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Ventricular Assist Device-Related Haemolysis Presenting with Acute Pancreatitis

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ABSTRACT

Acute pancreatitis is one of the rare complications in patients fitted with a left ventricular assist device (LVAD). We herein report a case of acute pancreatitis in a patient with LVAD triggered by intravascular haemolysis. A 44-year-old man with non-ischaemic cardiomyopathy (NICM) after VAD implantation presented with epigastric pain. Laboratory work-up showed acute pancreatitis and haemolysis. As there was concern that device thrombosis was causing haemolysis, the patient was started on unfractionated heparin infusion. The patient was discharged when haemolysis and pancreatitis had resolved. To our knowledge, VAD-associated haemolysis presenting with acute pancreatitis is infrequently described in the literature.

LEARNING POINTS

- Our case report highlights a rare presentation of device thrombosis presenting as haemolysis and pancreatitis in a patient fitted with a ventricular assist device (VAD).
- Our case report aims to educate internists to keep in mind a potentially life-threatening condition when taking care of patients with VAD.
- Our case report highlights haemolysis as a rare cause of acute pancreatitis.

KEYWORDS

VAD thrombosis; VAD complication; acute pancreatitis; haemolysis

INTRODUCTION

Acute pancreatitis is an inflammatory disorder of the pancreas that ranges in severity from mild to severe and may lead to multiorgan dysfunction. Acute pancreatitis mortality varies from 1.5% to 17% depending on the severity of disease[1]. Several conditions are known to cause acute pancreatitis, with gallstones (40–70%) and alcohol (25–35%) responsible for most cases[2]. However, 15–25% of cases are labelled idiopathic[3]. In recent years, there has been an increase in the use of continuous flow ventricular support devices such as left ventricular assist devices (LVADs) and biventricular support assist devices (BiVADs) for patients with end-stage heart failure. Ventricular assist devices (VADs) are used in end-stage heart failure as a bridge to orthotopic heart transplantation (OHT) or as a destination therapy in those who decline or are not candidates for OHT. Mechanical circulatory assist devices can be challenging to manage and are associated with several complications which can be life threatening such as bleeding, infection, pump thrombosis, right heart failure and device malfunction[4]. Among the abdominal complications, acute pancreatitis is one of the rare complications seen in patients with LVADs[5–7]. We here report a case of acute pancreatitis in a patient with LVAD triggered by intravascular haemolysis.

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CASE PRESENTATION

A 42-year-old man with end-stage-heart-failure treated with an LVAD for 1 year, atrial fibrillation (on warfarin), hypertension and recent stroke presented with epigastric abdominal pain of 3 days' duration. Physical examination was notable for moderate epigastric tenderness. Laboratory studies revealed a leukocytosis of 16.5×10^3/µl and a haemoglobin decrease from 9.2 g/dl to 7.8 g/dl, total bilirubin of 2.2 mg/dl, direct bilirubin of 1.3 mg/dl and lipase of 100 IU/l. An abdominal ultrasound showed a normal bile duct and gallbladder. Computed tomography (CT) of the abdomen demonstrated an oedematous pancreas with infiltration of surrounding fat consistent with acute interstitial pancreatitis. The patient received supportive care with intravenous fluids, analgesia and bowel rest. The acute anaemia and hyperbilirubinaemia prompted work-up for haemolysis. The haemolysis panel showed an LDH of 440 IU/l, haptoglobin <8.0 mg/dl, reticulocyte count 4.3% and evidence of schistocytes on blood smear microscopy. The patient was started on unfractionated heparin infusion for suspected haemolysis due to VAD thrombosis. The anaemia gradually improved along with resolution of pancreatitis in 3 days. The patient was discharged to the rehabilitation centre on warfarin.

One month later, the patient again presented to the clinic with dark-coloured urine. Subsequent laboratory evaluation revealed an LDH of 1,575 IU/l, haptoglobin <8 mg/dl, haemoglobin 9.1 g/dl and total bilirubin 2.7 mg/dl. VAD interrogation revealed a recent power elevation suggestive of device thrombosis. The patient was admitted and started on unfractionated heparin infusion for presumed pump thrombosis. An echocardiographic ramp study confirmed the diagnosis. The LDH peaked at 1,880 IU/l. Despite heparin infusion, the patient continued to have haemolysis, so a decision was made to explant the device and the patient underwent pump exchange. Post-operatively, the haemolysis resolved and the LDH started trending down to a nadir of 432 IU/l at the time of discharge.

DISCUSSION

Animal studies have shown that heme released after massive haemolysis can induce pancreatitis in 80% of the studied samples. Haemolysis itself may induce acute pancreatitis by neutrophil activation, chemo-attraction, oxidative burst, a direct pro-inflammatory effect, microcirculatory disturbance, and increased expression of pro-inflammatory and immunoregulatory cytokines[8]. In our case, the patient developed findings of acute pancreatitis secondary to intravascular haemolysis at the time of initial diagnosis of device thrombosis. One study estimated the incidence of haemolysis in LVAD patients to be 9% at 2 years after LVAD implantation[9]. A literature review shows that very few cases of haemolysis-induced acute pancreatitis[10] have been reported and we feel that the true incidence of acute pancreatitis due to haemolysis especially in patients with LVAD may be under-reported. Robertson et al. described seven cases of VAD-associated haemolysis precipitating acute pancreatitis[5].

Our patient developed device thrombosis, which is a major complication of VAD. Early recognition of this entity is important for both internists and cardiologists to avoid serious consequences such as stroke or pump malfunction. Thrombus formation in VAD is a multi-factorial process. The surrogate markers of device thrombosis include power elevation, clinical signs of haemolysis, an isolated increase in LDH and symptoms of heart failure[10]. VAD-associated haemolysis is diagnosed in the presence of elevated LDH (>2.5 times the upper limit of normal) and low haptoglobin in the absence of other causes of haemolytic anaemia. Device thrombosis can be confirmed using the methods of the Columbia ramp echocardiographic study[11]. Persistent power spikes, haemolysis or heart failure despite anticoagulation may require surgical device explantation and exchange[12].

In recent years, there has been an increase in the number of mechanical circulatory assist devices being implanted. This represents a clinical challenge for physicians as they need to be familiar with the different types of devices, understand the unique physiology associated with them, and learn to recognize and manage the complications of these devices.

Aggressive prevention and early identification of VAD complications is critical in the management of mechanical circulatory devices. Our case aims to highlight several points. First, it draws attention to intravascular haemolysis as a potential aetiology of acute pancreatitis in patients with LVAD. Second, it emphasizes that haemolysis, in patients with LVAD, may serve as an early indicator of pump thrombosis and adverse events. Further prospective studies are needed to further establish the cause and effect relationship between pump thrombosis, haemolysis and acute pancreatitis.

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