ORIGINAL RESEARCH PAPER

Radio-Diagnosis

STUDY OF MESENTERIC LYMPH NODE EVALUATION- ULTRASOUND, SURGICAL & PATHOLOGICAL CORRELATION

KEY WORDS:

Dr. Vimal Dugad Resident, Department of Radiology, MGM medical college, Aurangabad

Dr R J Totla MS, MCH, Paed. Surgeon, Asso. Prof MGM Medical college, Aurangabad, TotlaHosp, Aurangabad.

Dr P S Mishrikotkar MD, Rad. Prof of Radiology MGM medical College, Aurangabad & Shanti Imaging Centre, Aurangabad

Dr. Sayali Umale Resident, Department of Radiology, MGM medical college, Aurangabad

Dr. Srushti Bajaj Resident, Department of Radiology, MGM medical college, Aurangabad

Dr. Shreya Sashi Resident, Department of Radiology, MGM medical college, Aurangabad

ABSTRACT

Background: Enlarged mesenteric lymph nodes (MLN) are frequently seen in children with abdominal pain. Mesenteric lymphadenitis is a common clinical finding in the pediatric population. Mesenteric lymphadenitis in childhood is known to have varied clinical presentations & that include fever and abdominal pain, inflammations, infections, malignancy, lymphoma etc. Physical examination has limited role. Imaging studies like ultrasound help in making the diagnosis. Because abdominal ultrasonography (US) does not expose the child to radiation, it is often the primary imaging choice in clinical practice. Color Doppler flow imaging (CDFI) is a non-invasive technique to investigate the cause of abdominal pain in pediatric patients .When in doubt needs surgico-pathological correlation .

INTRODUCTION

Conventional ultrasound (US) is the recommended imaging method for lymph node (LN) diseases with the advantages of high-resolution, real-time evaluation and relative low costs, also helps in the guidance for LN biopsy. Recent advances in US technology, such as contrast enhanced ultrasound (CEUS), contrast enhanced endoscopic ultrasound (CE-EUS), and real time elastography show potential to improve the accuracy of US for the differential diagnosis of benign and malignant lymph nodes. In addition, CEUS and CE-EUS have been also used for the guidance of fine needle aspiration and assessment of treatment response. Complementary to size criteria, CEUS could also be used to evaluate response of tumor angiogenesis to anti-angiogenic therapies. In this paper we review current literature regarding evaluation of lymphadenopathy by new and innovative US techniques

OBJECTIVE

To evaluate the prevalence of enlarged MLN (short axis ≥5 mm) as detected by abdominal Ultrasound, wherever needed CT, surgical correlation & their histopathological confirmation in children with a low likelihood for mesenteric lymphadenopathy

MATERIAL AND METHODS

During a 23-month period from Jan 2019 to Dec 2020 at MGM medical college hospital & Totla hospital were identified. All patients undergone ultrasound examination. Wherever needed, contrast enhanced abdominal CT examinations performed for evaluation of mesenteric adenitis & those who needed surgery were compared with Ultrasound diagnosis. Enlarged mesenteric nodes measured in short-axis diameter and noted the quadrant location. The nodes were characterized on ultrasound & color doppler appearance being acutely inflamed, chronic adenitis, tuberculous, malignant etc & followed up on ultrasound, where needed surgical excision or ultrasound guided biopsy for confirmation. Mesenteric lymphadenitis is a common clinical finding in the pediatric population. Mesenteric lymphadenitis in childhood is known to have varied clinical presentations that can include fever and abdominal pain. However, physical examination alone is often limited in the young child and requires imaging studies to make the diagnosis. Because abdominal ultrasonography (US) does not expose the child to radiation, it is often the primary imaging choice in clinical practice [1]. Color Doppler flow imaging (CDFI) is a non-invasive technique to investigate the cause of abdominal pain in pediatric patients [2]. All lymph nodes in the study group and the control group underwent grayscale ultrasound (US), color Doppler flow imaging (CDFI), and superb microvascular imaging (SMI) imaging. All the ultrasound examinations were conducted using a Philips Epiq 7G or Samsung Hera W 10 ultrasound, GE voluson E8 system with 12 to 18 MHz line array transducer. All patients in both groups first underwent US examination with transverse and longitudinal scans of the lower abdomen. Conventional ultrasonic characteristics including size, shape, and echogenicity were recorded for further analysis. The number of lymph nodes, their localizations, dimensions, shape, and architecture were recorded. Size referred to the longest (L) axis and shortest (S) axis, while shape referred to the ratio of L to S axis (L/S). CDFI (frame rate, 10–15 Hz) and SMI (frame rate, >50 Hz) were used to assess vascular imaging parameters. The velocity scope of SMI was adapted to <2.5 cm/sec. Gentle pressure was applied through the transducer to prevent collapse of the vessels. Grey scale ultrasound the reactive nodes are hypoechoic, round to oval in shape. They show echogenic hilum with central hilar artery on color flow. On low flows dichomatous branching pattern is seen. Short axis to long axis ratio < 0.5. The nodes show low vascular resistance , low RI & PI. in inflammation due to vasodilatation increased blood flow in reactive lymph node, leading to low vascular resistance. Malignant nodes are usually hypoechoic, round shows no echogenic hilus. Eccentric cortical hypertrophy is suggestive of focal tumour infiltration. Cystic necrosis also suggestive of malignancy. A proven metastatic lymph node with ill defined borders may suggest extracapsular spread and patients may have a poor prognosis. Metastatic nodes from papillary carcinoma of the thyroid may be hyperechoic compared with adjacent 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. The differentiation of malignant from benign lymph nodes by ultrasound (US), computed tomography (CT) and magnetic resonance imaging (MRI) traditionally relies mainly on size measurements and topographic distribution [1-3]. However, sensitivity and specificity in the differentiation of benign and

malignant lymph nodes are disappointing using only size parameters. Reasons for the low accuracy include that malignant lymph node infiltration occurs in up to 30% in lymph nodes of less than 5 mm which has been shown for lung, esophageal, gastric, pancreatic and rectal carcinoma[4-10]. The evaluation of shape and border often adds no or only little more information to exclude malignancy[11,12]. New imaging methods should be able to delineate the early and circumscribed malignant infiltration and to improve ultrasound guided biopsy. Colour Doppler ultrasound (CDI) adds value for the differentiation of malignant from normal or reactive nodes by displaying the macrovessel architecture. Normal LNs generally show hilar predominant normal vascularity. Inflammatory lymph nodes are typically more vascularised without changes of the predominant hilar vessel architecture. In contrast metastatic lymph nodes present peripheral or mixed vascularity and loss of hilar type of vascularisation[13].

OBSERVATION AND RESULT

Table 1: Distribution of demographic and clinical data

Sr No	Study Variable	mesenteric lymphadenitis group N=77	control group N=84	Total	P Value
1	Age	12.23 ± 2.99	12.46 ± 3.12	12.3 ± 3.05	0.63
2	Gender a. Male b. Female	 43 (27 %) 34 (21 %)	 52 (32 %) 32 (20 %)	 95 (59 %) 66 (41 %)	0.43
3	Symptoms a.Body Temperature (≥37.5°C) b. Nausea c.anorexia	. 62 (39 %) 61 (38 %) 47 (29 %)	 51 (31 %) 58 (36 %) 42 (26 %)	 113 (70 %) 119 (74 %) 89 (55 %)	0.0069 0.14 0.16

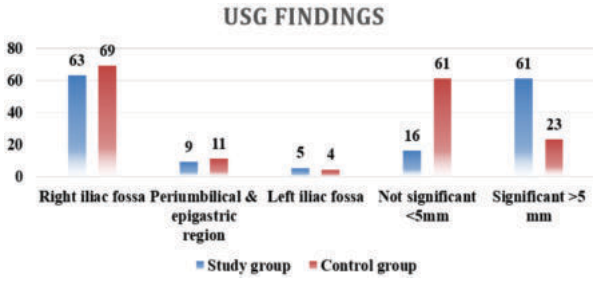
Two hundred & fifty-three children were identified with Enlarged mesenteric lymph nodes and amongst these 166 met entry criteria; out of those 54 patients were operated or biopsied for confirmation of diagnosis. Mean age was 12.3 years (range 1.1–17.3 years). Enlarged mesenteric nodes were found in 253 in whom the largest enlarged mesenteric lymph node most frequently in the right lower quadrant (RIF) (222 of 253, 88%). Most of the children had three or more enlarged mesenteric nodes, all were in the RLQ. The largest short-axis diameter measured was 10 mm. 48 patients were associated with adjacent cecal thickening, appendicular pathology. Four were having matted, necrotic nodes, suspecting tuberculous pathology. Two were having round hypoechoic nodes suspected to have lymphoma. These patients were operated or biopsied for confirmation of ultrasound findings. Histopathological correlation done to corelate ultrasound diagnosis in operated or biopsied patients to confirm ultrasound diagnosis.

The definition of pathologic lymphadenopathy varies. Some studies suggest use of a longest diameter greater than 10 mm as pathologic, whereas some use the term mesenteric lymphadenitis only when the short.axis diameter of the enlarged lymph node exceeds 10 mm. However, even small lymph nodes less than 5 mm in short.axis diameter may be symptomatic. [20] Usually, 5 or more nodes are present and are often clustered. Nodal tenderness in response to transducer pressure is typical. Nodes are more rounded and hypoechoic than normal. Abnormal nodes have a short-axis diameter of at least 5 mm, and the diameter can exceed 1 cm. The nodes are typically larger and more numerous with mesenteric lymphadenitis than with appendicitis (see the images below). [10]

From the total number of patients five patients were excluded, due to technical problems in blood sampling (n=2) and incomplete ultrasound (US) imaging (n=3). Table 1 shows the demographic and clinical data of the children included in the study. There was no significant difference in age or gender between the two groups (p>0.05). Body temperature of ≥37.5°C (70.4%), nausea (74.1%), and anorexia (55.6%) were the common clinical characteristics in children with mesenteric lymphadenitis.

Table 2: Distribution of USG findings

Sr No	USG Findings	mesenteric lymphadenitis group N=77	control group N=84	Total N=161	P Value
1	Site of nodes a.Right iliac fossa b.Periumbilical & pigastric region c.Left iliac fossa	63 (39 %) . 9 (6 %) 5 (3 %)	69 (43 %) 11 (6 %) 4 (3 %)	132 (82 %) 20 (12 %) 9 (6 %)	0.86
2	Size a. Not significant <5mm b. Significant >5 mm	. 16 (10 %) 61 (38 %)	 61 (38 %) 23 (14 %)	77 (48 %) 84 (52 %)	<0.00001



Graph 1: Distribution of USG findings

In the mesenteric lymphadenitis group, there were 76.6% (59/77) enlarged mesenteric lymph nodes. In the control group, there were 72.6% (61/84) enlarged mesenteric lymph nodes. All the enlarged mesenteric lymph nodes in children were located in the right lower quadrant, whereas two were found in the left lower quadrant in one healthy child. Details of the mesenteric lymph nodes, including their size and shape, are shown in Table 2. The size of the mesenteric lymph nodes was greater in children with mesenteric lymphadenitis compared with the healthy control group. Both the greatest diameter and the least diameter of the mesenteric lymph nodes in children with mesenteric lymphadenitis was significantly greater than that of mesenteric lymph nodes in the normal healthy group (p<0.001). The mesenteric lymph nodes were mostly oval in shape in both groups (p=0.361).

Table 3: Distribution of blood flow findings

Sr No	Radiological modality	Number of cases N	Percentage %
1	Color Doppler flow imaging (CDFI) Blood flow identification G1 G2	 137 71 47	 85 % 44 % 29 %
2	Superb microvascular imaging (SMI) Blood flow identification G2 G3	 148 89 35	 92 % 55 % 22 %

There was a significant difference in the vascularity index between the two groups. Color Doppler flow imaging (CDFI) identified blood vessels in 85.2% (23/27) of the mesenteric lymph nodes in the mesenteric lymphadenitis group. Superb microvascular imaging (SMI) detected blood flow signals in

92.6% (25/27) of the mesenteric lymph nodes in the mesenteric lymphadenitis group (Table 3). In comparison, the majority of mesenteric lymph nodes in the control group showed no increase in vascularity using CDFI (83.3%) and SMI (80.0%) (Figure 1). CDFI showed that 74.0% of mesenteric lymph nodes were graded as G1 (44.4%) (Figure 2) and G2 (29.6%) in terms of the number of vessels visualized. SMI showed that 77.8% of mesenteric lymph nodes were graded as G2 (55.6%) and G3 (22.2%). These findings support that SMI was a superior imaging method for identifying both high-velocity and low-velocity blood flow.

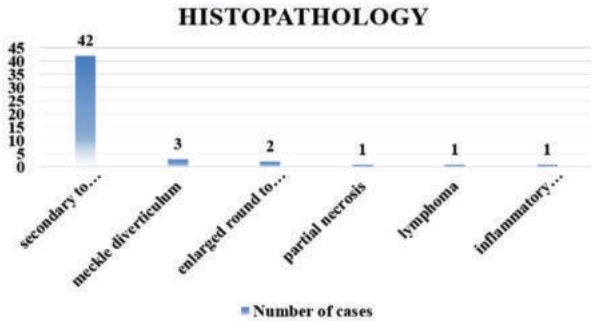
Out of 54 patient who were either operated or biopsied were confirmed on histopathology. 52 patients who had appendicular & tuberculous pathology on ultrasound/ CT 46 were turned to be secondary to appendicular inflammation. 3 were having associated meckle diverticulum. The two showed enlarged round to oblong shaped nodes with matting & one showed partial necrosis ,so were biopsied by transabdominal approach using 22 g trucut biopsy needle and were given as tuberculous turned out to be tuberculous etiology. Two patient in whom the nodes showed round hypoechoic appearance with edematous IC region, thought to inflammatory but biopsied, 1 turned out to be lymphoma one turned out to be inflammatory secondary to typhoid.

Table 4: Distribution of operated or biopsied cases on USG

Sr No	Associated Pathology	Number of cases N	Percentage %
1	adjacent cecal thickening, appendicular pathology	48	89 %
2	matted, necrotic nodes, suspecting tuberculous pathology	4	7 %
3	hypoechoic nodes suspected to have lymphoma	2	4 %
Total		54	100 %

Table 5: Distribution of operated or biopsied cases on histopathology

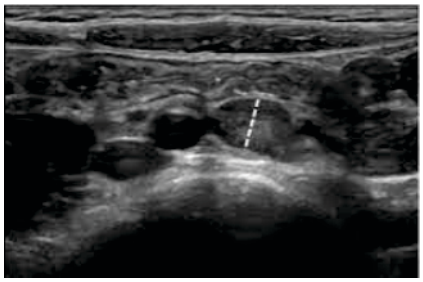
Sr No	Associated Pathology	Number of cases N	Percentage %
1	secondary to appendicular inflammation.	42	89 %
2	meckle diverticulum	3	7 %
3	enlarged round to oblong shaped nodes with matting	2	4 %
4	partial necrosis	1	2 %
5	lymphoma	1	2 %
6	inflammatory secondary to typhoid	1	2 %
Total		54	100 %



Graph 2: Distribution of operated or biopsied cases on histopathology

DISCUSSION

The inflammatory nodes are diagnosed by measuring transverse& long axis measurements with short axis measurement of more than 8 mm. The nodes showed preserved central hilum, showed increased vascularity. There was no e/o necrosis or matting. The tuberculous nodes showed round to oval appearance with matting & few showed necrosis. The rounded hypoechoic nodes thought to be lymphoid origin, two turned out to be lymphoma, one turned out to be typhoid in etiology.



Summary

Mesenteric nodes with a short-axis diameter of >5–10 mm is commonly found on abdominal Ultrasound or CT examination of children with a low likelihood for mesenteric lymphadenopathy and should be considered a non-specific finding. A short-axis diameter of 8 mm might better define the upper limit of normal mesenteric lymph node size in children. The differentiation of malignant from benign lymph nodes by ultrasound (US), computed tomography (CT) and magnetic resonance imaging (MRI) traditionally relies mainly on size measurements and topographic distribution[1-3]. However, sensitivity and specificity in the differentiation of benign and malignant lymph nodes are disappointing using only size parameters. Reasons for the low accuracy include that malignant lymph node infiltration occurs in up to 30% in lymph nodes of less than 5 mm which has been shown for lung, esophageal, gastric, pancreatic and rectal carcinoma[4-10]. The evaluation of shape and border often adds no or only little more information to exclude malignancy[11,12]. New imaging methods should be able to delineate the early and circumscribed malignant infiltration and to improve ultrasound guided biopsy. Colour Doppler ultrasound (CDI) adds value for the differentiation of malignant from normal or reactive nodes by displaying the macrovessel architecture. Normal LNs generally show hilar predominant normal vascularity. Inflammatory lymph nodes are typically more vascularised without changes of the predominant hilar vessel architecture. In contrast metastatic lymph nodes present peripheral or mixed vascularity and loss of hilar type of vascularisation[13]. The differentiation of malignant from benign lymph nodes by ultrasound (US), computed tomography (CT) and magnetic resonance imaging (MRI) traditionally relies mainly on size measurements and topographic distribution[1-3]. However, sensitivity and specificity in the differentiation of benign and malignant lymph nodes are disappointing using only size parameters. Reasons for the low accuracy include that malignant lymph node infiltration occurs in up to 30% in lymph nodes of less than 5 mm which has been shown for lung, esophageal, gastric, pancreatic and rectal carcinoma[4-10].The evaluation of shape and border often adds no or only little more information to exclude malignancy[11,12]. New imaging methods should be able to delineate the early and

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