Case Report

SPLENECTOMY FOR BACTERIAL CULTURE STERILE SPLENIC ABSCESS MANAGEMENT

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ABSTRACT

We presented a rare case, a 26-year-old woman have sterile aerobic and anaerobic bacterial cultures. Splenic abscess is a common case, the increased immunosuppression and treatment incidence. Clinical examination of the patient showed a dense cystic mass in the left upper abdomen. Ultrasonography examination suspected a dermoid cyst. However, MRI examination of the abdomen showed turbid cystic lesions. The surgery revealed a splenic abscess, while pus and splenic tissue examination revealed no bacterial proliferation. Abdominal CT scan or MRI imaging and splenectomy was very helpful for successfully this surgery. Based on the literature, the patient had a good prognosis.

Keywords: *Splenic abscess; splenectomy; woman; health risk*

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Highlights:

1. A 26-year-old woman have sterile aerobic and anaerobic bacterial cultures.
2. Pus and splenic tissue examination revealed no bacterial proliferation, while the surgery revealed a splenic abscess.

INTRODUCTION

Spleen is a vascular-rich organ in a reticuloendothelial immune system part. If splenectomy is mandatory, it will give consequence on the susceptibility to encapsulated bacterial infections and intraerythrocytic parasites. Splenic abscess may cause bacteremia. It is usually trauma, embolization or hemoglobinopathy consequence (Mustafa et al. 2015). Immunodeficiency is HIV virus risk factor impact (Haider et al. 2019, Kusumaadhi et al. 2021). Splenic abscess is a rare case. Based on discovery autopsy, it has an incidence rate ranging from 0.14%-0.7%. Splenic abscess incidence was higher in the tropics, where it is associated with splenic vascular thrombosis and infarction in sickle-cell anemia patients. Splenic abscess is potentially life-threatening. The mortality rate ranges from 15%-20% in healthy patients with unilocular lesions. It can be 80% in multiple-immunocompromised abscess patients.

The most recent case report reveals that spontaneous rupture due to various infections (malaria, listeria, fungal infections, dengue and Q fever), while neoplasms is the cause of splenic abscesses (Lal & Clark 2015, Townsend et al. 2016). The most common organisms causing splenic abscess are Streptococcus and Staphylococcus species, but Salmonella species, Gram-negative *Escherecia coli*, Enterococcus species, and fungal infections can be also the causative organisms (Yeo 2018).

About two-thirds of adult abscess cases are solitary and one-third are multiple. Children's conditions are the opposite of those in adults. Splenic abscess has a

bimodal age distribution with peak cases in the 3rd and 6th life decades. The mortality rate of splenic abscess is quite high and varies, depending on immune status and abscess type. The mortality rate shows about 80% in immunocompromised patients with multilocular abscesses, and 15% in immunocompetent patients with unilocular abscesses (Petroianu et al. 2009). Pathogens ware often isolated include *Streptococcus spp*., Staphylococcus (endocarditis is the most common cause of splenic abscess), mycobacteria, fungi and parasites (Kaczorek-Łukowska et al. 2021). Based on Sabah Malaysia research reports, *Burkholderia pseudomallei* is the most common cause of splenic abscess in certain individuals (Mustafa & Jayaram 2004).

Splenic abscess classified according to the cause. The most common cause was primary hematogenous spread from the nearest septic source. The common cause was bacterial endocarditis associated with valvular disease, intravenous drug consumption, bacteremia, and postoperative or primary intra-abdominal infections (McKinney 2012). Patients with abnormal functions and spleen forms were highly susceptible to this disease, such as lymphoproliferative, myeloproliferative, trauma and systemic arterial embolism. Immunocompromised patients, such as malignancy, organ transplants, HIV/AIDS and chronic steroid consumptions reach 35% for splenic abscesses (Yeo 2018). However, in this case report, disease exact cause was unknown, because clinical and supporting examinations could not identify the cause of the splenic abscess patient.

An initial supportive therapy and parenteral broad-spectrum antibiotics were prominently important to undertake while waiting for further diagnostics and therapies arrangements were made (Chang et al. 2008). The splenic abscess standard therapy is splenectomy. However, recent studies show different success rates with different abscesses approaches (Cash et al. 2006). Medical technology development, such as ultrasonography, computed tomography (CT), and magnetic resonance imaging (MRI) can improve diagnosis and therapy, so that the prognosis also improves (Mustafa et al. 2015).

Splenic abscess can occur in immunocompromised patients, neoplasm processes, immunodeficiency, trauma, infection spread, splenic infarction, and diabetes. These conditions can aggravate the single or multiple abscess progression. Multiple splenic abscess accompanied by lymphoma has not been documented (Abbasi et al. 2016). Variations of microorganisms isolated from splenic abscess were quite diverse. The most common aerobic and facultative bacteria were *Eschericia coli*, *Proteus mirabilis*, *S. bovis*, *Klebsiella pneumoniae*, and *S. aureus*, whereas the anaerobes were Pepto *Streptococcus spp*., *Bacteroides spp*., *Fusobacterium spp*. and *Clostridium spp.*

Successfully cultured organisms often reveal the underlying pathogenesis, for example, *S. aureus* and *S. bovis* are associated with endocarditis, *K. pneumoniae* with respiratory infections or liver abscess, *E. coli* with urinary and abdominal tract infections, *Bacteroides spp.* and *Clostridium spp.* with abdominal infections (Lee et al. 2011). Splenic abscess cases caused by *S. bovis* are rare and usually associated with septic emboli from endocarditis patients with colon cancer (Fitzsimmons et al. 2020). Aseptic splenic abscess was less common than splenic abscess in general. Most cases occur in Europe (Brooks & Ghaffari 2014). A small number of case series assess patients with sterile splenic abscess specifically. One case series found M-TB as the cause of negative culture in splenic abscess. A case series states that about 13% of the patients produced sterile abscess pus culture (Birkenmaier et al. 2006).

Some case reports found that splenic abscess is the first sign of Crohn's Disease. A case report in 2010 explained that aseptic splenic abscess patients showed Crohn's disease initial manifestations. Crohn’s disease was diagnosed after endoscopic biopsy that revealed cryptitis, inflammatory cells in lamina propria and epithelioid granuloma (Calzado et al. 2010). Infective endocarditis can associated with ischemic embolization and 10% is associated with splenic abscess. When clinician discovers a splenic abscess case, other investigations should immediately undertake to find the infection primary focus. In splenic abscess cases with suspected cause of infective endocarditis, a serial transthoracic echocardiogram can examined if it was not found other infection focus (McOwat et al. 2014). Here, we presented a rare case of aseptic splenic abscess in 26-year-old woman.

CASE REPORT

A 26-year-old female patient referred to the Digestive Surgery Clinic, Dr. Soetomo General Academic Hospital, Surabaya. The patient complained of a lump in stomach since 1 month before coming to the hospital. The lump was enlarged (Schuffner 2; Hacket 4) within 2 weeks felt a little sting when pressed. The patient also complained of nausea, subfebris fever and weakness in the last 1 week. The patient had no complaints of respiratory and cardiovascular organs, urinary tract organs, the change of bowel habit nor significant weight loss in the past 1 month. There was no previous trauma history.

The clinical presentation, general condition patient was moderate, compos mentis, cooperative, adequate nutrition, and sepsis (subfebrile temperature 37.5 ºC, leukocytosis 18.450, and qSOFA score 1). The patient's general status showed edema in both legs. Patient's local status inspection showed distended abdomen without *darm contour* and *darm steifung* description. Auscultation showed normal bowel sounds without abnormal sounds, such as metallic sound or borborygmi. Palpation showed a well-differentiated mobile cystic mass measuring 22 x 14 x 16 cm in the left upper abdominal region. The lump was painful when pressed and percussion showed liver dullness and shifting dullness. There were no enlarged lymph nodes in the bilateral inguinal region.

Upper lower abdominal ultrasound showed a mass measuring >20 cm firmly isoechoic with spleen and moderate vascularization suspected of a dermoid cyst. The abdomen MRI without and with contrast showed cystic lesions image with large turbidity inside in the upper left to lower abdomen (between the spleen and the right kidney). The spleen appeared pressed to the left rear and right kidney to down as high as the L5 with a lesion size of 15 x 20 x 24.2 cm.

The diagnosis was an intra-abdominal tumor. Regular blood tests indicated patient was suffering from anemia and hypoalbuminemia (Hb 9.9 g/dL, albumin serum 2.5 gr/dL), PPT/APTT was within normal limits (Ppt 13.4, cPpt 14.6, Aptt 38.4, cAptt 28.5). On July 19, 2018, surgery was carried out in general anaesthesia in exploratory laparotomy form, adhesiolysis, abscess drainage, and splenectomy. Based on clinical microbiology examination, aerobic form, anaerobic, and gram pus cultures operation did not find a germs formation, only polymorphonuclear (PMN) cells formation. Informed consent of fasting 6-8 hours pre-surgery procedure was obtained from the patient's family.

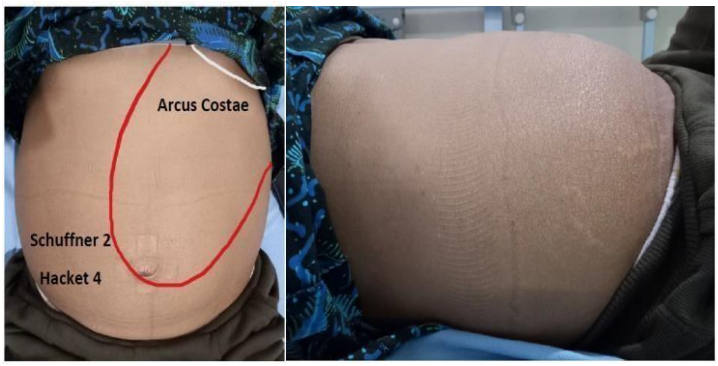

Figure 1. Patient's clinical presentation

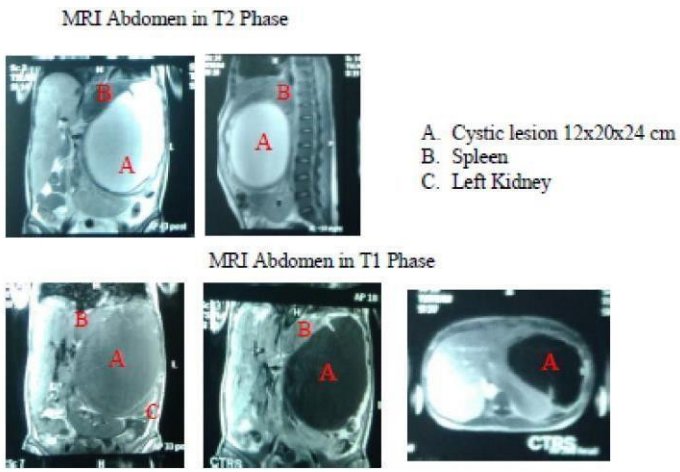

Figure 2. MRI of the patient's abdomen without and with contrast

Figure 3. The surgical procedure

Anatomic pathological examination of the spleen showed stroma with infiltration of neutrophil inflammatory cells, lymphocytes, histiocytes, and plasma cells. The fibrosis and necrosis area did not show malignancy signs. Cytological examination of pus fluid also showed spread of inflammatory PMN cells, signs of malignant cells, mononuclear, and macrophage. The operation began with the patient in supine position on the operating table in general narcosis with abdominal exposure as the operating object. A septic marker procedure was undertaken in the area to be incised, followed by an incision median line, starting from the xyphoideus process to suprapubic (Figure 3).

Then, the incision was deepened layer-by-layer until it opened the peritoneum and reached the peritoneal cavity. The exploration showed 5000 ml of turbid peritoneal fluid mixed with pus and intestine adhesion grade I-III. The omentum was walling off to the left upper and an enlarged spleen was found measuring 20 x 15 cm. Abscess was found. Then, adhesiolysis and splenectomy were undertaken, followed by washing the abdominal cavity with 0.9% NaCl as much as 10 liters. Bleeding was overcome by ligation and cauterization. The surgical wound was closed layer-by-layer and the operation was complete.

On the 19th day of post-surgery, the status patient was outpatient. Complaints of pain in minimal surgical wounds, no fever, and no swelling of both legs. On physical examination, dry surgery scars, hyperemia, and tenderness were not found. Furthermore, wound care was done once a day at home. Upon returning home, the patient was given therapy for 500 mg mefenamic acid, taken 3 times a day and 200 mg cefixime antibiotics taken 2 times a day. The patient was given education to vaccinate *Haemophilus influenzae*, meningococcal, and pneumococcal 4 weeks post-operatively.

DISCUSSION

Although splenic abscess is a rare case, basically this case is very fatal if not recognized and treated. With the increased incidence of immunosuppression and treatment, splenic abscess is a common case. Patients may have fever symptoms, leukocytosis and left upper abdominal pain as an immune response form. Radiological examination of the thorax and abdomen often shows left pleural effusion, increased left hemidiaphragm, mass in the upper left quadrant, and extra luminal air. CT Scan and MRI are imaging modalities that have very high sensitivity. Splenic abscess typically shows a thick irregular edge with hypodense in the middle, but multiple abscesses may be difficult to recognize (Krokos et al. 2011, Zavariz et al. 2017). In this case report, we presented a rare case about splenic abscess according to the literature.

In this splenic abscesses patient, bacterial culture was found to be aseptic. The case report by Brooks and Ghaffari (2014) stated that aseptic spleen abscess unresponsive to antibiotics were precursors of Inflammatory Bowel Disease and require further examination of colonoscopic biopsy (Brooks & Ghaffari 2014). Whereas, in this case report, the patient showed clinical improvement in antibiotics after splenectomy. Lee also reported K. pneumonia as a coinfected bacteria found in splenic abscesses originating from liver abscess or as sequel bacteria that spread from the liver to the spleen (Suk et al. 2011).

Treatment options for splenic abscess include broad spectrum antibiotics, splenectomy, and upper left quadrant drainage. If the patient's condition is critical and surgery is not possible, image-guided drainage should be considered (Yeo 2018). Percutaneous image-guided drainage has an open surgery advantage, including minimally invasive procedures, useful in high-risk patients who avoid general anesthesia with a

short operating time (Hamarayan et al. 2012). In this case, the splenic abscess patient had splenectomy and intravenous antibiotics with 750 mg levofloxacin in 24 hours and 500 mg metronidazole every 8 hours.

Typical signs and symptoms include fever, abdominal pain and tenderness in the left upper quadrant or palpable spleen due to enlargement (in 40% of the patients) along with chest symptoms (Plummer et al. 2004). Clinical examination did not reflect anything other than abdominal pain, which was more dominant in the left upper quadrant (Hamarayan et al. 2012). Diagnosis may be difficult given that only two-thirds of patients showed classic triad symptoms, e.g., fever, splenic enlargement, and left upper quadrant pain (Nagem & Petroianu 2009).

In splenic abscess cases laboratory findings, such as leukocytosis, increased C Reactive Protein (CRP), liver function, and kidney function were normal. Blood culture in 24-50% of the cases was positive (Ng et al. 2008). Chest and abdominal photos often show unspecified changes and can be used as a screening tool because they have high sensitivity but low specificity. Abnormal findings include infiltrates in the left lower lung lobe, left pleural effusion, and increased left hemidiaphragm. Abdominal ultrasound has very useful and added advantage for guideline of percutaneous needle aspirations, and catheter placement for continuous drainage. CT scan and MRI of the abdomen are more superior imaging modalities than others for splenic abscess evaluation (Hamarayan et al. 2012, Krokos et al. 2011).

In this case, the right decision for the patient was splenectomy, both with open and laparoscopic splenectomy. Significant splenomegaly (length >22 cm or weight >700 grams) was considered a contraindication, so that laparoscopic resection was performed, because it was difficult to manipulate and there was a risk of bleeding (Krokos et al. 2011). There are only three therapeutic modalities, namely (a) antibiotics only, (b) antibiotics with percutaneous drainage, and (c) splenectomy. Of the three therapeutic modalities, splenectomy provides the best results (Llenas-Garcia et al. 2009).

The surgery combination and antibiotic therapy were considered the most suitable treatment method. However, broad spectrum antibiotics should be given to patients who cannot be operated (Krokos et al. 2011). Minimally, the invasive method has the advantages of surgical risk minor and hospitalization short duration (Fotiadis et al. 2008).

Based on the results of examination (history, physical examination, laboratory, and pathology) and prognosis on the patient, we decided to perform splenectomy and provide antibiotics to obtain optimal operating results to reduce morbidity and mortality rate. As to the splenic abscess treatment, intravenous antimicrobial therapy, CT guided percutaneous aspiration, and splenectomies were the options.

An initial study had shown that the use of intravenous antimicrobial therapy alone resulted in 100% mortality (Ooi & Leong 1997). Percutaneous drainage was only performed when the abscess is unilocular or bilocular with a discrete wall, no internal septa, and liquid content (Llenas-Garc´ıa et al. 2009). Lee and Lee made a clinical review from 2012-2016 about the comparison of recovered and mortality rates with various treatment options, patients who get antimicrobial therapy alone (81,8% recovered; 18,2% mortality rate), antimicrobial therapy with splenectomy (100% recovered; no mortality rate), and antimicrobial therapy and percutaneous drainage (100% recovered; no mortality rate). Since there are no guidelines regarding its diagnosis and management. The best therapeutic approach for splenic abscess is still a matter of debate (Lee & Lee 2018). Complications of splenic abscess include fistula formation, rupture (43% mortality) and sepsis (Krokos et al. 2011).

In this case report, the patient's microbiological examination did not find bacterial growth. Sterile abscess indicated that the optimal isolation technique for anaerobic bacteria was not done (Krokos et al. 2011). The reported frequency of negative culture results reached 30%. This showed that the patient had been treated with antibiotics, sterile necrosis presence due to infarction, anaerobic cultures failure, and organisms that had not been identified (Brook & Frazier 1998). The bacterial culture sterile potential reason was antimicrobial treatment 3 days in this patient before. However, it seems to have geographical variations and a different population.

Klebsiella pneumoniae was a leading pathogen causing splenic abscess in Taiwan (Chang et al. 2006). *Mycobacterium tuberculosis* had been reported to be the most common liver abscess pathogen in Spain (Llenas et al. 2009). In Thailand, *Burkholderia pseudomallei* had been prescribed to be the most predominant pathogen in 60 cases of retrospective study on splenic abscess (Sangchan et al. 2003). Regarding fungal splenic abscesses, they were found predominantly in immunocompromised patients (Lee & Lee 2018). In this patient, we did not perform fungal and parasitic infection tests, because the HIV Screening test was

negative, and there was no immunocompromised clinical features.

Splenectomy patients have overwhelming post splenectomy infection (OPSI) lifelong risk. A condition associated with high mortality rates (Casciani et al. 2020). Encapsulated organisms are frequently associated with sepsis in splenectomies patients. An encapsulated organism, such as Streptococcus pneumoniae is particularly resistant to phagocytosis, but quickly overcome in the presence of even a small amount of type-specific antibody (Davidson & Wall 2001). Without the spleen, prompt antibody production against a newly encountered antigen is impaired and bacteria proliferate rapidly. Therefore, the invasive pneumococcal disease risk in patients without a spleen is 12-25 times greater than that in the population at large (Hirose et al. 2016).

The invasive disease in splenic patient due to such encapsulated organisms as *Streptococcus pneumoniae* (50%-90%), *Neisseria meningitidis*, *Haemophilus influenzae*, and *Streptococcus pyogenes* (25%) leads to uninhibited bacterial overgrowth (Okabayashi & Hanazaki 2008). According to the CDC, adult patients are required to have several vaccinations after splenectomy. Haemophilus influenzae B vaccination should be given once, Human Papilloma Virus (HPV) three times, Meningococcal A and B two times at interval of 8 weeks, Pneumococcal (Previary and Pneumovax) 1 to 2 times, and DPT (Diphtheria, Pertussis, Tetanus) and Zoster vaccinations, while vaccination for Hepatitis A, Hepatitis B, MMR (Mumps, Measles, Rubella) and varicella are given if necessary (Center for Disease Control and Prevention 2015). In this patient, vaccinations post splenectomy will be given based on CDC recommendation.

Strength and limitation

The strength of this case is the successful diagnosis and management of a rare condition, splenic abscess, despite the absence of bacterial proliferation on cultures. The use of advanced imaging techniques, such as abdominal MRI, allowed for the accurate identification of the lesion. The surgical intervention, splenectomy, was also effective in treating the abscess. Additionally, the prognosis for the patient was favorable, as reported in the literature. This case was the importance of considering unusual diagnoses and utilizing appropriate diagnostic tools to achieve successful outcomes in patient care.

CONCLUSION

Since splenic abscess has a high mortality rate when too late recognized. It should suspect diagnosis if a mass was found in the left upper abdomen. Careful clinical examination, supported with an initial imaging examination in the form of ultrasound abdomen as screening, was very helpful in establishing the diagnosis. Abdominal CT scan or MRI imaging can be used as a very sensitive and specific imaging tool for splenic abscess cases. For therapeutic modalities, splenectomy is one modality that is still the main choic for reducing mortality and morbidity by giving broad spectrum antibiotics to optimize therapy results.

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Conflict of interest
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Author contribution

APK conceived the idea of the study and wrote the manuscript. ED have to lead the surgery, validation the grammar and content. All authors were involved in the revision of the manuscript and have agreed to the final content.

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