

Basic Data Underlying Clinical Decision Making

SECTION EDITOR: Lloyd M. Taylor, Jr.

Common Splanchnic Artery Aneurysms: Splenic, Hepatic, and Celiac

Charles J. Shanley, MD, Nikhil L. Shah, BS, and Louis M. Messina, MD, Ann Arbor, Michigan, and San Francisco, California

Aneurysms involving the splanchnic arteries represent an uncommon and potentially lethal form of vascular disease. Because they frequently present as life-threatening clinical emergencies, a clear understanding of the presentation and management of these aneurysms is essential for the practicing vascular surgeon. The purpose of this review was to document recent changes in the diagnosis and management of common splanchnic artery aneurysms.

Traditionally the most commonly reported splanchnic artery aneurysms have involved, in decreasing order of frequency, the splenic, hepatic, and celiac arteries.¹ We reviewed the English language literature for the past 10 years (1985 to 1995) for reports of these lesions. Interestingly, in contrast to previously published series, aneurysms of the hepatic arteries were the most frequently reported splanchnic artery aneurysms in the past decade. This trend probably relates to the increasing use of percutaneous diagnostic and therapeutic biliary tract procedures. During these procedures, injury to the intrahepatic branches of the hepatic artery can lead to the development of false aneurysms of these vessels. In addition to these iatrogenic false aneurysms, the increased use of diagnostic CT scanning following blunt liver trauma has also led to increased detection of posttraumatic false aneurysms of the intrahepatic arterial

branches. Subsequent rupture of these false aneurysms into the biliary tree frequently presents as life-threatening gastrointestinal hemorrhage (hemobilia). Coincidentally, recent advances in percutaneous catheter-based therapy for these lesions has also undoubtedly contributed to the increased number of hepatic artery aneurysms reported in the literature. Thus it is not surprising that nearly 50% of all hepatic artery aneurysms reported within the past decade are false aneurysms of the intrahepatic arterial branches. Furthermore, the vast majority of these lesions were managed percutaneously. If these iatrogenic and posttraumatic false aneurysms are excluded from the analysis, the distribution of true splanchnic artery aneurysms has actually varied little from that in previously reported series.

The presentation and treatment of splenic and celiac artery aneurysms has changed little over the past decade. The risk of rupture of true splenic artery aneurysms remains low except in pregnant women where they continue to be a serious threat to both the mother and the fetus. Splenic artery aneurysms are being treated increasingly by catheter-based techniques, whereas celiac aneurysms are still treated by open surgical techniques.

Because splanchnic artery aneurysms are so uncommon, very few series have been reported involving more than 30 cases at a single institution.¹ Thus in the past decade most of the cases reported in the literature consist of single case reports or small series of 10 cases or less. This introduces obvious biases in favor of unusual presentations and positive outcomes. Nevertheless, it is interesting to note that the majority of splanchnic artery aneurysms still present with

From the University of Michigan Medical Center (C.J.S. and N.L.S.), Ann Arbor, Mich., and the University of California, San Francisco (L.M.M.), San Francisco, Calif.

Reprint requests: Louis M. Messina, MD, 505 Parnassus Ave., M-488, Box 0222, San Francisco, CA 94143-0222.

frank rupture and that rupture frequently results in the death of the patient. Therefore a continued aggressive approach to the diagnosis and management of these unusual aneurysms is clearly warranted. Finally, it is now quite clear that percutaneous catheter-based therapy will play an increasingly prominent role in the management of these lesions in the future.

Tables I to VII present summary data for

Table I. Hepatic artery aneurysms: Age

	Mean	Range
Age (yr)	52	2-93

Table II. Hepatic artery aneurysms: Demographics

Characteristics	No.	Percent*
Men	54	55
Women	44	45
Ruptured	66	65
Mortality (overall)	16	16
Mortality (ruptured)	14	21†

*Percentage of total cases.

†Percentage of ruptured cases.

Table III. Hepatic artery aneurysms: Clinical presentation

Symptoms	No.	Percent*
Abdominal pain	57	55
Gastrointestinal hemorrhage/hemobilia	47	46
Jaundice	9	9
Mass	6	6
Asymptomatic	2	2
Shock	7	7
Not stated	1	1

*Percentage of total cases (some cases may have had more than one symptom).

hepatic artery aneurysms (103 cases) reported in the English literature between 1985 and 1995.²⁻⁷²

Tables VIII to XIV present summary data for splenic artery aneurysms (83 cases) reported in the English literature from 1985 to 1995.⁷³⁻¹⁰⁶

Tables XV to XX present summary data for celiac artery aneurysms (29 cases) reported in the English literature from 1985 to 1995.¹⁰⁷⁻¹²⁴

Table IV. Hepatic artery aneurysms: Diagnostic techniques

Technique	No.	Percent*
Arteriography	74	72
CT scan	18	17
Ultrasound	11	11
Autopsy	2	2
Other	3	3
Laparotomy	21	20

*Percentage of total cases (some cases may have had more than one diagnostic technique).

Table V. Hepatic artery aneurysms: Treatment modality

Modality	No.	Percent*
Aneurysmectomy	28	27
Bypass/revascularization	15	15
Ligation	37	36
Aneurysmorhaphy	4	4
Lobectomy	2	2
None	3	3
Embolization	38	37
Not stated	3	3

*Percentage of total cases (some cases may have had more than one treatment modality).

Table VI. Hepatic artery aneurysms: Aneurysm characteristics

Characteristics	No.	Percent*
Type		
True	33	40
False	41	49
Mycotic	3	4
Inflammatory	6	7
FMD, CMN	1	1
Not stated	19	
Location		
CHA	21	22
PHA	16	16
RHA	46	47
LHA	13	13
Cystic	1	1
Not stated	6	
Intrahepatic	32	34
Extrahepatic	61	66
Not stated	10	
Distribution		
Multiple	9	10
Solitary	86	91
Not stated	8	

CHA = common hepatic artery; CMN = cystic medial necrosis; FMD = fibromuscular dysplasia; LHA = left hepatic artery; PHA = proper hepatic artery; RHA = right hepatic artery.
*Percentage of total cases for which data are available.

Table VII. Hepatic artery aneurysms: Common associated conditions

Condition	No.	Percent*
Liver transplant	17	17
Percutaneous biliary	10	10
Catheter/biopsy		
Pancreatitis	11	11
Cholecystectomy	11	11
Abdominal trauma	8	8

*Percentage of total cases.

Table VIII. Splenic artery aneurysms: Age

	Mean	Range
Age (yr)	52	2-93

Table IX. Splenic artery aneurysms: Demographics

Characteristics	No.	Percent*
Men	28	34
Women	55	66
Ruptured	42	51
Mortality (overall)	15	18
Mortality (ruptured)	15	36†

*Percentage of total cases.

†Percentage of ruptured cases.

Table X. Splenic artery aneurysms: Clinical presentation

Symptoms	No.	Percent*
Abdominal pain	38	46
Shock	21	25
Gastrointestinal hemorrhage	11	13
Back pain	5	6
Asymptomatic	17	20
Other	3	4
Not stated	7	8

*Percentage of total cases (some cases may have had more than one symptom).

Table XI. Splenic artery aneurysms: Diagnostic techniques

Technique	No.	Percent*
Arteriography	43	52
CT scan	15	18
Ultrasound	6	7
Autopsy	9	11
Other (abdominal x-ray, MRI)	2	2
Not stated	1	1
Laparotomy	22	27

*Percentage of total cases (some cases may have had more than one diagnostic technique).

Table XII. Splenic artery aneurysms: Treatment modality

Modality	No.	Percent*
Aneurysmectomy	22	27
Bypass	1	1
Ligation	18	22
Reanastomosis	1	1
Pancreatectomy	5	6
None	12	15
Embolization	10	12
Not stated	1	1
Splenectomy	39	47

*Percentage of total cases (some cases may have had more than one treatment modality).

Table XIII. Splenic artery aneurysms: Aneurysm characteristics

Type	No.	Percent*
Type		
True	60	72
False	9	11
Mycotic	1	1
Fibromuscular	3	4
dysplasia		
Not stated	10	12
Location		
Distal	20	35
Mid	25	44
Proximal	1	2
Multiple	10	18
Not stated	26	

*Percentage of 57 cases for which location was available.

Table XIV. Splenic artery aneurysms: Common associated conditions

Condition	No.	Percent*
Pregnancy	22	27
Portal hypertension	28	34
Pancreatitis	8	10

*Percentage of total cases.

Table XV. Celiac artery aneurysms: Age

	Mean	Range
Age (yr)	56	18-86

Table XVI. Celiac artery aneurysms: Demographics

Characteristics	No.	Percent*
Men	19	66
Women	10	34
Ruptured	2	7
Mortality (overall)	4	14
Mortality (ruptured)	2	100†

*Percentage of total cases.

†Percentage of ruptured cases.

Table XVII. Celiac artery aneurysms: Clinical presentation

Symptoms	No.	Percent*
Abdominal pain	20	69
Gastrointestinal hemorrhage	1	3
Jaundice	3	10
Mass	1	3
Asymptomatic	4	14
Other	3	10
Hemoptysis	2	7

*Percentage of total cases (some cases may have had more than one symptom).

Table XVIII. Celiac artery aneurysms: Diagnostic techniques

Technique	No.	Percent*
Arteriography	25	86
CT scan	11	38
Ultrasound	12	41
Autopsy	2	7
Other	1	3
Not stated	0	0
Laparotomy	2	7

*Percentage of total cases (some cases may have had more than one diagnostic technique).

Table XIX. Celiac artery aneurysms: Treatment modality

Modality	No.	Percent*
Aneurysmectomy	20	69
Bypass	9	31
Ligation	5	17
Aneurysmor- rhaphy	3	10
Reimplantation	2	7
None	3	10
Embolization	1	3
Other	2	7

*Percentage of total cases (some cases may have had more than one treatment modality).

Table XX. Celiac artery aneurysms: Aneurysm type

Type	No.	Percent*
True	16	55
False	3	10
Mycotic	4	14
Inflammatory	2	7
Fibromuscular dysplasia	1	3
Not stated	3	10

*Percentage of total cases.

REFERENCES

- Stanley JC, Thompson NW, Fry WJ. Splanchnic artery aneurysms. *Arch Surg* 1970;101:689-697.
- Beningfield SJ, Bornman PC, Krige JE, et al. Control of hemobilia by embolization of a false aneurysm and arterioportobiliary fistula of the hepatic artery. *AJR Am J Roentgenol* 1991;156:1263-1265.
- Komori K, Sonoda T, Ikeda Y, et al. Demonstration of hepatic artery aneurysm by subtraction angiography. *Am J Gastroenterol* 1991;86:1650-1653.
- Kestenbergl WL, Mittal VK. Post-traumatic pseudoaneurysm of the left hepatic artery initially appearing as upper gastrointestinal hemorrhage secondary to hepatic artery-duodenal fistula. A case study. *Am Surg* 1992;58:451-454.
- Parangi S, Oz MC, Blume RS, et al. Hepatobiliary complications of polyarteritis nodosa. *Arch Surg* 1991;126:909-912.
- Reid C, Cameron D, Simon TA, et al. Selective embolisation of intrahepatic aneurysms. *Aust NZ J Surg* 1992;62:582-584.
- Briggs PJ, Morris IR, Chamberlain J. Hepatic artery aneurysm and acute cholecystitis. *Br J Clin Pract* 1989;43:462-463.
- Alexander DJ, Madan M. Hepatic artery aneurysm: An unusual presentation. *Br J Clin Pract* 1993;47:269-270.
- Hutchinson CE, Mackinlay JY, Buckels JA. Case report. Pseudoaneurysm of transplant hepatic artery: A late presentation. *Br J Radiol* 1993;66:158-160.
- Goodacre BW, Chipperfield P, Harrison PB. Embolization of a catheter-related hepatic artery pseudoaneurysm after long-term biliary drainage. *Can Assoc Radiol J* 1990;41:308-310.
- Walton JM, Abraham RJ, Perey BJ, et al. Hepatic artery pseudoaneurysms in acute pancreatitis. *Can J Surg* 1991;34:377-380.
- Barba CA, Bret PM, Hinchey EJ. Pseudoaneurysm of the cystic artery: A rare cause of hemobilia. *Can J Surg* 1994;37:64-66.
- Zajko AB, Chablani V, Bron KM, et al. Hemobilia complicating transhepatic catheter drainage in liver transplant recipients: Management with selective embolization. *Cardiovasc Intervent Radiol* 1990;13:285-288.
- Rosch J, Petersen BD, Hall LD, et al. Interventional treatment of hepatic arterial and venous pathology: A commentary. *Cardiovasc Intervent Radiol* 1990;13:183-188.
- Herskowitz MM, Flyer MA, Sclafani SJ. Percutaneous transhepatic coil embolization of a ruptured intrahepatic aneurysm in polyarteritis nodosa. *Cardiovasc Intervent Radiol* 1993;16:254-256.
- Savader SJ, Savader BL, Fishman EK, et al. Giant pseudoaneurysm of the hepatic artery—CT demonstration. Case report. *Clin Imaging* 1992;16:175-179.
- Ross P Jr, Denny DF Jr, Baker CC. Angiographic embolization of traumatic hepatic artery pseudoaneurysm. *Conn Med* 1990;54:308-310.
- Werner C, Bonnevillie B. Gastrointestinal bleeding from a fistula between an aneurysm of the hepatic artery and the pancreatic duct. *Eur J Vasc Surg* 1993;7:95-97.
- Chilovi F, Amplatz S, Piazzzi L, et al. Hemorrhage from fistula between duodenal cap and hepatic artery aneurysm [letter]. *Gastrointest Endosc* 1992;38:523-524.
- Tsai CH, Mo LR, Chiou CY, et al. Therapeutic embolization of postcholecystectomy hepatic artery aneurysm. *Hepatogastroenterology* 1992;39:158-160.
- Thibodeaux LC, Deshmukh RM, Hearn AT, et al. Management options for hepatic artery aneurysms. *Ann Vasc Surg* 1995;9:285-288.
- Warshauer DM, Keefe B, Mauro MA. Intrahepatic hepatic artery aneurysm: Computed tomography and color-flow Doppler ultrasound findings. *Gastrointest Radiol* 1991;16:175-177.
- Namieno T, Hata Y, Uchino J, et al. Spontaneous rupture of intrahepatic artery aneurysms with complicated vascular anomalies. *Gastrointest Radiol* 1991;16:172-174.
- Fernandez-Cruz L, Pera M, Vilella A, et al. Hemosuccus pancreatitis from a pseudoaneurysm of the hepatic artery proper in a patient with a pancreatic pseudocyst. *Hepatogastroenterology* 1992;39:149-151.
- Horejsova M, Bozovska J, Kocandrlje V. Aneurysm of the common hepatic artery diagnosed by ultrasonography. *Hepatogastroenterology* 1990;37(Suppl 2):74-76.
- Lal RB, Strohl JA, Piazza S, et al. Hepatic artery aneurysm. *J Cardiovasc Surg (Torino)* 1989;30:509-513.
- SgROI G, Stringhi E, Bergamaschi E, et al. A case of asymptomatic giant aneurysm of the common hepatic artery. *J Cardiovasc Surg (Torino)* 1994;35:337-339.
- Nemeth GG, Eljovich F, Schanzer H. Hepatic artery aneurysm simulating a pancreatic mass. *J Cardiovasc Surg (Torino)* 1992;33:629-631.
- Lukancic SP, Nemcek AA Jr, Vogelzang RL. Posttraumatic intrahepatic arterial pseudoaneurysm: Treatment with direct percutaneous puncture. *J Vasc Interv Radiol* 1991;2:335-337.

30. Sarkar R, Coran AG, Cilley RE, et al. Arterial aneurysms in children: Clinicopathologic classification [see Discussion]. *J Vasc Surg* 1991;13:47-56.
31. Nakamura S, Yokoi Y, Suzuki S, et al. A case of melena caused by a hepatic aneurysm ruptured into the intrahepatic bile duct in a patient with allergic granulomatous angiitis. *Jpn J Surg* 1991;21:471-475.
32. Schroeder PL, Trego AJ. Hemobilia from a ruptured hepatic artery aneurysm. *Kans Med* 1991;92:131-133.
33. Shannon R. Hepatic artery aneurysm. *Med J Aust* 1991;154:773-774.
34. Kubo S, Nakagawa H, Imaoka S. Systemic multiple aneurysms of the extracranial internal carotid artery, intracranial vertebral artery, and visceral arteries: Case report. *Neurosurgery* 1992;30:600-602.
35. Curran FT, Taylor SA. Hepatic artery aneurysm. *Postgrad Med J* 1986;62:957-959.
36. Blue JM, Burney DP. Current trends in the diagnosis and treatment of hepatic artery aneurysms. *South Med J* 1990;83:966-969.
37. Tan W, Schiano TD, Moss D, et al. Hepatic artery aneurysm associated with acute gastroenteritis: Successful treatment after intraperitoneal rupture. *South Med J* 1994;87:831-832.
38. Madariaga J, Tzakis A, Zajko AB, et al. Hepatic artery pseudoaneurysm ligation after orthotopic liver transplantation—A report of 7 cases. *Transplantation* 1992;54:824-828.
39. Weingarten MS, Noshier JL. Combined hepatic and gastric artery aneurysms: A case report and review of the literature. *Ann Vasc Surg* 1987;1:598-603.
40. Morales JM, Skudder P, Leach C. Hepatic artery aneurysm. *Surg Rounds* 1994, pp 501-506.
41. Perry MO. Giant hepatic artery aneurysm. *Contemp Surg* 1990;36:50-53.
42. Salo JA, Aarnio PT, Jarvinen AA, et al. Aneurysms of the hepatic arteries. *Am Surg* 1989;55:705-709.
43. Rothbarth LJ, Redmond PL, Kump DA. Percutaneous transhepatic treatment of a large intrahepatic aneurysm. *AJR Am J Roentgenol* 1989;153:1077-1078.
44. Stauffer JT, Weinman MD, Bynum TE. Hemobilia in a patient with multiple hepatic artery aneurysms: A case report and review of the literature. *Am J Gastroenterol* 1989;84:59-62.
45. Zachary K, Geier S, Pellicchia C, et al. Jaundice secondary to hepatic artery aneurysm: Radiological appearance and clinical features. *Am J Gastroenterol* 1986;81:295-298.
46. Jeans PL. Hepatic artery aneurysms and biliary surgery: Two cases and a literature review. *Aust NZ J Surg* 1988;58:889-894.
47. Wolinski AP, Gall WJ, Dubbins PA. Hepatic artery aneurysm following pancreatitis diagnosed by ultrasound. *Br J Radiol* 1985;58:768-770.
48. Ayuso JR, Gilabert R, Bru C, et al. Hepatic artery aneurysm: Diagnosis by duplex-Doppler ultrasound. Case report. *Eur J Radiol* 1988;8:263-265.
49. Rao RC, Kumar A, Berry M. Pseudoaneurysm of anomalous right hepatic artery as a cause for hemosuccus pancreatitis. *Gastrointest Radiol* 1987;12:313-314.
50. Zalcman M, Matos C, Van Gansbeke D, et al. Hepatic artery aneurysm: CT and MR features. *Gastrointest Radiol* 1987;12:203-205.
51. Hugel HE, Oser W, Bodner E. Aneurysm of the proper hepatic artery as a rare source of upper gastrointestinal bleeding. *Gastrointest Radiol* 1986;11:158-160.
52. Smith JA, Macleish DG, Collier NA. Aneurysms of the visceral arteries. *Aust NZ J Surg* 1989;59:329-334.
53. Taylor DW Jr, Babchuk WI, Walz DJ, et al. Gastrointestinal hemorrhage from fistula between traumatic pseudoaneurysm of the right hepatic artery and the duodenum. *Clin Nucl Med* 1988;13:337-338.
54. Song HY, Choi KC, Park JH, et al. Radiological evaluation of hepatic artery aneurysms. *Gastrointest Radiol* 1989;14:329-333.
55. Satoh H, Takeda T, Takashima M, et al. Gas-forming liver abscess following transcatheter hepatic arterial embolization for an iatrogenic intrahepatic pseudoaneurysm: Report of a case. *Surg Today* 1995;25:361-364.
56. Marks WH, Coran AG, Wesley JR, et al. Hepatic artery aneurysm associated with the mucocutaneous lymph node syndrome. *Surgery* 1985;98:598-601.
57. Houssin D, Ortega D, Richardson A, et al. Mycotic aneurysm of the hepatic artery complicating human liver transplantation. *Transplantation* 1988;46:469-472.
58. Psathakis D, Muller G, Noah M, et al. Present management of hepatic artery aneurysms. Symptomatic left hepatic artery aneurysm: Right hepatic artery aneurysm with erosion into the gallbladder and simultaneous colcholecystic fistula—A report of two unusual cases and the current state of etiology, diagnosis, histology and treatment. *Vasa* 1992;21:210-215.
59. Stierli P, Graf D, Stamm B. Recurrent bleeding from a hepatic artery aneurysm feeding a large cavernous hemangioma of the liver. *Vasa* 1991;20:164-168.
60. Merhav H, Zajko AB, Dodd GD, et al. Percutaneous transhepatic embolization of an intrahepatic pseudoaneurysm following liver biopsy in a liver transplant patient. *Transpl Int* 1993;6:239-241.
61. Geelkerken RH, van Bockel JH, de Roos WK, et al. Surgical treatment of intestinal artery aneurysms. *Eur J Vasc Surg* 1990;4:563-567.
62. Czkelius P, Deichert L, Gesenhues T, et al. Rupture of an aneurysm of the splenic artery and pregnancy: A case report. *Eur J Obstet Gynecol Reprod Biol* 1991;38:229-232.
63. Falkoff GE, Taylor KJ, Morse S. Hepatic artery pseudoaneurysm: Diagnosis with real-time and pulsed Doppler ultrasound. *Radiology* 1986;158:55-56.
64. Roh LS, LeSher A. Dissecting aneurysm of the hepatic artery. *Am J Forensic Med Pathol* 1989;10:67-70.
65. Pinsky MA, May ES, Taxier MS, et al. Late manifestation of hepatic artery pseudoaneurysm: Case presentation and review. *Am J Gastroenterol* 1987;82:467-469.
66. Noshier JL, Trooskin SZ, Amorosa JK. Occlusion of a hepatic arterial aneurysm with Gianturco coils in a patient with the Ehlers-Danlos syndrome. *Am J Surg* 1986;152:326-328.
67. Searles GE, Wellington JL. Hepatic artery aneurysm presenting as abdominal pain and hemoperitoneum. *Can J Surg* 1989;32:292-294.
68. Trambert J, Reinitz E, Buchbinder S. Ruptured hepatic artery aneurysms in a patient with systemic lupus erythematosus: Case report. *Cardiovasc Intervent Radiol* 1989;12:32-34.
69. Bajakian RL, Swayne LC, Palace FM. Scintigraphic detection of hemobilia and hemoperitoneum secondary to rupture of hepatic artery aneurysm. *Clin Nucl Med* 1988;13:831-832.
70. Cooper SG, Richman AH. Spontaneous rupture of a congenital hepatic artery aneurysm. *J Clin Gastroenterol* 1988;10:104-107.
71. Navarro Gomez A, Garcia Lorenzo C, Ruiz Orpez A, et al. Hepatic artery aneurysm in a child. *J Pediatr Surg* 1987;22:1027-1028.
72. Caputo AE, Roberts WN, Yee YS, et al. Hepatic artery aneurysm in corticosteroid-treated, adult Kawasaki's disease. *Ann Vasc Surg* 1991;5:533-537.

73. Quinn SF, Finney R, Rosemurgy A, et al. Splenic artery pseudoaneurysm after placement of percutaneous transgastric catheter for a pancreatic pseudocyst. *AJR Am J Roentgenol* 1988;151:495-496.
74. Walker TG, Geller SC, Waltman AC. Splenic artery pseudoaneurysms causing lower gastrointestinal hemorrhage. *AJR Am J Roentgenol* 1988;150:433-434.
75. Osawa M, Masui M, Wakasugi C. Rupture of a giant splenic artery aneurysm. Report of an autopsy case. *Am J Forensic Med Pathol* 1991;12:337-339.
76. Park H. Rupture of splenic artery aneurysm. *Am J Forensic Med Pathol* 1992;13:230-232.
77. Short DH, Puyau MK, Sauls JL, et al. Use of digital subtraction angiography in the diagnosis of splenic artery aneurysms. *Am Surg* 1985;51:606-608.
78. Huncharek M, Klassen H, Klassen M. Splenic artery aneurysm and upper gastrointestinal bleeding in a nulliparous woman. A case history. *Angiology* 1994;45:733-735.
79. Sendra F, Safran DB, McGee G. A rare complication of splenic artery aneurysm. Mesenteric steal syndrome. *Arch Surg* 1995;130:669-672.
80. Pomerantz RA, Eckhauer FE, Strodel WE, et al. Splenic aneurysm rupture in cirrhotic patients [letter]. *Arch Surg* 1986;121:1095-1096.
81. Stumer MB. Rupture of a splenic artery aneurysm in pregnancy [letter; comment]. *Aust NZ J Obstet Gynaecol* 1991;31:90-91.
82. Hayde SM, Gillett WR, Thompson IA. Rupture of a splenic artery aneurysm in pregnancy [see Comments]. *Aust NZ J Obstet Gynaecol* 1990;30:132-133.
83. Jotkowitz MW, Polglase AL. Splenic artery aneurysm in pregnancy [letter]. *Aust NZ J Obstet Gynaecol* 1995;35:232-233.
84. Evans GH, Gunn J, Castleden WM. Spontaneous rupture of a splenic artery aneurysm. *Aust NZ J Surg* 1992;62:664-665.
85. Jacobson IV, Crowe PJ. Splenic infarction: A complication of splenic artery aneurysm. *Aust NZ J Surg* 1994;64:53-54.
86. McDermott VG, Shlansky-Goldberg R, Cope C. Endovascular management of splenic artery aneurysms and pseudoaneurysms. *Cardiovasc Intervent Radiol* 1994;17:179-184.
87. Avery GR, Wilsdon JB, Mitchell L. Case report: CT and angiographic appearances of intrasplenic mycotic aneurysm. *Clin Radiol* 1991;44:271-272.
88. Furuta Y, Kashii A, Asaoka Y, et al. Splenic arteriovenous fistula formation due to angiodyplasia in a splenic aneurysm of a patient with liver cirrhosis—A report of a case. *Gastroenterol Jpn* 1987;22:374-378.
89. Murayama S, Shimoda Y. Completely thrombosed splenic artery aneurysm mimicking cystic pancreatic mass: Computed tomographic findings. *Gastrointest Radiol* 1990;15:205-206.
90. Ueda J, Kobayashi Y, Hara K, et al. Giant aneurysm of the splenic artery and huge varix. *Gastrointest Radiol* 1985;10:55-57.
91. Sasada T, Maki A, Takabayashi A. Recurrent splenic artery aneurysms developing after aneurysmectomy without splenectomy: Report of a case. *Surg Today* 1995;25:168-171.
92. Hashizume M, Ohta M, Ueno K, et al. Laparoscopic ligation of splenic artery aneurysm. *Surgery* 1993;113:352-354.
93. Sidhu PS, Khaw KT, Belli AM. Anomalous splenic artery aneurysm: Demonstration on CT scanning and angiography. *Postgrad Med J* 1995;71:49-51.
94. Lie M, Ertresvag K, Skjennald A. Rupture of a splenic artery aneurysm into the pancreatic duct. Case report. *Acta Chir Scand* 1990;156:411-413.
95. Chen CW, Chen CP, Wang KG. Splenic artery aneurysm rupture in the second trimester [letter]. *Int J Gynaecol Obstet* 1995;49:199-200.
96. English JD. Spontaneous rupture of a splenic artery aneurysm in the third trimester. *Ir J Med Sci* 1993;162:169-170.
97. Tam TN, Lai KH, Tsai YT, et al. Huge splenic artery aneurysm after portocaval shunt. *J Clin Gastroenterol* 1988;10:565-568.
98. Brunet WG, Greenberg HM. CT demonstration of a ruptured splenic artery aneurysm. *J Comput Assist Tomogr* 1991;15:177-178.
99. Martin KW, Morian JP Jr, Lee JK, et al. Demonstration of a splenic artery pseudoaneurysm by MR imaging. *J Comput Assist Tomogr* 1985;9:190-192.
100. Williams JJ. Splenic artery aneurysm rupture: An uncommon obstetrical catastrophe. *J Fam Pract* 1988;26:73-74.
101. McNeely RG, Anderle LJ, Conklin CR. Splenic artery aneurysm rupture in pregnancy with maternal and fetal survival. A case report. *J Reprod Med* 1992;37:939-942.
102. Norotsky MC, Rogers FB, Shackford SR. Delayed presentation of splenic artery pseudoaneurysms following blunt abdominal trauma: Case reports. *J Trauma* 1995;38:444-447.
103. Lowry SM, O'Dea TP, Gallagher DI, et al. Splenic artery aneurysm rupture: The seventh instance of maternal and fetal survival. *Obstet Gynecol* 1986;67:291-292.
104. Fukunaga Y, Usui N, Hirohashi K, et al. Clinical courses and treatment of splenic artery aneurysms—Report of three cases and review of literature in Japan. *Osaka City Med J* 1990;36:161-173.
105. Long CD, Bakshi KR, Kahn MB, et al. Giant splenic artery aneurysm. *Ann Vasc Surg* 1993;7:474-478.
106. Macia M, Pulido-Duque JM, Hortal L, et al. Percutaneous embolization of splenic artery pseudoaneurysm as a treatment of hemoperitoneum in a CAPD patient. *Perit Dial Int* 1993;13:157-159.
107. Carrel D, Cohle SD, Chapman AJ. Fatal hemothorax from mycotic celiac artery aneurysm. *Am J Forensic Med Pathol* 1992;13:233-237.
108. Vohra R, Carr HM, Welch M, et al. Management of coeliac artery aneurysms. *Br J Surg* 1991;78:1373-1375.
109. Onohara T, Okadome K, Mii S, et al. Rupture of embolised coeliac artery pseudoaneurysm into the stomach: Is coil embolisation an effective treatment for coeliac anastomotic pseudoaneurysm? *Eur J Vasc Surg* 1992;6:330-332.
110. Werner K, Tarasoutchi F, Lunardi W, et al. Mycotic aneurysm of the celiac trunk and superior mesenteric artery in a case of infective endocarditis. *J Cardiovasc Surg (Torino)* 1991;32:380-383.
111. Viglione G, Younes GA, Coste P, et al. Mycotic aneurysm of the celiac trunk: Radical resection and reconstruction without prosthetic material. *J Cardiovasc Surg (Torino)* 1993;34:73-75.
112. Junewick JJ, Grant TH, Weiss CA, et al. Celiac artery aneurysm: Color Doppler evaluation. *J Ultrasound Med* 1993;12:355-357.
113. Bailey RW, Riles TS, Rosen RJ, et al. Celiomesenteric anomaly and aneurysm: Clinical and etiologic features. *J Vasc Surg* 1991;14:229-234.
114. Phillips WS, Macmanus Q, Lefrak EA. Celiac artery aneurysms: Case reports. *Va Med Q* 1991;118:235-237.
115. Kazui T, Baba M, Komatsu S. Aneurysm of the celiac artery. *J Cardiovasc Surg* 1988;29:567-569.
116. Bret PM, Partensky C, Bretagnolle M, et al. Obstructive jaundice by a dissecting aneurysm of celiac axis and hepatic artery. *Dig Dis Sci* 1987;32:1431-1434.
117. Wolf RK, Carmichael PA, Clark JH. Celiac artery aneurysmectomy with pancreatectomy. *J Vasc Surg* 1986;3:817-819.
118. Taheri PA, Bitzer LG, Curl R, et al. Surgical repair of a celiac axis aneurysm and renal oncocytoma: A single case report. *Ann Vasc Surg* 1992;6:453-455.

119. Hoshi H, Yuki Y, Miyaji S, et al. Pseudoaneurysm of the celiac artery demonstrated by radionuclide angiography. *Clin Nucl Med* 1988;13:837-839.
120. White RA, White GH, Klein SR, et al. Biliary and portal obstruction by celiac artery aneurysm. *J Cardiovasc Surg (Torino)* 1987;28:42-44.
121. Lubbers PR, Goff WB, Volpe RJ, et al. CT diagnosis of celiac artery aneurysm. *J Comput Assist Tomogr* 1988;12:352-354.
122. Hashemi HA, Comerota AJ, Dempsey DT. Foregut revascularization via retrograde splenic artery perfusion after resection of a juxtaceliac mycotic aneurysm: Complicated by pancreatic infarction because of cholesterol emboli. *J Vasc Surg* 1995;21:530-536.
123. Graham LM, Stanley JC, Whitehouse WM Jr, et al. Celiac artery aneurysms: Historic (1745-1949) versus contemporary (1950-1984) differences in etiology and clinical importance. *J Vasc Surg* 1985;2:757-764.
124. Risher WH, Hollier LH, Bolton JS, et al. Celiac artery aneurysm. *Ann Vasc Surg* 1991;5:392-395.

BOUND VOLUMES OF ANNALS

Bound volumes are available to subscribers only. The hardbound volume of six issues of the 1996 *Annals of Vascular Surgery* must be ordered by October 1, 1996, from Quality Medical Publishing, Inc., 11970 Borman Dr., Ste. 222, St. Louis, MO 63146. Payment of \$60 in U.S. funds must accompany all orders.