Mesenteric Thrombosis Following Splenectomy

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Three cases of postsplenectomy mesenteric thrombosis, two associated with thrombocytosis, are presented. Experience has shown that persistent thrombocytosis, accompanied by abnormal platelet function, is not a benign condition and may be associated with thrombosis. When encountered, postsplenectomy thrombocytosis of greater than 800,000 per mm³ must be evaluated by platelet function studies and anticoagulation begun. Post-prandial cramping abdominal pain may be an early symptom of thrombosis, demanding immediate anticoagulation. Low-dose heparin, ASA, and dipyridamole are three of the more commonly used treatment modalities. Small bowel resection is indicated if thrombosis occurs.

MESENTERIC VEIN THROMBOSIS following splenectomy is a rare but often fatal complication which may be related to thrombocytosis. Normal platelet counts (140,000–440,000 per mm³) routinely will increase 30–100% following splenectomy, usually reaching a maximum 7–20 days postoperatively.[1,2] Postsplenectomy mesenteric thrombosis usually has been accompanied by platelet counts in excess of 600,000–800,000 per mm³,[3,4,5] contributing to a postoperative hypercoagulable state. Signs, symptoms and sequelae for three patients with postsplenectomy mesenteric thrombosis are presented, two of whom had platelets in excess of 1,300,000 per mm³.

Case Reports

Case 1. A 26-year-old Puerto Rican dentist with a history of anemia since age 11 was found to have spherocytosis with hypersplenism and was referred for splenectomy. The spleen was not grossly palpable, and the remainder of the physical examination was unremarkable. His preoperative hemoglobin was 8.5 gm%, and his platelet count 399,000 per mm³. On March 27, 1973, the patient underwent routine splenectomy and liver biopsy. Initially he did well, with a hemoglobin of 8.3 gm%, a white count showing the usual elevation to 25,000 per mm³, and a platelet count of 515,000 per mm³ on his first postoperative day. On his second postoperative day his platelets rose to 815,000 per mm³, with hemoglobin and white count unchanged. Four days after surgery he was eating a regular diet, which he tolerated well. Two days later he complained of an inability to pass flatus and of postprandial abdominal distention. Supine and upright films of the abdomen showed distended loops of colon and small bowel, a nonspecific gas pattern, with no evidence of bowel obstruction. His platelet count was 1,325,000 per mm³; serum amylase was normal.

Eight days after operation the patient's temperature rose from 100.2 to 104.6 F and his pulse rose to 240 beats/min. His blood pressure dropped from 120 to 60 mm Hg systolic. His hemoglobin had risen to 11.9 gm%, and his white count to 31,400 per mm³. Supine and upright X-rays of the abdomen showed little small bowel gas, and less gas in the colon than on the previous day's study. The patient was resuscitated with multiple blood and colloid transfusions. An exploratory laparotomy a few hours later showed superior mesenteric venous thrombosis with arterial pulsations intact. Almost 100% of the small bowel was infarcted. This was resected, and a jejuno-right colostomy performed. He expired 36 hours later in irreversible shock, which was due to a combination of sepsis, hemorrhage, and "third space" fluid accumulation.

Immediately prior to surgery, the patient appeared to develop a consumptive coagulopathy, with platelets dropping to 95,000 per mm³ (Fig. 1), a Lee-White clotting time of 18 min (normal 8–12 min), thrombin time of 21 sec (normal 12 sec), quantitative fibrinogen of 88 mg% (normal 170–410 mg%), and fibrinogen degradation products increased to a 1:20 dilution (normal 1:5 dilution).

Case 2. The patient, a 56-year-old gravida IV, para IV, was admitted June, 1970, for elective repair of vaginal prolapse. Routine preoperative evaluation showed a platelet count of 30,000 per mm³. After hematologic evaluation, splenectomy was advised for her idiopathic thrombocytopenic purpura.

On June 24 her hemoglobin was 14.6 gm%, and her platelet count 42,000 per mm³. She had an elective splenectomy and hiatus hernia repair on June 30, 1970. Initially she did well. However, two weeks postoperatively she began complaining of vague but generalized abdominal discomfort, especially after eating. An upper gastrointestinal series and barium enema showed no evidence of intra-abdominal abscess. On July 18 she experienced more intense abdominal pain, and her pulse increased to 130 beats/min. Supine and upright films of the abdomen were interpreted as showing ileus. She became progressively more distended; serous fluid was aspirated from her peritoneal cavity. At operation 2000 cc of serous fluid was aspirated and 62 cm of gangrenous bowel was found just distal to the ligament of Treitz. The gangrenous segment was resected, with a primary end-to-end anastomosis. Pathology reported hemorrhage in the mesentery,

Submitted for publication May 9, 1974.

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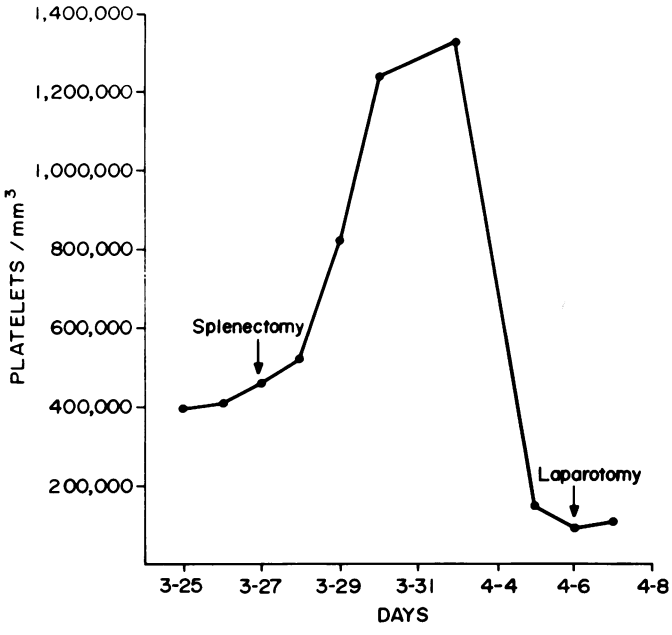

FIG. 1. Postsplenectomy thrombocytosis. Note drop in platelet count as patient developed a pattern of disseminated intravascular coagulopathy.

with inflammation and necrosis of the mesenteric veins. The arteries were intact. Postoperatively she was given heparin but still complained of mild abdominal pain after eating.

On July 25 the patient was unable to void, her abdomen became quite distended, and her pain increased. Twenty-five hundred cc of serosanguineous fluid was removed from her abdomen at emergency surgery, but no cyanotic or distended bowel was seen. Postoperatively she continued to have mild cramping abdominal pain, exacerbated by eating. On August 15 her pain increased in severity, and her pulse rose to 160 beats/min. Laparotomy revealed complete small bowel infarction with venous thrombosis. She died on the operating table.

Case 3. The patient, a 43-year-old white woman, was first noted to have an enlarged spleen at the time of a varicose vein stripping in 1959. In 1963, she was admitted because of progressive fatigue and epigastric fullness. Family history revealed that both parents had died of leukemia, and one brother was post splenectomy for myelofibrosis. The patient's platelet count was 1,175,000 per mm³, her hemoglobin 12.8 gm%, and her white count 8,100 per mm³. Myelofibrosis was diagnosed on the basis of a bone marrow biopsy, and she was started on Myleran and discharged. She was readmitted in February, 1967, with abdominal pain and difficulty in breathing. Splenomegaly was noted and splenectomy recommended. Platelet count at splenectomy was 1,325,000 per mm³. After routine splenectomy she was released on Myleran, with the discharge diagnosis of myelofibrosis with myeloid metaplasia.

The patient was readmitted three months later with vague abdominal pain, for which no etiology could be ascertained. She was found to have an enlarged liver and was discharged. She returned in June, two weeks later, with left epigastric pain, which was exacerbated by eating and relieved by passing flatus and moving her bowels. In September she developed upper gastrointestinal bleeding; massive hepatomegaly and esophageal varices were noted. Portal decompression was suggested, but at operation her portal venous pressure measured 55 cm H_2O, and both her middle colic and superior mesenteric veins were found to be thrombosed. A shunt was not performed, and her abdomen was closed. She was discharged two weeks later without complication.

She was readmitted six days later with massive esophageal bleeding. Esophageal varices were ligated, and a perforated duodenal ulcer was oversewn. On her twenty-first postoperative day she again perforated her ulcer, and died five days later. Postmortem examination showed portal vein thrombosis extending into the splenic and superior mesenteric veins, pulmonary embolus with infarction of the right upper lobe, and myelofibrosis with myeloid metaplasia of the liver.

Discussion

Historically, Rosenthal[10] first described postsplenectomy thrombocytosis in 1923, by classifying people with "Banti's syndrome," congestive splenomegaly, into two groups. One group had low to normal preoperative platelet counts but postoperatively experienced a tremendous rise, which remained elevated. This group had an increased incidence of generalized thrombosis and hemorrhage.

Miller and Hagedorn[8] reported a high complication rate in splenectomy for congestive splenomegaly. Four of 45 patients with cirrhosis of the liver developed thrombosis of splenic, superior mesenteric, portal or left gastric veins.

Barker and co-authors[1] found a high incidence of embolic and thrombotic complications following splenectomy, when compared to all other abdominal operations performed. Thrombophlebitis was second in incidence only to that following hysterectomy. Fatal and nonfatal pulmonary emboli, and all other emboli and thromboses, occurred most frequently following splenectomy.

In 1963 Hayes[4] reported three cases of systemic thrombocytosis. Two were post splenectomy for hemolytic anemia, and both had pulmonary emboli.

Bull, Zikria, and Ferrer,[3] in 1964, reported two cases of mesenteric thrombosis post splenectomy and reviewed the literature, finding two other cases.

In an attempt to uncover its etiology, Johnson and Bagenstoss[6] have described three major factors affecting vascular thrombosis: 1) alterations in blood composition, such as reticulocyte proliferation and increase in red cell hemolysate; 2) stasis of blood; and 3) injury to vessels. Thrombocytosis is the most common alteration in blood composition associated with splenectomy. Lipson and Bayrd[7] demonstrated thrombocytosis in 29% of 119 splenectomized patients. They found that patients with hemolytic anemia or agnogenic myeloid metaplasia displayed a high incidence of thrombocytosis, presumably on the basis of bone marrow stimulation. There are no other diseases for which splenectomy has consistently produced thrombocytosis and thrombosis. Since no relationship exists between pre- and postoperative platelet counts, it is difficult to predict which patients will have postoperative thrombocytosis. Hayes and Spurr[4] have proposed that postsplenectomy thrombocytosis is due to loss of important splenic properties such as: removal of senescent platelets; production of a humoral factor to stimulate or suppress bone marrow megakaryocytes; or a combination of both properties, thus allowing a build-up of platelets to occur.

Hirsch and Dacie[5] have found a close correlation between postsplenectomy anemia and thrombocytosis. They

suggest that anemia stimulates thrombopoiesis as well as erythropoiesis, and that splenectomy in the face of pre-existing anemia may cause a persistent thrombocytosis.

Zucker and Mielke,[14] in a clinical study, divided thrombocytosis into three categories; all had similar platelet counts: 1) reactive thrombocytosis secondary to splenectomy; 2) asymptomatic thrombocytosis associated with myeloproliferative disease; and 3) symptomatic thrombocytosis with myeloproliferative disease, causing recurrent emboli, hemorrhage, or thrombosis. Bleeding time, platelet adhesiveness, and platelet aggregation response to ADP, epinephrine, and collagen were normal for patients in category 1, and mildly abnormal in category 2. All those in category 3 had absence of epinephrine-induced platelet aggregation, with resultant increased bleeding time. Platelet adhesiveness was decreased in this group, and epinephrine caused neither platelet aggregation nor activation of platelet factor III, responses which were normal in the other two groups. It was their opinion that the response of platelets to epinephrine could be used to differentiate those with high-risk thrombocytosis from those with asymptomatic thrombocytosis, at least in those with myeloproliferative disorders.

Treatment of postsplenectomy thrombocytosis remains a controversial topic. Some authors recommend anticoagulation routinely, many use anticoagulants only until the patient ambulates, while others anticoagulate routinely if the platelet count exceeds 800,000–1,000,000 per mm^3. Acetylsalicylic acid[13] and dipyridamole have been successfully used, while heparin,[11] in doses of up to 100 mg intravenously q 6 hr, has also become popular. The latter, in low doses, has been shown to prevent routine postoperative decrease in platelet aggregation to ADP.[9]

Chemotherapy, using 6-mercaptopurine, ^{32}P, Busulfan, and uracil mustard, has been effectively used for thrombocytosis associated with myeloproliferative diseases. In one clinical trial,[14] chemotherapy reduced platelet counts and incidence of pulmonary embolus in four out of five patients with symptomatic thrombocytosis. Recently, L-phenylalanine mustard has shown promise in the treatment of symptomatic postsplenectomy thrombocytosis, and in hemorrhagic thrombocythemia.[2]

Mesenteric thrombosis must be considered in any patient whose progress is slow post splenectomy. Vague, cramping abdominal pain, exacerbated by eating and relieved by passage of flatus or bowel movement, is a common symptom. Depressed bowel sounds, with abdominal distention and generalized abdominal tenderness, accompanied by dilated loops of bowel in an ileus pattern by X-ray, support the diagnosis. Tachycardia and low-grade fever, accompanied by a rising hemoglobin and white count, further support the diagnosis of mesenteric venous thrombosis, with massive loss of fluid into a "third space." Once thrombosis has occurred, immediate surgery offers the patient his only chance for survival. Since the advent of oral and intravenous hyperalimentation, many surgical triumphs have been made in massive gastrointestinal resection, and large segments of small bowel can be resected safely.

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