

Role of Ultrasonography in Evaluation of Cervical Lymphadenopathy



Mourya Vandana^{*1}, Sah Dambar¹, Jha Amit²

¹ Department of Radiology, National Medical College, Birgunj, Nepal

² Department of Otorhinolaryngology, National Medical College, Birgunj, Nepal

Date of Submission: Feb 09, 2019

Received in Revised Form: March 18, 2019

Date of Acceptance: April 25, 2019

Date of Publishing: July 30, 2019

ABSTRACT

Background:

Enlargement of cervical lymph nodes is a very common condition in developing country like Nepal due to many underlying pathologies. Ultrasonography supercedes CT and MRI because it is easily available, cost-effective, non-invasive, radiation free and hence, a safe investigation. In this study, the ultrasonographic findings of cervical lymphadenopathy were correlated with the FNAC reports.

Methods:

All the patients presenting in the Department of Radiology with cervical lymphadenopathy underwent ultrasonographic examination of their neck lymph nodes followed by Fine Needle Aspiration Cytology (FNAC) of the most representative lymph node. Ultrasound findings and FNAC results were then correlated. Statistical analysis and calculation of 'p values' was done by chi-square test. P-value <0.05 was considered as significant.

Results:

The frequently affected age group was 5-20 years accounting for 67.5% (54) cases. Of this, 35.0% (28) cases were female patients while 32.5% (26) cases were male. The mean age was 19.2 years. Most of the malignant lymph nodes were found in male patients which were 3.7% (3) of total cases while reactive & tubercular lymph nodes were

found in 22.5% (18) and 36.2% (29) cases respectively. The later were found more common in female.

Out of 80 cases of cervical lymphadenopathy, 95% were non-neoplastic and only 5% were neoplastic. Most common finding in non-neoplastic (benign) cervical lymphadenopathy was reactive lymph nodes, seen in 55% (44) cases followed by tuberculosis 37.5% (30) cases and while only 5% (4) cases were malignant.

Conclusion:

In this study, 6 cases were diagnosed as malignant lymphadenopathy by ultrasound but only 4 cases were proved malignant by FNAC. Out of 4 cases, 3.7% (3) cases were <1 cm in size and only 1 case was > 1 cm size. The sensitivity and specificity of USG in the evaluation of cervical lymph nodes are 96.1% and 75.0% respectively. The correlation between the ultrasonographic findings with FNAC of cervical lymphadenopathy was statistically significant ($p < 0.0001$).

Key words: Ultrasound, Cervical lymphadenopathy, FNAC, Malignant, Non-malignant, Reactive, Tuberculosis.

***Corresponding Author:** Dr. Vandana Mourya, Department of Radiology, National Medical College, Birgunj Nepal.
Email: mouryavandana@gmail.com

INTRODUCTION

Enlargement of cervical lymph nodes is a very common condition in a developing country like Nepal due to many underlying pathologies. There is much anxiety and confusion in detection of the cause of lymphadenopathy. Biopsy and other pathological tests are invasive and time consuming. Though computed tomography and magnetic resonance imaging can be used for assessing lymphadenopathy, ultrasonography supercedes because it is easily available, cost effective, non-invasive, radiation free and hence, a safe investigation. The differentiation of benign from malignant lymphadenopathy is of critical importance in both treatment planning and prognosis.¹

This study has been conducted to evaluate the efficacy of ultrasonography to differentiate benign (non-malignant) from malignant cervical lymphadenopathy and findings were correlated with another diagnostic procedures viz. fine needle aspiration cytology (FNAC).

Reactive lymph nodes:

On gray scale imaging, these nodes tend to be hypoechoic compared to the adjacent muscles and oval in shape [Short Axis/Long Axis (S/L) ratio < 0.5] except those in submandibular and parotid regions (S/L ratio is ≥ 0.5) which have echogenic hilum. The upper limit of short axis diameter for reactive and normal lymph node is 10mm for subdiaphragmatic and submandibular region.² On color Doppler study, normal cervical lymph nodes show hilar vascularity or no vascularity but reactive lymph nodes predominantly shows hilar vascularity.³

Tubercular lymph nodes

On gray scale sonography, tubercular nodes tend to be hypoechoic, round and without echogenic hilum and show intranodal necrotic change, matting and adjacent soft tissue edema⁴. On Doppler study, it shows variable vascular distribution and it simulates benign and malignant nodes. However, displacement of hilar vascularity is common in tubercular nodes and is due to high incidence of intranodal necrosis, which displaces vessels.⁵

Malignant Lymph nodes

It includes primary as well as metastatic lymph nodes. On gray scale sonography, metastatic nodes are usually hypoechoic, round and without

echogenic hilum due to coagulation necrosis.^{6,7} On Doppler study, malignant lymph nodes shows peripheral or mixed vascularity.⁵ Gray scale sonography has a sensitivity of 95% and a specificity of 83% in differentiating metastatic and reactive nodes.⁷

MATERIAL AND METHODS

This study was carried out over a period of one year from November 2017 to October 2018 in the Department of Radiology, National Medical College, Birgunj, Nepal. During this period 150 patients with clinically palpable neck masses visited in our department. Out of these, 80 patients were included in this study on the basis of positive imaging findings while 70 patients were excluded as they had non-lymph nodal lesions. These patients underwent ultrasonographic examination of their neck nodes followed by FNAC of most representative lymph node. Correlation of the ultrasound findings and FNAC diagnosis was done later.

Method of Ultrasonography and FNAC

Ultrasonography was done by using linear (high resolution) transducer of 10 MHz. The patient lay supine on the couch with the shoulders supported by a pillow and the neck hyper extended. Scans were obtained with the transducer placed transversely and longitudinally and measurements were made in the plane that showed a minimum cross-sectional area. Gray scale ultrasonographic characteristics were described as delineation of shape & size of nodes, a tendency towards fusion, an internal echo, and margin. Fusion of lymph nodes was defined as partial or complete disappearance of a borderline echo between them. The shape of the lymph node was assessed by the L/S ratio. An L/S ratio < 2 indicates a round node whereas an L/S ratio > 2 indicates an oval or elongated node.

Fine Needle Aspiration Cytology (FNAC) of the most prominent node was carried out using a 22 gauge needle attached to a 10 ml. syringe. Multiple passes using negative suction through a single puncture site were done. This ensured that both the cortical and subcapsular areas of the node were sampled. Statistical analysis and calculation of 'p values' were done by chi-square test. P-value < 0.05 was considered as significant.

RESULT

A total of 150 patients with palpable neck masses

were referred from OPD for USG to Department of Radiology in National Medical College, Birgunj. Out of this number, 80 patients were included in this study for cervical lymphadenopathy. They were examined using grey scale and Color Doppler USG and confirmed by FNAC.

Table 1: Distribution of cervical lymphadenopathy according to age and gender

Age	Gender		Total/ Frequency
	Male	Female	
5-20	26 (32.5%)	28(35.0%)	54 (67.5%)
21-35	2(2.5%)	14 (17.5%)	16 (20.0%)
36-50	2(2.5%)	5(6.2%)	7 (8.7%)
51-65	1(1.2%)	1(1.2%)	2 (2.5%)
>65	0	1(1.2%)	1 (1.2%)
Total	31(38.7%)	49(61.2%)	80 (100%)

In this study, patients who were 5 years to 70 years old were included. The most common age group presenting with cervical lymphadenopathy was 5-20 years (67.5% or 54 cases) with female predominance accounting 35.0% (28 cases) followed by 21-35 years 20.0% (16 cases).

Table 2: FNAC findings in different age groups

Age group	FNAC				Total
	Reactive	Tuberculous	Malignant	Equivocal	
5-20 years	32(40.0%)	19(23.7%)	0	2(2.5%)	54(67.5%)
21-35 years	10(12.5%)	6(7.5%)	0	0	16(20.0%)
36-50 years	2(2.5%)	4(5.0%)	2(2.5%)	0	7(8.7%)
51-65 years	0	1(1.2%)	1(1.2%)	0	2(2.5%)
>65 years	0	0	1(1.2%)	0	1(1.2%)
Total	44(55.0%)	30(37.5%)	4(5.0%)	2(2.5%)	80(100%)

Among all the age groups, reactive lymph nodes were most common in the age bracket of 5-20 years with 40% (32 cases) being reactive and 23.7% (19 cases) diagnosed tuberculous in FNAC. Lymph nodes in age group of 36-50 years tended to be more malignant (2.5%, 2 cases). Similarly, equivocal nodes (2.5%, 2 cases) were commonly seen in age group of 5-20 years.

Table 3 Ultrasonographic findings of cervical lymphadenopathy

Parameters	Frequency	FNAC				
		Reactive	TB	Malignant	Equivocal	
Size	<1 cm	21 (26.3%)	10(12.5%)	7(8.7%)	3(3.7%)	1(1.2%)
	>1cm	59 (73.8%)	34(42.5%)	23(28.7%)	1 (1.2%)	1(1.2%)
Shape (L/S ratio)	Oval (>2)	70 (87.5%)	44(55.0%)	22(27.5%)	2 (2.5%)	2(2.5%)
	Round(<2)	10 (12.5%)	0	8(10.0%)	2 (2.5%)	0
Echotexture	Iso	25 (31.3%)	23(28.7%)	1(1.2%)	1 (1.2%)	0
	Hypo	55 (68.8%)	21(26.2%)	29(36.2)	3(3.7%)	2(2.5%)
Margin	Regular	76 (95.0%)	44(55.0%)	27(33.7%)	3(3.7%)	2(2.5%)
	Irregular	4 (5.0%)	0	3(3.7%)	1(1.2%)	0
Fusion	Present	23 (28.7%)	9(11.2%)	11(13.7%)	1(1.2%)	2(2.5%)
	Absent	57 (71.3%)	35(43.7%)	19(23.7%)	3(3.7%)	0
Hilum	Present	45 (56.3%)	41(51.2%)	4(5.0%)	0	0
	Displaced	24 (30.0%)	3(3.7%)	19 (23.7%)	0	2(2.5%)
Necrosis	Absent	11 (13.8%)	0	7 (8.7%)	4(5.0%)	0
	Present	35 (43.8%)	6(7.5%)	24 (30.0%)	4(5.0%)	1(1.2%)
Vascularity	Peripheral	45 (56.3%)	38(47.5%)	6(7.5%)	0	1 (1.2%)
	Hilar	69 (86.3%)	44(55.0%)	23(28.7%)	0	2(2.5%)
Vascularity	Peripheral	11 (13.8%)	0	7(8.7%)	4(5.0%)	0

In the present study, out of 80 cases of cervical lymphadenopathy, 95% were non-malignant and only 5% were neoplastic. Most common finding in non-malignant (benign) cervical lymphadenopathy was reactive lymph nodes seen in 55% (44) cases followed by tuberculosis 37.5% (30) cases and only 5% (4) cases were malignant.

The most common group of lymph nodes diagnosed by ultrasound and FNAC were reactive. The ultrasonographic features of these lymph nodes were high L/S ratio (oval shaped) found in 55% (44) cases with isoechoic echotexture in 28.7% (23) cases. Hilum was intact in 51.2% (41) cases with absence of fusion in 43.7% (35) cases. On color flow study, hilar vascularity was noted. However, FNAC proven reactive lymph nodes were 26.2% (21) cases that showed hypoechoic echotexture with necrotic change 7.5% (6) cases and hilum were displaced in 3.7% (3 cases) with 11.2% (9) cases were fused.

Out of 30 cases of tubercular lymph nodes, most of the lymph nodes were > 1 cm size in 28.7% (23) cases and oval shaped (high L/S ratio) in 27.5% (23) cases. They showed hypoechoic echotexture in 36.2% (29) cases with necrosis in 30.0% (24) cases. Hilum was displaced in 23.7% (19) cases with regular margin of 33.7% (27) cases and fusion tendency noted in 13.7% (11) cases. Hilum was displaced but vascularity was hilar in 27.5% (23) of cases in the tubercular lymph nodes. In FNAC proven, tubercular lymph nodes shows variable ultrasonographic features that include size <1 cm in 8.7% (7) cases and shape was round in 10.0% (8) cases. Only 1.2% (1) case shows homogeneous isoechoic echotexture. Most of the FNAC proven tubercular lymph nodes do not shows fusion on ultrasound that included 23.7% (19) cases. Hilum was intact in only 5.0% (4) cases and absent in 8.7% (7) cases. In 7.5% (6) cases no any evidence of necrotic changes were noted on ultrasound.

In this study 6 cases were diagnosed as malignant lymphadenopathy by ultrasound but only 4 cases were proved malignant by FNAC. Out of 4 cases 3.7% (3) cases were <1 cm in size and only 1 case was > 1 cm size. Ultrasonographic findings was hypoechoic in 3.7% (3) cases and both oval and round shape in 2.5% (2) cases with regular margin

noted in all 5% (4) cases but they show necrotic change with absent hilum in 5% (4 cases) and peripheral vascularity found in all 5% (4 cases).

Table 4: Correlation of ultrasound findings with FNAC

USG findings	FNAC findings		Total
	Non malignant	malignant	
Non malignant	73 (96.1%)	1(25.0%)	74(92.5%)
Malignant	3 (3.9%)	3 (75.0%)	6(7.5%)
Total	76 (100%)	4(100%)	80(100%)
P-value	0.001		

The sensitivity and specificity of USG in the evaluation of cervical lymph nodes are 96.1% and 75.0% respectively. The correlation between the ultrasonographic findings with FNAC of cervical lymphadenopathy was statistically significant ($p=0.0001$).

DISCUSSION

A total 80 patients presenting with cervical lymphadenopathy were evaluated with high frequency transducer and ultrasonographic finding was correlated with FNAC. In the study, 61.3% patients were female while 38.8 % were male.

The most frequently affected age group, in this study, was 5-20 years which included 67.5% of cases. In the study conducted by Jha BC et al., the most commonly affected age group was 13-20 years (39.13%).⁸ Similarly, another study conducted by Benjamin J and D Agrawal shows similar findings.^{9,10}

In our study, 95% cases were non-malignant while only 5 % were malignant. Reactive lymph nodes were found to be most common cause of cervical lymphadenopathy in 55% cases followed by tuberculosis in 37.5% cases. In contrast to our study, Mohammad Ali Motiwala *et al.* found that tuberculosis occurring in as many as in 54.7% was the commonest cause for cervical lymphadenopathy followed by reactive lymphadenopathy in 22.6% cases.¹¹

In our study, most of the non-malignant lymph nodes were > 1 cm in size (72.5%). Malignant lymph node were < 1 cm in its minimum diameter in 3.7% (3 cases) with hypoechoic echotexture in 3.7%(3 cases) and necrotic change with peripheral vascularity noted in all 5% (4cases). Similarly, previous study showed that a minimal

axial diameter of >0.8cm (<1 cm) with heterogeneous hypoechoic echotexture and necrotic lymph nodes is highly specific for malignancy.^{12,13}

In our study, fusion of lymph nodes was present mostly in tubercular lymphadenopathy (13.7%, 11 cases). Majority of malignant lymph node were not fused with only 1.2% (1case) of malignant lymphadenopathy being fused. The study conducted by Ahuja *et al.* stated that fusion is commonly found in the tubercular lymph nodes, they are rare in malignancy.¹⁴

Out of 4 malignant lymph nodes, margin was regular in 3 cases (75%). Irregular margin was mostly seen in tubercular lymph nodes (in 10% cases of 30 cases). In one study done by Kaji et al., 16 of 19 nodes showed sharp margin in proven malignancy (84.2%) and blunt borders in 3 cases (15.8%).¹⁵

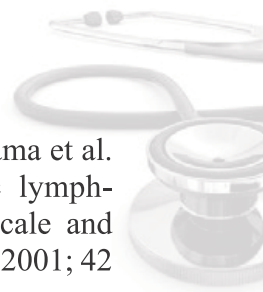
In our study sensitivity and specificity of USG in the evaluation of cervical lymph nodes are 96.1% and 75.0% respectively. In a study conducted by Takeuchi et al found the sensitivity and specificity of ultrasound in diagnosis of malignant lymph nodes were 97.2% and 100%, respectively.¹⁶ The correlation between the ultrasonographic findings with FNAC of cervical lymphadenopathy in our study was statistically significant ($p=0.0001$).

CONCLUSION

Sonographic characterization of cervical lymph nodes are extremely important from therapeutic point of view. It is also important to make the correct diagnosis at early stage because a delayed diagnosis can lead to delay in the treatment and make curable disease incurable. Our study shows that ultrasound has 96.1% sensitivity and 75.0% specificity in the diagnosis of cervical lymphadenopathy.

REFERENCES

1. Michael Ying, Anil A, Constantine M. Diagnostic accuracy of Sonographic criteria for evaluation of cervical lymphadenopathy; American Institute of Ultrasound in Medicine J. 1998; 17: 437-445.
2. Van den Brekel MW, Casteliins JA, Stel HV, Golding RP, Meyer CJ, Snow GB. Modern Imaging techniques and



- ultrasound- guided aspiration cytology for assesement of neck node metastases: a prospective comparative a study. *Eur Otorhynolaryngol* 1993; 250:11-17.
3. Ying M, Ahuja. Sonography of neck lymph nodes. I. Normal lymph nodes. *Clin Radiol*. 2003; 58:351-358.
4. Ahuja A, Ying M. Sonography of neck lymphnodes. II. Abnormal lymph nodes. *Clin Radiol*. 2003; 58:359-366.
5. Ahuja A, Ying M. Sographic evaluation of cervical lymphadenopathy: is power Doppler sonography routinely indicated? *Ultrasound Med Biol*. 2003; 29:253-359.
6. Grasl MC, Riedl KN, N Gritzmam et al. Value of somorphologic criteria in the identification of regional metastases of squamous cell cancers of the ENT area. *HNO*. 1989 Aug;(8):333-7.
7. Zehra H. Differentiation of benign and malignant cervical lymph nodes; value of B Mode and colour Doppler Sonography; *JRadiology*. 1998; 28:232-234.
8. Jha BC, Das A, Nagarkar NM, Gupta R, Singhal S. Cervical Tuberculosis Lymphadenopathy: changing clinical pattern and concept in management. *BMJ Post graduate Med J*. 2000;7(7):185-7.4.
9. Benjamin J. Ludwig, Jimmy Wang, Rohini N. Nadgir, Naoko Saito, Ilse Castro-Aragon and Osamu Sakai. Imaging of cervical lymphadenopathy in Children and Young Adults. *Neuro-radiology/Head and neck imaging. American Journal of Roentgenology*. 2012;199: 1105-1113.
10. D. Agrawal, P. Bansal, S.Sharma, S.Chawala, V.Bharat, S.Sharma. Evaluation of etiology of lymphadenopathy in different age groups using Fine Needle Aspiration Cytology: A Retospective study. *The Internet Journal of Pathology*.2009; 2:10-15.
11. Mohammed Ali Motiwala, Deepak Dalmia, Sanjaya Kumar Behara. Cervical lymphadenopathy: a clinicopathological study. *Int J Otorhinolaryngol Head Neck Surg*. 2017 ;3(2):210-215.
12. Y. Toriyabe, T. Nishimura. Feb Differentiation between benign and meta-static cervical lymph nodes with US; *Clinical Radiology* 1997; 52:927-932.
13. Q.Wang, S.Takashima, F.Takayama et al. Detection of occult metastatic lymphnodes in the neck with grey scale and power Doppler. *Acta Radiology*. 2001; 42 :3 312-319.
14. Ahuja. A.T, Ying.M, Ho.S.Y, Antonio.G, Lee.Y.P, King.A.D, Wong.K.T.Ultrasound of malignant cervical lymph nodes. *Cancer Imaging*. 2008; 8: 48-56.
15. Arjun Vikram Kaji, Tamara Mohuchy, Joel D. Swartz. Imaging of cervical lymphadenopathy. *Seminars in ultrasound, CT and MRI*. 1997;18:220-249.
16. Takeuchi Y, Suzuki H, Different diagnosis of cervical lymph nodes in head and neck cancer by ultrasonography. *Auris Nasus Larynx*. 1999 ; 26(3): 33-6.