# Diverticular Hemorrhage in an Elderly Patient

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DR. JIM L. WILSON (*Professor and Residency Director, Department of Family Practice*): I will begin the conference on rectal bleeding in diverticular disease of the colon this morning by making a short presentation of the patient who will provide the focus for our discussion.

## CASE PRESENTATION

The patient is an 83-year-old widowed lady whom I have been following for about two years at the Family Practice Center. She is a former nurse and lives alone. Her current medical history includes the diagnoses of congestive heart failure, degenerative arthritis of the spine and hips, severe esophageal motility disturbance, esophagitis, and hiatal hernia. In addition, she suffered a stroke in 1982, which resulted in a right hemiparesis and a partial aphasia. She also had a left mastectomy many years ago for breast cancer and she has had a hysterectomy. Her current medications included digoxin, 0.125 mg daily, isosorbide dinitrate, 10 mg four times a day, dipyridamole, 25 mg three times a day, and aspirin, 2.5 g daily. Prior to her hospitalization earlier this year, I had seen her several times in the office, mainly for discomfort from radiographically documented osteoarthritis of the back and hips. For a short time she took ibuprofen, which helped, and when the pain in her hip resolved, she stopped taking the medication.

On May 27 she was admitted to the hospital with a complaint of painless rectal bleeding. She had been seen on the evening prior to admission in the emergency room with the same complaint but refused to come into the hospital despite strong recommendations to do so. The next morning, however, she had another episode of painless rectal bleeding with the passage of clots and the feeling of weakness, which prompted her to change her mind. She denied any other bowel symptoms. Specifically, she had had no change in her bowel habits before this episode and had not noticed any change in her stools. She had not experienced any weight loss.

On examination her vital signs were as follows: blood pressure 100/60 mmHg, pulse 76 beats per minute, temperature, 98.6 °F, and respirations 16/min. She was alert, oriented, and appeared to be in no distress. Examination of the head, ears, eyes, nose, and throat was unremarkable for any abnormal findings. Mucous membranes were moist. Her chest was clear with good breath sounds. Heart was regular without murmur. Her abdomen was soft with mild generalized tenderness to palpation. There were no masses or organs palpable, and bowel sounds were active. On rectal examination, gross blood was noted around the anus and on the examining glove. There were no masses palpated. She had a mild right hemiparesis, which was previously noted. Osteoarthritic changes of her hands and knees and decreased range of motion of her left hip were evident. No skin lesions were noted.

Laboratory data at the time of admission showed hemoglobin to be 130 g/L (13 g/dL); hematocrit was 0.39, which with intravenous fluid infusion came down to 0.32 and thereafter remained stable in the range of about 0.32 to 0.34 during her hospitalization. White blood count was $9.1 \times 10^9$/L ($9.1 \times 10^3/\mu$L) with a normal differential. Prothrombin and partial thromboplastin time were normal. All the values on the blood chemical profile were in the normal range. A surgical consultation was obtained at the time of admission. Initially, flexible sigmoidoscopy was attempted by the surgery consultants; however, because of an occlusion of the lumen at approximately 18 to 20 cm with dark blood clots, the procedure was not completed. She had no active bleeding at that time, and the surgeons recommended monitoring her with serial hematocrit determinations and a barium enema followed by total colonoscopy. They also recommended arteriography should she continue to have massive, active bleeding.

The patient remained stable. A barium enema was performed the following morning, which revealed diverticulosis coli affecting the distal descending and the rectosigmoid colons. The possibility of a mass in the cecum was also noted. When total colonoscopy was performed

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on the fifth hospital day, no masses anywhere in the colon were found, and the diagnosis of multiple pseudodiverticula of the sigmoid and descending colon was confirmed. There was no evidence of vascular ectasia.

The remainder of the hospital course was uncomplicated. Her hematocrit stabilized, and she had no further hemorrhage. She was begun on oral iron therapy at the time of discharge, and I have followed her in the Family Practice Center. Her recovery has been unremarkable. When last seen about two weeks ago, she was doing well and has had no further rectal bleeding.

I would like to begin today's conference with some general remarks about diverticular disease of the colon, and then focus more specifically on rectal bleeding in this disorder.

## CLASSIFICATION AND TERMINOLOGY

Diverticular disease of the colon is really a family of diseases, which includes diverticulosis, diverticulitis, and related complications. Initially, a prediverticular stage occurs, where the typical finding is thickening of the muscle layer and narrowing of the lumen. The term *myochosis* has been used to describe this mounding up or heaping up of muscle layers.[1] Diverticulosis is the development of one or more colonic diverticula that protrude through the bowel wall but are not inflamed. Diverticulitis is the presence of inflamed diverticula. The colon is the most common site of diverticulum formation in the gastrointestinal tract, and the sigmoid colon is the most common part of the colon involved. In some series, either alone or in combination with other parts of the colon, the sigmoid colon is involved in as much as 95 percent of the cases.[2]

Four distinct patterns of diverticulosis have been described. All of these patterns are characterized by the formation of pseudodiverticula, except the single diverticulum, which may be either a true diverticulum or pseudodiverticulum. The single diverticulum and diverticulosis of the right colon are relatively rare. Diverticulosis of the right colon is more common in Oriental populations, and in this country is found more commonly in Hawaii. Simple massed diverticulosis is relatively common in the United States, with the spastic colon diverticulosis being the most common. The anatomical defect in diverticulosis is the formation of a pseudodiverticulum that is created by the herniation of the intestinal mucosa and the submucosa through the bowel wall into the serosa. True diverticula of the colon have been described, but these occur only rarely. Two factors are necessary for the formation of diverticula—a relative weakness of the wall of the colon, and an increased intraluminal pressure.[3,4]

## EPIDEMIOLOGY

The patterns of geographical variation and increasing incidence of this disorder over the past century are interesting to observe. Diverticulosis has been called a disease of the 20th century[5] because it was not seen in any great frequency before the early 1900s. It has also been called a disease of Western civilization[6] because it is found in much greater frequency in countries in the Western Hemisphere. The decrease in dietary fiber, especially cereal fiber, that has occurred with the advance of industrialization is closely associated with increasing incidence of diverticular disease.

In the early 1900s the incidence of diverticulosis in the United States and Western Europe was approximately 5 to 10 percent. By the 1960s and 1970s, the incidence was reported to be as high as 35 to 45 percent.[6] In non-Western parts of the world including Africa and Asia, the disease was said to be nonexistent in the 1960s and 1970s.[5] Studies repeated more recently in Jordan,[7] Iran,[8] Japan[9] and other places in non-Westernized parts of the world have shown that the disorder is still not very common in these countries. Diverticulosis is, however, increasing in the areas that are becoming more Westernized. In Japan an increase in diverticular disease has been noticed in the last decade along with a decrease in the amount of cereal fiber in the diet.[9] A similar pattern has been observed in Kenya.[10]

That the incidence of diverticular disease increases with age has obvious implications in our society, where there is a rapidly increasing elderly population. Patients are most often in the sixth, seventh, or eighth decade of life when they arrive at the hospital with symptoms.[11] Diverticulitis is uncommon in younger age groups, with studies reporting less than 2 or 3 percent in patients younger than 40 years.[11] Diverticulosis is very uncommon in children unless they have a collagen disorder such as Marfan's syndrome.

## SYMPTOMATOLOGY

In most patients diverticular disease is asymptomatic. In fact, it has been estimated that roughly 80 percent of patients who are diagnosed either radiologically or at laparotomy will remain symptom-free throughout their lives.[2] For those patients who do become symptomatic, pain is the most common symptom. In Parks's[12] 1969 study of the clinical features of diverticular disease, the lower abdomen, involving both the right and left sides, was the most common location of pain occurring in 30 percent of the 521 patients studied. Left-sided pain, alone or in combination with other sites, however, was found in more than 53 percent of the 521 patients.

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In that same study, 26 percent of the patients experienced no abdominal pain at all; 42 percent of the patients described their pain as a crampy continuous pain, while 31 percent had an intermittent aching type of pain. Pain affecting both sides of the lower abdomen was more often described as crampy, whereas pain affecting one or the other side individually was more often described as aching.[12]

Change in bowel habits is usually the next most common symptom that is reported in various studies. In the previously cited study, Parks[12] found that 62 percent of patients experienced this symptom. Some patients (18.6 percent) noticed continuous or intermittent constipation, while 8.6 percent of the subjects complained of alternating diarrhea and constipation.

## COMPLICATIONS

Although a variety of spontaneous complications of diverticular disease of the colon occur, bleeding is one of the most common complications. Diverticulitis is usually the second most common complication reported.

Rectal bleeding has been recognized and reported as one of the major complications of diverticular disease for at least 30 years. In several series involving great numbers of symptomatic patients, the number of patients presenting with rectal bleeding varies from 5 to 20 percent.[13–17] Characteristically the onset is sudden, painless, and often severe; however, bleeding may occur intermittently over time, or it may be continuous for a period of several days. Severe blood loss has been reported to occur in 3 to 5 percent of patients with diverticulosis,[2] and in the elderly, bleeding from diverticular disease is thought to be the most common cause of life-threatening lower gastrointestinal bleeding.[18]

Hemorrhage severe enough to require surgery occurs fairly often. Several recent studies show bleeding as an indication for surgery occurring in 6 to 20 percent of patients.[13,14,16,17] Often the bleeding will stop spontaneously, and the patient can be managed conservatively. Conservative management is said to be successful in 75 to 95 percent of patients.[3] If bleeding recurs, it is likely to be severe and to require surgical management under emergency conditions. In these cases, blind resection of the segment of the colon thought to be involved is usually performed. The source of bleeding often cannot be determined by investigative studies, at operation, or even in pathological specimens. In a study of ten patients who underwent arteriographic studies, the site of the bleeding diverticulum was localized. After the operation, histological studies were performed, and in eight of the ten patients the precise site of bleeding was histologically identified.[19]

Rodkey and Welch[16] were able to identify with colonoscopy the bleeding point in 22 of 25 patients with massive hemorrhage. Seven of these bled from the ascending colon, six from the sigmoid colon, three each from the transverse and descending colon, two from the cecum, and one from the splenic flexure.

The development of diverticula seems to occur in the lateral intertenial area between the mesenteric tenia and the antimesenteric tenia. At this point the forming diverticulum and the vascular structures of the bowel wall are in close relationship. As the diverticulum penetrates through the bowel wall, it carries a branch of the arterial blood vessel with it. The blood vessel, then, lies close to the neck of the diverticulum and over its dome. Through this anatomical relationship it is possible for the vessel to become exposed to trauma or some other mechanism to cause bleeding.

## DIAGNOSIS

Most of the time the diagnosis of diverticular disease is made on clinical grounds. The barium enema is probably the most helpful diagnostic tool, and when performed correctly, it will demonstrate the characteristic flasklike appearance of the diverticula in the colon. Air contrast studies enhance the appearance of the diverticula, but this technique does have some risk involved and does not particularly add to the results obtained.[20] Colonoscopy is usually not necessary in making the diagnosis of diverticulosis, but it is useful to rule out other pathology in the colon such as carcinoma, polyps, or some other co-existing cause for bleeding.

Boley and colleagues[18] studied lower gastrointestinal bleeding in a group of 183 elderly patients and found that diverticulosis was the most common cause of this type of bleeding in that age group. Forty-three of the patients had diverticulosis, and 20 had vascular ectasia of the right colon. In the 43 patients with diverticular bleeding, 19 had one episode, 11 had two episodes, and 13 had more than three episodes. In the patients with vascular ectasia, three of the 20 experienced one episode, one of the 20 had two episodes, and 16 of the 20 had more than three episodes.

## MANAGEMENT

DR. JOHN J. FERRARA (*Associate Professor, Department of Surgery*): While inflammatory diverticula (ie, diverticulitis) are generally located in the left hemicolon (hereafter meant to include left colon and sigmoid colon), hemorrhagic lesions are typically found in the right colon. This fact plays an important role when surgical intervention for massive lower gastrointestinal hemorrhage is undertaken. Fortunately, the vast majority of patients (at least 75 percent) with lower gastrointestinal bleeding will spontaneously stop bleeding following institution of noninvasive measures such as bedrest and isotonic volume or blood replenishment. As this is the rule rather than the exception, diagnostic evaluation to pinpoint the site of hemorrhage is best deferred until hemodynamic stability is assured; failing this, surgical intervention is warranted regardless of the extent to which the diagnostic workup has been completed. In these instances, the surgeon will be guided reliably to the optimal surgical procedure by intraoperative inspection of the viscera. Hence, time should not be wasted in lengthy diagnostic tests in the face of an unstable patient.

In the more common scenario of bringing the patient to the point of hemodynamic stability, the subsequent diagnostic evaluation should be based upon the presumption that surgical intervention may be yet required. From this perspective, the following points are to be considered in the selection of tests: (1) the severity or persistence of bleeding, (2) the availability and capabilities of ancillary personnel to perform the tests, (3) the risk-benefit ratio of each test, and (4) a careful review of the patient's past history. Certainly a recent history of weight loss or change in bowel habits leads one to consider the uncommon phenomenon of colorectal carcinoma as the source of massive hemorrhage. A history of dyspepsia or aspirin or nonsteroidal anti-inflammatory agent use may warrant upper gastrointestinal endoscopy rather than simply passing a nasogastric tube in search of blood-tinged aspirate. This is a simpler, but not totally reliable, means of ruling out the stomach and duodenum as the source of hemorrhage. Finally, previous medical records should be reviewed to determine whether a barium contrast enema has been performed. Because of its inaccuracy regarding isolation of bleeding site, as well as its capacity to interfere with more accurate diagnostic maneuvers, this particular diagnostic test is best deferred until the patient clearly will not require immediate surgical intervention. Inspection of a set of previous roentgenographs will yield valuable anatomic information, such as presence of or location of diverticula.

Although intraluminal clots and blood-streaked mucosa often limit one's view, proctosigmoidoscopy is generally felt to be the initial diagnostic procedure of choice, particularly if bleeding has been limited and well controlled. Of the many reasons for selecting this procedure, several deserve mention: (1) a majority of colorectal carcinomas are within range of view, (2) blood coming from above the level of a complete examination assures the point of hemorrhage to be emanating from the abdominal colon, making subsequent surgical intervention far less difficult

than if the rectum were to require resection, (3) the sigmoid colon can be evaluated for diverticula, the presence of which has significant impact upon surgical decision making, and (4) a decision regarding the feasibility of pancolonoscopy can be made. If the distal colon is found by proctosigmoidoscopy to be clear enough to attempt complete colonic inspection, this procedure should be immediately performed.

In patients who demonstrate persistent, mild hemorrhage, determining whether the site is located on the left or right hemicolon can occasionally be achieved with radioisotope studies. The easiest procedure involves the intravenous administration of technetium-labeled compounds[21] followed by serial visceral scanning in hopes of identifying the point of hemorrhage (indicated by isotope extravasation). A more complex technique involves injection of chromium-labeled red blood cells to accomplish a similar task.[22] Regardless of the isotope utilized, both tests are noninvasive. It does, however, generally take several hours for the tests to indicate a positive finding and they are often nondiagnostic (implying that hemorrhage has either stopped or was not rapid enough to result in significant isotope extravasation). Furthermore, if the scans are not replayed in frequent sequence, any extravasated material may be carried by colon peristalsis to a site removed from the point of bleeding. Despite these shortcomings, the tests carry such minimal risk that they remain an important part of the diagnostic armamentarium.

With little doubt, selective mesenteric angiography remains the most accurate nonsurgical means of pinpointing the site of lower gastrointestinal hemorrhage.[23] Unfortunately, accuracy depends upon bleeding rates of at least 0.5 mL/min (2 mL/min preferred). The procedure can be time-consuming, particularly when balanced against the rapid bleeding rate required to reach its diagnostic potential. Finally, the test is clearly the most invasive of those previously mentioned. Patients likely to undergo angiography for colon hemorrhage are typically elderly and have preexisting arterial vascular disease that both limits its success rate and increases the complications. Furthermore, angiography exposes the patients to considerable nephrotoxic dye loads. Nevertheless, in experienced hands, the selective administration of coagulants or vasoconstrictor substances into the bleeding vessel can be achieved with good short- and long-term success rates. For these reasons, selective angiography remains an excellent diagnostic and therapeutic tool for patients with lower gastrointestinal hemorrhage.

Most patients who present with lower gastrointestinal hemorrhage will not require surgical intervention. The concepts to be applied to those who do come to surgery are based upon operative risk, the level of confidence with which the site of hemorrhage has been localized, and careful intraoperative inspection of the colon.[3] It has long been appreciated that massive lower gastrointestinal hemorrhage generally comes from right-sided colon lesions. Hence, a "blind" right hemicolonectomy was considered the procedure of choice for those patients in whom the bleeding point had not been preoperatively identified. Unfortunately, this procedure resulted in control of hemorrhage only 80 percent of the time. Since the mortality and morbidity rates associated with a second emergency operation to control hemorrhage are high, total abdominal colectomy became the favored procedure of many surgeons, despite its higher risks when compared with partial colectomy.

As a result of recent diagnostic advances, the bleeding point in many instances can be localized preoperatively in a great percentage of cases. Of particular importance is the realization that right-sided diverticula are often not the sole cause of bleeding. Rather, acquired vascular ectasias (angiodysplasias), alone or in concert with diverticula, have been found by both angiographic and colonoscopic techniques to be a common source of hemorrhage.[24] Nevertheless, surgeons tend to place little importance upon identification of the pathologic cause of hemorrhage beyond ruling out the presence of a colon malignancy. It is generally accepted that right hemicolectomy is indicated when the bleeding source is clearly found to come from the right colon and diverticula of the left colon are effectively ruled out (surgical inspection and, if available, review of a barium contrast enema). In most other instances, that is, for pancolonic diverticula, right-sided angiodysplasia with left-sided diverticula, and colon hemorrhage of unknown source, total abdominal colectomy is the preferred procedure. On rare occasions, a left hemicolectomy alone is performed; this mandates that both the bleeding point has been clearly localized to the left colon and no other colon pathology is identified. Following the colon resection, restoration of gastrointestinal continuity (ileocolostomy or ileoproctostomy) is warranted unless the surgical procedure must be completed with extreme expedience because of comorbid patient conditions (eg, prolonged hypotension, coagulopathy, or myocardial ischemia). Under such circumstances, an end ileostomy is performed, with the distal end of the residual colon either sutured closed and left within the abdomen (Hartmann's procedure) or brought out through the skin as a mucous fistula.

Patients requiring surgical intervention for massive lower gastrointestinal hemorrhage are by definition critically ill. Since the decision tree regarding the extent of colon resection requires only a little information, much of which can be obtained, if necessary, at celiotomy, one must guard against a preoperative search for the exact site of bleeding, thereby prolonging the patient's exposure to the adverse consequences of hemodynamic instability.

DR. WILSON: Either Dr. Ferrara or I would be happy to respond to any questions from the audience.

DR. JEPTHA COBB (*Family Physician, Private Practice*): What's the relationship between diverticular disease and carcinoma of the colon?

DR. WILSON: There is no direct relationship. They may coexist, and both have been related to low-fiber diets.

DR. JEFFREY ZIEMAN (*Third-year Family Practice Resident*): If a patient presents with suspected lower gastrointestinal bleeding, and it is not certain whether an operation will be performed, would it not be better to do the barium enema after coloscopy, arteriography, and other studies?

DR. FERRARA: Yes, I agree. Doing a barium enema early may preempt other procedures.

DR. ZIEMAN: Does preparing the bowel for colonoscopy ever cause rebleeding?

DR. FERRARA: That is a subject of controversy. I think that most of the time, a patient who bleeds after a bowel preparation would have bled again anyway. I don't think a clot will be dislodged by the enema tip. I think it is more important to get a diagnostic evaluation completed before the patient leaves the hospital and not worry about the possibility of causing rebleeding.

DR. CHARLES H. BRYARS (*Assistant Professor, Department of Family Practice*): Do you see any place for the water-soluble barium enema?

DR. FERRARA: A water-soluable barium enema probably underestimates in a manner similar to colonoscopy the number of diverticula. There are some potential problems. A hyperosmolar solution can cause diarrhea, particularly in an older patient who may already be intravascularly depleted from dehydration or blood loss. The advantage is that if diverticula are demonstrated, the contrast material will be rapidly reabsorbed or diffused so that angiography can be quickly performed afterward, if necessary. Colonoscopy can be performed soon after, also. Most important, if the patient is operated upon, there is no risk of exposure if the water-soluble contrast materials spill out into the abdominal cavity.

DR. WILSON: With that we will conclude our presentation for today. Thank you very much for your interest and participation.

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