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Original Research Article

Evaluation of mesenteric lymph nodes by ultrasonography and it's clinical correlation in pediatric patients

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Abstract

Background: Pain abdomen is common symptom in children, increasing use of abdominal ultrasound in the screening and follow-up of patients with pain abdomen, enlargement of the regional mesenteric lymph nodes have become a fairly common finding, particularly in children and young adults.
Aims: Evaluation of mesenteric lymph nodes by ultrasonography and its clinical correlation in pediatric patients.
Objectives: 1. To evaluate the ultra-sonographic spectrum of mesenteric lymph nodes and assess the various sonographic patterns involved. 2. To study the clinical correlation of mesenteric lymphadenitis with the symptoms of pediatric patients.
Materials and Methods: The study was conducted in Radio-diagnosis Department, S.N. Medical College, Agra. The symptomatic patients presenting to the department of Radio-diagnosis with clinical history of fever, abdominal pain, nausea & vomiting referred from department of Pediatrics, SNMC, Agra were included in the study. All lymph nodes undergone grayscale ultrasound (US) & color flow imaging.
Conclusion: Enlarged mesenteric lymph node is a common medical cause of abdominal pain in pediatric patients. It is a common self-limiting inflammatory process frequently caused by viral pathogen, affecting mesenteric lymph nodes in the abdomen. There is no any mortality and complication are noted with mesenteric adenitis.

Keywords: Mesenteric lymphadenopathy, Ultrasonography, Abdominal Pain, SWUF-symptomatic with USG finding, SW/OUF-symptomatic without USG findings.

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1. Introduction

Pain abdomen is common symptom in children and young adults. So, there is increasing use of abdominal ultrasound in the screening and follow-up of these patients. On USG, subcentimetric and enlarged mesenteric lymph nodes are common finding in pediatric age group.[1]

Therefore, lymphadenopathy may often be an incidental finding in patients being examined for various reasons, we as a radiologist must decide, whether it is a normal finding or a sign of a patient's condition requiring further study correlating with whether the patient is asymptomatic or developing some associated clinical symptoms.[2]

In pediatric age group mesenteric lymphadenitis is various clinical presentation likely fever, abdomen pain, vomiting, loss of weight gain. In pediatric age group physical examination is limited role so imaging study required USG abdomen is primary choice than CT abdomen because of radiation.

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Table 1: Lymph node characteristics

Criteria[14]	Normallymphnode	Inflammatory	Metastatic	Lymphoma
1. Size	<6-25mm[1]	>5-25mm[2]	>5-25mm[2]	>5-25mm[2]
2. L/Sratio	>2	>2	<1.5	<1.5
3. Shape	oval	Round-oval	Round-oval	Round-oval
4. Border	Regular	Regular-sharp	Regular- Sharp (capsule infiltration with unsharpness)	Regular
5. Architecture	Preserved architecture, homogeneous, variably thin cortex, hyper-echoic hilum	Preserved architecture, homogeneous, variably thickened cortex	Destroyed architecture (capsule), Eccentric (asymmetric) hypoechoic cortical infiltration and thickening, in homogeneity of the internal structure, loss of echogenic hilum, surrounding edema	Normal but asymmetric, reticular appearance. "Supersized" focal or global hypo-echoic cortical thickening, usually without echogenic hilum, peri-nodular edema, pseudo-cystic appearance.
6. Echogenicity		Echopoor[2]	Echopoor[2]	Echopoor[2] (pronounced)
7. Echo texture		Heterogeneous	Variable	Homogenous
8. Focal Infiltration	No	No, except granulomatous diseases	Echo rich, echo poor	Not typically
9. Vessel Density	Normal	Relatively low (no Neo angiogenesis)	High[2]	High[2]
10. Vascular Pattern	Normal hilar vessel architecture with or without tree like branching	Preserved normal vessel architecture, hilar vascularity with or without tree like branching	Peripheral or mixed vascularity, aberrant and infiltrative, inhomogeneous vessel density, immature and split arteries, torturous course of vessels, avascular are as	Often but not always preserved mixed hilar and Peripherally vessel architecture, high vascularity
11. RI	<0.75	<0.8	>0.8	>0.75
12. PI	<1.6	<1.6	>1.6	Intermediate. Variable at different site
13. Elastography	Normal architecture	Normal architecture	Focal infiltration, relatively harder	Normal but asymmetric architecture

Disease dependent[2] Localization dependent[1]

Size criteria of mesenteric lymph node enlargement in pediatric patients on USG>5mm (SAD), >10mm(LAD)**.** Imaging criteria for diagnosis of necrosis in a lymph node on USG is focal area-hypoechoic, hyperechoic (eg. Not in contiguity with the hilum), isoechoic (eg. Distinguished from normal issue by mobility of that area when compressed with probe).[3] On USG characteristics of mesenteric lymph nodes for comparison of normal, inflammatory, metastasis and lymphoma based on criteria given in this **Table 1**.

2. Materials and Methods

The study was conducted in Radio-diagnosis Department, S.N. Medical College, Agra. The symptomatic patients presenting to the department of Radio-diagnosis with clinical history of fever, abdominal pain, nausea & vomiting referred from department of Pediatrics, SNMC, Agra were included in the study. All lymph nodes undergone grayscale ultrasound (US), color Doppler flow imaging.

The cross sectional study was conducted from November 2022 to May 2024 with 264 sample size.

2.1. Inclusion criteria

In this study patients of Age group >1 year to ≤18 years, Pediatric patients with symptoms of abdomen pain, fever, loss of appetite, loss of weight and failure to thrive and patients with parents' consent were included.

2.2. Exclusion criteria

In this study Patients with history of abdominal trauma, very sick patients, Patients not giving consent and any prior abdominal surgery were excluded.

On Ultrasonography abdomen examination mesenteric lymph nodes seen as mentioned in **Figure 1-3.**

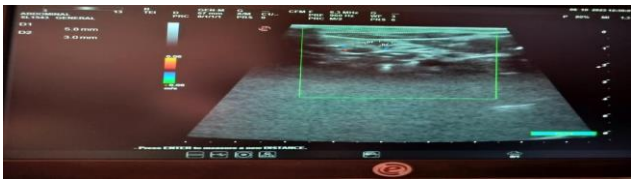

Figure 1: Normal mesenterric lymph node with maintained fatty hilum.

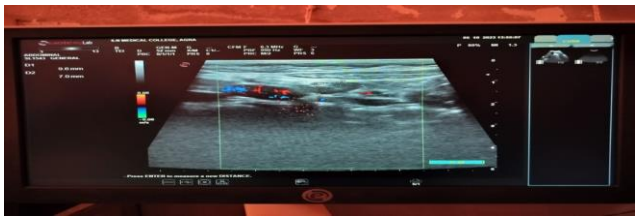

Figure 2: Mesenteric lymph node>5mm (sad) with maintained fatty hilum.

Figure 3: Enlarged conglomerated mesenteric lymph nodes with loss of fatty hilum.

3. Results

The study included 264 paediatric patient were referred to the S.N. Medical College, Agra in Department of Radiodiagnosis for assessment from November 2022 to May 2024. All patients enrolled in the study were subjected to Abdominal Ultrasonography including Colour Doppler study as per the protocol.

The table shows that out of 264 participants, 150 (56.82%) boys and 114 (43.18%) girls. The chi-square value (X^2) is 10.5332 and the p-value is 0.0005135, indicating statistically significant association sex distribution.(**Table 2**)

The table shows that out of 264 participants, Fever (41.67%), Abdominal Pain (67.42%), Anorexia and weight loss (15.9%) and Diarrhea (20.07%) etc. (**Table 3**)

The table shows that out of 264 participants, 56.82% Boys in which visualized MLN (60.0%) & non-visualised (40.0%) and 43.18% girls in which visualized MLN (71.92%) & non-visualised (28.07%). Overall visualised MLN (65.15%) and non-visualised MLN (34.85%). The chi-square value (X^2) is 4.1592 and the p-value is 0.041409, indicating statistically significant distribution.(**Table 4**)

The table shows that out of 172 visualised MLN, 90 Boys and 82 Girls distribution on location on abdomen USG. The chi-square value (X^2) is 18.365 and the p-value is 0.008710557, indicating statistically significant distribution.(**Table 5**)

The table shows that out of 172 visualised MLN according to size and age distribution. >5mm SAD show 146 out of 172 in which 56.84% boys and 43.15% girls. The chi-square value (X^2) is 18.365 and the p-value is 0.008, indicating statistically significant distribution.(**Table 6**)

The table shows that out of 146 enlarged MLN. SWUF - 68 and SW/OUF – 78. Show according age and size distribution. The chi-square value (X^2) is 43.26 and the p-value is 0.0003, indicating statistically significant distribution.(**Table 7**)

The table shows 60 case with definite diagnosis with symptoms and significant USG findings in which infective (51.67%), Inflammatory (31.67%), Neoplastic (01.67%), lymphoma (01.67%) and Other Etiologies (13.33%).(**Table 8**)

Table 2: Demographic profile of selected study group

Age group (Years)	Gender (N=264)			
	Boys (n=150)	% (56.82)	Girls (n=114)	% (43.18)
1-4years	20	13.33%	9	07.89%
5-12years	80	53.33%	83	72.81%
13-18years	50	33.33%	22	19.30%

The chi-square statistic is 10.5332. The p-value is .0005135 .The result is significant at p <. 05.

Table 3: Distribution of patients according to clinical symptoms.

S.No.	Symptoms		Cases (N=264)	Percentage (%)
1	Fever		110	41.67%
2	Abdominal pain		178	67.42%
	Diffuse		90	50.56%
	Localized		88	49.44%
		Right hypochondrium	4	4.5%
		Epigastrium	10	11.36%
		Left hypochondrium	8	9.0%
		Right lumbar	8	9.0%
		Para-umbilical	38	43.18%

		Left lumbar	2	2.3%
		Right iliac fossa	4	4.5%
		Infra-umbilical	10	11.36%
		Left iliac fossa	4	4.5%
3	Anorexia and weight loss		42	15.9%
4	Diarrhea		53	20.07%
5	Malaise and lethargy		17	6.43%
6	Constipation		10	3.78%
7	Burning micturition		26	9.8%
8	Cough and cold(URTI)		11	4.16%
9	Vomiting		60	22.72%
10	SAIO		6	2.27%
11	Fever with headache		5	1.89%
12	Polyphagia + Polydipsia + Polyuria		1	0.37%

Table 4: Division of study group with reference to mesenteric lymph node in abdominal usg.

Types of MLN	**Gender(N=264)**			
	Boys (%)	**Girls (%)**	**Total**	**%**
Visualised MLN	90 (60.00%)	82 (71.92%)	172	65.15%
Non-Visualised MLN	60 (40.00%)	32 (28.07%)	92	34.85%

The chi-square statistic is 4.1592.The p-value is.041409.Significant at p< .05.

Table 5: Visualized MLN based on location site in ultrasonography of abdomen

Site	**Cases (N=172)**	
	Boys	**Girls**
Right iliac fossa	17	37
Periumbilical	19	15
Right iliac fossa & Periumbilical	40	15
Right iliac fossa + Periumbilical + Epigastric + Left iliac fossa	8	7
Right iliac fossa + Periumbilical + Left iliac fossa	6	8
Total	90	82

The chi-square statistic is18.365.The p-value is .008710557.The result is significant at p <. 05.

Table 6: Distribution of visualized mesenteric lymph node according to size and age group (n=172)

Age Group (In Years)	**Total No. Of Patient N=172**	**Group A (>10MM)**	**Group B (8-10MM)**	**Group C (5-8MM)**	**Group D (<5MM)**	
1-4 years	16	0	3	13	0	
5-12years	106	20	21	58	7	
13-18years	50	6	5	21	18	
Patients with significant mesenteric lymph nodes						
>5mm SAD	**Male**		**Female**		**Total**	**%**
	83(56. 84%)		63 (43.15%)		146	84%

The chi-square statistics 18.365.The p-value is 0.008. The result is significant at p <. 05.

Table 7: Correlation of significantly enlarged lymph nodes on the basis of symptoms with/without significant associated USG findings and size.

Age Group (Y)	**Group**	**Group A (>10MM)**	**Group B (8-10MM)**	**Group C (5-8MM)**
1-4	SWUF	0	2	7
	SW/OUF	0	1	6
5-12	SWUF	20	11	22
	SW/OUF	0	10	36
13-18	SWUF	6	0	8
	SW/OUF	0	5	12

SWUF N=68 and SW/OUF N=78

The chi-square statistics 43.26. The p-value is 0.0003. The result is significant at p <. 05.

SWUF-symptomatic with USG finding, **SW/OUF**-symptomatic without USG findings.

Table 8: Cases with definite diagnosis with symptoms and significant usg findings (n=60)

S.No.	Etiology	Cases	%
1	Infection	31	51.67%
2	Inflammation	19	31.67%
3	Neoplastic	01	01.67%
4	Lymphoma	01	01.67%
5	Other Etiologies	08	13.33%
	A)Anemia	03	37.50%
	B)Renal calculus	02	25.00%
	C)Sub-acute intestinal obstruction	01	12.50%
	D)PCOD	01	12.50%
	E) Slow flow venous malformation	01	12.50%

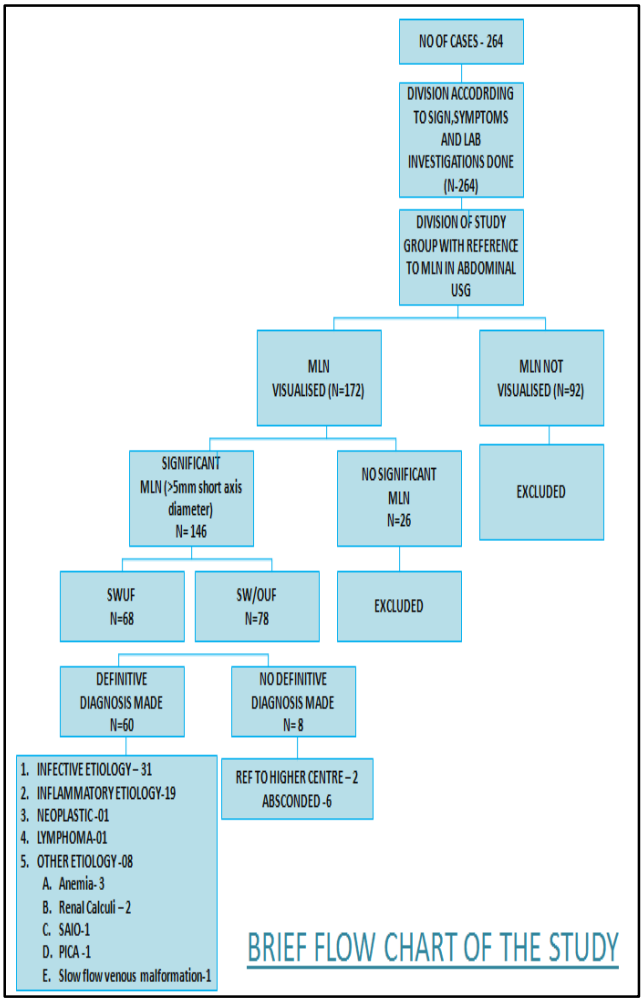

Chart 1: Brief flow chart of the study

4. Discussion

A total of 264 subjects were enrolled, including 150 male subjects and 114 female subjects. Majority of children presented with clinical symptoms in our study group, were male 150 (56.82%) as compared to female 114 (43.18%). Majority of the patient were from 5-12Yr (61. 74%) of age group followed by 13-18year (27.27%) of age group. In all the age groups the prevalence of boys were greater than that of girls. In a study done by than Lili He, Yinghua Sun & Guoying Huang stated that in all groups included in their study, male subjects had a higher prevalence than female subjects in each age range after the age of 1 year.[3-8]

In our study, in the total number of cases involved, the most common symptom noted is of abdominal pain 62.21% of total number of cases followed by fever and vomiting. The most common site observed for abdominal pain is diffuse (50.56%), in localized pain 43.18% (right iliac fossa + paraumblical) region and most common sign observed is abdomen tenderness followed by pallor and decrease in weight gain. Essential lab investigation were also done wherever clinically needed in which routine hemogram (CBC) was done in 89.77% cases. In a study done by Vaisakh Sambasivan Balakrishnan, Shrikiran Aroor et al also observed Vomiting, fever and constipation were the main symptoms other than abdominal pain and on physical examination, the most common finding was pallor.[9-11]

WANG WG et al concluded that his distribution of enlarged mesenteric lymph nodes was detected in the right lower quadrant (RLQ) in 46.3%, in the para-aortic areas in 19.2% and in the left lower quadrant (LLQ) in 13.6% of the children,[12-15] which is similar to our study in which most common site for mesenteric lymph node noted were RIF+ periumblical region (47.68%).

5. Conclusion

In this study we can concluded that enlarged mesenteric lymph node was a common medical cause of abdominal pain in pediatric patients. It was a common self-limiting inflammatory process frequently caused by viral pathogen, affecting mesenteric lymph nodes in the abdomen. There was no any mortality and complication noted with mesenteric adenitis. CT abdomen is diagnosis of choice for acute appendicitis; however ultrasonography help in differentiating to other cause as base of bowel thickening and right iliac fossa lymphadenopathy and avoid unnecessary surgery. The case is improved by follow up. Mesenteric adenitis in Indian children is a clinical syndrome, frequently found in a relatively young age group, which improves spontaneously unless specific anti-microbial agents are indicated by microbiological tests, such as tuberculosis or typhoid fever. This is a self-limiting and benign condition. That does not require surgical/ medical intervention but follow up is

necessary in these patients. By knowing the chronicity and treatment response to FAP, good approach can be obtained to these cases early and will follow up regularly to modify their painful early school life, mental state and the consequences. The present study can assure the parents about the benign nature of the disease.[2]

6. Source of Funding

None.

7. Conflict of Interest

None.

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