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Article history: Received: 04.03.2016 Accepted: 22.12.2016 Published: 28.02.2017

ABSTRACT:

Left ventricular assist device (LVAD) is one of the modern management therapies in patients with advanced heart failure, and it serves as a bridge to heart transplantation or even as destination therapy. However, it is burdened with a high risk of thromboembolic, hemorrhagic, and infectious complications despite prophylactic management. Splenic abscesses, as septic complications following implantation of mechanical ventricular support, have not yet been described in the literature.

We report a patient with severe left ventricular insufficiency (NYHA II/III), pulmonary hypertension, and arrhythmia who underwent implantation of the Heart Ware[®] pump for left ventricular support with simultaneous tricuspid valvoplasty, as a bridge therapy to heart transplantation. During two years after LVAD implantation, the patient had three MRSA skin infections, localized at the exit site of the drive-line connecting the artificial ventricle with external unit, that were complicated by sepsis and treated with broad-spectrum antibiotics. A few months later, abdominal CT revealed two abscesses in the spleen, and the patient was qualified for splenectomy. Open splenectomy was performed under full-dose anticoagulant therapy with continuous intravenous infusions of unfractionated heparin (UFH). The intra- and postoperative course was uneventful. UFH therapy was continued for 6 days, and oral anticoagulation was re-administered on day 4 after surgery. The patient was discharged on day 7 after surgery with primary healed wound. Open splenectomy, performed with full-dose anticoagulant therapy, proved to be an effective and definitive method of treatment without any complications.

KEYWORDS:

splenic abscesses; splenectomy; left ventricular assist device (LVAD); infection

Splenic abscesses are a rare entity, with a frequency of 0.07–0.14% reported in autopsy studies (1,2). It remains a diagnostic and treatment challenge, and late diagnosis and delayed treatment are poor prognostic factors. Over the last years, the disease has become increasingly frequent due to the growing number of immunologically comprised patients and the widespread use of advanced imaging methods that facilitate more effective diagnosis (3,4). The etiology of splenic abscesses is mostly related to hematogenous dissemination of infection from a distant purulent focus, as in the case of bacterial endocarditis (5) or inflammation at catheter insertion sites. Septic emboli lead to splenic infarction which may evolve into an abscess. Splenic abscesses caused by methicillin-resistant *Staphylococcus aureus* (MRSA) are rarely described. To date, only few such cases have been reported in the literature (3,6).

Left ventricular assist device (LVAD) for advanced heart failure most often serves as a bridge therapy to heart transplantation and is burdened with a high risk of thromboembolic and infectious complications despite prophylactic management (Schaffer, Simon). To our knowledge, no cases of splenic abscesses related to infections have been described in patients with artificial heart ventricle. In this case report, we describe for the first time a patient with splenic abscesses resulting from LVAD drive-line infection who underwent open splenectomy.

CASE REPORT

A 45-year-old patient was admitted with a diagnosis of two splenic abscesses, heart failure (NYHA II/III), pulmonary hy-

hypertension, and mechanical circulatory support. He was transferred from a department of cardiac surgery, where he was qualified for heart transplantation due to a significant reduction of the pulmonary arterial pressure, borderline transpulmonary pressure gradient, and low pulmonary resistance despite treatment with mechanical left ventricular support over two years.

Medical history revealed that the patient underwent anterolateral wall myocardial infarction in 1997 that was treated with percutaneous transluminal coronary angioplasty of the left anterior descending artery (PTCA LAD) with stent implantation, followed by permanent oral anticoagulant and acetylsalicylic acid therapy. In 2007, the patient underwent cardioverter-defibrillator implantation with ventricular resynchronization function (replaced in 2012). In 2010, he was implanted with the HeartWare® pump for ventricular support (HeartWare® International Inc., USA) and underwent simultaneous tricuspid valvoplasty. Between January 2011 and November 2012, the patient had three skin infections of the LVAD drive-line orifice that were complicated by sepsis. Each time, blood cultures revealed the presence of methicillin-resistant *Staphylococcus aureus* (MRSA), and targeted antibiotics were administered (cloxacillin, metronidazole, rifampicin, linezolid, rovamycine, and itraconazole). In December 2012, abdominal CT revealed two infarcted areas in the spleen (9x6x5 and 3x3x4 cm), suggestive of septic transformation into abscesses (Fig.1). The patient was qualified for splenectomy and transferred to the Institute of Hematology.

On admission, his clinical status was good, the heart rate was 80 bpm, and BP was 110/80 mm Hg. On the physical examination, left subcostal tenderness with no pathological rigidity or symptoms of peritonitis were found. Laboratory findings were as follows, Hb, 9.6 g/dL; Ht, 29.5%; RBCs, 3.01 T/L; PLTs, 205.0 G/L; WBCs, 7.98 G/L; normal differential white cell count; and CRP, 164 mg/L. The remaining biochemical parameters were normal. On abdominal ultrasonography, splenomegaly (140 x 90 mm) and two hypoechoic lesions corresponding to the abscesses were confirmed. Blood cultures in aerobic and anaerobic conditions revealed no pathogens. On admission, standard skin, sputum, and anal cultures revealed no pathogenic flora (bacterial, fungal, or yeast).

In the preoperative period, acetylsalicylic acid was discontinued 7 days before surgery, and the patient was given subcutaneous low molecular weight heparin (LMWH) at therapeutic doses (enoxaparin, 80 mg b.i.d., Clexane®, Sanofi-Aventis, France). Acenocoumarol was discontinued 4 days before surgery, and on the following day, enoxaparin was substituted with continuous intravenous infusions of unfractionated heparin (UFH) to maintain APTT at twice the normal range (Heparin sodium®, Polfa, Poland). Since admission, the patient was administered

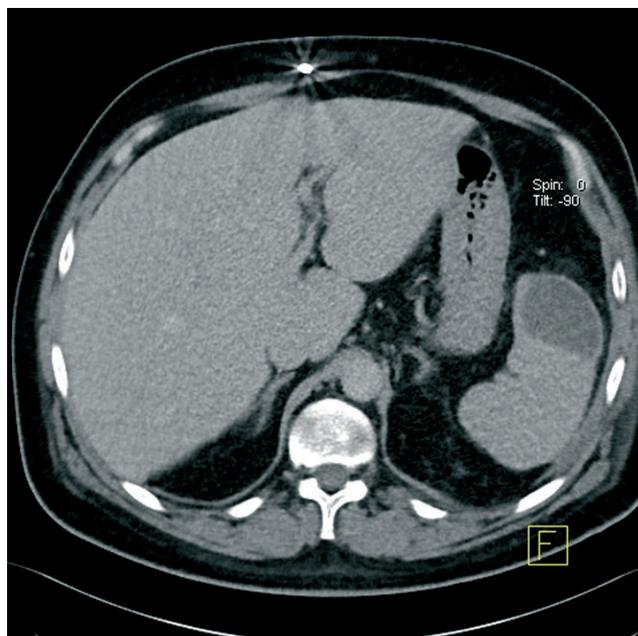


Fig. 1. CT - an abscess is seen in the spleen.



Fig. 2. Excised spleen with two abscesses

antibacterial and antifungal drugs (rifampicin 2x300 mg iv., linezolid 2x 600 mg iv., and fluconazole 100 mg iv). The patient was operated on January 21st, 2013. Laparotomy revealed massive omental adhesions in contact with the spleen, which were dissected with the Liga-Sure™ system (Covidien, USA). Two splenic abscesses were found; one, located in the lower splenic pole bulging the splenic capsule, was 9 cm in diameter, the other, located on the border of the corpus and upper splenic pole, was 4 cm in diameter. Classic splenectomy by posterior approach was performed without complications. The operat-

ing time was 80 min, the total weight of the resected spleen was 460 g (Fig. 2). There was no intraoperative blood loss, and the postoperative course was uneventful. UFH therapy was continued for 6 days, and on day 4, oral anticoagulation was administered. The patient was discharged on day 7 after surgery, with primary healed wound. The cultures of the contents of the splenic abscesses showed no fungal or bacterial growth in aerobic and anaerobic conditions. Repeated blood cultures in the postoperative period were all negative. The histopathological examination revealed foci of infarction in the spleen parenchyma with partial organization, scar formation, peripheral fibrosis, and two abscess cavities.

DISCUSSION

Recently, splenic abscesses have been increasingly described in the literature due to the growing number of immunocompromised patients, widespread use of chemotherapy and steroid therapy, and easy availability of diagnostic imaging modalities.

The most frequent cause of splenic abscesses is hematogenous spread of distal infections. In several recent reports (5), this route was observed in about 50% of cases (49-68%) (4,9). Endocarditis is the most common infection that leads to abscess formation. Other common primary sites of infection include the urinary tract, lungs (pneumonias), bones (osteomyelitis), tooth sockets (following tooth extraction), and vascular access sites in the skin (10). Other causes of splenic abscesses include contiguous infections (diverticulitis, subphrenic or perirenal abscess, Crohn's disease, perforated gastric ulcer), hematologic diseases (leukemias, hemoglobinopathies), and infections of the splenic parenchyma due to injuries that are treated conservatively (11,12).

The splenic abscesses that were found in our patient were secondary to an infection of the drive-line entry site of the left ventricular assist device. Such infections may be life-threatening and can lead to sepsis or endocarditis, require LVAD exchange, or even cause death (7,8,13,14). To date, splenic abscesses, as infectious complications of LVAD, have not been described in the literature.

Most frequent bacteria that are found in splenic abscesses are *Staphylococcus aureus* (6-20%), *Streptococcus pyogenes* or *viridans* (6-22%), *Salmonella* (11-16%), *E. coli* (11-13%), *Pseudomonas* (1-6%), *Enterococcus* (4-6%), and *Mycobacterium tuberculosis* (4-7%). Moreover, fungi can also be found (*Candida*) (10,12,15). Negative cultures of splenic abscess contents were reported in 11-29% of cases (2,4). During the period of 2 years before splenectomy, our patient had three methicillin-resistant *Staphylococcus aureus* (MRSA) skin infections at the drive-line exit site that were treated locally and with targeted antibiotics including linezolid. Intensive antibiotic treatment that was administered before and after admission was most likely responsible for the sterile abscess cavities. Blood culture tests that were performed before and after splenectomy were negative.

Untreated splenic abscesses almost always have a poor prognosis; they may perforate to the peritoneal cavity causing systemic peritonitis, and penetrate through the diaphragm to the pleural cavity or the large intestine. The overall mortality in patients with splenic abscesses is about 12% (4). Classic splenectomy with postoperative antibiotic therapy is the method of choice for the treatment of splenic abscesses, and it is still considered as the gold-standard treatment (11,12). However, it is burdened with severe complications such as pneumonia, pleural effusion, or subphrenic abscesses. In individual cases, percutaneous abscess drainage under ultrasound or CT guidance is an alternative method of treatment (15). However, these methods are not effective in the case of multiple abscesses, inaccessible localization, dense abscess contents, fungal abscesses, or in the case of abscesses that do not empty after drainage. Percutaneous drainage is the treatment of choice in severely ill patients with a high risk associated with general anesthesia and open splenectomy (15). In our patient, we decided to perform classic splenectomy, as it seemed to be the most effective and definite form of treatment that expedited surgical management and enabled early cardiac surgery. Our decision proved right, as no thromboembolic, hemorrhagic, or infectious complications were observed after surgery, and the patient was discharged soon after splenectomy.

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Word count: 1700 Page count: 4 Tables: – Figures: 2 References: 15

DOI: 10.5604/01.3001.0009.6005

Table of content: <http://ppch.pl/resources/html/articlesList?issuelid=9609>

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Competing interests: The authors declare that they have no competing interests.



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Cite this article as: Gajda S., Szczepanik A. M., Religa G., Misiak A., Szczepanik A. B.; Splenic abscesses as infectious complication following implantation of left ventricular assist device - case report; *Pol Przegł Chir* 2017; 89 (1): 61-65
