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Splenic abscess is a relatively uncommon but potentially fatal condition in children

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Abstract

Splenic abscess is a very rare disease entity in pediatric age group which has become relatively uncommon in developed country. But its incidence among children is still high in developing country like India. Population-based studies have established incidence of splenic abscess at between 0.2% and 0.7%, but incidence has been found to be increasing due to increased use of radiological intervention. Male to female ratio in children is equal. The aim of this study is to know the clinical aspects, predisposing factors, investigations, and treatment modalities of splenic abscess in children.

Data searched from PubMed Medline and google scholar database from 1982 to 2020 and all type of studies prospective, retrospective, reviews, case reports and case series were searched with keywords splenic abscess, predisposing factors, children included. The high mortality in splenic abscess is commonly associated with delayed diagnosis, which emphasizes the need for prompt detection and early treatment.

The nonspecific nature of the signs and symptoms of splenic abscess make imaging studies a cornerst one of diagnosis, newer imaging modalities, Ultra Sonography, computerized tomography, Magnetic Resonance Imaging and the successful application of percutaneous aspiration and percutaneous closed drainage have changed approaches for diagnosis and therapy. The triad of fever left upper quadrant pain and a tender mass has been suggested as an important complex. For this reason, it should be considered, especially in cases with malignancy, persistent fever, and left upper quadrant pain. Early diagnosis, prompt treatment with splenic preservation as a goal in children should be considered unless there are multiple abscesses and unresponsiveness to conservative regimen.

Keywords: Splenic abscess, children, predisposing factors.

Introduction

Splenic abscesses represent a rare disease entity which is even rarer in the pediatric age group. In most cases, these abscesses are caused by an infectious organism like Staphylococcus aureus, streptococcus spp., Klebsiella pneumoniae, Escherichia coli, Myco bacterium tuberculosis, or Salmonella spp. Risk factors include infections of the abdominal cavity, endocarditis, and immunosupression.[1,2]

Population-based studies have established the incidence of splenic abscess at between 0.2% and 0.7%. The high mortality is associated with delayed diagnosis which emphasizes the need for prompt detection and early treatment.[3,4]

New imaging modalities, ultrasonography (US), computerized tomography (CT), magnetic resonance imaging (MRI) and the successful application of percutaneous aspiration and percutaneous closed drainage have changed approaches to diagnosis and therapy.[5-7]

Due to the immunological and phagocytic function of the spleen, most cases of splenic abscess in children occur due to immunosuppression.[8]This review is focused on how clinicians should suspect splenic abscess and initiate further diagnosis to determine a potential life threatening underlying condition. Many studies and case reports have been taken up all across the globe to guide towards the treatment of choice which can be antibiotic therapy, splenectomy or percutaneous drainage. We have taken up 8 studies from all over the globe for a comprehensive comparison on outcomes, treatment plan and mortality.

Due to the nonspecific clinical picture, it still remains a diagnostic challenge for physicians. Splenic abscess should be suspected in febrile patients with left upper quadrant tenderness, leukocytosis, and diagnosis is confirmed mostly on imaging studies, microbiologic and/or pathologic evidence, or by response to antibiotic or antifungal treatment.[9]

Discussion

In a study conducted in Kaohsiung Medical University, Taiwan during 11 years period from December 1990 to October 2001, total 29 patients were admitted. There were 5 pediatrics patients (17%) and 24 adults (83%). The most common associated condition was leukemia. Immunodeficiency was the major predisposing factor for splenic abscess (72%). The most common signs and symptoms were fever (90%), chills (41%), abdominal pain (31%), and leukocytosis (38%). Ultrasonography (US), is an effective tool in the early diagnosis of splenic abscess. CT or Magnetic resonance imaging (MRI) was used in 26 patients (90%) and was abnormal in all these patients. The typical finding on CT scan was a low-density mass with peripheral enhancement following interval contrast injection. Positive blood cultures were found in only seven patients (24%): Staphylococcus sp. in two patients, and *Klebsiella pneumoniae*, Salmonella sp., Pseudomonas sp., Enterococcus sp., and Enterobacter sp. in one patient each. Splenic abscesses, those located at the upper pole, tend to irritate the diaphragm, causing an elevated diaphragm, pleural effusion, increased lung infiltration, pneumonia, or left lower pulmonary lobe atelectasis, chest roentgenography was performed in all patients. This showed increased bilateral lung infiltration in three patients (10%), right lower lobe pneumonia in four patients (14%), pleural

effusion in one patient (3%), and left lower pulmonary lobe fibrosis in one patient (3%).[9]

CT is superior in its ability to localize lesions as small as several millimeters and gives better anatomic information about the peri splenic area and contiguous viscera. Thus, US and CT are both sensitive in detecting splenic abscesses, although neither of the two is specific; the differential diagnoses include splenic infarcts, cysts, primary and secondary tumors, hematomas, and lymphomatous masses.[9]

Another case report presented 15-year-old adolescent girl with a 10 day fever, aphthous putrid ulcers on the back of her throat and left upper quadrant abdominal pain radiating to the ipsilateral shoulder. Investigations revealed: white blood cell count (WBC) 14.8 × 109/L (78.4% neutrophils, 12.7% lymphocytes), erythrocyte sedimentation rate (ESR) 56mm/hour and C-reactive protein (CRP) 101 mg/L. Abdominal ultrasound showed multiple an-/hypoechoic lesions in the spleen with lack of perfusion in duplex sonography (Figure 1A, B). In abdominal magnetic resonance imaging (MRI) the splenic lesions showed a hypointense signal on the T1- and T2-weighted images without contrast enhancement.

Serologic studies for acute infection with Epstein-Barr virus, cytomegalovirus, Herpes simplex-virus, Human immunodeficiency virus, Mycoplasma pneumoniae, Yersinia enterica/pseudotuberculosis, Treponema pallidum, Coxiella burnetii, Brucella spp., Bartonella henselae, Francis Ella tularensis, and Echinococcus, as well as blood cultures were negative. On admission the patient was started on ceftriaxone and clindamycin leading to no clinical improvement except for cessation of fever but CRP levels were raising (129 mg/L). Therefore, antibiotics were switched to meropenem and metronidazole after 4 days.

In the follow up of 24 days after initial presentation the splenic lesions increased in number and in size. Moreover, the inflammatory parameters had risen again (WBC 14.19 × 109/L, CRP 175 mg/L). Subsequently, a computed tomography-guided needle biopsy was performed. The patient was restarted on meropenem and metronidazole. Using this therapy, the CRP decreased, and the white blood cell count normalized again (WBC 9.86 × 109/L, CRP 75.8 mg/L) within 9 days. An immunosuppressive therapy with prednisone 2 mg/kg was started while at first continuing with metronidazole. After initiation of immunosuppressive treatment, the splenic lesions decreased in size for the first time and were no longer detectable after 6 weeks. The CRP normalized completely. The glucocorticoid dose was then tapered and stopped after 11 weeks.[10]

A case reported from National Hospital, Abuja, Nigeria, 7year old girl presented with insidious fever of 4 days associated with non-bilious vomiting, abdominal pain and non-bloody diarrhea of 2 days. On examination, she was acutely ill looking, pale and dehydrated with intermittent fever of 40.2^{o}C. Respiratory and heart rates were high at 52cycles per minute and 128beats per minute respectively. Abdominal examination revealed mild generalized tenderness more marked in the left hypochondrium. No masses or enlarged organs were palpable. Complete blood count showed leukocytosis of 14,300mm3 with neutrophilia of 83% and hemoglobin was 12 gm/dl. Hemoglobin genotype was AA. Human immunodeficiency virus (HIV) test was negative. Abdominal ultrasonography showed an oval thick walled, mixed echogenic mass in the lower pole of the spleen. Abdominal computed tomography (CT) scan showed an enlarged spleen with mixed density collection in its lower pole on precontract studies, measuring 5.05

cm × 4.1 cm x 4.58cm with contrast enhancement. Diagnosis of splenic abscess was considered. Intravenous antibiotics consisting of ceftriaxone (50mg/kg/day), metronidazole (30mg/kg/day) and amikacin (15mg/ kg/day) were commenced, at laparotomy, the peritoneal cavity was clean. There was an enlarged spleen with an abscess involving the lower pole measuring 10 cm × 12 cm with omental adhesions and adherence to the tail of the pancreas. The affected poles of the spleen were resected along with the tail of the pancreas to which it was inseparably adherent. Peritoneal cavity was cleansed, and abdomen closed. Culture of the pus yielded a pure growth of Streptococcus species. Histology confirmed a single abscess cavity in a healthy spleen. Once the diagnosis of primary splenic abscess is established, antibiotics should be commenced, and these may be changed to specific antibiotics when culture results are available. However, with the development of more potent antibiotics, antibiotic therapy alone can lead to complete resolution of disease. The duration of antibiotic therapy is not well established but treatment for 6–9 weeks has been reported. When drainage of the abscess is required, percutaneous drainage under imaging guide can be done. In a recent report, 88% of children treated for splenic abscess combined with antibiotics and percutaneous drainage achieved full resolution of the disease. The spleen should be preserved as much as possible because of its important immunological functions. Therefore, total splenectomy should be avoided in children. In the present report, partial splenectomy was effective in treating the abscess and was chosen because of the large size of the abscess.[11](table 1)

Successful management of 4 patients with splenic abscess by needle aspiration and antibiotics was reported by Department of Pediatric Surgery, LHMC, New Delhi. Four children (aged 7-11 years; male-female, 3:1) were presented with high-grade fever with chills, anorexia, left hypochondrial pain, and splenomegaly. One child was a known case of thalassemia, and one had a typhoid fever. The others did not have any predisposing condition. Ultrasonography (USG) and computed tomographic scan of the abdomen showed a solitary abscess in the spleen in 2 subjects and multiple abscesses in the other two subjects. Ultrasonography-guided needle aspiration in 3 cases revealed purulent fluid which on culture, grew Escherichia coli in 1 case, Salmonella Para typhi A in 1 case, but sterile in 1 case. Blood culture was sterile in all the cases, but Widal's test was positive in 2 patients. Treatment protocol included USG-guided needle aspiration of pus along with intravenous ceftriaxone, metronidazole, and amikacin for 3 to 12 weeks. All 4 patients showed a good response to conservative treatment. Serial USG showed gradual resolution of abscess, and none was subjected to splenectomy.[12](table2)

In another retrospective review in Department of Surgical Gastroenterology, KGMU Lucknow Saket et al[13] published a case report of a 14-year-old boy presented with intermittent high-grade fever, abdominal pain, and anorexia for 1 month. There was no history of vomiting, diarrhea, jaundice, or any trauma in the recent past. Patient had no known medical co-morbidities, and there was no history of intravenous drug abuse. He was initially treated elsewhere with no significant clinical improvement. On physical examination, the patient was febrile with pallor and tachycardia. Per-abdominal examination revealed a tender splenomegaly without any other lump or ascites. Abdominal ultrasonography (USG) which was done prior to presentation showed a

hypoechoic lesion of 62 mm × 53 mm × 52 mm in the spleen, suggestive of an abscess.

Choudhury Set al[12] reported successful management of pediatric cases of multiple splenic abscesses by conservative management. They reported that US-guided percutaneous needle aspiration was performed in 10 cases (56%; all >3 cm), four of which involved multiple abscesses. They documented that the larger collection was drained among the multiple abscesses and the smaller collections responded to antibiotics treatment. They suggested that an isolated splenic abscess in children responds to conservative treatment with intravenous broad-spectrum antibiotics and percutaneous drainage without the need for splenectomy, even in cases of multiple abscesses.

Conclusion

The nonspecific nature of the signs and symptoms of splenic abscess make imaging studies a cornerstone of diagnosis and imaging modalities, USG, computerized tomography, and the successful application of percutaneous aspiration and percutaneous closed drainage have changed approaches to diagnosis and therapy. The triad of fever left upper quadrant pain, and a tender mass has been suggested as an important complex.

The common organism found was salmonella typhi followed by streptococcus and Para typhi and in many instances the etiology could not be assessed. Most frequently used antibiotic was cephalosporins along with metronidazole for duration of 7-14 days extending up to 3-12 weeks also.

Only at one instance, use of immunosuppressive therapy was found to be useful. The most common intervention was USG guided aspiration or CT guided aspiration, and very rarely splenectomy was performed.

For this reason, splenic abscess should be considered, especially in cases with persistent fever, malignancy, and left upper quadrant pain. Early diagnosis, prompt treatment, and splenic preservation as a goal in children should be considered unless there are multiple abscesses and unresponsiveness to conservative regimen.

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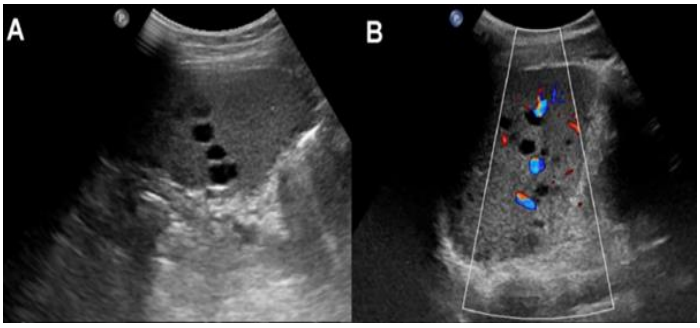
Legend Figures and Tables

Figure 1: A, B



Abdominal ultrasound showed multiple an-/hypoechoic lesions in the spleen with lack of perfusion in duplex sonography.

Table 1: Summary of Available Data.

Sn.	Institute	Age/ Sex	Chief complaint sign and symptoms	USG Abdomen/CT Abdomen	Organism isolated	Treatment	Outcome
1.	Institute of Child Health Kolkata (n=2)						
	Case 1 (Case report)	10 yrs/M	Fever, Pain abdomen – since 15 days Fever 102^{o}F Abdominal tenderness with	USG – Multiple hypoechoic area in spleen (largest – 42	Salmonella typhi	IV ceftriaxone / Ofloxacin. Splenectomy was	Recovered

			muscular guarding	mm diameter) CT – Multiple splenic abscess		performed as multiple abscesses were present which were not amenable to percutaneous drainage.	
	Case 2 (Case report)	10 yrs/M	Fever 1 month, pain abdomen 7 days Toxic look, T-103^{o}F, abdominal tenderness +, moderate hepatosplenomegaly	USG – Space occupying cystic lesion in spleen 5.5×4.9 cm	Salmonella typhi	IV ceftriaxone/ Ofloxacin. percutaneous splenic aspiration of 70 ml was done, Deroofing of abscess cavity was also done.	Recovered
2.	Kasturba Medial College Manipal (Case series) (n=7)	7 months – 15 years 4 M, 3 F	Fever, abdominal pain, splenomegaly	……	Burkholderia pseudo mallei, CONS	I/V antibiotics (3 generation cephalosporin, metronidazole, aminoglyco-coside) 5 children managed conservatively, 2	Recovered

						managed with USG guided aspiration	
3.	KGMC, Lucknow (Case report) (n=1)	14 yrs/ M	Fever, abdominal pain, anorexia Pallor, tachycardia, tender splenomegaly	USG- hypoechoic lesion 62× 53×52 mm in spleen suggestive of abscess CT – Moderate splenomegaly with well-defined heterogenous peripherally enhancing cystic lesion 40×45×48 mm in the lower pole of spleen	Specific etiology could not be established	I/V Amoxiclav for 7 days, CT at one month shows hypodense lesion of 8×10×10 mm and patient was symptom free with complete resolution at one year follow-up.	Recovered
4.	Gyeongsung National University, Jinju South Korea (Case report) (n=1)	14 yrs/F	Fever, chills, abdominal pain, vilious vomiting Abdominal tenderness present	CT – Multiple splenic abscess with largest 4 cm	Salmonella typhi	Antibiotics cefotaxim, Piperacillin/ tazobactum and amikacin, Day 6 – US guidance aspiration done Day 9 – CT guided percutaneou	Recovered

						s catheter drainage with pig tail catheter Day 26 – Patient discharged in good condition	
5.	LHMC, New Delhi (Retrospective review) (n=18)	18 childre n (3-16 years) M:F – 5:1	Fever, abdominal pain, anorexia Splenomegaly in 12		Salmonella para typhi A -1 in blood culture, splenic aspirate culture positive in 3, E-coli – 1, S. paratyphi A – 1, Acinetobact er – 1, Widal serology positive in 9 patients (50%)	I/V broad spectrum antibiotics (ceftriaxone, metronidazo le, amikacin, percutaneou s aspiration in 10 cases (56%). All patients responded with complete resolution	Recovered
6.	LHMC, New Delhi (Case report) (n=4)	4 childre n (7-10 yrs) M:F – 3:1	High grade fever with chills, left hypochondrial pain and splenomegaly	USG – Solitary abscess in 2 patients, multiple abscess in 2 patients	Blood culture sterile in all cases, Widal positive in 2 patients, E. coli in 1	I/V antibiotics (ceftriaxone, metronidazo le, amikacin), USG guided	Recovered

					case, Salmonella paratyphi A – 1 case	needle aspiration	
7.	National Hospital Abuja, Nigeria (Case report) (n=1)	7 yrs/F	Fever 4 days, vomiting, abdominal pain, diarrhea T – 40.2^{o}C Abdomen tender present	USG – Oval think walled echogenic mass in lower pole of spleen CT – Enlarged spleen with collection in lower pole – 5.05×4.1×4.58 cm	Pus culture – streptococcus	I/V broad spectrum antibiotics (ceftriaxone, metronidazole, amikacin) Laparotomy confirmed splenic abscess in lower pole necessitating partial splenectomy	Recovered
8.	Heidelberg University, Germany (Case report) (n=1)	15 yrs/F	Fever, aphthous ulcer 10 days, pain abdomen radiating to shoulder	USG – Multiple hyperechoic lesions in the spleen MRI – Hypointense signal on T1-T2 image	Multiple aseptic splenic abscess	Ceftriaxone, clindamycin, Day 4 – Meropenem, metronidazole Day 9 – Doxycycline Abscess aspiration shows granulocyte but no bacteria Immunosuppressive therapy with	Recovered

						prednisolone 2 mg/kg tapered after 11 weeks	

Table 2: Success and mortality rates with various treatment options.

Treatment	Number(n=29)	Success n= 21 (72%)	Mortality n=8 (28%)
Antibiotics alone	16	12 (75.0)	4 (25.0)
Antibiotics plus antifungals	5	3 (60.0)	2 (40.0)
Antifungals alone	3	2 (66.7)	1 (33.3)
Splenectomy and antibiotics	3	2 (66.7)	1 (33.3)
US- and CT-guided drainage	2	2(100)	0 (0)