

Sonographic Detection of Enlarged Mesenteric Lymph Nodes in Children and its Significance

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Abstract:- Mesentery lymphadenitis is an inflammation of the lymph nodes in the membrane (mesentery) that connects the colon or bowel to the abdominal wall. It is often mimicked by appendicitis, but is rarely dangerous. 150 consecutive paediatric patients were recommended for abdominal sonography for a variety of reasons. Any lymph node greater than 5 mm found was recorded. The age of the patient, the diagnosis, the presence of clusters, the presence of enlarged abdominal lymph nodes, their position, size, and quantity were all noted. Acute appendicitis, intussusception, and ovarian torsion are the three main clinical concerns. Mesenteric adenitis is an inflammation of the mesenteric lymph nodes caused by Yersinia, Staphylococcus, Salmonella, other mycobacterium, and viruses. It is believed that the clinical condition of mesenteric adenitis mimics an "acute abdomen". A total of 260 patients were investigated in a study, with the most common complaints being abdominal discomfort, excessive weeping, fever, dysuria, vomiting, and others. 76 patients had swollen lymph nodes, of whom 73 (35.6%) were from paediatric emergency and 3 (5.5%) were from opd. The prevalence of enlarged mesenteric lymph nodes in symptomatic children was significantly greater than in asymptomatic children. Children under the age of 10 are more likely to have larger MLNs, and those with abdominal pain as their main complaint are more likely to have swollen lymph nodes. Mesenteric lymphadenitis is the most frequent diagnosis, with right iliac fossa lymph nodes being enlarged in the majority of patients. This study found that swollen lymph nodes are more common in children who have a history of abdominal pain. Younger children are more likely to have swollen lymph nodes, and intussusception is more common in larger lymph nodes. Sonography can help establish a primary diagnosis and distinguish between medical and surgical crises.

Keywords: Lymph nodes, Inflammation, Abdomen, Swollen, Patients.

I. INTRODUCTION

Inflammation of the lymph nodes in the membrane (mesentery) that connects the colon or bowel to the abdominal wall results in mesentery lymphadenitis. Intestinal infection is typically the cause of mesenteric lymphadenitis. The signs and symptoms of appendicitis are frequently mimicked by mesenteric lymphadenitis, which

primarily affects children. However, mesenteric lymphadenitis is rarely dangerous, unlike appendicitis.

Children frequently have abdominal ache. Younger children have poor pain localization, and a suffering child's physical examination is frequently constrained. As a result, sonographic examination of the abdomen is frequently carried out on young kids to ascertain the cause of the discomfort and rule out any immediate surgical situations (1).

Acute appendicitis, intussusception, and ovarian torsion are the three main clinical concerns. The discovery of enlarged abdominal lymph nodes is particularly common with the routine use of high-frequency transducers, especially for the assessment of the right lower abdominal quadrant. The term "mesenteric lymphadenitis" is frequently used to describe an inflammatory process of the abdomen when swollen nodes are discovered without any other abnormality being noted.

The word is only used in the paediatric literature to refer to a particular inflammation of the mesenteric lymph nodes brought on by Yersinia, Staphylococcus, Salmonella, other mycobacterium, and viruses. (2–6). The phrase is typically used in the radiologic literature to denote lymph nodes that are larger than 5 mm in diameter (7–13). There is also disagreement in the radiologic literature concerning the importance of the presence of Enlarged abdominal lymph nodes in healthy children and in children with abdominal pain.

➤ Anatomy:

Any of the numerous peritoneal folds that support and connect the intestines are known as mesenterys. The peritoneum is a fibrous connective tissue covered by the visceral peritoneum serosal membrane.

The lower colon is supported by and connected to the dorsal abdominal wall by the mesocolon, a fold of the peritoneum whose interior is rich in lymphatics, lymph nodes, and nerves.

Falciform Ligament: This is a line on the anterior and upper surfaces of the liver that extends back from the notch on the anterior margin of the liver and is attached to the underside of the diaphragm, the sheath of the rectus muscle, and other anteroposterior folds of the parietal peritoneum; it serves as the liver's primary support in the abdominal cavity.

Lesser Omentum: The fold of the peritoneum that connects and supports the liver's hepatic vessels as well as the stomach and duodenum's portions. Its interior is rich in lymphatics, lymph nodes, and nerves.

The greater omentum is a huge fold of the peritoneum that joins the transverse colon to the stomach and supports it. The fold is large enough to completely enclose the intestines anteriorly, and its inside is filled with nerves, lymphatics, and lymph nodes as well as a plentiful supply of blood.

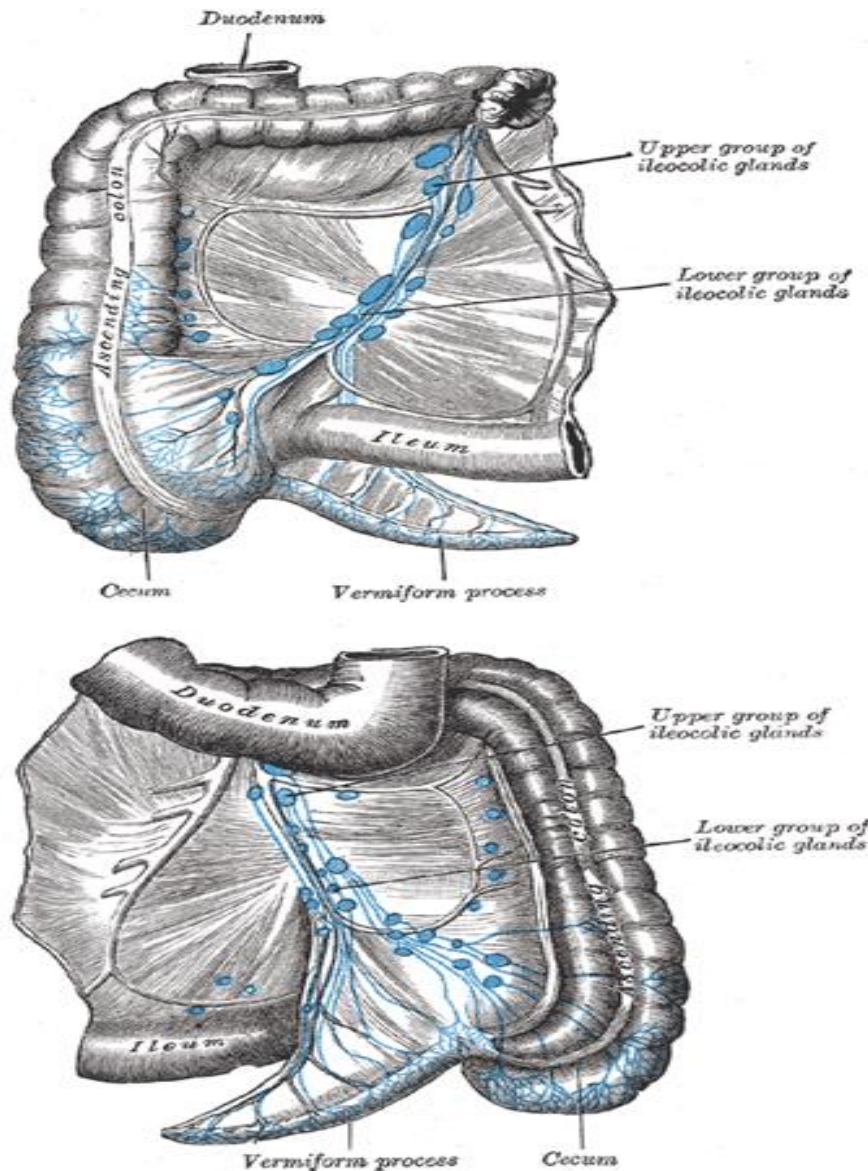


Fig 1 Courtesy: Greys Anatomy

➤ **Pathophysiology:**

It is believed that microbial agents enter the lymph nodes through the intestinal lymphatics. Then the organisms grow and, depending on how virulent the disease is that has invaded, they cause varied degrees of inflammation and, occasionally, suppuration.

The lymph nodes are grossly swollen and frequently soft. Edoema with or without exudates may be present in the adjoining mesentery. Evidence of inflammation is frequently visible when a contiguous primary site of infection is present (such as the appendix). (14) Under a microscope, the lymph nodes exhibit nonspecific

proliferation and necrosis with a large number of pus cells in cases of suppurative infection.

Lymph node inflammation is known as mesenteric lymphadenitis. The membrane that connects the intestine to the abdominal wall contains the lymph nodes that swell up.

These lymph nodes are a few of the many that aid the body's immune system. They capture and eliminate microscopic "invaders" like bacteria or viruses.

➤ **Mesenteric Lymphadenitis Causes:**

Infection is the most common cause. Mesenteric lymphadenitis can be brought on by localised (local) or

systemic (systemic) infections. (15)The illnesses could be brought on by:

- Viruses
- Bacteria
- Parasites

Gastroenteritis is one ailment that frequently results in mesenteric lymphadenitis. This could be brought on by viral illnesses like rotavirus or norovirus. Infections with bacteria like salmonella, staphylococcus, or streptococcus may potentially be the cause.

Yersinia enterocolitica. In children, it is the most typical cause of mesenteric lymphadenitis. In addition to other issues, this bacterium can cause gastroenteritis. It could resemble other ailments. Examples include acute appendicitis and Crohn's disease.

The following infections can also result in mesenteric lymphadenitis: HIV-related infections, either directly or indirectly

- ✓ Tuberculosis.
- ✓ Whipple illness. This bacterial illness affects the whole body.
- ✓ Ileitis terminale acute. This is an infection of the small intestine's end. A microorganism or Crohn's disease could be at blame.(16)

The following inflammatory diseases are frequently associated to mesenteric lymphadenitis:

- Appendicitis, an appendix inflammation.
- Bowel inflammation conditions include Crohn's disease and ulcerative colitis.
- Conditions affecting the connective tissues, like lupus, sclerosis, or rheumatoid arthritis.
- Diverticulitis, an inflammation of the large intestine lining.
- Pancreatitis, or pancreatic inflammation. (19)
- Less frequently, cancers such as lymphoma can cause inflamed mesenteric lymph nodes.
- Lung cancer; breast cancer
- Pancreatic cancer
- Gastrointestinal cancer

➤ *Mesenteric Lymphadenitis Signs and Symptoms:*

An upper respiratory tract infection may occur together with mesenteric lymphadenitis, prior to the onset of any additional symptoms. Symptoms like a sore throat could result from this.(20)

Tenderness or pain, typically in the lower right side or centre of the belly, is one of the signs of mesenteric lymphadenitis.

Lower right abdominal pain is a common sign of mesenteric lymphadenitis. Thus, it is frequently misdiagnosed as appendicitis.

You might also exhibit additional symptoms. Depending on what caused the irritation, yes. Some warning signs and symptoms are:

- Being unwell
- Appetite loss
- Tiredness or lack of energy
- Increased white blood cell count
- Vomiting, diarrhoea, or nausea

There are situations when mesenteric lymphadenitis goes unnoticed. Imaging studies for some other issue may reveal enlarged lymph nodes. (17) Blood tests could be used to identify an infection. Tests on the urine may help exclude a urinary tract infection. Other potential causes of symptoms can be ruled out with an abdominal ultrasound or CT scan. Mesenteric lymphadenitis has been associated to numerous illnesses.a few serious, a few not. (22)

Among the differential diagnoses are acute gastroenteritis:

- ✓ Diverticulitis Meckel
- ✓ Intussusception
- ✓ Purpura Henoch-Schönlein
- ✓ Pleurisy with lobular pneumonia.

➤ *Imaging In Mesenteric Lymphadinitis:*

• *Radiography:*

Abdominal radiograph results in the upright and supine positions are frequently normal. A regional ileus or signs of intestinal wall thickening in the right lower quadrant are examples of nonspecific findings.

Plain radiography results can occasionally support an alternate diagnosis but never provide a definitive diagnosis in mesenteric adenitis. Regardless of the plain radiography findings, cross-sectional imaging may be necessary.

• *Ultrasonography:*

In order to diagnose youngsters, an ultrasound of the right lower region with graduated compression has been the mainstay.(27)

5 or more nodes are typically present, and they are frequently grouped. It is typical for transducer pressure to cause nodal soreness. Nodes are less echoic and more rounded than usual. Abnormal nodes have a minimum short-axis diameter of 5 mm and a maximum diameter of 1 cm. Compared to appendicitis, mesenteric adenitis often has larger and more nodes [28].

Doppler imaging has reportedly shown hyperemia inside the node and the surrounding mesentery.

Intestinal hyper peristalsis, which is infrequently seen in appendicitis, nodular or circumferential thickening of the gut wall, thickening of the mesentery, fluid-filled loops, cecal involvement, and free fluid are other findings [29].A fluid-filled appendix may occasionally be observed, although its lumen is easily compressible.(26)

A non-specific sign for right lower quadrant inflammatory disease, observed in appendicitis, mesenteric adenitis, and other disorders, has been described as increased echogenicity of intra-abdominal fat. [30] Similar to increased echogenicity of the mesenteric adenitis, appendicitis, and other acute illnesses in children, increased echogenicity of the renal parenchyma is a temporary characteristic and does not always signify renal disease. [29]

Although the clinical context is helpful in reducing the differential diagnosis, the size, shape, distribution, and Doppler imaging properties of the lymph nodes in mesenteric adenitis and lymphoma overlap significantly. [31] In the absence of disease, mesenteric lymph nodes larger than the normal size threshold may be seen, however they are typically not painful.

➤ *Computed Tomography:*

A normal appendix is present with larger mesenteric lymph nodes that may or may not be accompanied by concomitant ileal or ileocecal wall thickening.

In comparison to appendicitis, mesenteric adenitis typically has larger, more numerous, and more evenly distributed lymph nodes. Despite gut lumen opacification and distention, ileal thickening is identified when the wall is thicker than 3 mm throughout at least 5 cm of the colon (28)

A clear diagnosis may not be made in a patient with ambiguous findings until a laparotomy performed to rule out appendicitis yields negative results, though additional imaging is typically not required. Non-opacified bowel, particularly in thin patients or young infants, may be misinterpreted for larger lymph nodes. It is challenging to measure bowel wall thickness in this situation.

➤ *Mesenteric Lymphadenitis Treatment:*

Mesenteric lymphadenitis frequently improves on its own. Still could require medication to lower a fever or manage pain. The combination of rest, drinks, and warm abdominal application may also help symptoms subside.

A serious bacterial infection (septicemia) that might lead to fatal complications can be avoided with the help of antibiotics. (23).

II. MATERIALS AND METHODS

150 consecutive paediatric patients who were recommended for abdominal sonography for a variety of reasons make up the study group. According to the size of the patient, transducers will be used for scanning. Additional scanning of the RLQ, left lower abdominal quadrant, and Para-aortic (along the aorta and inferior vena cava) areas will be done with linear 7 to 12 MHz and curved 5 to 8 MHz transducers at the conclusion of each full abdominal examination.

Any lymph node greater than 5 mm found in this patient group is recorded. The lymph node is measured in three dimensions, and the diameter with the smallest value is recorded. The age of the patient, the diagnosis, the presence of clusters, the presence of enlarged abdominal lymph nodes, their position, size, and quantity at each region, will all be noted. Ages ranged from one month to fifteen years. A lymph node in the abdomen is deemed swollen if its smallest diameter is 5 mm. A cluster is defined as three or more closely spaced swollen abdominal lymph nodes. Additional discoveries including the presence of free fluid or thickening of the intestinal wall are also noted.

➤ *The Patients will be Divided into 2 Groups:*

150 kids (aged one month to 15 years) with stomach pain who were clinically suspected to have an acute abdominal disease were placed in Group 1 and sent for sonography.

50 patients (ranging in age from one month to 15 years) were referred for elective research in Group 2 for a variety of reasons. A urinary tract infection, hydronephrosis, suspected congenital defects, renal stones, hepatomegaly, undescended testicles, meatal stenosis, an inguinal hernia, hypertension hypospadias, chronic constipation, suspected premature puberty, voiding dysfunction, abdominal distension, a urachal duct cyst, and recurrent vomiting are among the conditions that fall under this category.

➤ *Exclusion Criteria:*

Patients with known splenomegaly, peripheral lymphadenopathy, and lymphoproliferative diseases.

➤ *Statistical Methods:*

In the current study, descriptive and inferential statistical analysis was completed. Results for categorical data are reported in Number (%) whereas results for continuous measurements are presented as Mean SD (Min-Max). The 5% level of significance is used to determine significance. The following data-related assumptions are made: 1. Dependent variables must have a normal distribution, 2. Samples selected at random from the population must have independent cases, and 3.

Under the binomial assumption of 0.50 for the analysed variables' frequency distribution, one proportion Z test has been run.

➤ *Statistical Software:*

The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

➤ Observations and Result Analysis

Table 1 Age Distribution of Patients Studied

Age in years	Number of patients	%
<1	64	24.6
1-5	103	39.6
6-10	67	25.8
10	26	10.0
Total	260	100.0

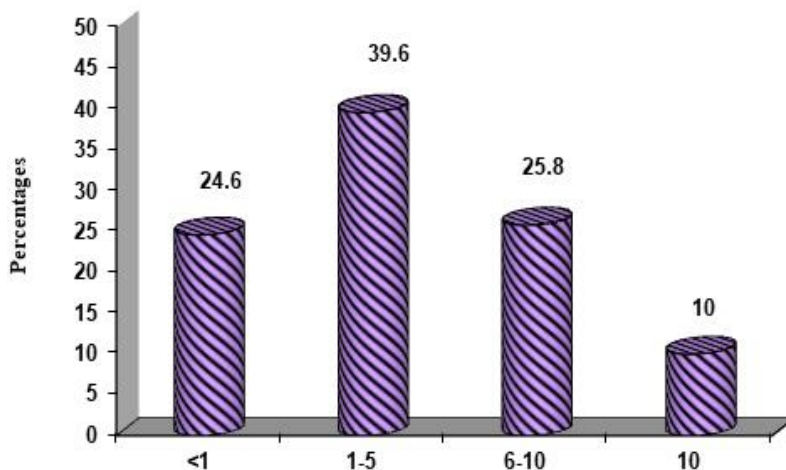


Fig 2 Age in Years

Table 2 Gender Distribution of Patients Studied

Gender	Number of patients	%
Male	155	59.6
Female	105	40.4
Total	260	100.0

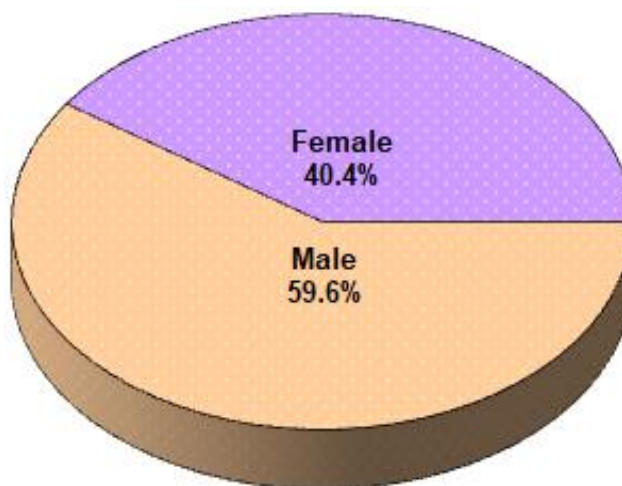


Fig 3 Gender

Table 3 Type of Patients Studied

Type	Number of patients	%
OPD	55	21.2
PDER	205	78.8
Total	260	100.0

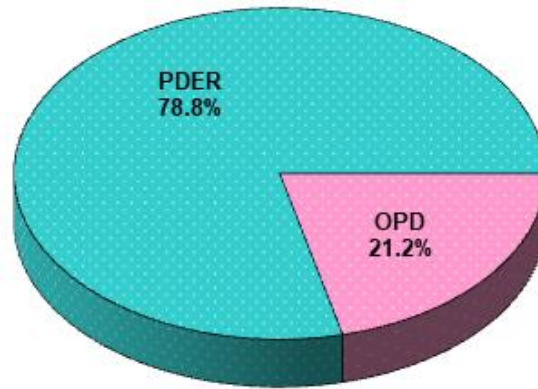


Fig 4 Type

Table 4 Compliments of Patients Studied

Compliments	Number of patients	%
1.EXCESSIVE CRYING	78	30.0
2.PAIN ABD	89	34.2
3.FEVER	28	10.8
4.DYSURIA/FREQ	13	5.0
5.Vomiting	16	6.2
6.Others	41	15.8
Total	260	100.0

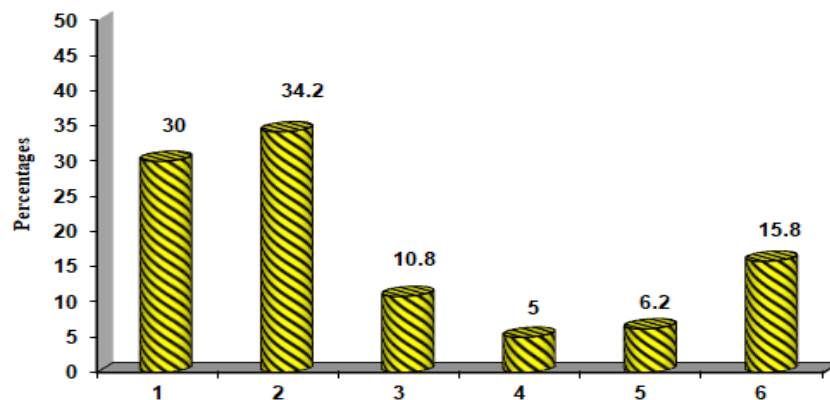


Fig 5 Compliments

Table 6 Clinical Diagnosis of Patients Studied

Clinical Diagnosis	Number of patients	%
INTUSSUSCEPTION	87	33.5
OTHERS	173	66.5
Total	260	100.0

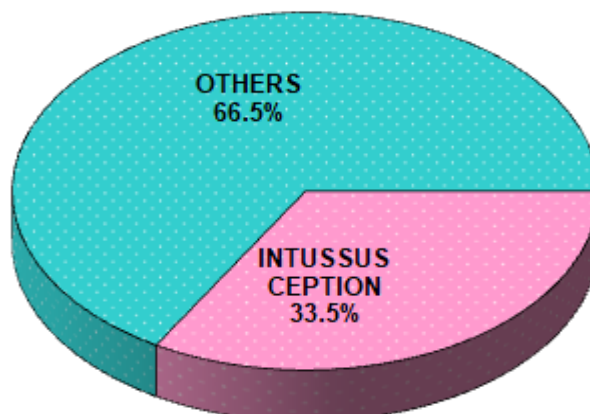


Fig 6 Clinical Diagnosis

Table 7 Ultrasound Findings of Patients Studied

Ultrasound findings presence of LNS	Number of patients	%
Negative	184	70.8
Positive	76	29.2
Total	260	100.0

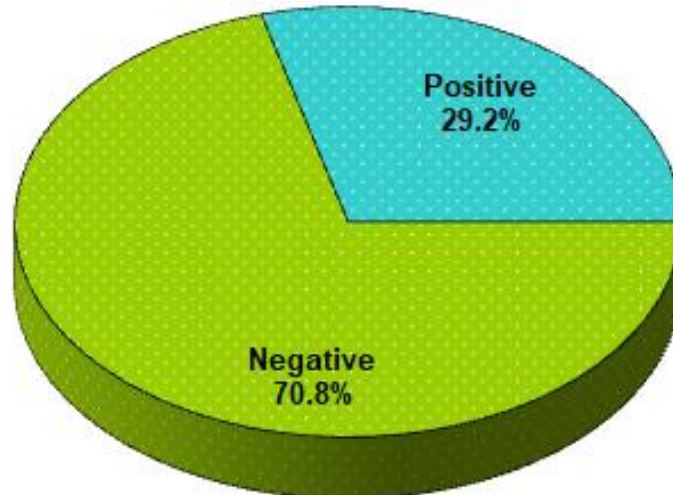


Fig 7 Ultrasound Findings Presance of LNS

Table 8 Ultrasound Findings of Patients Studied

Ultrasound findings	Number of patients	%
LOCATION		
TOTAL POSSITIVES	76	29.2
• RIF/LIF	56	21.5
• RIGHT HYPOCHONDRIMUM	14	5.4
• LUMBAR/UMB REG	3	1.2
• EPIGASTRIUM	1	0.4
• PARA UMB	1	0.4
SIZE:LONG AXIS		
• >5 mm	46	17.7
• >10 mm	29	11.1
SIZE:SHORT AXIS		
• >5 mm	72	27.7
• >10 mm	3	1.2
NUMBER		
• Multiple	15	5.8
• FEW	61	23.5
CLUSTERS		
• Yes	24	9.2
FREE FLUID		
• MILD FF	15	5.8
• INTERLOOP FLUID	2	0.8
BOWEL THICKENING		
• No	258	99.2
• Yes	2	0.8
APEENDEX		
• No	256	98.5
• Yes	4	1.5
INTUSSUSCEPTION		
• No	239	91.9
• Yes	21	8.1

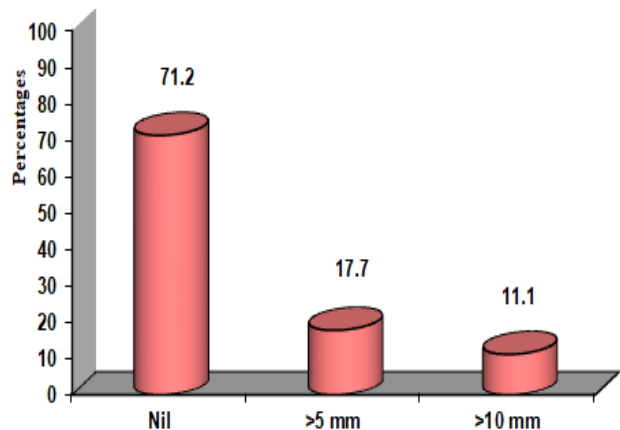


Fig 8 Size: Long Axis

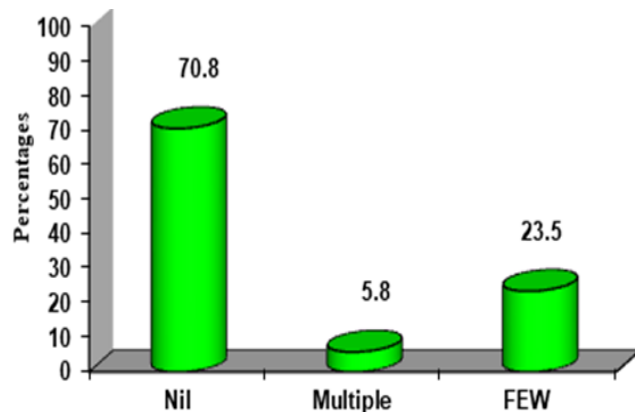


Fig 12 Number

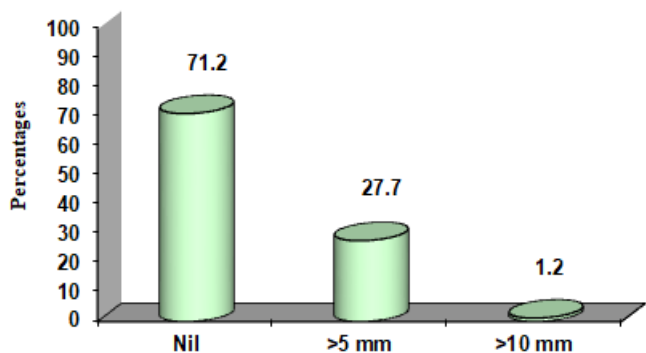


Fig 9 Size: Short Axis

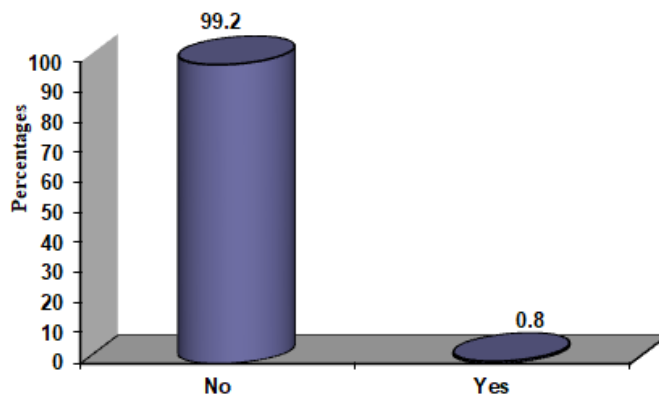


Fig 13 Bowel Thickening

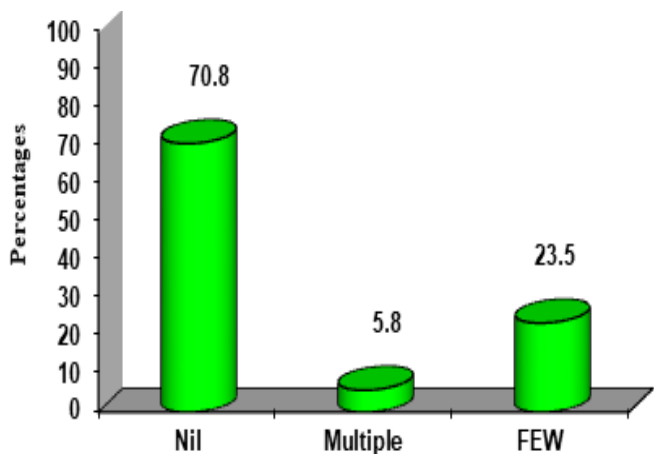


Fig 10 Number

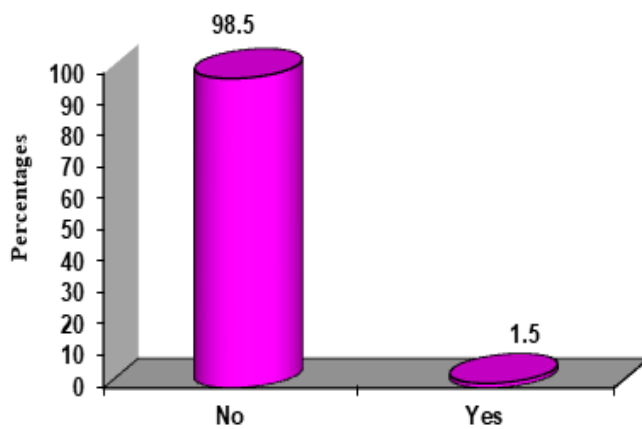


Fig 14 Apendex

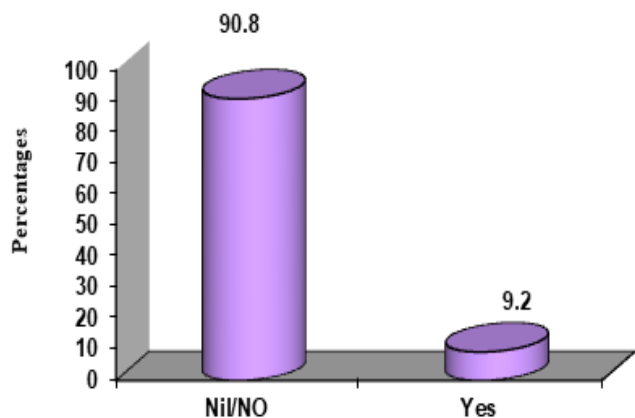


Fig 11 Clusters

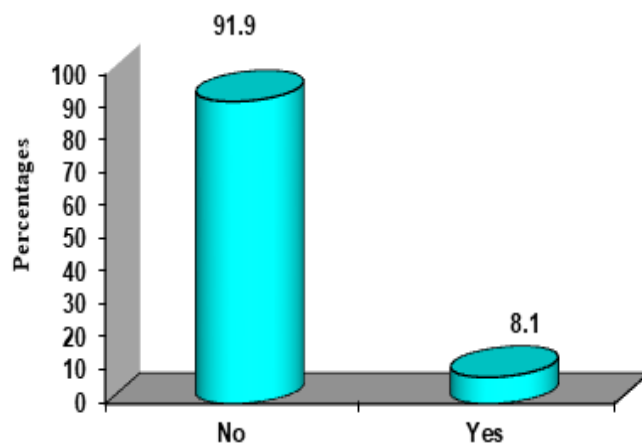


Fig 15 Intussusception

Table 9 USS Diagnosis of Patients Studied

USS diagnosis	Number of patients	%
1.MESEN LYMPHADENITIS	57	43.2
2.MILD RT HN	8	6.1
3.MILD INTERLOOP FLUID	1	0.8
4.INTUSSUSCEPTION	20	15.2
5.CYSTITIS	5	3.8
6.AC APPENDICITIS	4	3.0
7.MILD FF	7	5.3
8.CHOLEDOCHAL CYST	2	1.5
9.SIGNIFICANT POSTVOID RESIDUE	2	1.5
10.HEPATOMEGALY	2	1.5
11.Others	24	18.2
Total	132	100.0

NAD=128

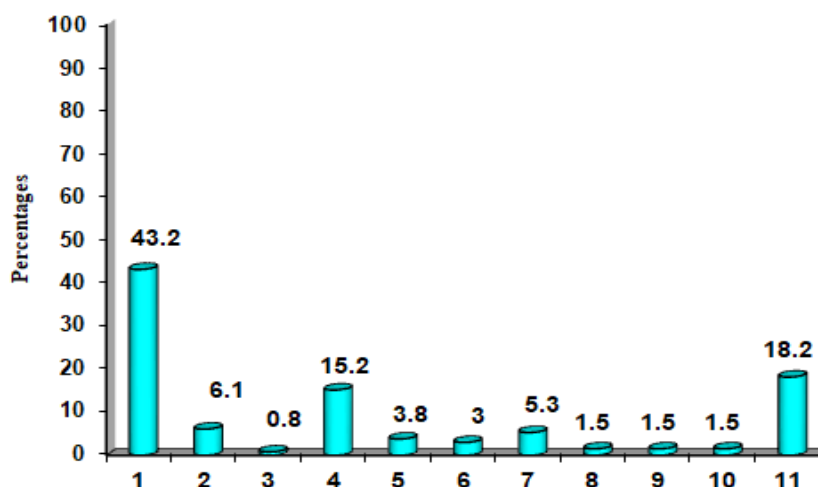


Fig 16 USS Diagnosis

Table 10 Correlation of Baseline Information with USG Positivity

Clinical Variables	Total number of patients (n=260)	Number of USG positives (n=76)	% of USG positives (29.2%)	P values
Age in years				
• <1	64	7	10.9	0.001**
• 1-5	103	43	41.7	0.005**
• 6-10	67	23	34.3	0.356
• 10	26	3	11.5	0.047*
Gender				
• Male	155	52	33.5	0.239
• Female	105	24	22.9	0.156
Type				
• OPD	55	3	5.5	<0.001**
• PDER	205	73	35.6	0.044*
Complaints				
• 1.Excessive crying	78	26	33.3	0.425
• 2.Pain abd	89	41	46.1	0.005**
• 3.Fever	28	6	21.4	0.364
• 4.Dysuria/freq	13	1	7.7	0.088+
• 5.Vomiting	16	2	12.5	0.142
• 6.Others	41	3	7.3	0.002**
INTUSSUSCEPTION				
• Yes	21	16	76.2	<0.001**

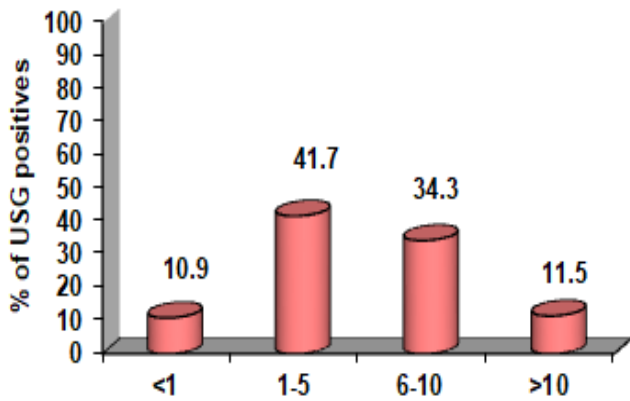


Fig 17 Age in Years

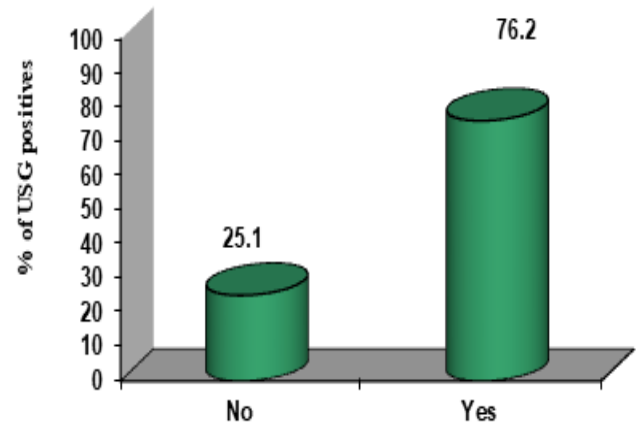


Fig 21 Intussusception

III. DISCUSSION

Numerous viral, bacterial, mycobacterial, and parasitic species have been linked to infections of the upper or lower respiratory tract and mesenteric lymph node enlargement [32–37]. Children who underwent surgery due to a suspected acute appendicitis had mesenteric adenitis as their most common alternate diagnosis in various series [38–40]. Therefore, it is believed that the clinical condition of mesenteric adenitis mimics a "acute abdomen".

A total of 260 patients were investigated in our study, of whom 205 (Group 1) were from paediatric aetiology where acute abdomen is suspected, and 55 (Group 2) were referred from the opd for various causes with no acute illness. These individuals are between the ages of one month and fifteen.

The most common complaints among patients who were referred from paediatric emergency rooms were abdominal discomfort (34% n89), excessive weeping (30% n30), fever (10.8% n28), dysuria (5% n13), vomiting (6.2% n16), and others (15.8% n41). In these patients, 87 (33.5%) were clinically diagnosed with intussusception, and the remaining patients were diagnosed with acute abdomen, including acute appendicitis, gastroenteritis, pyrexia of unclear cause, and malrotation.

76 patients among these patients had swollen lymph nodes, of whom 73 (35.6%) are from paediatric emergency and 3 (5.5%) are from opd. In contrast to asymptomatic youngsters, patients who present with an acute abdomen are more likely to have swollen lymph nodes. In a study conducted by **C. J. Sivit , K. D. Newman , R. S. Chandra** The prevalence of enlarged mesenteric lymph nodes in symptomatic children (35/250, 14%) was significantly greater than in asymptomatic children (2/50, 4%).

In this study, lymph nodes were more prevalent in children under the age of ten. 6 to 10 years (n 23 34%) and 1 to 5 years (n 43 41.7%). Researchers **RATHAUS, MD, M SHAPIRO, M GRUNEBAUM,** and **R ZISSIN** conducted a study. Children between the ages of 2 and 10 were substantially more likely to have larger MLNs (p0.006). additionally, in a different study by **C. J. Sivit, K. D.**

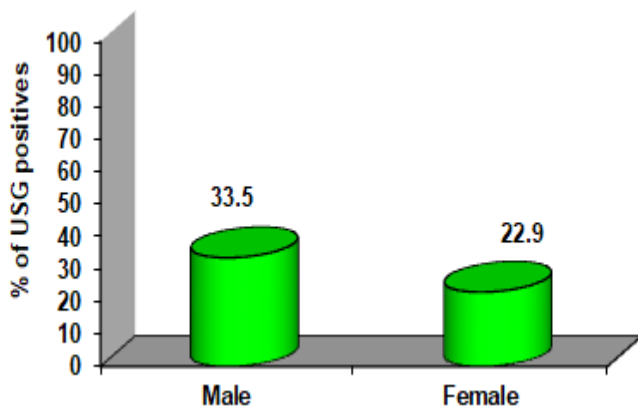


Fig 18 Gender

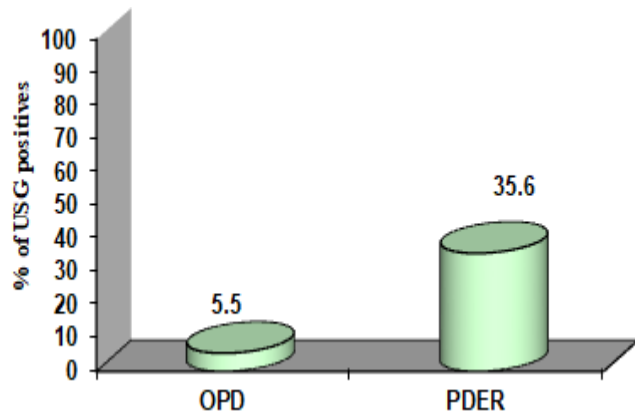


Fig 19 Type

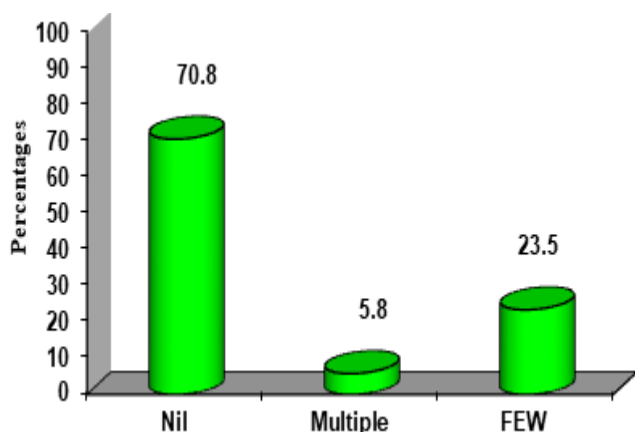


Fig 20 Number

Newman, and R. S. Chandra In comparison to children nine years of age and older, children under nine showed a considerably higher prevalence of swollen lymph nodes (17/81, 21% versus 18/169, 11%).

The incidence of swollen lymph nodes is higher among children who reported having abdominal pain as their main complaint (n89) (n 41 46.1%). A. Alamdaran, MD, did a study.. Dr. M. Hiradfar Dr. B. Zandi Dr. M. Orei Taheri, R. All 213 individuals with acute abdominal pain reported mesenteric lymphadenitis as their most frequent diagnosis (53%) overall.

In this study, right iliac fossa lymph nodes were observed to be enlarged in the majority of patients with mesenteric lymphadenitis (n76), and 24 of these patients had clusters of lymph nodes. In a study by Drs. Nurith Hiller and Natalia Simanovsky In another study by Boaz Karmazyn, 44% of the patients had swollen lymph nodes in the RLQ. Belinda A. Werner Babak Rejaie Kimberly E. Applegate The largest lymph node was most commonly in the right lower quadrant (88%).

In this study, 72/76 patients had enlarged lymph nodes with short axis sizes > 5 mm and 3 patients had sizes > 10 mm. Patients with acute abdominal pain who participated in a study by Drs. Natalia Simanovsky and Nurith Hiller 83.3% (20/24) of the lymph nodes had enlarged lymph nodes that were 5 mm (short axis) and greater in the shortest diameter.

16 children (76%) out of the 21 patients in whom intussusception was found to exist had swollen lymph nodes.

Paediatric emergency departments found intestinal wall thickening in 2 patients (0.8%), minor free fluid in 7 patients (5.3%), and acute abdominal appendicitis in 4 patients (1.5%) of patients who came with the condition.

IV. CONCLUSION

According to the study's findings, swollen lymph nodes are more frequently discovered in children who have a history of abdominal pain.

Younger children, or those under the age of 10, are more likely than older children to have swollen lymph nodes.

When compared to children who have symptoms, the prevalence of enlarged lymph nodes is quite low in the asymptomatic group.

In children who had larger lymph nodes, intussusception is more common.

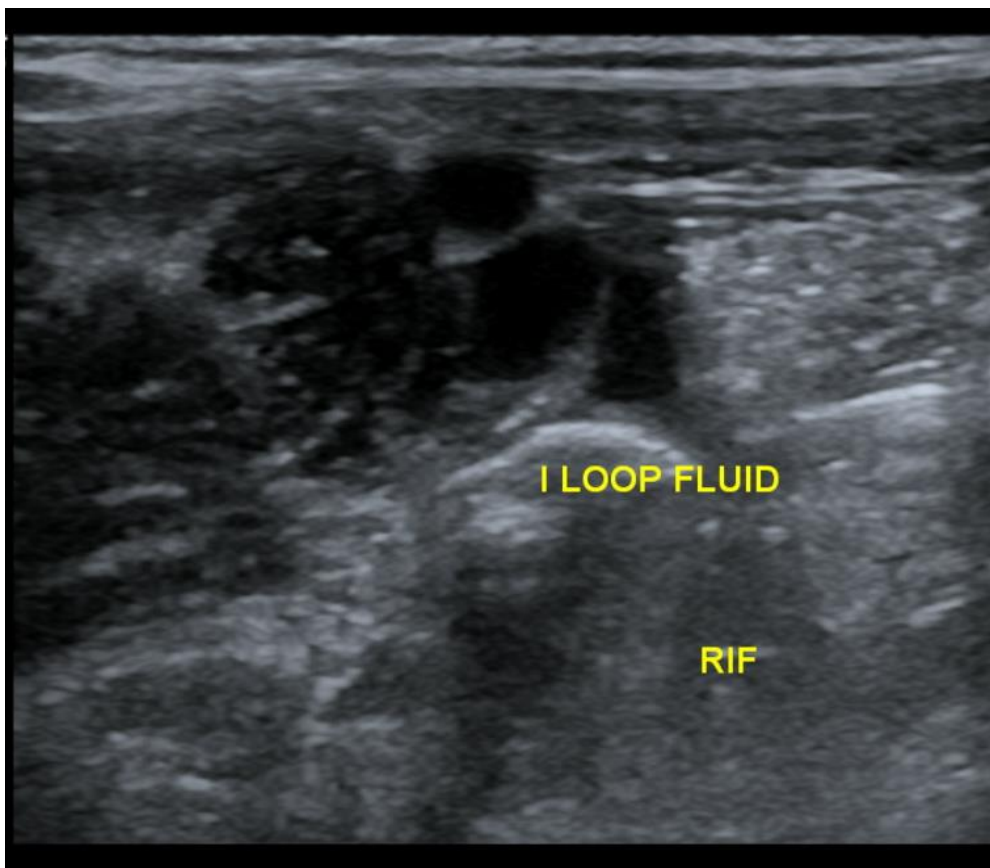
When a kid presents with an acute abdomen, sonography can help establish a primary diagnosis and distinguish between medical and surgical crises, such as acute appendicitis.

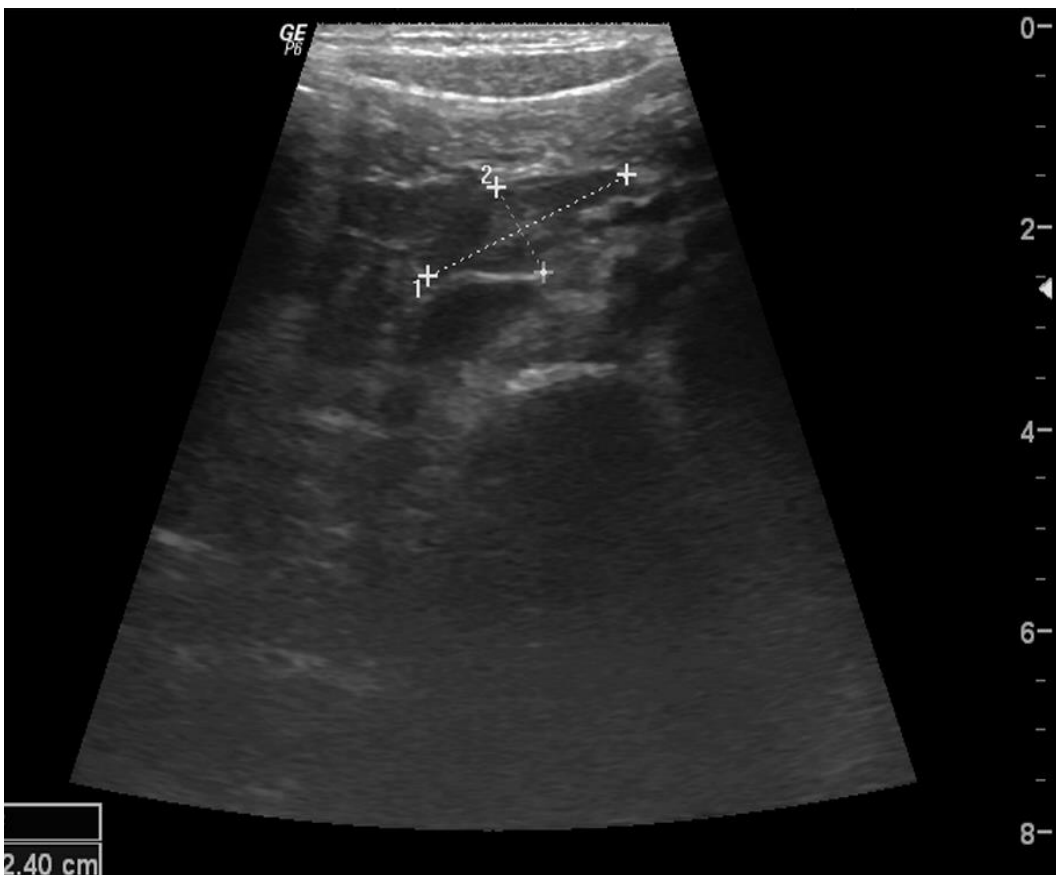
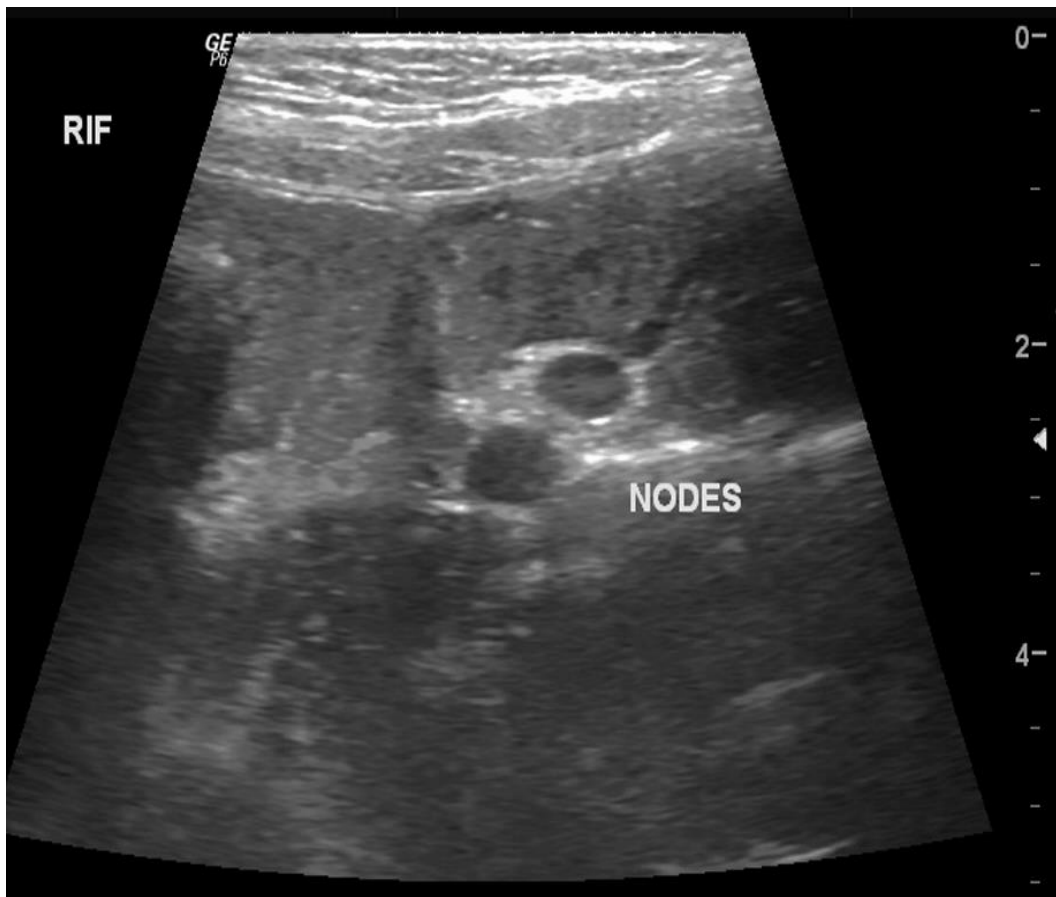
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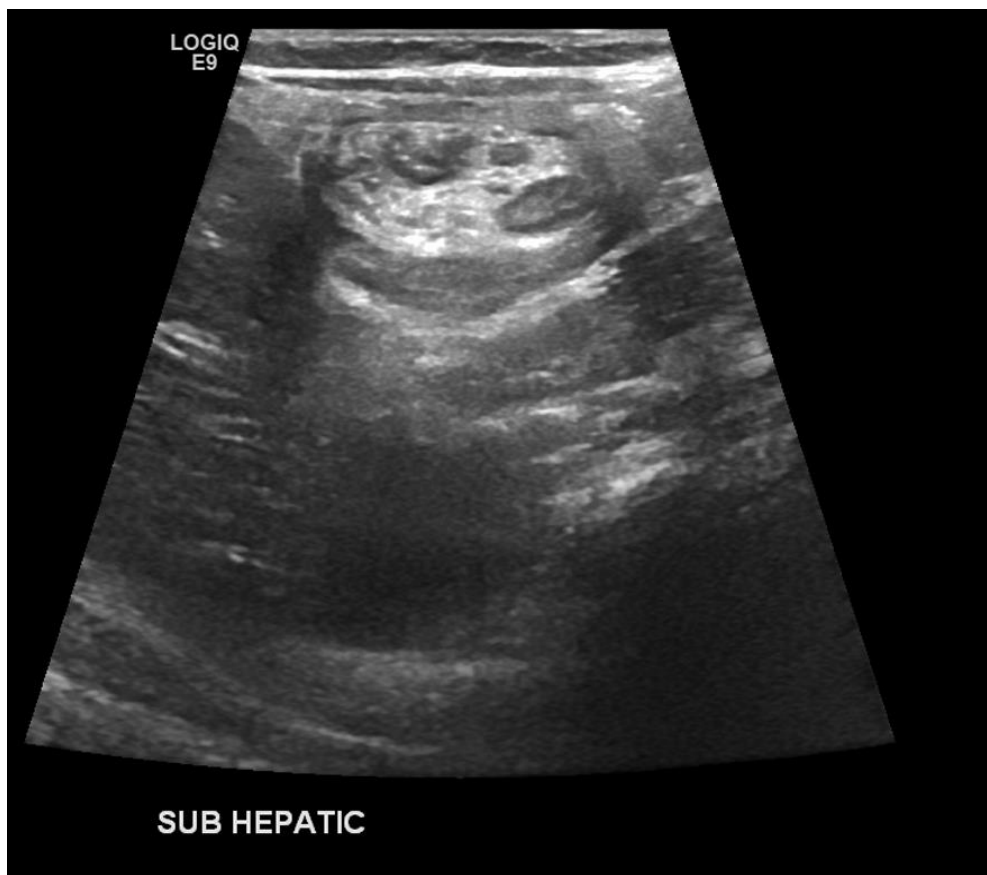
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IMAGES





Enlarged Mesenteric Lymph Nodes



Intussusception