

Aortoenteric Fistula

Incidence, Presentation Recognition, and Management

MALCOLM C. CHAMPION, M.D., F.R.C.P.(C), STEVEN N. SULLIVAN, M.D., F.R.C.P.(C),
JOHN C. COLES, M.D., F.R.C.P.(C), MARTIN GOLDBACH, M.D., F.R.C.P.(C),
WILLIAM C. WATSON, M.D., Ph.D., F.R.C.P.

Twenty-two patients developed one or more aortoenteric fistulae following aortic reconstruction with a dacron graft. Endoscopy was performed on 11 of these patients on 17 occasions and a preoperative diagnosis was made in eight patients. Fistulous communication was most common between the aorta and duodenum (60%), and a further 30% penetrated into the jejunum and ileum. The mean period from operation to time of diagnosis was 36 months and the mean length of bleeding was 25 days, allowing ample time for preoperative evaluation. Surgery was performed on 21 of the 22 patients with an overall mortality of 77%. The best surgical results were obtained with graft resection, closure of the aorta, and maintenance of circulation by an axillofemoral graft.

FISTULOUS COMMUNICATION between an aortic graft and the bowel is a serious and life threatening complication of aortic graft surgery. It was first reported by Brock in 1953,¹ and in 1957 Herberer² reported the first successful repair. Since then over 200 cases have been reported. The gravity of this complication is compounded by the poor results of surgery and the difficulty in making a diagnosis. Aortography and other gastrointestinal contrast studies have a high false negative rate.³ Scattered reports on the use of endoscopy have appeared,⁴⁻⁶ but the value of this procedure as a diagnostic tool has only been emphasized once in a paper in which five cases of aortoduodenal fistula were described. We report 22 patients with aortoenteric fistula and stress the importance of early diagnostic endoscopy and removal of the original graft followed by axillofemoral grafting.

Methods and Results

Medical records of University Hospital, Victoria Hospital and St. Joseph's Hospital, London, Ontario were reviewed. In the past 11 years (1968-1979), 22 patients had this complication, 3 women (mean age 61 years) and 19 men (mean age 62 years), in 1,376 abdominal aortic graft reconstructive operations. The clinical details are summarized in Table 1. The initial op-

From the Division of Gastroenterology and Cardiovascular Surgery, University of Western Ontario and Victoria Hospital Corporation, London, Ontario, Canada

eration was for aortic aneurysm in 38%, peripheral vascular disease in 48%, and for individual cases of renal artery stenosis, Buerger's disease and primary aortoenteric fistula. Fistulous communication was most common between aorta and duodenum (60%), but involvement of the jejunum was present in 12%, ileum in 18%, cecum in 8%, and appendix in 4%. Three patients had two fistulae. The mean period of time from operation to diagnosis was 36 months (range, 11 days to 146 months). The mean length of bleeding prior to diagnosis was 25 days (range, two hours to eight months). The proximal suture line was involved in all but one case (patient 7). The most common form of presentation was melena. Hematemesis occurred 22% of the patients, but the classical presentation of a "herald hemorrhage" was evident in only four patients.

Endoscopy was performed in 11 patients on 17 occasions and established a preoperative diagnosis in eight patients. On three occasions a dacron graft was seen eroding through the small bowel wall. In one patient (number 16) two sources of bleeding were present. A duodenal ulcer was oversewn at the initial surgery, but the patient had a further bleed, and an aortoduodenal fistula was seen at the third endoscopy prior to subsequent surgery.

Contrast radiography was of benefit in only two patients. At angiography contrast extravasated at the site of the fistula in patient 7 (Fig. 1). The fistula was identified on upper gastrointestinal radiography in patient 19 (Fig. 2). A pseudoaneurysm was present at angiography or at the time of surgery in only five patients.

Infection was present at the time of surgery in 16 patients (72%) as proven by macroscopic examination, culture of the graft, or culture of swabs from the surgical site. No common organism was cultured. Several patients had prebleed fever or leukocytosis suggestive of infection. One patient (patient 3) was known to be

Reprint requests: Dr. W. C. Watson, M.D., Ph.D., Gastroenterology Unit, Victoria Hospital, London, Ontario, Canada N6A 4G5.

Submitted for publication: July 30, 1981.

TABLE I.

Patient Age and Sex	Time Surgery—Diagnosis	Length of Bleeding	Endoscopy	Site of Fistula	Operation	Complications
1. RD 74, M	2 years, 2 months	Melena 3 weeks	—	Appendix cecum	Simple repair	Died—rebleed
2. AS 59, M	4 years, 0 months	Melena 1 week	—	Ileum	Graft removed aorta oversewn	Died—wound infection
3. ET 63, M	1 year, 4 months	Melena 1 week	—	Ileum	Partial graft resection inserted	Died—thrombosis both legs
4. AA 73, M	5 weeks	Melena 24 hours	—	Duodenum	Laparotomy	Died—exsanguinated at surgery
5. EB 63, F	4 years, 5 months	Hematemesis and melena 2 weeks	Punched out crater 3rd part of duodenum	Duodenum	1. Graft resected 2. L. Axillo fem. bypass 3. L. below knee amputation	Died—sepsis
6. CH 66, M	10 months	Melena 1 week hematemesis	—	Duodenum	1. Gastrostomy 2. Graft removed aorta oversewn	Died—sepsis
7. EG 40, M	1 year, 7 months	Melena 2 hours	—	Two loops of ileum	Graft changed	Good recovery
8. FM 59, M	2 years, 10 months	Melena 2 weeks	No bleeding source up to 2nd part of duodenum	Duodenum	1. V & P 2. Simple repair	Died—renal failure peritonitis
9. WA 75, M	5 years, 5 months	Hematemesis 6 hours	—	Duodenum	Simple closure	Died—peritonitis
10. AD 61, F	7 years, 2 months	Melena 6 weeks	1. ? DU 2. AD fistula	Duodenum	Graft removed	Died—rebleed from false aneurysm at aorti stump
11. MS 52, M	2 years, 5 months	Melena 3 months	1. No bleeding source 2. Lesion distal duodenum	Duodenum	simple repair	Died—recurrent fistula
12. WC 44, M	1 year, 10 months	Hematemesis 12 hours	1. Lesion distal duodenum 2. AD fistula	Jejunum	Simple repair	Died—rebleed reinfection
13. GD 62, M	6 weeks	Melena hematemesis 2 weeks	—	Jejunum	Laparotomy	Died—exsanguinated surgery
14. RH 66, M	11 months	Melena 48 hours	—	Duodenum	1. Graft removed Aorta oversewn 2. Axillo-fem. 16 months later	Doing well
15. HK 67, M	9 months	Melena 8 months	Fresh blood 3rd duodenum	1. Graft removal 2. Bilateral axillo-fem. grafts	Doing well	
16. RH 64, M	2 years, 2 months	Melena 48 hours	1. Bleeding Du 2. Clot in duodenum 3. AD fistula	Duodenum	1. V & P 2. Graft repair 3. Graft replaced	Infected graft. on long-term antibiotics, doing well
17. DS 61, M	11 days	Melena 1 day	—	Duodenum	No further surgery	Died—repeated bleed
18. SC 59, F	4 years, 11 months	Melena 8 weeks	1. No bleeding source delineated 2. Bleeding 2nd part duodenum	Duodenum	1. Graft removed 2. Axillo-fem. graft	Doing well
19. AO 57, M	4 years, 0 months	Melena 4 weeks	1. Erosion 3rd part duodenum	1. Duodenum 2. Cecum	1. Laparotomy 2. Graft removed R. axillofemoral graft	Died—repeat bleed infected stump
20. GW 64, M	3 months	Melena 48 hours	—	Ileum	1. Surgical drainage 2. Removal R. limb of graft 3. Graft removed	Died—abdominal sepsis
21. HV 55, M	12 years, 2 months	12 hours melena	1. No bleeding source 2. Bleeding distal to duodenum	Jejunum	Laparotomy	Died exsanguinated at surgery
22. JM 71, M	5 years, 10 months	4 weeks melena	Bleeding 3rd part duodenum	Duodenum	Graft removal aorta oversewn bilateral axillofemoral graft	Died—sepsis renal failure

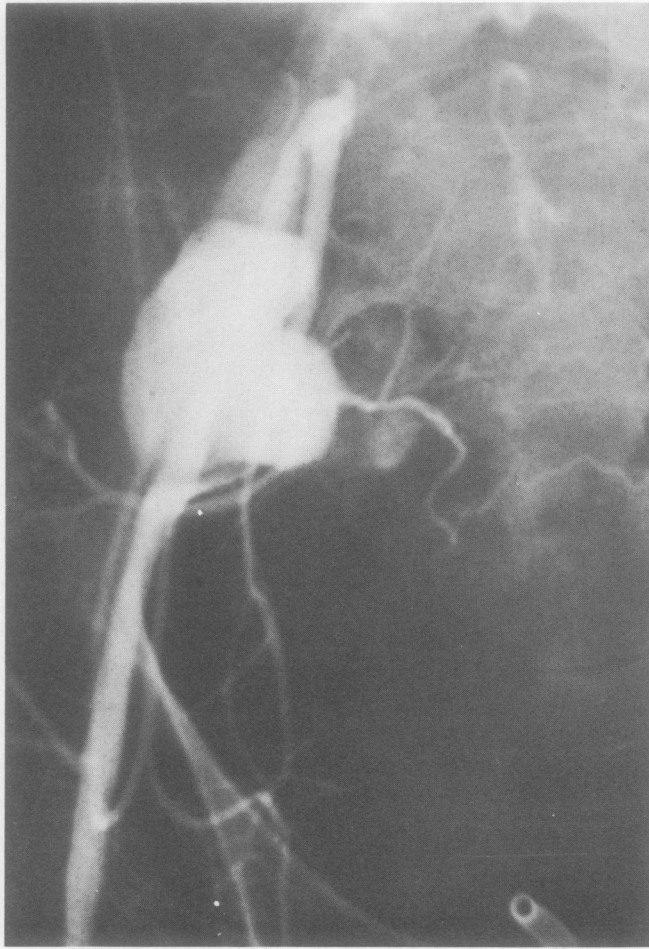


FIG. 1. Angiogram showing extravasation of dye into small bowel.

infected at the time of initial surgery; the same organism was cultured 16 months later following the development of a fistula. Abdominal pain was not a common presenting feature.

Surgery was performed on 21 of the 22 patients. A second operation was necessary in eight patients, a third operation in two. Seventy-seven per cent died as a result of the fistula or subsequent complication. Of the remaining five patients, one has a chronically infected graft. The other four have made a good recovery. Three of these had graft resection and axillofemoral grafts. Surgical fatality was high after each operation, 45% after the first and 50% after the second and third. Three patients exsanguinated at the time of initial surgery, emphasizing the importance of early surgical intervention.

Discussion

Aortoenteric fistulization in patients with an aortic dacron graft is not a rare event as confirmed by our incidence of 1.6% of 1,376 cases over an 11-year period. This is comparable to the incidence of 0.6%⁸ to 4%⁹ as previously reported. The fistula most commonly devel-

ops at the upper aortoprosthetic anastomosis and communicates with the third part of the duodenum. It may also enter the stomach, jejunum, ileum, or colon. Occasionally fistulae may develop at the femoral anastomosis (one patient in our series) and communicate with the appendix, cecum, or sigmoid colon. We have just seen our first case of aorto-esophageal fistula in a male patient with a mycoplasma mediastinitis following an instrumental tear of the esophagus. Multiple fistulae have not previously been reported, but occurred in 3 of 22 patients (14%).

The pathogenesis of this condition is unknown. There are two major theories. The first proposes that the fistula is the result of repeated mechanical trauma from arterial pulsation. The second, and more probable, proposes low grade infection as the primary event with abscess formation and subsequent erosion through the graft into the adjacent bowel.¹⁰ Whatever the etiology, the majority of grafts are infected at the time of hemorrhage, and blood cultures may be positive for enteric organisms in up to 85% of patients.¹¹

Bleeding from aortoenteric fistulae can occur any

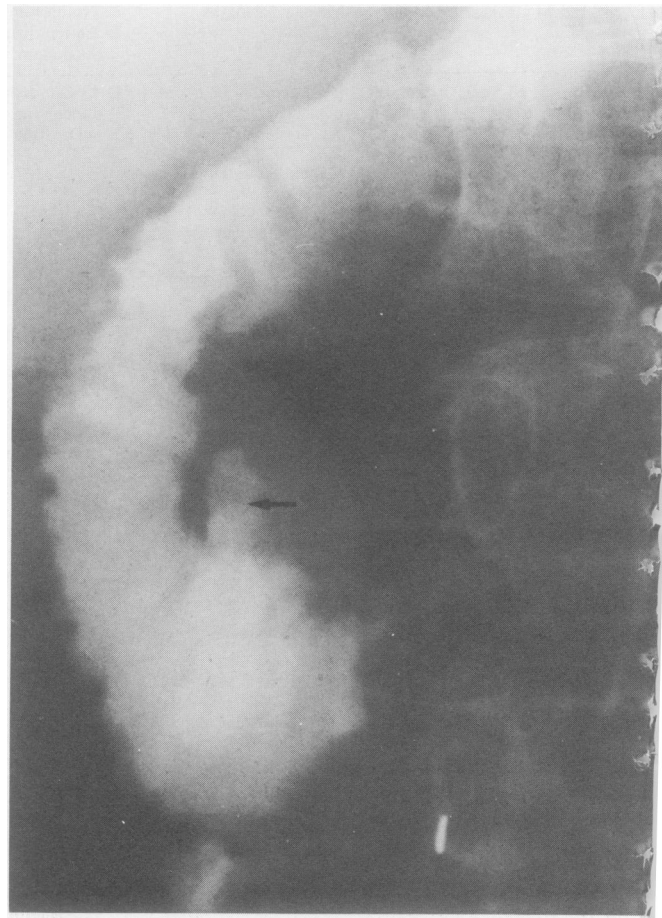


FIG. 2. Upper gastrointestinal series showing (arrow) extravasation from third part of duodenum at site of fistula.

time from the first postoperative week to 14 years after surgery, with a mean interval from operation to diagnosis being previously reported at 15 months. We found the mean interval to be 36 months, much longer than previously observed, and emphasizing the importance of continuing vigilance. Contrary to what one might predict, bleeding may cease spontaneously with recurrent intermittent hemorrhage, usually melena, being common. Only 22% of our patients presented with a "herald hemorrhage," namely a brisk initial bleed accompanied by hypotension and hematemesis which ceases spontaneously to be followed by a further bleed hours to days later. The duration of bleeding is quite variable, being from six hours to eight months, with a mean of 25 days. This allows ample time for preoperative evaluation and diagnosis in the majority of patients. Unfortunately delay in diagnosis and terminal exsanguination are common.

Every patient with a gastrointestinal bleed and a past history of aortic graft surgery must be considered to have an aortoenteric fistula until proved otherwise. All patients should have upper gastrointestinal endoscopy as soon as possible. The endoscopic appearances vary from those of a graft protruding through the bowel wall to fresh bleeding distal to the first part of the duodenum. There may be an extrinsic pulsating mass with the suture line protruding into the duodenum or this may be covered by blood clot. In one of our patients there was an alternative bleeding source, with the fistula being missed at the initial endoscopy and also at time of repair of the bleeding duodenal ulcer. Another diagnosis was missed because the endoscopist examining only up to the second part of the duodenum.

It is important to insert the endoscope to its limit, if necessary, taking care to avoid dislodging impacted graft material. In our experience there is no significant difference in the technical merits of medium calibre and thin endoscopes.

Without active surgical intervention exsanguination is inevitable. The overall survival of patients with aortoenteric fistula varies from 30% to 75%^{8,12,13} according to the surgery performed. Attempts at local repair or graft replacement result in a low survival rate (20%)¹² either because of hemorrhage in the postoperative period or reinfection of the graft with refistulization. None of our patients with local repair of the graft survived the immediate postoperative period. Only two patients in our series are still alive following graft replacement, and one has a chronically infected for which he is receiving antibiotics (patient 16). Once it is accepted that the most likely cause of an aortoenteric fistula is low grade infection¹⁰ and that all grafts are infected at the time of surgery due to contamination from the bowel,

then the treatment of choice is graft resection and establishment of an extra-anastomotic circulation, preferably by a single axillofemoral bypass.¹⁴

Aortoenteric fistulization is frequently fatal. A high index of suspicion and an aggressive team approach to the diagnosis and management of this condition is recommended. In the present series, endoscopy revealed a site of bleeding in 80% of those examined. We believe that gastrointestinal hemorrhage in a patient with an aortic dacron graft is an indication for immediate upper gastrointestinal endoscopy. The endoscopist should not be reassured by finding an alternative bleeding or non-bleeding lesion and must attempt to examine as much of the upper alimentary tract as possible. If massive hemorrhage precludes endoscopic evaluation, emergency aortography should be performed. Prior barium contrast studies are discouraged as they will interfere with subsequent aortography. Resuscitation should be aggressive and in the exsanguinating patient surgical exploration should not be delayed by investigative procedures. Because infection is frequent we believe that the original graft should be removed, the aorta oversewn and replaced by an axillofemoral dacron prosthesis.

References

1. Brock RC. Aortic homografting—a report of six successful cases. *Guys Hospital Report* 1953; 102:204–228.
2. Heberer G. Diagnosis and treatment of aneurysms of the abdominal aorta. *Germ Med Mon* 1957; 2:203.
3. Thompson WM, Jackson DC, Johnsrude IS. Aortoenteric and paraprothestic-enteric fistulae. Radiologic findings. *Am J Roentgenol* 1976; 127:235–242.
4. Mir-Madjlessi SH, Sullivan BH, Farmer RG, Beven EG. Endoscopic diagnosis of aortoduodenal fistula. *Gastrointest Endoscop* 1973; 19:187–188.
5. Skibba RM, Greenberger NJ, Hardin CA. Para-prothestic-Enteric Fistulae—role of preoperative endoscopy. *Digest Diseases* 1975; 20:1081–1086.
6. Baker MS, Fischer JH, vanderReise L, Baker BH. The endoscopic diagnosis of aortoduodenal fistula. *Arch Surg* 1976; 111:304–306.
7. Brand EJ, Sivak MV, Sullivan BH. Aorto-duodenal fistula—endoscopic diagnosis. *Digest Disease* 1979; 24:940–945.
8. Elliott JP, Smith RF, Szilagyi DE. Aorto-enteric and para-prothestic-enteric fistulae. Problems of diagnosis and management. *Arch Surg* 1974; 108:479–490.
9. Levy MJ, Todd TB, Lillehei CW, Varco RL. Aortointestinal fistula following surgery of the aorta. *Surg Gynecol Obstet* 1965; 120:992–926.
10. Bussetil RW, Reese W, Baker JD, Wilson SE. Pathogenesis of aortoduodenal fistula, experimental and clinical correlates. *Surgery* 1979; 85:1–12.
11. Rosenthal D, Deterling Jr RA, O'Donnel Jr TF, Callow AD. Positive blood culture as an aid in the diagnosis of secondary aortoenteric fistula. *Arch Surg* 1979; 114:1041–1044.
12. Weirman WH, Strahan RW, Spencer JR. Small bowel erosions by synthetic aortic grafts. *Am J Surg* 1966; 112:791–797.
13. Becker RM, Blundell PE. Infected aortic bifurcation grafts: experience with 14 patients. *Surgery* 1976; 80:544–549.
14. Puglia E, Fry PD. Aortoenteric fistula: a preventable problem? *Can J Surg* 1980; 23:74–76.