Rectosigmoid Ischemia In Surgery Of Abdominal Aortic Aneurysms

Roger F. Smith
John G. Whitcomb
D. Emerick Szilagyi

Follow this and additional works at: https://scholarlycommons.henryford.com/hfhmedjournal

Part of the Life Sciences Commons, Medical Specialties Commons, Public Health Commons, and the Surgical Procedures, Operative Commons

Recommended Citation
Available at: https://scholarlycommons.henryford.com/hfhmedjournal/vol6/iss2/12

This Article is brought to you for free and open access by Henry Ford Health System Scholarly Commons. It has been accepted for inclusion in Henry Ford Hospital Medical Journal by an authorized editor of Henry Ford Health System Scholarly Commons. For more information, please contact acabrer4@hfhs.org.
RECTOSIGMOID ISCHEMIA IN SURGERY OF
ABDOMINAL AORTIC ANEURYSMS

ROGER F. SMITH, M.D.,* JOHN G. WHITCOMB, M.D.* AND D. EMERICK SZILAGYI, M.D.*

The rectosigmoid area of the colon is singularly vulnerable to ischemia due to the anatomical characteristics of its arterial blood supply. The critical area of Sudeck has been demonstrated both anatomically and clinically to be an important consideration when dealing with intrinsic lesions of this region. Another aspect of this problem has manifested itself with our increasing experience in the surgical management of abdominal aortic aneurysms. When resecting the abdominal aorta, it is usually necessary to sacrifice the inferior mesenteric artery and oftentimes one or both internal iliac arteries. The blood supply to the rectosigmoid colon may, under these circumstances, depending upon the adequacy of the collateral circulation, be so markedly diminished that the viability of this segment of colon is threatened. Major bowel complications have arisen from the ischemia produced in this manner. The advisability of maintaining the patency of at least one internal iliac artery following resection of an abdominal aortic aneurysm was pointed out by us previously. A recent report by McKain and Shumacker of two cases of severe ischemia of the left colon following resections of arteriosclerotic abdominal aneurysms serves to emphasize further the precarious nature of the arterial blood supply to the distal colon following aneurysmectomy. Moore and Movius have reported rectal strictures presumably related to ischemic changes produced by aortic bifurcation resection.

We have had experience in seventy-five resections for abdominal aortic aneurysm, with five patients who have clinically demonstrated varying degrees of ischemia of the rectosigmoid. These changes ranged from frank necrosis of the sigmoid and rectum to mucosal sloughing with transient bloody diarrhea. It is the purpose of this report to describe these cases and indicate the factors most likely responsible for their occurrence.

REPORT OF CASES

Case 1. W. M. was a 73 year old man in whom a large arteriosclerotic abdominal aneurysm was discovered during a cholecystectomy in 1949. The aneurysm became progressively larger and on 5-5-53 an aortogram was performed demonstrating it to be technically resectable. On 5-14-53 the patient underwent resection of his aneurysm which measured 22 x 22 cm. and extensively involved the left common iliac artery, including its bifurcation, and to a lesser degree the right common iliac artery. It was necessary to divide and ligate both the inferior mesenteric artery and the left internal iliac artery to accomplish satisfactory resection of the aneurysm. A homograft was used for replacement. The distal anastomosis on the left was made to the external iliac artery and on the right to the common iliac artery after first carrying out an intimectomy of its bifurcation. The graft was then wrapped in fascia lata and observed to function satisfactorily. Distal pulses were present postoperatively.

The immediate postoperative course was satisfactory. The patient regained consciousness and had a stable blood pressure of 120/70. Approximately twelve hours
following operation a state of irreversible vascular collapse developed and the patient expired.

Postmortem examination revealed only extensive systemic arteriosclerosis. In addition, however, a 39 cm. segment of rectum and sigmoid colon was found to have undergone early necrosis with the significant changes starting 4 cm. from the anus. Undoubtedly this contributed to his death. The homograft was found to be intact and apparently functional except for the right internal iliac artery which had thrombosed.

Case 2. A. H. was a 62 year old man who was discovered to have a pulsating abdominal mass during a physical examination. An aortogram was carried out five weeks later on 11-11-54. This demonstrated a typical arteriosclerotic aneurysm. On 11-30-54 resection of the 10 x 20 cm. aneurysm with homograft replacement was satisfactorily accomplished. The aneurysm involved the right common iliac artery and was, therefore, included in the resection making it necessary to anastomose this limb of the graft to the right external iliac artery. The right internal iliac artery was tied. Due to the extensive arteriosclerotic changes in the left common iliac artery bifurcation it was necessary to intimectomize the distal stump into both the left internal iliac and external iliac arteries before an anastomosis could be accomplished. This was done in an attempt to preserve the function of the left internal iliac artery. The inferior mesenteric artery had, of course, been divided. Before circulation was re-established into the left iliac system, the rectum and lower sigmoid colon were observed to be cyanotic with the definite appearance of localized ischemia. After a 20 minute period following return of circulation into the left internal iliac artery, the condition of the rectosigmoid was considerably improved.

Postoperatively the patient's condition was satisfactory and he had good peripheral pulses. On the first postoperative day there was the onset of a bloody diarrhea. The first movements were tarry and later contained bright red blood. This was associated with fever to 103.4° F. but there was no evidence of peritonitis. With conservative management the diarrhea and blood disappeared by the fourth day. Unfortunately proctoscopic examination was not done. The patient's convalescence was otherwise uneventful and he was discharged following a postoperative aortogram which demonstrated a well functioning homograft on the nineteenth day after operation.

No further colon difficulty was experienced by the patient and a subsequent barium enema showed a good mucosal pattern of the left colon with no evidence of stricture in the rectosigmoid. He later died of a reticulum cell sarcoma of the stomach.

Case 3. C. K. is a 52 year old man who was referred for treatment of a known arteriosclerotic abdominal aneurysm. Operation was carried out on 10-5-57. The aneurysm was a large one with involvement of the right common iliac artery and to a lesser extent the left common iliac artery. Due to the marked adherence of the aneurysm to the vena cava and common iliac veins, the aneurysm wall was left intact at these locations. In spite of this precautionary measure of unroofing the aneurysm, the vena cava was entered with a resultant loss of blood and hypotension. Following resection, replacement was accomplished with a homograft; suturing the right limb of the graft to the external iliac artery and the left limb to the common iliac artery just proxi-
Rectosigmoid Ischemia

mal to its bifurcation. The right internal iliac artery and inferior mesenteric arteries were of necessity sacrificed.

The early postoperative course was complicated by sinus tachycardia, hypotension, and fever to 103°F. The blood pressure was supported by Levophed until the fourth day when it stabilized. Intravenous Achromycin was also given. On the ninth postoperative day he developed evidence of thrombophlebitis of the left leg and suffered a pulmonary infarct in the right lung with compatible x-ray changes. Heparin and Marcumar were administered and twenty-four hours later moderately severe bright red rectal bleeding occurred. The bleeding increased and the anticoagulants were stopped. Vitamin K therapy and transfusions were instituted. Because of the persistent severe rectal hemorrhage being possibly due to a perforation of the graft, the patient was operated upon. Vena caval ligation was done to protect against further pulmonary embolism. The homograft was found to be intact. No source of colon hemorrhage was discernable and the hemorrhage was felt to be due to an intrinsic colon lesion which had bled as a result of the anticoagulant therapy. Recovery from the procedure was gratifying and rectal bleeding subsided.

One week later the patient developed fever, severe rectal pain, and purulent diarrhea. Proctoscopic examination revealed an extensive purulent ulcerative proctitis. Stool cultures revealed only coliform and proteus organisms. Because of failure of the conservative management, a right transverse colostomy was done on 11-12-57. The colon appeared normal at this level. Rapid improvement followed the fecal stream diversion and the patient was discharged fifty-one days following his aneurysmectomy.

Since discharge his condition has continued to improve with weight gain and return of strength. The homograft continues to function satisfactorily with good peripheral pulses. There has been no marked leg swelling from the vena caval ligation. At present, proctoscopic and barium enema examinations reveal an almost complete obliteration, by structure and granulation, of the rectum starting 5 cm. from the anal verge and extending to the rectosigmoid. The future plan is to do a pull-through resection of his stricture followed by colostomy closure.

Case 4. B. D. is a 54 year old man who underwent a diagnostic laparotomy at another hospital in June 1957 at which time an arteriosclerotic abdominal aneurysm was discovered. No treatment was advised. The aneurysm ruptured while the patient was at work and he was immediately transported to our emergency room where the proper diagnosis was made and the patient taken to the operating room. Emergency laparotomy was carried out on 11-23-57 and a large ruptured aneurysm was found. There was a very extensive retroperitoneal and pelvic hematoma and free intraperitoneal blood. The aneurysm involved both common iliac arteries and was adherent to both iliac veins and the vena cava. After gaining control of the proximal aorta, the aneurysm was unroofed and because of the extensive involvement of the iliac arteries these were oversewn at the bifurcation level. It could not be determined if either the right or left internal iliac artery was functional. An elastic dacron prosthesis was used for replacement. Because of the amount of arteriosclerotic involvement of the iliac systems, making anastomoses at this level impossible, the limbs of the prosthesis were bypassed into the groin and end-to-side anastomosis made to each common femoral artery. Even the
common femoral arteries were found to be markedly arteriosclerotic. Fortunately the prosthesis functioned satisfactorily and the patient tolerated the operation surprisingly well.

The postoperative course was gratifying and essentially uncomplicated until the eleventh day when he developed evidence of thrombophlebitis in the left leg and also had the onset of diarrhea. Proctoscopic examination revealed a severe ulcerative proctitis. Because of the danger of rectal bleeding, a two week course of Heparin alone was given for the thrombophlebitis. The patient's diarrhea persisted and he ran a low-grade fever. At no time was there significant blood loss per rectum. Stool culture revealed coliform, proteus and streptococcus viridans organisms. Conservative management, which included sulfathaladine, was continued with gradual symptomatic improvement of the diarrhea and objective evidence of healing by proctoscopy. The peripheral pulses remained of good quality and the patient was discharged thirty-eight days following successful emergency aneurysmectomy.

The patient has been followed in the clinic with serial proctoscopic examinations which have shown complete healing of the rectal mucosa. There has been weight gain and complete return of normal bowel function. There remains, however, by barium enema, an area of narrowing 5 cm. in length at the junction of the rectum and sigmoid colon. Sigmoidoscopic examination reveals at 10 cm. a strictured area of rectosigmoid with satisfactory bowel lumen and intact mucosa. The patient has now returned to work and it is hoped that no further difficulty will arise from his colon deformity.

Case 5. H. C. is a 69 year old man who was well until one week before admission when he developed sudden severe back pain which radiated in a radicular manner to the lower abdomen and scrotum. This pain persisted, and in addition, he developed more abdominal discomfort with nausea and vomiting. He had also noted the passage of several bloody stools.

Physical examination at time of admission revealed a dehydrated, severely ill, elderly man with a blood pressure of 130/80. There was abdominal tenderness in both the RLQ and the LLQ but this seemed more acute on the left. Some widening of aortic pulsation was noted. Proctoscopic examination was carried out which showed an annular constriction at 15 cm. with an ulcerative, erythematous mucosal process extending distally into the rectum. The rectal mucosa was very friable and bled easily.

After hydration the hemoglobin was 15.8 cm., WBC 15,350 and his urine showed 1+ albumin with an occasional hyalin cast. Intravenous pyelograms demonstrated only a double collecting system on the left and no other abnormalities. Emergency barium enema revealed no colon obstruction or other specific lesions but did strongly suggest the presence of an arteriosclerotic aneurysm. Because of the appearance of the sigmoid colon, which showed a lack of normal mucosal pattern, arterial insufficiency to this area was suggested.

Because of the lack of clinical improvement, and the likelihood of a leaking aneurysm being present, the patient was operated upon 3-11-58. A moderate sized arteriosclerotic aortic aneurysm was found with evidence of rupture into the left retroperitoneal tissues. There was an extensive inflammatory change associated with the extravasated blood. As was later demonstrated during dissection and ligation of
Rectosigmoid Ischemia

the inferior mesenteric artery, it had been occluded by this process. The sigmoid colon and upper rectum were somewhat cyanotic, contracted, and had the appearance of being viable but definitely ischemic. Resection of the aneurysm was carried out utilizing an elastic dacron prosthesis for replacement. The distal limbs were sutured in an end-to-side manner into the common iliac arteries at the bifurcation level. There was considerable arteriosclerotic involvement of the internal iliac arteries and their functional status was not known. The prosthesis worked well with satisfactory peripheral pulses present at the termination of the operation.

Postoperatively it was necessary to sustain the blood pressure with vasopressors for twenty-four hours. Aside from some difficulty with chest secretions, patient's convalescence was completely uncomplicated except for a superficial wound infection. Two proctoscopic examinations failed to show any residual rectal ulcerations. The patient has had no diarrhea or bowel disfunction. He was discharged thirty-one days following his aneurysmectomy.

COMMENT

It seems evident that the cases described clearly demonstrate that significant ischemia of the rectosigmoid colon may be produced when interruption of the inferior mesenteric artery, and one or both internal iliac arteries, occurs during abdominal aneurysmectomy. The collateral circulation that is available, and its efficiency in preventing serious colon complications under these circumstances, is of special interest.

It has been well established that in most instances a functioning inferior mesenteric artery may be ligated at or near its origin with relative impunity. Collateral circulation is readily established to the sigmoid and rectum by way of the marginal artery of Drummond, an extension of the superior mesenteric system through middle colic branches, and the middle and inferior hemorrhoidal branches of the internal iliac arteries. When in addition, one of the internal iliac arteries is also ligated, the collateral circulation becomes more dependent upon the cross connections between the two internal iliac systems and also upon peripheral connections in the ligated internal iliac system such as the superior and inferior gluteal, obturator, and iliolumbar arteries. If both internal iliac arteries are ligated along with the inferior mesenteric artery even greater reliance is placed upon the marginal artery and the above described collateral connections of the internal iliac system by way of the lumbar, circumflex iliac, and circumflex branches of the deep femoral artery. The collateral system of the inferior hemorrhoidal arteries, through their pudendal connections, is apparently adequate for the limited anal segment but can not be expected to contribute significantly to the blood supply of the rectosigmoid colon.

It is worthy of comment, that when dealing with aneurysmal disease of the abdominal aorta one is more often faced with the necessity of interrupting functional arteries than when performing resections for occlusive disease. Certainly, if the inferior mesenteric artery is occluded by an atheromatous process prior to aortic bifurcation resection, there will have been an opportunity for the natural collateral blood supply to develop which will undoubtedly make its sacrifice less apt to produce any significant degree of ischemia. It is of interest that we have not observed one instance of bowel ischemia in aortic resections done for occlusive disease alone, while all of the cases
Smith, Whitcomb and Szilagyi

cited in this report had patent aneurysmal aortas and, therefore, lacked the physiological stimulus to develop a substantial collateral network prior to aneurysmectomy.

This same principal also applies to the internal iliac vessels. As illustrated by our cases, one may often be obligated to ligate a diseased but functioning internal iliac artery because of its involvement in the aneurysmal process. In fact, as shown in our fourth case, the aneurysm was so extensive that doing a long bilateral bypass to the common femoral arteries was the only possible choice. In this situation, retrograde filling of the diseased iliac arteries was apparently not favorable enough for the establishment of an adequate collateral circulation.

Other factors also may function impair circulation to the sigmoid and rectum. A diffusely diseased internal iliac system will markedly reduce its efficiency and certainly make it more vulnerable to thrombosis, especially when the aorta is clamped, or during a hypotensive episode. Also, if an anastomosis is made to a diseased internal iliac artery, there is always risk of thrombosis. This is more apt to occur in our experience if intitomectomy has been done, as in our first case.

There are certain precautions that should be observed in an attempt to prevent these distressing complications. It would seem axiomatic that at least the function of one internal iliac artery must be preserved if at all possible, preferably the left one. Care must be taken to avoid prolonged clamping of the aorta and periods of hypotension that may promote thrombosis in a part of the collateral system. Sufficient distal heparinization is, of course, essential. Also, as the surgeon is readily able to observe the state of the circulation in the rectosigmoid, he should carefully evaluate this segment of colon during aortic occlusion and after re-establishment of the blood flow. The improvement in the appearance of the bowel in our second case following insertion of the graft was very striking. If this should not occur, prophylactic resection of the impaired colon or colostomy may be mandatory.

Rectosigmoid ischemia, produced by an arteriosclerotic abdominal aneurysm, may present itself as a diagnostic problem as illustrated by our fifth case. Abdominal symptoms associated with a bloody diarrhea for one week strongly suggested the presence of a primary colon lesion. As was observed at laparotomy, rupture of the aneurysm had produced an occlusion of the inferior mesenteric artery with the extravasated blood in the mesosigmoid further impairing the circulation of the rectosigmoid. Fortunately aneurysmectomy allowed return of an adequate circulation and uncomplicated recovery ensued.

SUMMARY AND CONCLUSIONS

Five cases are presented illustrating various degrees of rectosigmoid ischemia associated with surgery for arteriosclerotic abdominal aneurysms.

When the inferior mesenteric artery is interrupted, the collateral circulation from the marginal artery of the colon and the hemorrhoidal branches of the internal iliac arteries may be adequate but at times it is not. Sacrifice of one or both internal iliac arteries increases the risk of ischemia and, therefore, care should be taken to preserve at least one, and if possible, both of these arteries during aneurysmectomy.
Rectosigmoid Ischemia

Surgeons confronted with these cases should be aware of this possible complication and be prepared to take whatever steps are necessary, which may include bowel resection, to protect properly the patient so afflicted.

REFERENCES