



Case Report

Splenic Artery Aneurysm in A Primigravida

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Citation: Mohammad M, Shokeir T (2022) Splenic Artery Aneurysm in A Primigravida. Arch Surg Clin Case Rep 7: 228. DOI: 10.29011/2689-0526.100228

Received Date: 22 June 2024; **Accepted Date:** 02 July 2024; **Published Date:** 05 July 2024

Abstract

Abstract: Splenic artery aneurysm is the third most common true aneurysm occurring in the abdomen after aortic and iliac artery aneurysms. Splenic artery aneurysms are more common in women, with a female to male ratio of 4:1. It is most common in the sixth decade of life as 80 percent occurring in patients >50 years of age. The exact pathophysiology of an aneurysm formation is increased blood flow in turn leading to case irreversible damage to the tunica media, predisposing to aneurysm formation followed by muscle atrophy and calcification. Mortality in case of rupture is 25% and 75% among pregnant women, with fetal mortality of 95%.

Case Presentation: 22-year-old female primigravida 26 weeks of gestation presented to the emergency department with sudden severe right upper quadrant (RUQ) pain. On examination upon general inspection the patient was irritated however, she was conscious and alert to place, person and time. Her heart rate was 110 beats per minute otherwise she was vitally stable. Abdominal examination revealed a gravid uterus with a fundal height matching gestational age. Proper abdominal examination was not performed as patient was agitated, and her pain increased in severity when lying supine however, there was tenderness upon palpation in the RUQ with no rebound tenderness or peritoneal signs. Baseline investigations, Electrocardiogram (ECG), and obstetric ultrasound were all normal. Ultrasound abdomen revealed splenic artery aneurysm 2 cm in size with no evidence of leaking or free fluid in abdominal quadrants. Her Hb dropped from 11 to 8 g/dl she received 2 PRBC and her Hb improved to 10 but again dropped to 8.6 g/dl. Her blood pressure was 98/65 and her pulse: 117 beats per minute. The patient was shifted to operating theater and exploratory laparotomy was done. Intraoperatively ruptured splenic artery noted with hemoperitoneum approximately around 1.5 liters and splenectomy done. The patient received 4 pints of PRBC and 4 pints of FFP intraoperatively. Ultrasound was repeated postoperatively by the obstetrician and revealed a single viable fetus with good biophysical profile (BPP) with a score of 8/8. During her hospital stay the patient was managed by a multidisciplinary team (MDT) involving the obstetricians, vascular surgeon, general surgeon and hematologist. Patient was discharge from the hospital on baby aspirin 81 mg po OD and prophylactic dose of enoxaparin according to her weight, which was 0.8 ml S/C once daily. She was commenced on prophylactic penicillin V to cover encapsulated organisms and to reduce her risk of developing Overwhelming post-splenectomy infection (OPSI). The patient was informed about the need to get post splenectomy vaccinations which were the polyvalent pneumococcal, meningococcus, and Hemophilus influenza vaccines. Despite being properly counselled regarding the benefits and risks, she refused to take any of them believing it will harm her unborn fetus. Furthermore, she was followed up routinely in the antenatal clinic according to hospital protocol. Her antenatal follow up was uneventful. Patient was admitted when she was 41 weeks, admitted for induction of labor (IOL) However, due to failure to progress, emergency caesarean section done with good outcome. She was discharged on aspirin 81 mg po od and enoxaparin s/c bd for 6 weeks. She was given a follow-up appointment with hematology outpatient clinic after six weeks from delivery. Six weeks after delivery she was seen in the outpatient clinic of both vascular, hematology and obstetrics and gynecology. Her hemoglobin level was 13.9 and her platelets were 899. A decision was made to stop enoxaparin and to continue aspirin 81 mg po od due to thrombocytosis post splenectomy.

Discussion: Always approach the patient in a systematic way not forgetting non-obstetrical causes of the patient presentation. Multidisciplinary team is necessary (MDT) in the management of such cases.

Introduction

Splenic artery aneurysm is the third most common aneurysm occurring in the abdomen. In case if it occurs along with pregnancy it has a higher chance of rupture, leading to internal bleeding hemorrhagic shock, maternal or fetal morbidity and mortality. In this case report we present a case of a 22-year-old female primigravida who presented with right upper quadrant pain (RUQ) and found to have splenic artery aneurysm and the clinical course of her condition.

Case Presentation

22-year-old female primigravida 26 weeks of gestation presented to the emergency department with sudden severe right upper quadrant (RUQ) pain. The pain was described as pressure like in nature, and it radiated to the right scapula and bilateral flanks. It was associated with dizziness and tingling of bilateral upper limbs. The pain was constant and increasing in severity. It was exacerbated by lying supine, and it was improved by taking paracetamol and leaning forward. There was no headache, blurry vision, palpitations, nausea, vomiting, fever, change in urine or bowel habits, no history of travel or recent rash or illness and no history of sick contact. Her past medical history is insignificant. She has no known allergies and no history of blood transfusion. Her past surgical history included an inguinal hernia repair by the age of six years. Her family and social history are both unremarkable.

On examination upon general inspection the patient was irritated however, she was conscious and alert to place, person and time. Her vitals were as the following: Blood pressure 110/60, Pulse 110 beats per minute, Oxygen saturation 98% on room air and Temperature 36.7 C. Upon examining her abdomen, a gravid uterus was noted with a fundal height matching the gestational age calculated from the first day of her last menstrual period (LMP). Proper abdominal examination was not performed as patient was agitated, and her pain increased in severity when lying supine however, there was tenderness upon palpation in the RUQ with no rebound tenderness or peritoneal signs. Our working differential diagnosis was of the following: Acute coronary syndrome (ACS), Peptic ulcer disease (PUD), Biliary colic, acute cholecystitis and Pancreatitis. Our patient was investigated according to the list of differential diagnosis worked up. Thus, an Electrocardiogram (ECG) done which was unremarkable. Baseline investigations taken including a complete blood count (CBC), troponin, liver function test (LFT), pancreatic workup (amylase and lipase), renal function test (RFT), urinalysis and results were as the following: Wight blood cells (WBC) 22, Hemoglobin (Hb) 11.1, Platelets 325,

Troponin 2.9, her LFT's were in normal range as well as lipase and amylase. The patient was seen by an obstetrician and ultrasound of the fetus was done and revealed a single viable fetus matching date with normal amniotic fluid index and an upper placenta with no signs of hematoma or separation. Chest and spine X-rays were done and both were normal. Abdominal ultrasound done and revealed splenic artery aneurysm around 2 cm with no evidence of extravasation or leaking as shown in Figure 1. In addition, Doppler was done for the aneurysm as shown in Figure 2.

After the result of the investigations and imaging. The patient was admitted to the obstetric ward and an urgent vascular consultation was sent. Patient was seen by vascular team and reviewed her history and investigation results and advised for conservative management since aneurysm is 2 cm in size however, advised to further imaging in the form of CT scan with contrast to rule out leak and to keep 4 pints of packer red blood cells (PRBC) and fresh frozen plasma (FFP). The patient was counselled by the obstetrician for the need for performing CT scan with contrast and all risks and benefits explained to the patient, but she refused and signed a refusal form. The vascular surgeon advised to shift the patient to the intensive care unit (ICU) for close monitoring, however, the patient refused and wanted to stay in the ward. CBC was repeated every six hours to monitor for any Hb drop, since the patient refused to perform a CT scan. She was also followed up by serial abdominal ultrasound to follow up the size of the aneurysm and to check for free fluid and was normal.

Her Hb dropped from 11 to 8 g/dl she received 2 PRBC and her Hb improved to 10 but again dropped to 8.6 g/dl. During that time the patient was vitally stable with no abdominal pain or per vaginal (PV) loss. The patient was seen by an obstetrician and ultrasound done to rule out any obstetric cause for Hb drop and revealed single viable fetus with normal amniotic fluid index upper placenta with no evidence of separation or hematoma. Dexamethasone was given according to hospital protocol. The patient then was counselled for the need to perform further imaging to rule out leaking and was given an alternative option to perform an MRI scan and agreed. The patient was offered to perform an MRI, in which she agreed. MRI was done and showed dilated terminal part of splenic artery at the splenic hilum measuring 29x81 mm with free fluid in the gastro-splenic and left splenorenal regions, with suspected early sub-acute blood loss as shown in Figure 3. Her vitals were as the following: Blood pressure 98/65, Pulse 117 beats per minute. Oxygen saturation 99% on 2L oxygen and Temperature: 36.7 C. Abdominal examination was the same finding with RUQ tenderness with no rebound or peritoneal signs.

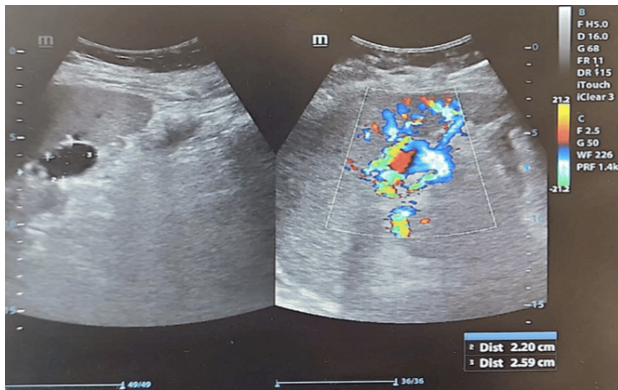


Figure 1: Splenic artery aneurysm.

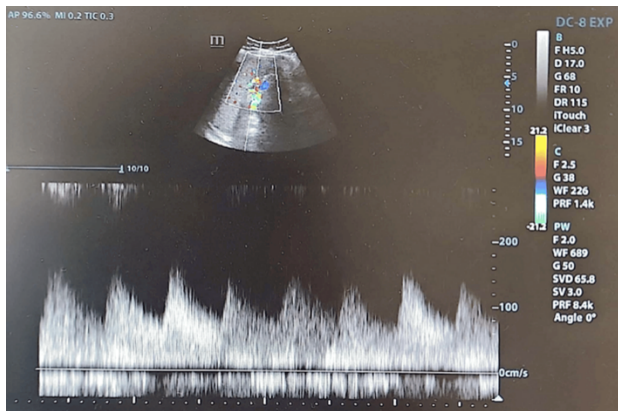


Figure 2: Splenic artery aneurysm Doppler.

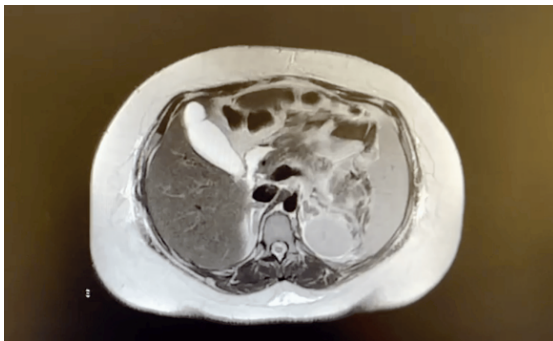


Figure 3: Free fluid in MRI reaching Morrison's Pouch.

The patient was given dexamethasone intramuscular injection and a loading dose of magnesium sulphate for neuroprotection as the patient was shifted to operating theater and exploratory laparotomy was done. Intraoperatively ruptured splenic artery noted with hemoperitoneum approximately around 1.5 liters and splenectomy done. The patient received 4 pints of PRBC and 4 pints of FFP intraoperatively. Postoperatively, the patient was

shifted to the ICU to be kept under close observation. Ultrasound was repeated postoperatively by the obstetrician and revealed a single viable fetus with good biophysical profile (BPP) with a score of 8/8.

On post-operative day 1 the patient developed hypoxia and was kept on high flow face mask. Septic workup sent and antibiotics escalated. ECG done and was normal. Troponin was 94. Bedside echocardiogram (ECHO) was done and revealed good left ventricular function, dilated right ventricle with mild tricuspid regurgitation (TR) and dilated pulmonary artery as shown in image. She was kept on heparin infusion according to protocol. Doppler of bilateral lower limbs was done, and deep vein thrombosis was excluded. The patient was counselled for the need of CT pulmonary angiogram to rule out pulmonary embolism (PE) however, she refused and signed refusal consent.

During her hospital stay the patient was managed by a multidisciplinary team (MDT) involving the obstetricians, vascular surgeon, general surgeon and hematologist. Patient was discharge from the hospital on post-operative day 14 (19/6/2022). As per Royal College of Obstetricians and Gynecologists (RCOG) he was discharged on baby aspirin 81 mg tablet once daily and prophylactic dose of enoxaparin according to her weight, which was 0.8 ml S/C once daily for thromboprophylaxis [1]. To prevent sever post splenectomy infection (OPSI) and according to latest guidelines she was commenced on prophylactic penicillin V [2]. However, she refused to receive pneumococcal, meningococcus, and Hemophilus influenza vaccines. Furthermore, she was followed up routinely in the antenatal clinic according to hospital protocol. Her antenatal follow up was uneventful.

Patient was admitted when she was 41 weeks, admitted for induction of labor (IOL) by Prostaglandin E2 as she was overdue. However, due to failure to progress, emergency cesarean section done outcome alive baby girl 3.6 Kg Apgar score 8 and 9. On Post-operative day two upon examination the patient was vitally stable her abdomen was soft and lax and the cesarean section wound intact, clean and dry. She was discharged on aspirin 81 mg oral tablet once daily and enoxaparin subcutaneous injection twice daily for 6 weeks. She was given a follow-up appointment with hematology outpatient clinic after six weeks from delivery. Six weeks after delivery she was seen in the outpatient clinic of both vascular, hematology and obstetrics and gynecology. Her hemoglobin level was 13.9 and her platelets were 899. A decision was made to stop enoxaparin and to continue aspirin 81 mg tablet to be taken once daily due to thrombocytosis post splenectomy.

Discussion

A true aneurysm is an abnormal thinning or ballooning in the wall of a weakened blood vessel. An aneurysm can rupture, causing

internal bleeding, and in severe cases it can lead to hemorrhagic shock and death if not identified and treated promptly. In comparison, a pseudoaneurysm or a false aneurysm of the vessels, occurs when a blood vessel wall is injured and the leaking blood collects in the surrounding tissue of the blood vessel. Aneurysms most commonly affect cerebral circulation and the aorta, but it can occur in any of the peripheral blood vessels in the body [3]. Splenic artery aneurysm is the third most common true aneurysm occurring in the abdomen after aortic and iliac artery aneurysms. Splenic artery aneurysms are more common in women, with a female to male ratio of 4:1. It is most common in the sixth decade of life as 80 percent occurring in patients >50 years of age [4]. Splenic artery aneurysms are usually solitary and are localized to the distal third of the artery, the bifurcation region, and the splenic hilum. Increased blood flow through the splenic artery has been suggested to lead to irreversible damage to the tunica media, predisposing to aneurysm formation followed by muscle atrophy and calcification [4]. Approximately one third of patients who have an aneurysm have multiple aneurysms [4]. Splenic artery aneurysms are commonly associated renal artery aneurysms as 14% of patients may have concurrent renal artery aneurysm. [4]. False aneurysms of the splenic artery are uncommon but can occur, in association with pancreatitis or can be a result of instrumentation, for example post Endoscopic retrograde cholangiopancreatography (ERCP) [4]. Risk factors of true splenic artery aneurysms are commonly associated with conditions of increased flow, such as: Pregnancy particularly multiparity with a prevalence of splenic artery aneurysm in females of childbearing age is less than 0.1 percent [4]. Arterial venous fistulas and malformations [4]. Portal hypertension with a prevalence of splenic artery aneurysm in patients with liver cirrhosis and portal hypertension is 7 to 20 percent because of the large portosystemic shunt [4].

Patients with symptomatic splenic artery aneurysm present with nausea and vague abdominal discomfort in the mild epigastric or left upper quadrant. This may be associated with left shoulder discomfort associated with irritation of the diaphragm [4]. The classic presentation of ruptured splenic artery aneurysm is the “double rupture phenomenon.” Initial rupture of a splenic artery aneurysm is associated with severe abdominal pain with or without hemodynamic instability, which is compensated for and followed by a period of relative normalization. This is due to containment rupture within the lesser sac and tamponade of the splenic artery aneurysm. If untreated, the lesser sac can give way, leading to free rupture into the peritoneal cavity with recurrent hemodynamic instability [4]. Diagnosis of splenic artery aneurysm is done after proper history taking, physical examination, investigations and imaging including ultrasound, computed tomography (CT scan) or magnetic resonance imaging (MRI scan) [4]. Mortality associated with splenic artery aneurysms (SAA) associated with a

high mortality rate of 25% in case of aneurysm rupture [4]. This increases to 75% among pregnant women, with fetal mortality of 95% [4].

The prevalence of splenic artery aneurysm in women in childbearing age is 0.1% [4]. Parity, however, seems to influence the incidence of SAA in women, being four times more common in multiparous women [5]. In pregnancy, influence of hormones namely estrogen, progesterone and relaxin on the arterial wall plays a significant role. The first two hormones presumably result in histological alteration of the arterial wall mainly medial degeneration leading to aneurysmal dilatation [6-7]. Relaxin may augment the effect of these hormones by further enhancing the elasticity of splenic artery as suggested by de Vries et al [8]. This may be responsible for the increased incidence of rupture during pregnancy as it weakens the arterial wall [9]. The incidence of rupture of the aneurysm during pregnancy is as follows: 12% of SAA rupture during the first two trimesters; 69% during the third trimester, 13% at childbirth; and 6% at puerperium [9]. Rupture of SAA in pregnancy is associated with an exceedingly high maternal and fetal mortality rate, reaching 75% and 95%, respectively [10-11]. Good perinatal outcomes can only be achieved by early diagnosis and prompt multidisciplinary treatment [12]. Splenic artery aneurysm may either be managed either conservatively or operatively. Conservative management is indicated for poor surgical candidate, aneurysms that are asymptomatic and less than 2 cm. Conservative management includes regular follow up and imaging to determine if their symptoms have developed or if there is any increase in the size of aneurysm which may warrant endovascular or surgical repair. This excludes pregnant patients with splenic artery aneurysms as it is recommended to treat this population regardless of the presence of symptoms to minimize the risk of rupture and the associated morbidity and mortality for both the mother and fetus [4].

On the other hand, it is recommended by the Society for Vascular Surgery (SVS) to surgically intervene in case of the presence of a pseudoaneurysm regardless of size or symptoms as it has a higher probability of rupture compared with true aneurysm. In addition, the following should also be treated promptly if present: asymptomatic aneurysm ranging from 2-2.5 cm or larger, symptomatic aneurysms, asymptomatic aneurysm with rapid expansion expanding more than 0.5 cm/year and aneurysms found in patients undergoing liver transplantation [13]. Management options include endovascular interventions and surgical procedures either done via laparotomy or laparoscopy. Endovascular intervention includes embolization or endovascular stenting. These interventions are done using catheter-based technologies that access the common femoral artery in the groin, or the brachial artery in the arm [13]. Complications of endovascular treatment include entry site hematoma, aneurysms

pseudo-aneurysms, arterial thrombosis, non-target vessel embolization, coil migration, splenic infarction leading to post-operative pain, allergy to contrast, contrast induced nephropathy, re-perfusion, compartment syndrome and rarely radiation induced skin injury. Stent thrombosis and occlusion may occur [4].

Finally, surgical interventions include either laparotomy or laparoscopy. In cases of hemodynamic instability laparotomy is preferred. In case of an elective procedure the decision to go for open or laparoscopic approach depends on the location of the aneurysm, previous surgeries, and available clinical expertise [4]. Compared with endovascular interventions, open surgery has the advantage of reduced need for follow-up studies, and mortality rates as low as 0.5 percent in elective repairs [4].

Conclusions

In conclusion, the exact incidence of SAA in primigravid women is unknown and needs to be investigated in further research. However, it has been shown that elderly primigravida are at increased risk for splenic artery aneurysm rupture. Despite being considered a rare diagnosis it should always be in the list of differential diagnosis even in a patient who is primigravida presenting symptoms of abdominal pain as it may lead to massive bleeding due to aneurysm rupture or even splenic rupture as reported by et al which can lead to hemorrhagic shock, fetal demise and maternal death. SAA should also be a differential diagnosis in women presenting with sever preeclampsia due to the effects of high blood pressure on circulation of blood and vascular integrity. Multidisciplinary team management improves outcomes for complicated cases.

Declarations

- **Ethics approval and consent to participate**

-Consent was taken from the patient and she was informed that data will be displayed in a manner insuring her confidentiality

- **Consent for publication**

-Consent was taken from the patient and she was informed that data will be displayed in a manner insuring her confidentiality

- **Availability of data and materials**

-All data and materials are available upon request

- **Competing interests**

-None

- **Funding**

-None

- **Authors' contributions in this paper**

- Conceived and designed the analysis

- Collected the data

- Contributed data or analysis tools

- Performed the analysis

- Wrote the paper

- **Co-author contributions in this paper**

- Conceived and designed the analysis

- Collected the data

- Contributed data or analysis tools

- Wrote the paper

- **Acknowledgements**

-I would like to thank my colleague Dr. Tarek Nabil Shokeir for bringing the weight of his experience and knowledge to this paper

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Citation: Mohammad M, Shokeir T (2022) Splenic Artery Aneurysm in A Primigravida. Arch Surg Clin Case Rep 7: 228. DOI: 10.29011/2689-0526.100228

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