Original Article

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Ultrasonography of Cervical Lymph Nodes

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Abstract

Background: Ultrasonography is a useful imaging tool in the evaluation of cervical lymph nodes. Gray-scale ultrasonography and color and power Doppler ultrasonography are commonly used in current practice. **Aim:** To determine the efficacy of ultrasound in differentiating between benign and metastatic group of cervical lymph nodes. **Subjects and Methods:** In this study, 160 patients age between 15 and 60 years with cervical lymphadenopathy referred for ultrasonography of neck to the Department of Radio diagnosis, P D U Medical College, over a period of 1 Year from December 2017 - December 2018 are included in this study. All scans carried out on high frequency linear transducer on Philips IU 22 ultrasound machine. **Results:** Lymph node with oval shape ([S/L] < 0.5) echogenic hilum, homogenous echotexture, and hilar vascularity were considered as significant parameters in detecting non-neoplastic (reactive) lymph nodes, which showed matting with soft tissue edema. Nodes which were round shape (S/L ≥ 0.5), absent hilum, heterogeneous echotexture, hilar, capsular vessels, and mixed vascularity were considered as significant parameters in detecting neoplastic (malignant) lymph nodes. **Conclusion:** The sonographic appearances of normal nodes differ from those of abnormal ones. Sonographic features that help to identify abnormal nodes include shape (round), absent hilum, intranodal necrosis, reticulation, calcification, matting, soft-tissue edema, and peripheral vascularity.

Keywords: Cervical lymph nodes, Malignant, Tubercular, Reactive, FNAC.

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Introduction

Metastatic cervical lymph nodes are common in patients with head and neck and non–head and neck cancers. In patients with squamous cell carcinoma in the head and neck, the presence of a metastatic node reduces the 5-year survival rate to 50%, and the presence of another metastatic node on the contralateral side further reduces the 5-year survival rate to 25%. Therefore, evaluation of cervical lymph nodes is important in patients with cancers because it aids in the assessment of patient prognosis and helps in planning treatment. Cervical lymph nodes are also common sites of involvement of lymphoma; tuberculous lymphadenitis; and other benign lymphadenitis such as Kikuchi's disease, Kimura's disease, and Rosai-Dorfman disease.

Ultrasonography is a useful imaging tool in the assessment of cervical lymph nodes. Gray-scale ultrasonography is widely used in the evaluation of the number, size, site, shape, borders, matting, adjacent soft-tissue edema, and internal architectures of cervical lymph nodes. Although both color and power Doppler ultrasonography are routine. With the use of spectral Doppler sonography, the vascular resistance of lymph nodes can also be measured. This article is to briefly reiterate and illustrate the sonographic features of normal and abnormal cervical lymph nodes.

Aims & Objectives

The aims and objectives of this study were to study and differentiate between neoplastic (malignant) and non-neoplastic (reactive and tubercular) cervical lymph nodes by high-resolution ultrasonography.

To establish correlation between ultrasound and fine needle aspiration cytology (FNAC) in cervical lymphadenopathy.

Subjects and Methods

In this study, 160 patients age between 15 and 60 years with cervical lymphadenopathy referred for ultrasonography of neck to the Department of Radio diagnosis, P D U Medical College, over a period of 1 Year from December 2017 - December 2018 are included in this study. All scans carried out on high frequency linear transducer on Philips IU 22 ultrasound machine.

Inclusion Criteria

1. All patients coming for ultrasound neck.
2. Patients more than 15 years of age of either sex.

Exclusion Criteria

1. Moribund patients.
2. No fine needle aspiration cytology (FNAC) available.
3. Patient with no evidence of cervical lymphadenopathy on ultrasound.

A written consent will be obtained either from patient or his/her relative for FNAC.
Findings of ultrasound will be correlated with FNAC findings.

Statistics

Table 1: Age Distribution

Age in years	No. of cases
15-20	34
21-30	22
31-40	26
41-50	30
51-60	14
61-70	18
>70	16

Table 2: Diagnosis of cervical lymphadenopathy on USG

Diagnosis on Ultrasound	No. of Patients
Reactive	48
Tubercular	42
Malignant	70
Total	160

Table 3: Diagnosis of cervical lymphadenopathy on FNAC

Diagnosis on Ultrasound	No. of Patients
Reactive	60
Tubercular	42
Malignant	58
Total	160

Table 4: Comparison of USG diagnosis with FNAC diagnosis

Ultrasound Diagnosis	FNAC Diagnosis			
	Reactive	Tubercular	Malignant	Total
Reactive	34	6	8	48
Tubercular	16	16	10	42
Malignant	10	20	40	70
Total	60	42	58	160

Results

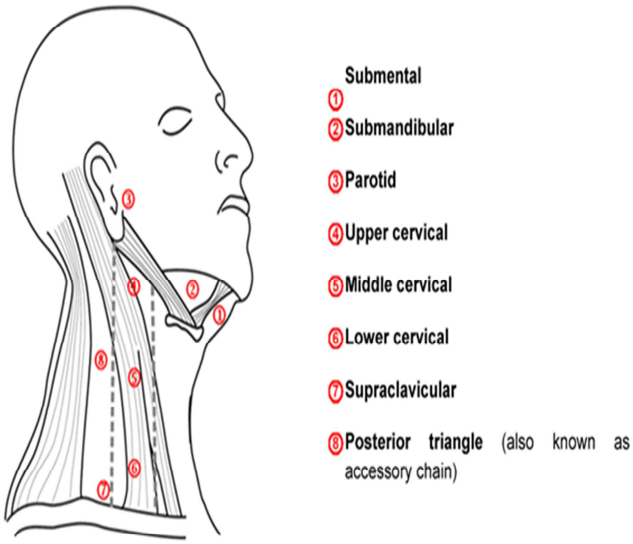

Figure 1: Levels of neck nodes

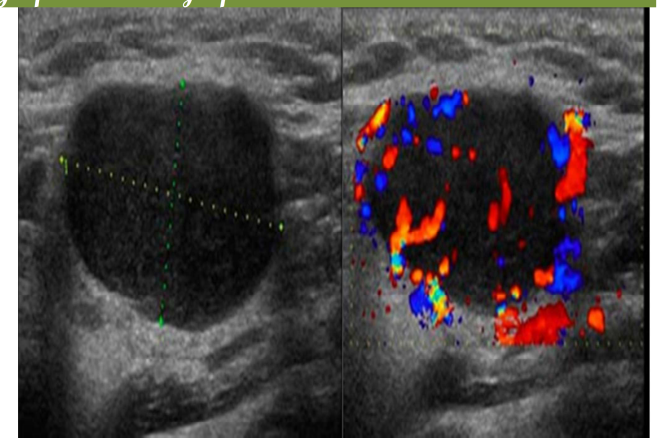

Figure 2: Ultrasound showing enlarged, hypoechoic, loss of fatty hilum lymph node showing diffuse predominantly peripheral vascularity consistent with metastatic node

In our study most common no. of cases seen in age group (15-20) as shown in [Table 1], out of 90 non-neoplastic nodes (reactive and tubercular), only 80 nodes were identified as non-neoplastic (reactive and tubercular) on ultrasound before FNAC. Out of 70 possible neoplastic (malignant nodes) detected on ultrasound, only 58 lymph nodes turned out to be neoplastic on FNAC. Lymph node with oval shape ([S/L] < 0.5) echogenic hilum, homogenous echotexture, and hilar vascularity were considered as significant parameters in detecting non-neoplastic (reactive) lymph nodes, which showed matting with soft tissue edema. Nodes which were round shape (S/L ≥ 0.5), absent hilum, heterogeneous echotexture, hilar, capsular vessels, and mixed vascularity were considered as significant parameters in detecting neoplastic (malignant) lymph nodes. Correlation of sonographic findings with FNAC findings was performed. Sensitivity and specificity of ultrasound in differentiating neoplastic from non-neoplastic cervical lymphadenopathy was found to be 89% and 76%, respectively. Our study had a high sensitivity of 91%, specificity of 76%, positive predictive value of 91%, and also a negative predictive value of 76% in differentiating neoplastic from non-neoplastic lymphadenopathy. Most of benign, reactive, tubercular and malignant lymph nodes showing lymph node perfusion, which is not significant and nonspecific criteria.
On USG two patients oval lymph node with maintained Hilum and hilar vascularity suggestive of reactive lymph node but on FNAC it was proved to be malignant.

Discussion

➢ **Normal and Reactive Lymph Nodes**

In ultrasound examinations, cervical lymph nodes are usually classified into eight regions [Figure 1].
Normal and reactive lymph nodes are usually found in submandibular, parotid, upper cervical, and posterior triangle regions. On gray-scale Ultrasonography, normal and reactive nodes tend to be hypoechoic compared with adjacent muscles and oval (short axis–to–long axis ratio [S/L] < 0.5) except for submandibular and parotid nodes,

which are usually round (S/L ≥ 0.5), and to have an echogenic hilus. The upper limit in minimal axial diameter of normal and reactive nodes is 9 mm for subdigastric and submandibular nodes and 8 mm for other cervical nodes.

On color Doppler, power Doppler, normal cervical nodes show hilar vascularity or appear avascular, and reactive nodes predominantly show hilar vascularity. On spectral Doppler sonography, normal and reactive nodes usually show low vascular resistance (resistive index [RI] and pulsatility index [PI]). Inflammation causes vasodilatation, which increases blood flow velocity in reactive lymph nodes. It may explain the low vascular resistance in reactive lymph nodes given that high blood flow velocity is always associated with a lower vascular resistance.

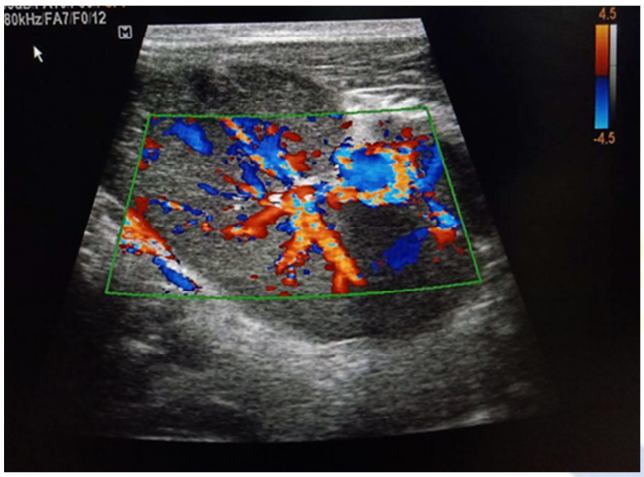

Figure 3: Colour Doppler ultrasound showing enlarged hypoechoic lymph node with cartwheel pattern of vascularity consistent with lymphomatous lymph node

➢ Malignant Lymph Nodes

Malignant lymph nodes include metastatic and lymphomatous nodes. On grayscalesonography, metastatic nodes are usually hypoechoic, round, and without echogenic hilum. Coagulation necrosis, which appears as a demarcated echogenic focus, may be found in metastatic nodes. Eccentric cortical hypertrophy is a useful sign to indicate focal tumor infiltration. Lymph nodes with cystic necrosis are suggestive of malignancy.

A proven metastatic lymph node with illdefined borders may suggest extracapsular spread and patients may have a poor prognosis. Metastatic nodes from papillary carcinoma of thc thyroid may bc hypcrcchoic compared with adjaccnt muscles and have punctate calcifications. In Hodgkin's lymphoma and non-Hodgkin's lymphoma, lymph nodes tend to be round, hypoechoic, and without echogenic hilus and tend to show intranodal reticulation.

On color Doppler, power Doppler, metastatic and lymphomatous nodes usually show peripheral or mixed vascularity. On spectral Doppler sonography, malignant lymph nodes tend to have high RI and PI values. In metastatic nodes, blood vessels within the nodes are compressed by tumor cells, which grow and spread and replace a large portion of the lymph node, resulting in an increase in vascular resistance.

Gray-scale sonography has a sensitivity of 95% and a specificity of 83% in differentiating metastatic and reactive nodes. Color or power Doppler sonography is essential and useful to patients when gray-scale sonography is equivocal.

➢ Tuberculous Lymph Nodes

On gray-scale sonography, tuberculous nodes tend to be hypoechoic, round, and without echogenic hilus and tend to show intranodal cystic necrosis, nodal matting, and adjacent soft-tissue edema. On color Doppler, power Doppler, the vascular distribution of tuberculous nodes is varied and simulates benign and malignant nodes. However, displacement of hilar vascularity is common in tuberculous nodes and is due to the high incidence of intranodal cystic necrosis, which displaces the vessels, in tuberculous nodes.

Abbrevations

Fine needle aspiration cytology (FNAC)
Short axis–to–long axis ratio [S/L]
Resistive index [RI]
Pulsatility index [PI]

Conclusion

We evaluated 160 patients with cervical lymphadenopathy using ultrasonography with FNAC correlation.

High resolution ultrasonography and color Doppler examination proved as a valuable primary investigation to identify lymph nodes and helps to differentiate neoplastic (malignant) from non-neoplastic (reactive and tubercular) lymph nodes.Ultrasound evaluation is very sensitive in differentiating between cystic/necrotic foci and solid swellings.Ultrasound helps in identifying abnormal nodes and useful for guided FNAC. Finally, all ultrasound diagnosis must be correlated with FNAC study not only to determine whether the nodes are malignant, reactive, tubercular, nodes but also to determine the histology of the neoplasm.

Evaluation Criteria that Help in Differentiating Non-neoplastic from Neoplastic Cervical Lymph Nodes

1. Gray scale findings of size, shape, long axis/short axis ratio, nodal echogenic hilum, lymph node echogenicity, matting, and nodal necrosis.
2. Color Doppler findings of focal absence of perfusion, capsular vessels, hilar vascularity and mixed vascularity.

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