

Splenic Embolus: 13 Cases from a Single Medical Department

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Abstract

Background: Despite the spleen having a very rich blood supply, there is a paucity of reports of splenic emboli.

Objectives: To investigate the incidence of splenic emboli treated in a single general internal medicine department over the last 3 years.

Methods: We examined the records of a 35 bed internal medicine department in a hospital in the center of Israel.

Results: Over a period of 3 years 13 patients admitted to one internal medicine department developed acute abdominal pain and areas of hypoperfusion in the spleen on contrast computed tomography imaging. The patients were treated with anticoagulants, their course was benign and there were no long-term sequelae.

Conclusions: Embolus to the spleen is not rare in an internal medicine department. Diagnosis can be easily made by contrast CT scanning, and treatment with anticoagulants results in a good prognosis.

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The spleen is an organ with a very rich vascular supply [1]. It receives about 5% of the cardiac output and is supplied by the splenic artery and the short gastric vessels [2]. Vascular organs such as the brain and the kidney are often affected by emboli. Arterial embolism is frequently the product of a cardiac source, while arterial-arterial embolization and paradoxical embolization also occur. Atrial fibrillation is a well-recognized independent risk factor for peripheral embolic events. Bacterial and marantic endocarditis are also sources of emboli. Despite its rich blood supply, there are only a few case series of splenic emboli in the English-language medical literature. We encountered 13 cases of splenic embolus in the last 3 years and present them in this report together with a review of the literature.

Patients and Methods

We searched the computerized database of Kaplan Medical Center for cases with a discharge diagnosis of splenic emboli from the Department of Internal Medicine C during the period 2001–2004. We performed a Medline search of the English-language literature using the key words atrial fibrillation, splenic embolus, and thrombosis. In addition, another Medline search was done using the key words embolus and endocarditis.

Results

The 13 cases of splenic emboli among hospitalized patients that we found comprised 9 males and 4 females. The age ranged from

16 to 75 years and the mean age was 48.08 ± 22.41 years. Table 1 presents the clinical features of patients with renal embolism. Three of the patients had endocarditis as the probable source of the embolism (patients 1, 2 and 9). Four patients had atrial fibrillation at the time of diagnosis and only in one patient was it an existing diagnosis. In this patient the degree of anticoagulation was not sufficient, with an admission international normalized ratio of 1.49. One patient had marantic endocarditis due to metastatic lung cancer (patient 8). Patients 11 and 13 were evaluated for a hypercoagulable state but none was found. The remaining patients did not undergo an investigation for thrombophilia at admission.

Patients with atrial fibrillation were treated with anticoagulants and remained in good general condition with no further embolic episodes. The patients with endocarditis were treated with appropriate antibiotics for the endocarditis, although one patient (# 2) did not respond and required aortic valve replacement. The patient with a myxomatous mitral valve (# 4) did not receive any specific treatment and had an uneventful recovery. The patient with non-bacterial thrombotic endocarditis secondary to carcinoma of the lung died (patient 8).

The incidence of splenic infarction is unclear. Our department has treated 11,204 patients during the past 3 years, suggesting an incidence of 0.12%, but we suspect that many cases were missed and the true incidence is probably higher.

Discussion

Splenic embolus is rarely reported in the literature. Jaroch et al. in 1986 [3] reported 75 cases of splenic infarction of which one-third were related to an embolic event. In 36 the diagnosis was made clinically and in 39 at autopsy. Those authors also identified another 77 cases of splenic infarction from the literature. Combining their experience with the literature yielded a total of 58 cases of splenic embolus. Most of the emboli cases were related to infectious endocarditis or with atherosclerotic lesions (or aneurysms) in the aorta. Less than a quarter of the cases were related to atrial fibrillation. A more recent survey of 59 patients with splenic infarction found in a retrospective chart review of 30 years [4] included 17 thromboembolic disorders. Other etiologies for splenic infarction noted in these two reports included hematologic disorders, especially sickle cell anemia, myeloproliferative and lymphoproliferative diseases, hypercoagulable states such as the antiphospholipid syndrome and paroxysmal nocturnal hemoglobinuria. In addition, manipulation of athero-

Table 1. Clinical features of patients with renal embolism

| Patient | Age (yrs) | Gender | Underlying condition | Symptoms | Diagnostic method | Outcome |
|---------|-----------|--------|---|---|-------------------|---------------------------|
| 1 | 32 | M | SBE bicuspid aortic valve (<i>Staphylococcus aureus</i>) | Sudden onset of LUQ pain | CT | Aortic valve replacement |
| 2 | 16 | F | SBE, mitral valve (<i>Streptococcus mitis</i>) | Left shoulder pain | CT | Responded to antibiotics |
| 3 | 54 | M | Atrial fibrillation, INR 1.49 | LUQ pain, renal infarction also | CT | Good, oral anticoagulants |
| 4 | 18 | F | Myxomatous mitral valve | Left-sided chest pain | CT | Good, no treatment |
| 5 | 40 | M | Atrial fibrillation | 4 days fever | CT | Good, oral anticoagulants |
| 6 | 64 | M | Atrial fibrillation | 2 days abdominal pain | CT | Good, oral anticoagulants |
| 7 | 73 | M | Poor LV systolic function | 2 days abdominal pain, renal infarction as well | CT | Good oral anticoagulants |
| 8 | 75 | M | Metastatic Ca in lung, non-bacterial endocarditis of mitral valve | Silent | CT, sSilent | Deceased |
| 9 | 72 | M | SBE aortic valve (MSSA) | 2 days, fever, pain | CT | IV antibiotics |
| 10 | 75 | F | Atrial fibrillation, post-myocardial infarction | 1 day, upper abdominal pain | CT | Oral anticoagulants |
| 11 | 43 | M | – | LUQ abdominal pain, fever | CT | Oral anticoagulants |
| 12 | 20 | F | Myxomatous mitral valve, oral contraceptive | Chest pain | CT | Good |
| 13 | 43 | M | – | Chest pain | CT | Good, oral anticoagulants |

MSSA = methicillin-sensitive *Staphylococcus aureus*, LUQ = left upper quadrant pain, SBE = subacute bacterial endocarditis, LV = left ventricle.

sclerotic arteries either at surgery or by invasive procedures can produce embolic complications.

An autopsy series of 97 consecutive cases of splenic infarction, also during a 3 year period, found a thromboembolic cause in 67%, with other organ involvement concomitantly in 62% [5]. The source of the embolus was atherosclerotic material from the aorta or thrombus from the left ventricles or vegetations from infected cardiac valves.

Two of our patients had splenic emboli as a complication of infectious endocarditis. Infectious endocarditis may be a more common cause of splenic embolus than is commonly appreciated. A retrospective review of 108 patients with left-sided endocarditis who underwent valvular surgery found 20 splenic infarcts and abscesses (a 19% incidence) [6]. Many of these cases were asymptomatic: i.e., 11 of 29 asymptomatic patients who underwent computed tomography examination of the abdomen (38%). Another report of 178 patients from a tertiary referral center in France identified 14 cases of splenic emboli [7]. Of all the embolic events in these patients, 21% were clinically silent and detected only by CT scan. A further report of 68 patients with endocarditis revealed 7 cases of splenic emboli [8]. These cases are from tertiary referral centers that presumably received the more

severely ill patients. It seems, however, that splenic emboli can be present in many cases of endocarditis even without being clinically apparent. A study of 25 consecutive patients with infectious endocarditis who underwent abdominal CT scan identified 6 patients with splenic emboli, of whom only 2 were clinically apparent [9].

It was previously observed that splenic embolus is more common in patients over the age of 40 [3]; in our series too, 4 of the 13 patients were less than 40 years old. The classic clinical presentation of a splenic embolus is the sudden onset of pain in the abdomen in the left upper quadrant, accompanied by nausea. The pain is likened to stabbing and is increased upon inspiration. These symptoms gradually resolve over 2 weeks. Seven of our patients had symptoms of either chest or abdominal pain; one presented with fever of unknown origin with no pain and one patient was found to have asymptomatic infarction of the spleen on routine imaging studies for staging of carcinoma of the lung.

All 13 cases were diagnosed on the basis of CT scanning of the abdomen. A splenic infarction may easily be visualized on a CT scan with injection of intravenous contrast medium. There is typically a well-defined area of decreased attenuation which may be focal or multiple. This area is classically wedge-shaped but is more commonly irregular in shape [Figure 1]. There is no enhancement following the injection of contrast medium [10]. Ultrasound is another diagnostic tool, however a period of at least 24 hours from the initial infarction is required for the demarcation between normal and infarcted tissue to become defined [10,11]. We did not use ultrasound as a diagnostic tool. Radionuclide scanning has also been employed and in an earlier study was found to be more sensitive than a

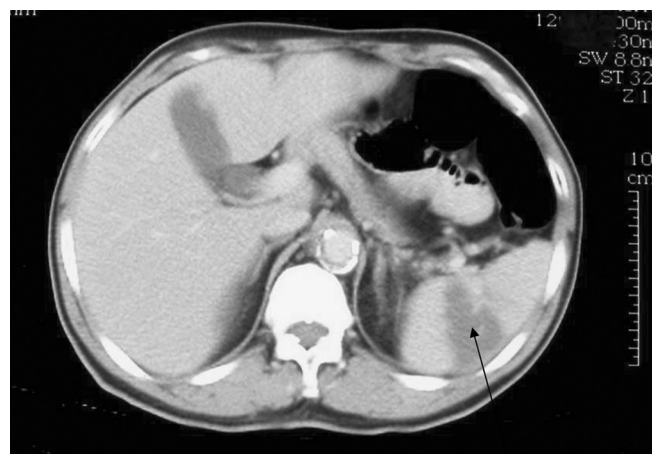


Figure 1. Axial post-contrast-enhanced CT image showing an elongated well-circumscribed hypodense area in the spleen (arrow) with normal enhancement of the remaining normal splenic tissue.

Table 2. List of reports involving more than five cases of splenic infarction or embolus

| No. of cases | Etiology | Diagnosis | Treatment | Authors [ref] |
|--------------|--|------------------|-----------------|----------------------|
| 5 | Multiple etiologies | CT | Not specified | Srp & Bruna [16] |
| 97 | Various | CT, ultrasound | Various | O'Keefe et al. [5] |
| 5 | Myocardial infarction | | Anticoagulants | Puletti et al. [17] |
| 8 | Hepatic, splenic artery embolization | CT ultrasound | Not specified | Shirkoda et al. [18] |
| 7 | Infective endocarditis | CT | Antibiotics | Millaire et al. [8] |
| 67 | Hematologic, cardiovascular, digestive | CT, isotope scan | 34% mortality | Frippiat et al. [19] |
| 31 | Infective endocarditis | CT | Splenectomy 50% | Ting et al. [6] |
| 6 | Endocarditis | CT | Not detailed | Haft et al. [9] |
| 75 | Multiple etiologies | Variable | Variable | Jaroch et al. [3] |
| 59 | Multiple etiologies | Variable | Variable | Nores et al. [4] |
| 17 | Infectious endocarditis | CT | Antibiotics | Di Salvo et al. [7] |
| 8 | Acute malaria | CT | Supportive | Bonnard et al. [20] |

CT scan [3]. Arteriography is considered the gold standard for the radiologic diagnosis of renal artery occlusion and infarction [12], but it is an invasive test. Splenic infarction can also be seen on magnetic resonance imaging, and hemorrhagic infarcts have a high signal on T1- and T2-weighted images. We believe that the investigation of choice is CT due to its availability, reliability and lack of invasiveness.

Table 2 lists the reports describing more than five cases of both splenic emboli and splenic infarction that we identified in our review of the English literature. (A list of the other single cases is available on request from the authors). The total number of cases of splenic infarction or embolus in the English-language literature, together with our 13 cases, is 438.

Five of our 13 patients had atrial fibrillation and either did not receive anticoagulant therapy or had an INR that was less than the therapeutic range on admission. Atrial fibrillation is well linked to embolic complications, of which the brain is the best recognized although other organs may also be involved.

We recently summarized our experience at two medical centers in central Israel and described 47 cases of renal embolus [13]. As a result of our experience we have a high index of suspicion for emboli to other organs and we describe here 13 patients with splenic embolus. It is thus highly likely that this condition is greatly under-diagnosed. Two of the nine patients described here had evidence of embolic events in other organs (patients 3 and 6). Argiris [14] reported two patients with atrial fibrillation and both splenic and renal emboli. Thus, a patient who has had one embolic event to the spleen is at risk for further emboli and requires anticoagulant therapy.

The etiology of the emboli is variable. Atrial fibrillation is the main cause although septic embolus is another common

cause. In our series, patient 9 may have had an embolus from thrombotic non-bacterial (marantic) endocarditis, although he also had atrial fibrillation.

Our patients had no sequelae to the splenic infarction. Splenic infarction can, however, progress to a massive subcapsular splenic hemorrhage, which may result in hypovolemic shock [15] or in a splenic abscess [3]. These complications are rare and the usual course is benign, as in our patients, with gradual resolution of the pain and no significant clinical sequelae. The tendency of splenic infarction to resolve with conservative management is demonstrated by a report of 75 cases identified clinically or at postmortem and another 77 reported in the literature [3]. Splenectomy was only required for either persistent symptoms or complications such as splenic pseudocyst, abscess or hemorrhage. Since the outcome of the splenic infarction is usually benign, the prognosis of the patient is mainly determined by the underlying etiology. Treatment should be directed to the cause; for example, antibiotic therapy in cases of infective endocarditis and anticoagulation in cases secondary to thromboembolism.

In summary, we present 13 cases of splenic emboli that we encountered in the past 3 years. We believe that this entity is under-diagnosed and that increased awareness by physicians will result in an increase in the diagnosis of this condition. The diagnosis is relatively straightforward with CT imaging and may help identify a group of patients who are at risk for other embolic events.

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INR = international normalized ratio

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