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Complications arising from splenic artery embolization: a review of an 11-year experience

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Abstract

BACKGROUND: Splenic artery embolization (SAE) is a staple adjunct in the management of blunt splenic trauma. We examined complications of SAE over an 11-year period.

METHODS: Patients who underwent SAE were identified. Demographic data and the location of the SAE—proximal, distal, or combined—were noted. Major and minor complications were identified.

RESULTS: Of 1,383 patients with blunt splenic trauma, 298 (21.5%) underwent operative management, and 1,085 (78.5%) underwent nonoperative management (NOM). SAE was performed in 8.1% of the NOM group. Major complications which occurred in 14% of patients, included splenic abscesses, infarction, cysts, and contrast-induced renal insufficiency. Three-fourths of patients with major complications underwent distal embolization. There were more complications in patients who underwent distal embolization (24% distal vs 6% proximal alone; $P = .02$). Minor complications, which occurred in 34% of patients, included left-sided pleural effusions, coil migration, and fever.

CONCLUSIONS: SAE is a useful tool for managing splenic injuries. Major and minor complications can occur. Distal embolization is associated with more major complications.

Over the past few decades, nonoperative management (NOM) of blunt splenic injuries has emerged as the standard mode of management of hemodynamically stable patients. Splenic artery embolization (SAE) has similarly evolved to be a staple adjunct in the management of this patient population. Several recent reports have credited the increased use of SAE with reductions in NOM failure rates.[1–3] Although now used more liberally, the common indications for SAE are the presence of a contrast blush or pseudoaneurysm on computed tomography (CT) of the abdomen, American Association for the Surgery of Trauma (AAST) grade IV and grade V injuries, or a continuous drop in the hemoglobin level in the course of attempting NOM.

Several authors over the past few years have reported their experience with SAE, focusing primarily on outcomes, ie, the efficacy and overall success of NOM of splenic injuries.[4–6] There has been little attention to complications that may arise from the use of this modality. In 2005, we reported our experience with complications arising from SAE in a small cohort of 15 patients over a 26-month period.[7] In that series, major complications were seen in 27% of patients, and minor complications were observed in 53%. We explored this issue of adverse events over a longer time frame with a larger number of

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patients as we gained increased experience with the SAE procedure at our level I trauma center.

Methods

Trauma registry (TraumaBase, Clinical Data Management, Evergreen, CO) and medical record information of patients with splenic injuries admitted to Miami Valley Hospital (an American College of Surgeons–verified level I trauma center) between January 2000 and December 2010 were reviewed. Patients were grouped by the type of management of their splenic injury: operative or nonoperative. Individuals who underwent SAE were selected for detailed analysis. Age, sex, length of stay, associated injuries, injury severity score (ISS), AAST grade of splenic injury, details of angiographic results, and complications were abstracted.

The decision to proceed with SAE was at the discretion of the admitting trauma surgeon and was performed by interventional radiologists in the angiography suite. Typical indications for SAE included the presence of a contrast blush or pseudoaneurysm on a computed tomographic scan of the abdomen, higher grades of splenic injury (grades III to IV), and a dropping hematocrit value in the course of NOM.

Per the standard protocol at our institution, arterial access was obtained through the common femoral artery with placement of a vascular sheath. Celiac arteriography was performed to delineate the arterial anatomy and then selective catheterization with subsequent performance of arteriography of the splenic artery was carried out. Arteriographic images were evaluated for location of splenic artery side branches, including the dorsal pancreatic and great pancreatic arteries, and for active contrast extravasation, degree of devitalized spleen, abnormally truncated vessels, and pseudoaneurysm formation. If images demonstrated only devitalized spleen with no evidence of abnormally truncated vessels, pseudoaneurysm, or active contrast extravasation, main splenic artery embolization was performed with fibered coils distal to the pancreatic side branches to allow for collateral supply. If images demonstrated active contrast extravasation or pseudoaneurysm formation, the injured vessels were selectively catheterized and embolized using fibered coils followed by main splenic artery embolization. In the event focal splenic injury required subselective catheterization, main splenic artery embolization was not performed. Embolization that occurred distal to the main splenic artery trunk was considered to be distal. Completion arteriography was performed from the proximal main splenic artery to ensure cessation of flow and absence of additional injury.

Table 1 Characteristics of patients who underwent SAE

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Sex distribution		
Male	59	67.1%
Female	28	32.9%
Angiographic lesions		
Contrast blush	17	19.3%
Pseudoaneurysm	21	23.9%
Location of SAE		
Proximal	51	57.9%
Distal	22	25%
Proximal and distal	15	17%
Splenic grade		
Grade I	2	2.3%
Grade II	7	7.9%
Grade III	38	43.1%
Grade IV	33	37.5%
Grade V	8	9.1%
Complications		
Major	12	13.6%
Minor	30	34.1%

SAE = splenic artery embolization.

Proximal SAE was defined as the embolization of the main trunk of the splenic artery in a proximal location. Distal embolization was defined as embolization involving one of the individual terminal branches of the splenic artery. The site of splenic artery occlusion (proximal or distal) was determined by review of the radiology reports. Statistical analysis was performed using GraphPad InStat software, version 3.05, (GraphPad Software, San Diego, CA).

Major complications were regarded as adverse events believed to arise from SAE that could result in severe disability or death. Consistent with our previous article, the following were considered to be major complications: splenic abscess, splenic infarction, and contrast-induced renal insufficiency. Minor complications were adverse events not deemed to be life-threatening. Reactive left-sided pleural effusions, fever, and coil migration occurring during the procedure were considered to be minor complications. Pleural effusions were considered complications when they occurred days and weeks after embolization and were not attributable to rib fractures. A failure of SAE was considered to have occurred when the patient required a splenectomy for hemodynamic instability during the same hospital admission.

The Institutional Review Board of Miami Valley Hospital approved the protocol.

Results

During the 11-year period studied, 1,383 patients with blunt splenic trauma were admitted to Miami Valley Hospital. There were 298 patients (21.5%) who underwent eventual operative management and 1,085 patients (78.5%) who were successfully managed nonoperatively.

In the NOM group, 91 patients underwent splenic angiography with the intent to perform SAE. Three of these patients did not undergo a completed SAE procedure. In 1 of these 3 patients, with a grade II splenic lesion and active pelvic hemorrhage, no bleeding from the spleen was