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ORIGINAL ARTICLE

Role of USG in assessment of surgical causes of acute abdominal pain in children

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ABSTRACT:

Background: Acute abdominal pain in the pediatric age group can be caused by a variety of conditions, ranging from mild and self-limiting to severe and life-threatening. The present study was conducted to assess the role of USG in assessment of surgical causes of acute abdominal pain in children. **Materials & Methods:** 58 children with abdominal pain of both genders were included. Grey- scale ultrasonography (U/S) 5-MHz linear transducer in both longitudinal and transverse orientation, combined with Color Doppler Ultrasonography (CDUS) was done. **Results:** Out of 58 patients, males were 32 and females were 26. The clinical features were abdominal pain in 58, vomiting in 12, distended abdomen in 25, rebound tenderness in 21, nausea in 19 and fever in 23 patients. The difference was significant ($P < 0.05$). The location of pain was epigastricin 8, hypogastric in 22, right lumbarin 5, left lumbar in 4, umbilical in 6, right hypochondrium in 7 and left hypochondrium in 6 cases. The difference was significant ($P < 0.05$). The sensitivity of UG in diagnosis for hemorrhagic cyst was 92%, ovarian torsion98%, appendicular mass97%, appendicitis94% and renal stone100%. **Conclusion:** When it comes to diagnosing and differentiating between various surgical causes of acute abdominal pain, USG is a very effective imaging method.

Keywords: Acute abdominal pain, pediatric, USG

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INTRODUCTION

Acute abdominal pain in the pediatric age group can be caused by a variety of conditions, ranging from mild and self-limiting to severe and life-threatening. It's essential to evaluate pediatric abdominal pain promptly to determine the cause and provide appropriate treatment.[1] Gastroenteritisis one of the most common causes of abdominal pain in children, usually caused by viral or bacterial infections. Symptoms include diarrhea, vomiting, and abdominal cramps. Inadequate fiber intake, dehydration, or certain medications can cause constipation, leading to abdominal discomfort or pain.[2] Appendicitis is the inflammation of the appendix and commonly presents with abdominal pain, often starting around the belly button and migrating to the right lower quadrant. Other symptoms may include fever, nausea, and vomiting.[3]

In almost all cases of mild to severe stomach pain in children, abdominal ultrasounds (US) are the first suggested evaluation, regardless of whether the cause is routine. Abdominal ultrasound is a valuable diagnostic tool in evaluating pediatric abdominal pain. It's non-invasive, does not involve radiation exposure, and is well-tolerated by children.[4] Imaging is determined by the etiology of acute abdomen based on clinical manifestation or clinical suspicion. When performed by trained professionals, computed tomography (US) is similar to computerized tomography (CT). Because US does not involve ionizing radiation, it is the imaging modality of choice for young patients, particularly when the results of CT are unclear.[5] The present study was conducted to assess the role of USG in assessment of surgical causes of acute abdominal pain in children.

MATERIALS & METHODS

The present study consisted of 58 children with abdominal pain of both genders. All gave their written consent to participate in the study.

Data such as name, age, gender etc. was recorded. A thorough clinical examination was performed. Grey-scale ultrasonography (U/S) 5-MHz linear transducer in both longitudinal and transverse orientation, combined with Color Doppler Ultrasonography (CDUS) was done. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 58		
Gender	**Male**	**Female**
Number	32	26

Table I shows that out of 58 patients, males were 32 and females were 26.

Table II Clinical presentation

Clinical presentation	Number	P value
Abdominal pain	58	0.05
Vomiting	12	
Distended abdomen	25	
Rebound tenderness	21	
Nausea	19	
Fever	23	

Table II shows that clinical features were abdominal pain in 58, vomiting in 12, distended abdomen in 25, rebound tenderness in 21, nausea in 19 and fever in 23 patients. The difference was significant (P< 0.05).

Table III Location of abdominal pain

Location	Number	P value
Epigastric	8	0.05
Hypogastric	22	
Right lumbar	5	
Left lumbar	4	
Umbilical	6	
Right hypochondrium	7	
Left hypochondrium	6	

Table III, graph I shows that location of pain was epigastric in 8, hypogastric in 22, right lumbar in 5, left lumbar in 4, umbilical in 6, right hypochondrium in 7 and left hypochondrium in 6 cases. The difference was significant (P< 0.05).

Graph I Location of abdominal pain

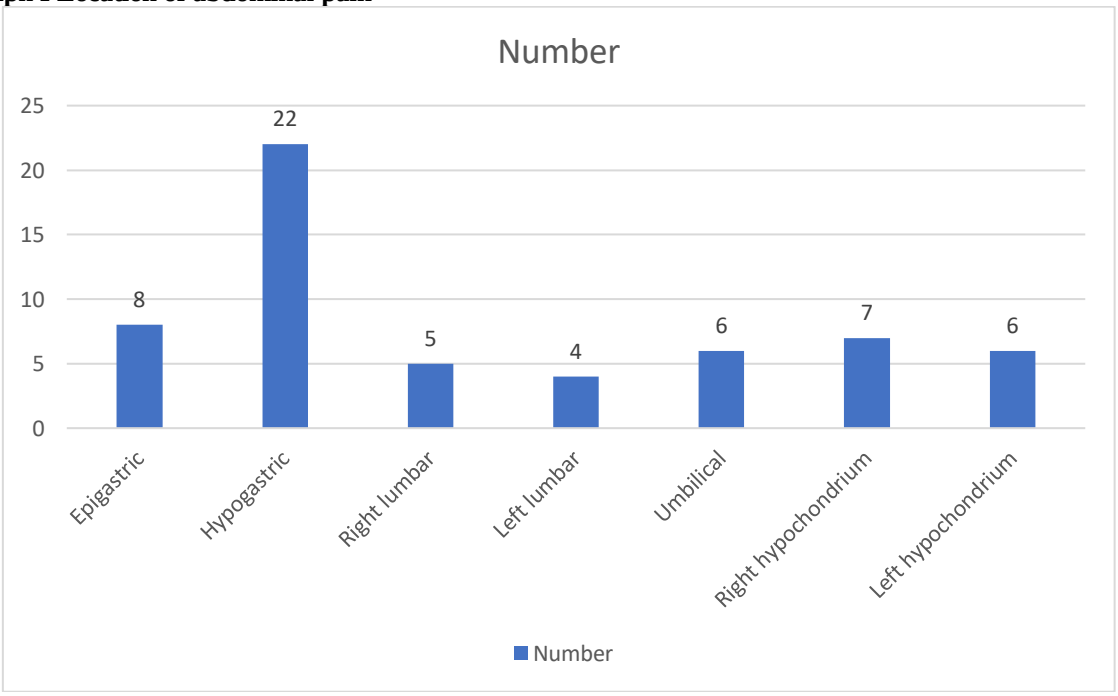

Table IV The sensitivity of US in the diagnosis of pathologies

Diagnosis	Sensitivity
Hemorrhagic cyst	92%
Ovarian torsion	98%
Appendicular mass	97%
Appendicitis	94%
Renal stone	100%

Table IV shows that sensitivity of UG in diagnosis for hemorrhagic cyst was 92%, ovarian torsion 98%, appendicular mass97%, appendicitis 94% and renal stone100%.

DISCUSSION

Ultrasound can be used to visualize the appendix and surrounding structures to assess for signs of inflammation or obstruction, such as increased appendiceal diameter, wall thickening, presence of appendicolith (calcified deposit), or fluid collection around the appendix.[6]

Ultrasound can help identify the presence and location of bowel obstruction by visualizing dilated loops of bowel, fluid-filled segments, or the presence of an obstructive mass.Abdominal ultrasound can evaluate the gallbladder for signs of inflammation (cholecystitis), gallstones, or obstruction of the biliary tract. It can also assess for other biliary abnormalities such as choledochal cysts.[7]Although computed tomography (CT) scan may be more sensitive for detecting pancreatitis, ultrasound can still be useful, especially in milder cases or when radiation exposure is a concern. It can visualize the pancreas for signs of inflammation, edema, or fluid collection.Ultrasound is often used to evaluate the kidneys and urinary tract for abnormalities such as hydronephrosis, kidney stones, urinary tract obstruction, or structural anomalies.[8]In cases of lower abdominal pain, particularly in adolescent girls, abdominal ultrasound can help evaluate pelvic structures such as the uterus, ovaries, and bladder for conditions like ovarian cysts, ovarian torsion, or pelvic inflammatory disease.Ultrasound can detect soft tissue abnormalities such as abscesses, hematomas, or masses in the abdominal wall or organs.[9]The present study was conducted to assess the role of USG in assessment of surgical causes of acute abdominal pain in children.

We found that out of 58 patients, males were 32 and females were 26. Holland et al[10] included 198 women who underwent preoperative TVS and laparoscopy. At laparoscopy 126/198 (63.6%) women had evidence of pelvic endometriosis. 28/126 (22.8%) of them had endometriosis in a single location whilst the remaining 98/126 (77.2%) had endometriosis in two or more locations. Positive likelihood ratios (LR+) for the ultrasound diagnosis of ovarian endometriomas, moderate or severe ovarian adhesions, pouch of Douglas adhesions, and bladder deeply infiltrating endometriosis (DIE), recto-sigmoid colon DIE, rectovaginal DIE, uterovesical fold DIE and uterosacral ligament DIE were >10, whilst for pelvic side wall DIE and any ovarian adhesions the + LH was 8.421 and 9.81 respectively.The negative likelihood ratio (LR-) was: <0.1 for bladder DIE; 0.1-0.2 for ovarian endometriomas, moderate or severe ovarian adhesions, and pouch of Douglas adhesions; 0.5-1 for rectovaginal, uterovesical fold, pelvic side wall and uterosacral ligament DIE. The accuracy of TVS for the diagnosis of both total number of endometriotic lesions and DIE lesions significantly improved with increasing total number of lesions.

We found that clinical features were abdominal pain in 58, vomiting in 12, distended abdomen in 25, rebound tenderness in 21, nausea in 19 and fever in 23 patients. We found that location of pain was epigastricin 8, hypogastric in 22, right lumbar in5, left lumbar in 4, umbilical in 6, right hypochondrium in 7 and left hypochondrium in 6 cases. Riera et al[11] in their study eighty-two patients were enrolled. The median age was 25 months (range 3 to 127 months). Thirteen patients (16%) received a diagnosis of ileocolic intussusception by diagnostic radiology. Bedside ultrasonography had a sensitivity of 85% (95% confidence interval [CI] 54% to 97%), specificity of 97% (95% CI 89% to 99%), positive predictive value of 85% (95% CI 54% to 97%), and negative predictive value of 97% (95% CI 89% to 99%). A positive bedside ultrasonographic result had a likelihood ratio of 29 (95% CI 7.3 to 117), and a negative bedside ultrasonographic result had a likelihood ratio of 0.16 (95% CI 0.04 to 0.57).

We found that sensitivity of UG in diagnosis for hemorrhagic cyst was 92%, ovarian torsion98%, appendicular mass97%, appendicitis 94% and renal stone100%.Yilmaz et al[12]compared non-contrast spiral CT, US and intravenous urography (IVU) in the evaluation of patients with renal colic for the diagnosis of ureteral calculi. During a period of 17 months, 112 patients with renal colic were examined with spiral CT, US and IVU. Fifteen patients were lost to follow-up and excluded. The remaining 97 patients were defined to be either true positive or negative for ureterolithiasis based on the follow-up data. Sensitivity, specificity, positive and negative predictive value and accuracy of spiral CT, US and IVU were determined, and secondary signs of ureteral stones and other pathologies causing renal colic detected with these modalities were noted. Of 97 patients, 64 were confirmed to have ureteral calculi based on stone recovery or urological interventions. Thirty-three patients were proved not to have ureteral calculi based on failure to recover a stone and diagnoses unrelated to ureterolithiasis. Spiral CT was found to be the best modality for depicting ureteral stones with a sensitivity of 94 % and a specificity of 97 %. For US and IVU, these figures were 19, 97, 52, and 94 %, respectively. Spiral CT is superior to US and IVU in the demonstration of ureteral calculi in patients with renal colic, but because of its high cost, higher radiation dose and high workload, it should be reserved for cases where US and IVU do not show the cause of symptoms.

The limitation of the study is the small sample size.

CONCLUSION

Authors found that when it comes to diagnosing and differentiating between various surgical causes of acute abdominal pain, USG is a very effective imaging method.

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