Nonoperative Management of Peripancreatic Arterial Aneurysms

A 10-year Experience

STANLEY R. MANDEL, M.D.* PAUL F. JAQUES, M.D.† STEPHEN SANOFSKY, M.D.* MATTHEW A. MAURO, M.D.†

The surgical approach to bleeding visceral artery aneurysms has a mortality rate of 16–50% that is dependent primarily on anatomic location and underlying cause. Nineteen patients were studied over a 10-year period who were definitively treated by embolization. There was a 79% success rate and no mortality. The cause of the aneurysms was pancreatitis in 13 patients, trauma in four patients, subacute bacterial endocarditis in one patient, and secondary to biliary tract surgery in one patient.

From the Department of Surgery and Department of Radiology,† School of Medicine, University of North Carolina, Chapel Hill, North Carolina*

THE SURGICAL APPROACH TO bleeding visceral artery aneurysms has a reported mortality rate of 12–50%, depending primarily on anatomic location and underlying cause.[1–4] Stimulated by a patient with a potential life-threatening gastrointestinal hemorrhage who was managed successfully by transcatheter visceral artery embolization, we reviewed the experience with embolization at North Carolina Memorial Hospital (NCMH). We present a representative case report, a description of the issues involved in embolization procedures, and a review of our 10-year experience with peripancreatic visceral artery aneurysms in 19 patients. The manifestations of this potentially lethal problem are discussed.

Case Report

A 67-year-old male with a history of alcohol abuse was transferred to NCMH with an epigastric mass and persistent abdominal pain that was aggravated by eating. The patient was afebrile, nonjaundiced, and had a normal serum amylase level. The white blood cell count was 13,000/μL and the hematocrit value was 38%. A dynamic contrast-enhanced computed tomography (CT) examination of the abdomen revealed a 5-cm, rapidly enhancing mass in the tail of the pancreas. A celiac arteriogram showed a 5-cm pseudoaneurysm of the splenic artery (Fig. 1). The patient had Gelfoam (Upjohn, Kalamazoo, MI) and coil embolization of the splenic artery (Fig. 2). The night after this procedure the patient had left upper quadrant pain, more severe than on admission, with a temperature of 100 F and a white blood cell count elevation to 21,000/μL. By the next morning the patient was afebrile with a normal white blood cell count, and his pain was gone. Repeat celiac and superior mesenteric arteriography showed total occlusion of the splenic artery without collateral filling of the pseudoaneurysm. The patient was put on a regular diet 2 days later and was discharged 4 days after the embolization procedure. The patient has remained asymptomatic in 9 months of follow-up.

Reprint requests and correspondence: Stanley R. Mandel, M.D., Department of Surgery, School of Medicine, University of North Carolina, Chapel Hill, NC 27514.

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Materials and Results

We have performed definitive peripancreatic visceral artery embolization on 19 patients over the past 10 years. A summary of the results are presented in Table 1. The causes of the aneurysms were pancreatitis and pseudocyst in 68% (13 patients); trauma in 21% (4 patients); bacterial endocarditis in 5% (1 patient); and secondary to biliary tract surgery in 5% (1 patient). In this study embolization of peripancreatic visceral aneurysms was performed with a 79% success rate (15 of 19 patients) with no mortality. Success is defined as satisfactory thrombosis of the aneurysm without any evidence of recurrence on clinical and, in some cases, radiologic follow-up. In spite of initial successful control of gastrointestinal hemorrhage, two of the 19 patients died of sepsis related to their underlying disease. Four patients required ancillary surgery, including drainage of pseudocyst and intra-abdominal sepsis. Complications were well tolerated without long-term sequelae, which included thrombosis of the hepatic artery in two patients and definite rupture of one pseudoaneurysm during embolization. There have been no rebleeding episodes in any of the seventeen surviving patients during the 10-year period.

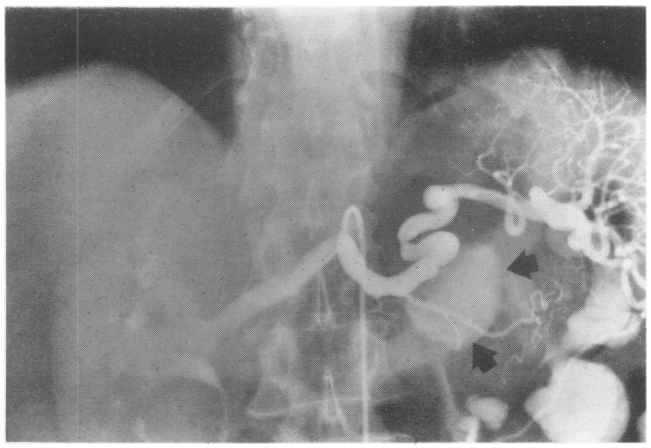

FIG. 1. Splenic arteriogram demonstrating a 5-cm pseudoaneurysm (arrows) arising from the proximal splenic artery.

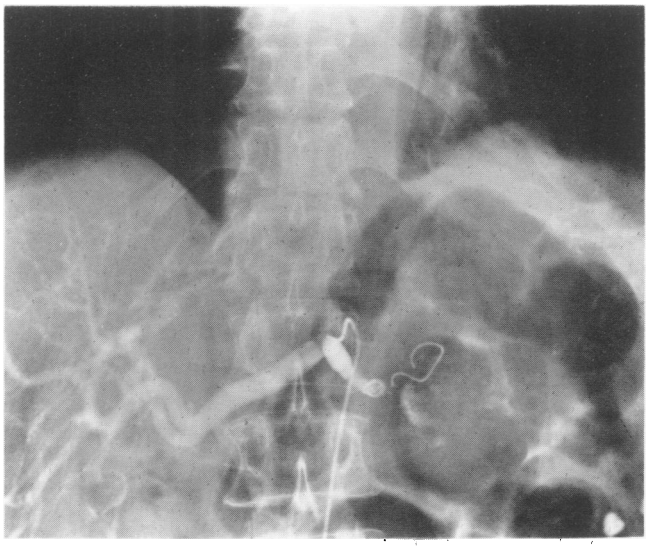

FIG. 2. Celiac arteriogram after embolization of the splenic artery. Gelfoam/Pantopaque mixture was used to peripherally embolize the splenic artery followed by two steel coils to produce permanent occlusion across the splenic artery segment from which the pseudoaneurysm originated.

Discussion

Pancreatitis with secondary pseudocyst formation is the most common cause of visceral pseudoaneurysms,[5] but they may also occur in the absence of a pseudocyst. Pseudoaneurysms occur in approximately 10% of patients with chronic pancreatitis.[6] Significant bleeding occurs in 2–10% of patients with pancreatitis.[1,4,7,8] These pseudoaneurysms are caused by digestion of adjacent vessels by elastase and trypsin, which may then bleed into a pseudocyst, pancreatic duct, peritoneal cavity, the gastrointestinal tract, or the retroperitoneum.[7,9] True aneurysms on the basis of atherosclerosis are known to occur but are a much less common cause of bleeding.[10] Although any visceral artery may develop a pseudoaneurysm, the splenic artery is most commonly affected, followed by the gastroduodenal and pancreaticoduodenal arteries.[2,7] Since pancreatitis is the most common underlying cause, the most common patients will be male alcoholics (80–90%) with a history of episodes of chronic pancreatitis and secondary pseudocyst formation.[1] The diagnosis of visceral artery aneurysm should be considered in any patient with a pseudocyst and a significant abdominal bruit. The clinical symptoms are highly variable but very suggestive. Critical clues are: (1) anemia of unexplained cause, (2) recurrent and intermittent hematemesis or hematochezia, (3) rapid enlargement of a previously stable pseudocyst, and (4) the syndrome known as "hemosuccus pancreaticus," characterized by bleeding from the ampulla of Vater colicky pain, and jaundice. The latter syndrome described by Sandblom[11] and others[12–14] is caused by the passage of blood clot through the pancreatic or common bile duct. Differential diagnosis should include other causes of gastrointestinal bleeding in patients with alcoholism, pancreatitis, portal hypertension, and pseudocyst. Several diagnostic tests are helpful, such as high elevations of the serum amylase level, pancreatic calcifications on abdominal radiographs, endoscopy to demonstrate blood clot in the ampulla of Vater or elsewhere in the upper gastrointestinal tract, and ultrasonography or dynamic contrast-enhanced CT to show the aneurysm. However, the single most valuable examination to establish the diagnosis is selective angiography of the celiac and superior mesenteric arteries and their branches.[1,3,5,15,16]

Once the diagnosis of visceral artery aneurysm with bleeding is established, therapy should be immediate, since mortality rates without treatment approaches 100%.[2] Even in the absence of active hemorrhage, in our experience, pseudoaneurysms secondary to pancreatitis should be treated as they do not appear to spontaneously thrombose early.

TABLE 1. *Results of Embolization*

Visceral Artery	No. of Patients	Successful Embolization	Complications
Pancreaticoduodenal	5	4/5	Occlusion of right hepatic artery*
Gastroduodenal	6	6/6	Rupture of artery**
			Occlusion of hepatic artery*
Splenic	4	2/4	
Hepatic	2	2/2	Fever, abnormal LFT's
Left gastric	2	1/2	
Total	19	15/19 (79%)	3/19 (16%)

LFT's = liver function tests.
* 2 patients had collateral blood flow, LFT's remained normal.
** Catheter left in place 5 days on Pitressin with no rebleed.

The recommended traditional surgical approach has included bipolar arterial ligation, direct intrapseudocyst ligation, or resection of that segment of the pancreas with the pseudocyst and pseudoaneurysm.[2,3,8]

These approaches unfortunately have an operative mortality rate of 16–50%, depending primarily on the anatomic location of the pseudoaneurysm rather than the method of surgery.[2,3,7] Thus, surgical intervention for treatment of pseudoaneurysm in the head of the pancreas has a 50% mortality rate, but only a 16% mortality rate in the body or tail of the pancreas.

There are isolated reports in earlier literature of selective embolization of visceral artery aneurysms.[6,9,17,18] Our own experience of a 79% success rate and no mortality from hemorrhage or morbid complications of embolization in 19 patients leads us to conclude that embolization is the preferred initial treatment in the management of peripancreatic visceral aneurysms. Furthermore, for the majority of such patients, embolization is the definitive treatment. Complications of the underlying disease may still require surgical intervention (*e.g.*, pseudocyst or abscess drainage), but without the attendant risk of surgical control of the pseudoaneurysm. Embolization may be a particularly advantageous approach in a patient who bleeds from a peripancreatic visceral artery aneurysm in the postoperative period after drainage of a pancreatic pseudocyst.

Various embolization techniques have been used, but are essentially decided by the clinical status of the patient, the visceral arterial anatomy, particularly in relation to the end organ supplied, and the specific geometry of the aneurysm. Although Gelfoam does not produce permanent arterial occlusion, the aneurysm remains thrombosed.[9] More permanent arterial occluding materials such as Ivalon (Unipoint Laboratories, High Point, NC), intravascular steel coils,[17] detatchable balloons, electrocoagulation, or cyanoacrylate glues occasionally may be required under specific anatomic circumstances to prevent distal organ infarction. Potential complications of therapeutic embolization are largely related to embolizing "normal" vessels and are further determined by the specific anatomy. The liver can tolerate considerable arterial embolization without significant consequence due to multiple collateral pathways.[19] The spleen may be embolized to a limited degree in the management of hypersplenism.[20] On the other hand, the small and large bowel are at considerable jeopardy from misplaced emboli. Pseudoaneurysms secondary to pancreatitis may be extremely fragile and require careful choice of embolic material to avoid rupture during the endovascular procedure.[9]

Conclusion

Visceral artery pseudoaneurysm should be suspected in any patient with chronic pancreatitis and unexplained blood loss. The *sine qua non* of diagnosis is selective angiography. Since the surgical mortality rate is 16–50%, depending on anatomic location of the aneurysm, selective embolization should be performed in all patients as an initial method to control bleeding. The results of this report indicate that the majority of patients with pseudoaneurysms can be treated definitively by embolotherapy.

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