

Ruptured splenic artery aneurysms are exceedingly rare in pregnant women

Liliana Nanez, MD, Martyn Knowles, MD, J. Gregory Modrall, MD, and R. James Valentine, MD,
Dallas, Tex

Objective: Pregnancy is cited as the most important risk factor for splenic artery aneurysm (SAA) rupture, but the true rupture rate of SAAs during pregnancy is unknown. Our objective was to evaluate the prevalence of SAAs, based on diagnostic and procedural codes, in an urban population treated in a county hospital with the highest number of births in the United States. We hypothesized that SAA rupture in pregnant women is very low and that SAAs are more likely to be diagnosed in older patients.

Methods: Patients diagnosed with a SAA during a recent 5-year period were identified using International Classification of Diseases-Ninth Edition, Clinical Modification, and Current Procedural Terminology (American Medical Association, Chicago, Ill) codes. Demographics, imaging, and risk factors for rupture were reviewed.

Results: We identified 35 patients with SAA. Patients were a median age of 63 years (interquartile range [IQR], 54-74 years), and 28 (80%) were women who were a median age of 62 years (IQR, 54-74 years). The SAAs in the 35 patients were a median size of 1.3 cm (IQR, 1-1.9 cm), and eight (23%) were >2 cm. Despite the very large number of deliveries recorded during the study period (67,616 births), no women who were pregnant or aged <45 years were identified. However, 89% of women with an SAA had previous pregnancies. Two women and one man (8.6%) experienced rupture, resulting in one death (2.9%). More than one imaging study was available for 19 patients (60%) without intervention for a median of 32 months (IQR, 7-76 months), with no significant change noted. Three patients underwent elective repair due to size criteria. Six patients (17%) had concurrent aneurysms, including three renal artery aneurysms, one aortic aneurysm, and three intracranial aneurysms. No risk factor for enlargement or rupture was particularly prevalent.

Conclusions: Ruptured SAAs are exceedingly rare in young women, and no ruptured SAA were identified during pregnancy in this study. SAA are frequently diagnosed as an incidental finding in middle-aged adults and tend to remain stable over time in this population. (J Vasc Surg 2014;60:1520-3.)

Although splenic artery aneurysms (SAAs) represent the most common type of splanchnic aneurysms, their natural history has remained elusive because SAAs are relatively rare and generally asymptomatic. With the increased use of imaging modalities in modern practice, the incidental detection of SAA has increased. Conventional wisdom suggests that aneurysms should be treated if they are symptomatic or at high risk for rupture. Proposed risk factors for rupture include portal hypertension, liver transplantation, pancreatitis, rapid growth, size >2 cm, and pregnancy.¹⁻⁵ Among these, pregnancy has been cited as the most important risk factor for SAA rupture.⁵⁻⁷ Because SAA rupture has been associated with maternal and fetal mortality rates as high as 75% and 95%,^{6,7} respectively, the current

standard of care is to repair all SAAs during pregnancy and in women of childbearing age.^{2,5-7} However, the strong association between pregnancy and SAA rupture has been based on case reports, small case series, and literature reviews.

The true prevalence of SAA and ruptured SAA in pregnant women has not been determined, nor is the prevalence of SAA known in women of childbearing age. The prevalence of SAA in the general population is very low. On one hand, a study of 28,512 unselected autopsy cases found SAA prevalence was 0.16%⁸ and was 0.8% on unselected angiograms.⁹ On the other hand, the incidence of SAA was 10.4% in autopsies performed to specifically examine the splenic artery in an older population.¹⁰

Parkland Memorial Hospital (PMH) in Dallas, Tex, provided a unique opportunity to evaluate the problem of ruptured SAA in pregnant women. PMH is perennially among the top hospitals in number of births per year in the United States and possesses an active maternal-fetal program for prenatal and postnatal care. Thus, the large obstetric population at PMH represented a unique opportunity to analyze the association between pregnancy and SAA rupture. The purpose of this study was to evaluate the prevalence of SAA based on diagnostic and procedural codes in adults of all ages treated at PMH during a recent 5-year period. We hypothesized that the prevalence of SAA rupture in pregnant women is very low and that SAA are more likely to be diagnosed in older patients.

From the Division of Vascular and Endovascular Surgery, Department of Surgery, the University of Texas Southwestern Medical Center.

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Reprint requests: R. James Valentine, MD, Division of Vascular and Endovascular Surgery, POB 1, Ste 620, 5959 Harry Hines Blvd, Dallas, TX 75390-9157 (e-mail: james.valentine@utsouthwestern.edu).

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Table. Demographics, comorbid conditions, and risk factors in patients with splenic artery aneurysm (SAA)

Variable	Median (IQR) or No. (%) (N = 35)
Age, years	63 (54-74)
Females	28 (80)
Ethnicity	
Hispanic	14 (40)
African American	6 (17)
Caucasian	9 (26)
Other	6 (17)
Diabetes	14 (40)
Hypertension	23 (66)
Chronic kidney disease	4 (11)
Tobacco	11 (31)
Risk factors	
Portal hypertension	4 (11)
Other aneurysms	6 (17)
Pancreatitis	5 (14)
Liver transplant	0

IQR, Interquartile range.

METHODS

The Institutional Review Board of the University of Texas Southwestern Medical Center in Dallas approved this retrospective record review study, and informed consent from patients was not deemed necessary. We reviewed the records of all patients diagnosed with SAA at PMH between October 1, 2008, and September 30, 2013. These patients were indexed from the institutional electronic medical record database. Patients were identified using the following International Classification of Diseases, Ninth Edition, Clinical Modification codes: SAA (442.83), ruptured abdominal aneurysm (441.3), and postpartum hemorrhage (666). The database was also queried for the following Current Procedural Terminology (American Medical Association, Chicago, Ill) codes: endovascular embolization (37204), direct repair of SAA (35111), and splenectomy (38100).

Electronic medical records were then reviewed for demographic data, presenting symptoms, diagnostic tests, risks for rupture, signs of rupture, medical comorbidities, other aneurysms, and parity. Included were patients with SAA determined from imaging from our institution that had been read by a radiologist. Patients who underwent SAA repair were evaluated for type of surgical management and operative details. Available serial imaging studies were reviewed for SAA stability in all patients, regardless of operative intervention.

RESULTS

A total of 67,616 live births occurred at PMH during the 5-year study period. During this time, 35 patients, with a median age of 63 years (interquartile range [IQR], 54-74 years), were identified with SAA, and 28 (80%) were women with a median age of 62 years (IQR, 54-74 years). Demographics and medical comorbidities are reported in the [Table](#). Despite the very large number



Fig 1. Imaging of patient with acute cholecystitis with splenic artery aneurysm (SAA) rupture after emergency cholecystectomy.

of deliveries recorded, no women who were pregnant, postpartum, or aged <45 years were diagnosed with SAA during the study period. However, 25 women (89%) with SAA had a history of at least one remote pregnancy.

The SAA were found incidentally on imaging studies performed for other indications in 34 individuals and one was found on a computed tomography scan performed for abdominal pain when the patient presented with rupture. The median size of the SAA among the 35 individuals was 1.3 cm (IQR, 1-1.9 cm), and eight (23%) were >2 cm. The median size of SAA was 1.3 cm (IQR, 1.1-1.8 cm) in women and 1.9 cm (IQR, 1.2-2.1 cm) in men. Six (17%) patients had concurrent aneurysms, including 3 with a renal artery aneurysm, 1 with an aortic aneurysm, 1 with an intracranial aneurysm, and 1 with both internal carotid and ophthalmic artery aneurysm. Three patients had multiple SAAs.

SAA rupture occurred in three of the 35 individuals (two women, one man), resulting in one death (2.9%). Two of the three ruptured SAAs were >2 cm. Two of the patients had known SAA before rupture: one had incomplete exclusion after coiling was attempted at another hospital and underwent an emergency open splenectomy, and the SAA in the second patient ruptured after emergency cholecystectomy for acute cholecystitis, but the patient died before an intervention could be attempted ([Fig 1](#)). The third patient presented with de novo SAA rupture and underwent successful coiling.

More than one imaging study was available for 19 of the 32 patients (59%) without SAA rupture or intervention. These patients had follow-up for a median of 32 months (IQR, 7-76 months) and had no significant change. Three of the 32 patients (9%) without SAA rupture underwent elective coil embolization of the splenic artery due to

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