma of Head and Neck. *Radiologic Clinics of North America*. 1990; 28:723-43.
6. Ahuja A, Ying M, Yang T et al. The Use of Sonography in Differentiating Cervical Lymphomatous Lymph Nodes from Cervical Metastatic Lymph Nodes. *Clinical Radiology*. 1996; 51: 186-190.
7. Ying M, Ahuja AT, Evans R et al. Cervical Lymphadenopathy: Sonographic Differentiation between Tuberculous Nodes and Nodal Metastases from Non-Head and Neck Carcinomas. *Journal of Clinical Ultrasound*. 1998; 8: 383-9.
8. Ahuja A, Ying M., Evans R et al. The Application of Ultrasound Criteria for Malignancy in Differentiating Tuberculous Cervical Adenitis from Metastatic Nasopharyngeal Carcinoma. *Clinical Radiology*. 1995; 50: 391-5.
9. Steinkemp HJ, Maurer J, Cornebl M, Recurrent Cervical Lymphadenopathy: Differential diagnosis with color-duplex sonography. *Eur Arch Otorhinolaryngol*. 1994; 251: 404-9.
10. Koischwitz D, Gritzmann D. Ultrasound Of The Neck. *Radiologic Clinics Of North America*. 2000; 38: 1029-45.
11. Na CG, Lim AK, Byun GS et al. Differential diagnosis of Cervical Lymphadenopathy: Usefulness

- of Color Doppler Sonography. The American Journal of Radiology. 1997; 168: 1311-6.
12. Sakai O, Curtin H, Romo LV et al. Lymph Node Pathology Benign Proliferative, Lymphoma, And Metastatic Disease. Radiological Clinics of North America. 2000; 38: 979-98.
 13. Gritzmann N, Hollerweger A, Macheiner P et al. Sonography of Soft Tissue Masses of the Neck. Journal of Clinical Ultrasound. 2002; 30: 356-73.
 14. Wu, Chang, Hsu et al. Usefulness of Doppler Spectral Analysis and Power Doppler Sonography in the differentiation of cervical Lymphadenopathies. American Journal of Roentgenology. 1998; 171: 503-9.
 15. Steinkemp HJ, Mueffelmann M, Bock JC et al. Differential diagnosis of lymph node lesions: a semi quantitative approach with color Doppler ultrasound. The British Journal of Radiology. 1998; 71: 828-33.

Yazışma Adresi / Address for Correspondence:

Dr. Sushil Ghanshyam Kachewar
Rural Medical College
PIMS (DU), Loni,
Maharashtra, INDIA
geliş tarihi/received :24.10.2012
kabul tarihi/accepted:30.11.2012