A Case of Malaria-Induced Splenic Infarction

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ABSTRACT

Splenic infarction is one of many possible complications arising from a Malarial infection and is commonly caused by *Plasmodium falciparum*. It is largely underdiagnosed due to the non-specificity of its signs and symptoms. Only few cases have been reported in the literature. A 42-year-old male presented with five-day history of a high-grade fever, headache, myalgia and generalized body weakness. Peripheral blood smear confirmed malarial infection as a result of *Plasmodium falciparum*. Few days later, the patient developed left upper quadrant abdominal pain and splenic infarction was diagnosed by ultrasound and computed tomography and the patient was treated successfully.

Keywords: Plasmodium falciparum, Complicated malaria, Splenic infarction

INTRODUCTION

Worldwide, an estimated 627,000 deaths were caused by Malaria in 2020, out of approximately 241 million people that were afflicted with the disease during that same year.[1] A disease that thrives in tropical and subtropical countries, it is transmitted to humans by a group of small protozoans known as the Plasmodium species, of which five are known to have the means to infect humans: *Plasmodium malariae*, *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium ovale* and *Plasmodium knowlesi*. These protozoans are transmitted to humans by infected Anopheles mosquito vectors[1,2].

With a mortality rate ranging from 0.3% to 2.2%, increasing up to 11% to 30% in tropical regions[3], it is important for a physician to efficiently recognize the signs and symptoms of Malaria, and to be able to effectively diagnose and manage it in order to avoid several life-threatening complications. A multitude of complications can be brought on by Malaria, such as shock, respiratory distress, cerebral malaria and multiple organ dysfunction[4,5]. In addition, Malaria can cause structural changes to the spleen, leading to an array of splenic complications ranging from asymptomatic splenomegaly to splenic infarction, splenic cysts, hyperspleenism and splenic rupture[6]. We present a case of a 42-year-old patient returning from Sudan with a classical clinical picture of Malaria complicated by the development of splenic infarction during admission in the ward.

CASE

A 42-year-old male presented to a General Practitioner (GP) clinic in our hospital complaining of a five-day history of a high-grade fever, headache, myalgia, generalized body weakness, and a two-day history of watery diarrhea and vomiting. The patient had no other significant associated symptoms. His past medical history was notable for Diabetes Mellitus, Hypertension and Dyslipidemia, and his relevant regular medications are Glucophage 1000 mg once daily and Perindopril/ Amlodipine 5mg/5mg once daily. He had a past surgical history compromising of an uncomplicated tonsillectomy and appendectomy. Prior to his presentation, he just arrived from a 2 months' vacation in Sudan.

Upon assessment in the GP, the patient was oriented and conscious, with a Glasgow Coma Scale of 15/15 and an intact neurological examination. He had a high-grade fever of 39.3^{0}C with a blood pressure of 113/73 mmHg. On physical examination, he was neither pale nor jaundiced, and his abdomen was soft and non-tender with a palpable liver edge and non-palpable spleen. Cardiovascular examination showed normal heart sounds with no murmurs, and a respiratory examination revealed equal bilateral air entry with no added sounds. The rest of his physical examination showed nothing of significance.

Blood investigations were ordered, and an initial complete blood count (CBC) revealed a white blood cell count (WBC) of 8.89 x $10^3/\mu$L, hemoglobin (Hb) of 11.7 g/dL, and a platelet count of 56 x $10^3/\mu$L. No liver function tests (LFTs) were performed at this stage. Laboratory investigations confirmed malarial infection as a result of *Plasmodium falciparum via* malarial blood smear and a positive *Plasmodium falciparum* histidine-rich protein 2 (Pf-HRP-2). Patient was prescribed a three-day course of an oral Chloroquine by the GP and was discharged home.

A few days later, patient presented to our Infectious Diseases clinic as a referral from the GP with worsening symptoms. Patient looked unwell and was hemodynamically unstable with hypotension (blood pressure of 88/52mmHg) and tachycardia (heart rate of 126bpm). He was immediately managed in the Accident and Emergency department and shifted to the medical ward after stabilization. On admission, his physical examination showed left upper quadrant abdominal tenderness, along with jaundice and dehydration. His admission investigations revealed a C-reactive protein (CRP) of 240.21 mg/L, Procalcitonin (PCT) of 228.6 ng/ml, serum aspartate aminotransferase (AST) of 152.2 IU/L, alanine aminotransferase (ALT) of 152.9 IU/L, alkaline phosphatase (ALP) of 380 IU/L, gamma-glutamyl transpeptidase (GGT) of 466 IU/L, total bilirubin of 68.9 umol/L, direct bilirubin of 55.1 umol/L, Urea of 11.7 mmol/L and Creatinine of 182 umol/L. A septic workup revealed no signs of infection in both urine and blood cultures. His malaria parasitemia was 9%. The patient was empirically started on Ceftriaxone and managed with a course of Atovaquone/Proguanil. The choice of anti-malarial was based on available drugs in our institute.

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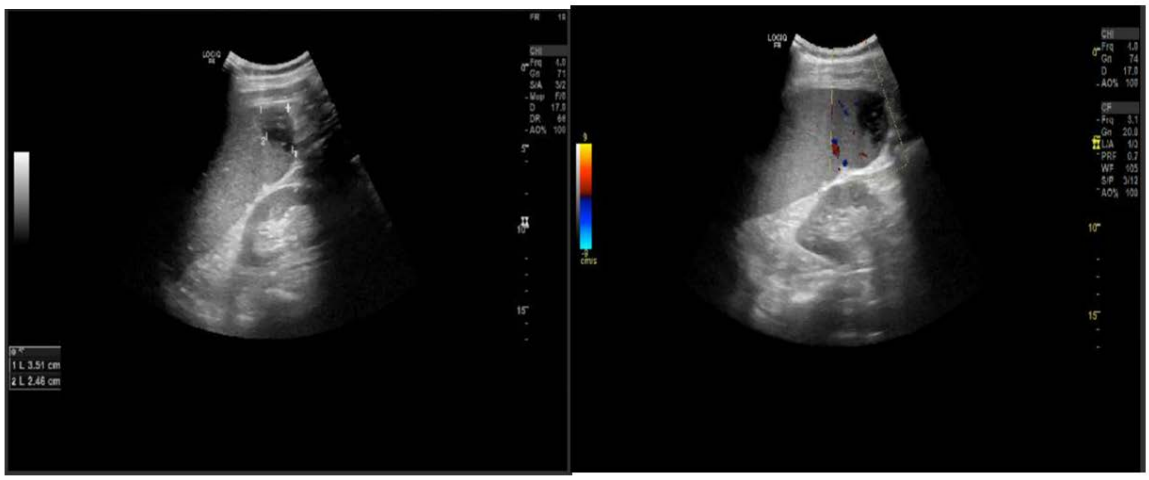

Figure 1: Ultrasound of upper abdomen showing enlarged spleen with an ill-defined hypoechoic areas seen in the spleen with no vascularity seen on color doppler

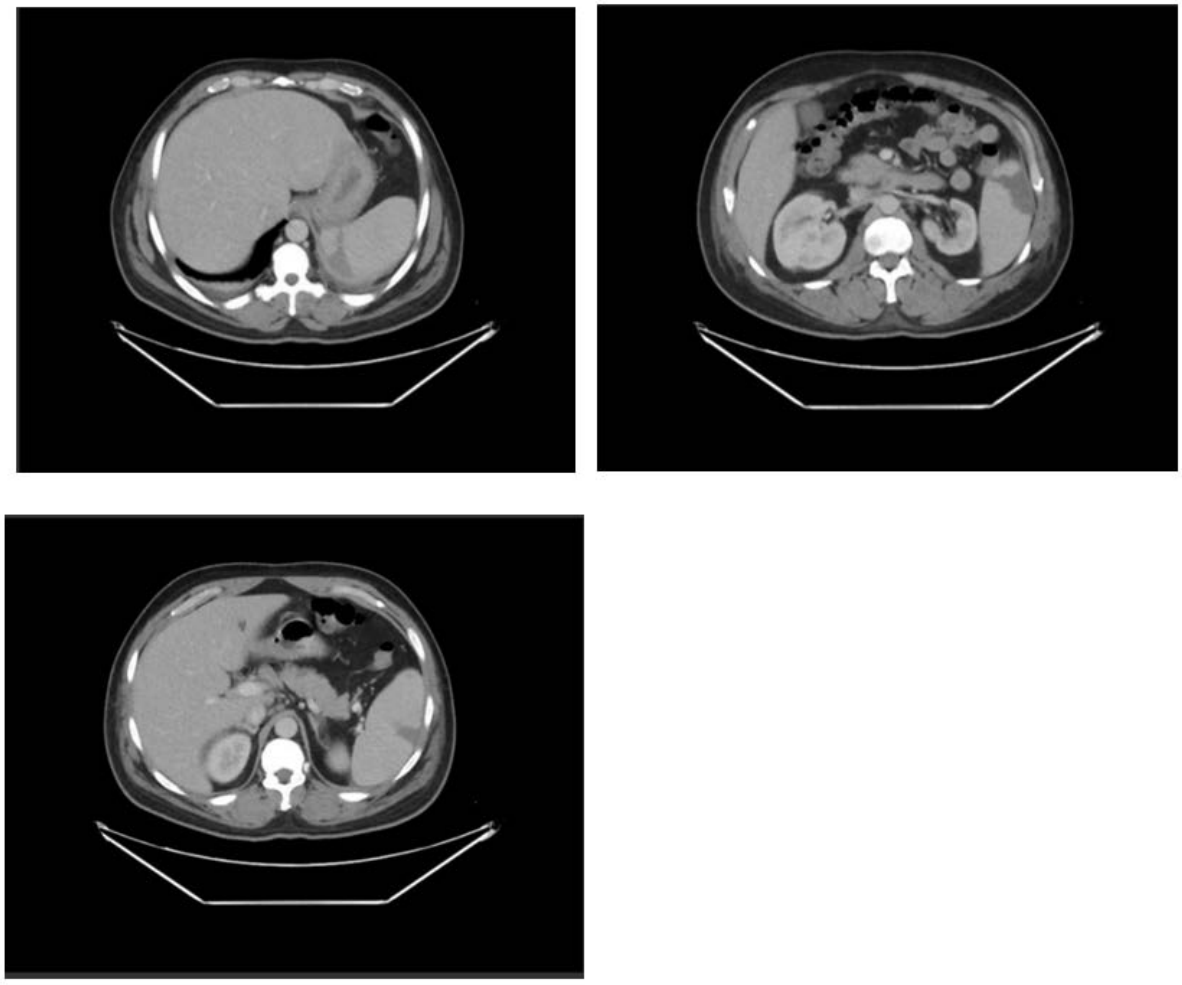

Figure 2: Enhanced CT scan of the abdomen at multilevel showed multiple peripheral wedged shape hypo enhancing lesions seen in the spleen

Two days' post admission, the patient developed left upper quadrant abdominal pain. An ultrasound showed an enlarged spleen with a hypoechoic lesion measuring 3.51x 2.46 cm. No vascularity seen within the lesion on color Doppler (Figure 1). The liver and kidneys were normal, and no intra-abdominal free fluid could be appreciated. The differential diagnosis for these findings is either splenic infarction, splenic abscess and less likely splenic rupture. Next step, CT scan with IV contrast (Porto-venous phase. Figure 2) was done and showed multiple wedged-shaped hypo-enhancing lesions seen in enlarged spleen which is consistent with multiple splenic infarctions. The liver, pancreas and the kidneys were unremarkable. The splenic vessels were patent and free of thrombus, and no intra-abdominal free fluid present.

The patient completed his treatment course, and his parasitemia level was monitored closely with complete resolution on discharge. The splenic infarction he developed was treated conservatively with no further complications. Post discharge from the ward, the patient was serially followed by our ID clinic, where he reported gradual improvement and complete resolution of all his symptoms. His latest appointment revealed that his inflammatory markers, CBC and LFTs were normalized, and had a parasite count of 0%, thus patient's clinical picture was deemed resolved and no longer required any further intervention. No follow-up radiological investigation was done for the patient.

DISCUSSION

Any disruption to the arterial supply of the spleen may lead to parenchymal ischemia, thus subsequently, splenic infarction occurs. While splenic infarction has several, well-established causes, a majority of cases can be attributed to hematological disorders that result in the congestion of the vascular circulation of the spleen, namely by thromboembolism or abnormal cells. These include adult respiratory distress syndrome, chronic myeloid leukemia, sickle-cell disease, infective endocarditis and atrial fibrillation[7]. Other less common causes include vasculitis, infiltrative diseases (sarcoidosis or amyloidosis), trauma or as a result of surgery, namely pancreatectomy or liver transplantation[8,9]. A rare cause of splenic infarction is Malaria, and while the exact pathophysiology is still unknown, several hypotheses have been suggested. One of these theories states that a formation of a microthrombus in the splenic capillary system can lead to a disturbance in the vascular supply system, and as such, results in necrosis. Another theory suggests that it occurs as a direct result of the release of vasoactive factors within capillaries due to red cell lysis[10].

Malaria-induced splenic infarction is largely underdiagnosed due to the non-specificity of its signs and symptoms. A patient's clinical presentation can vary from an asymptomatic or mild course that goes unnoticed or incidentally diagnosed by radiography or post-mortem to more severe cases with complications such as splenic rupture and hemorrhagic shock. Patients can present with left upper quadrant (LUQ) abdominal pain that radiates to the left shoulder, tachycardia, nausea, vomiting, fever or pleuritic chest pain, although it is quite rare. On physical examination, LUQ abdominal tenderness is the most common sign that a patient may present with[9]. A clinician must be able to suspect a diagnosis of splenic infarction in patients afflicted with Malaria that develop abdominal pain, especially when that pain arises in the left hypochondrial region.

No specific laboratory investigation can confirm the diagnosis of splenic infarction, although the literature available suggests that a patient with splenic infarction may present with a CBC that reveals anemia, leukocytosis and thrombocytosis[7,9]. Several radiological investigations are available that can accurately identify splenic infarction and have a significant role in its diagnosis.

The literature available suggests that although ultrasonography can be used, it is not recommended as a definite diagnostic tool as the difference between the echogenicity of normal and infarcted splenic tissue is quite minimal in the acute phase, as it was only diagnostic in 18% of the patients , but it is helpful in identifying certain complications that may arise as a result of splenic infarction, such as the development of a subscapular or peritoneal hemorrhage, or the formation of a pseudocyst or abscess[8]. The gold standard non-invasive investigation is the use of a contrast Computed Tomography (CT), and is the radiological modality of choice. A splenic infarction on a CT scan may appear as a wedge-shaped or focal localized infarct, or as a global one, and this largely depends on the site of vascular occlusion by the thrombus. Arising as a branch of the short gastric artery, the splenic artery is responsible for the blood supply to the spleen, and as the arterial supply within the spleen is segmental, any obstruction of its branches will cause the infarcts to develop[7]. As of this date, there are no radiological findings that are specific to malaria-induced splenic infarction.

In most cases of splenic infarction, treatment is conservative without the need for any surgical intervention. In cases of malaria-induced splenic infarction, it is essential to properly treat the infection with the recommended regimen of anti-malaria medications. Nonetheless, surgery should be performed when complications such as persistent symptoms, pseudocyst, abscess and splenic rupture arise[7,9]. In both modes of management, taking either a conservative or surgical approach both warrant close follow-up of the patient post-discharge.

CONCLUSION

While splenic infarction occurs in a minority of cases of Malaria, its' resulting complications may prove devastating to a patient's clinical outcome, thus prompt diagnosis and management is vital. Although symptoms of splenic infarction are highly non-specific, the presence of LUQ pain that radiates to the left shoulder, tachycardia, nausea and vomiting are indicative of it, especially in patients who are actively afflicted with Malaria. Several radiological interventions, such as ultrasound and CT scan, are available and can help lead a physician into reaching the proper diagnosis. Finally, if detected early on, splenic infarction can successfully be managed conservatively with excellent clinical outcomes without the need of any further interventions.

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