ORIGINAL COMMUNICATIONS

RUPTURED SPLEEN AS A DIFFERENTIAL DIAGNOSIS IN RUPTURED TUBAL PREGNANCY

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Two cases of traumatic biphasic or secondary splenic rupture are presented to demonstrate the clinical picture of an entity the obstetrician-gynecologist will be encountering more commonly in the future. The signs and symptoms of this condition figured prominently in the differential diagnosis of ruptured tubal pregnancy.

Spontaneous rupture of a normal spleen, although rare, has been well documented. It was first described by Atkinson[1] in 1874 and the subject was comprehensively reviewed in 1958 by Orloff and Peskin,[2] who recorded 20 cases that satisfied their stringent diagnostic criteria: no history of trauma, no evidence of pre-existing splenic disease, no perisplenic adhesions suggestive of previous trauma, and a spleen normal on macroscopic and histological examination.

Since then 18 cases have been documented in the English literature. Holt[3] described two patients who presented with signs and symptoms suggestive of ruptured ectopic pregnancy, but were found to have spontaneous rupture of the normal spleen.

Barnett,[4] writing of splenic rupture in 1952, referred to it as "one of the rarest complications incident to childbearing." In 1967 Buchsbaum[5] summarized the literature up to that date and reported a total of 70 cases. Three major causes of splenic rupture have been identified: trauma, underlying splenic disease, and spontaneous rupture.

The figures mentioned above attest to the fact that splenic rupture in pregnancy is no longer rare. The incidence has markedly increased, and will continue to grow as vehicular traffic increases and the pregnant woman assumes a greater role in a more active and mobile society.

Two cases of traumatic biphasic or secondary splenic rupture are presented, not because of its rarity, but as a demonstration of the clinical picture in an entity the obstetrician-gynecologist will be encountering more commonly in the future. It is significant that a history of trauma was either not solicited or not volunteered in either case until during the postoperative period.

With increased incidence of ruptured tubal pregnancy, physicians may expect to see some of the rare conditions listed in the differential diagnosis of tubal pregnancy. The gynecologist may be unfamiliar with an emergency such as this in which the emphasis is placed upon stopping the critical flow of blood from an intra-abdominal organ, whether it be the tube or some other organ, but he must be able to perceive the nature of the condition even if he does not feel qualified to treat it. Failure to recognize the emergency could be tragic.

Two cases of ruptured spleen that figured prominently in the differential diagnosis of ruptured tubal pregnancy are reported. When entering the abdomen, ostensibly for a ruptured tube, the phy-

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sician must first detect the point of bleeding and then ligate it before closing the abdomen.

CASE REPORTS

Case 1

M.H., a 35-year old gravida 3, para 2, abortus 1, was admitted to the emergency room of Martin Luther King, Jr, General Hospital on the service of the Charles R. Drew Postgraduate Medical School in November 1982. Her last menstrual period was three weeks prior to admission. She contended that she was not pregnant. She was cold and clammy with an initial blood pressure of 60/0 mmHg and pulse of 180 beats/min. The abdominal examination revealed generalized tenderness with guarding and rebound. No masses were palpable. Vaginal examination revealed a parous cervix and a corpus of normal size. Culdocentesis revealed 5 mL of nonclotting blood. Urine human chorionic gonadotrophin testing was negative. The venous hematocrit was 25 percent and the hemoglobin was 8.5 g/dL. Prothrombin time and partial thromboplastin time were normal. The initial impression was hematoperitoneum with hypovolemic shock due to a ruptured ectopic pregnancy.

On pelvic exploration after intravenous fluids, plasma expanders, and the first unit of whole blood had been administered, the abdominal cavity contained about 2,000 mL of clotted and unclotted blood. The fluid was siphoned out and the clots were removed. The tubes, ovaries, and uterus were found to be intact with no evidence of tubal pregnancy or rupture. To allow exploration of the upper abdomen, a left paramedian incision extending upward to the rib cage was made. A rent in the splenic capsule was seen. At this point the general surgeon assistant took over. The splenic pedicle was clamped and the hemorrhage controlled. A splenectomy was performed. Two additional units of whole blood were administered and the patient left the operating room in satisfactory condition.

According to the pathology report, the spleen measured $11.5 \times 6.5 \times 5.0$ cm. On one side of the organ the capsule was ruptured and the surrounding surface was hemorrhagic. The cut surfaces of the spleen were grossly unremarkable except in the area of the subcapsular rupture.

The patient later gave a history of having fallen against a table end a few days earlier and being treated by her family physician for bruised ribs. Her postoperative course was uneventful and she was discharged on the seventh postoperative day to outpatient care.

Case 2

K.T., a 22-year-old gravida 7, para 6, abortus 1, was admitted to the emergency room of Western Park Community Hospital in a state of impending shock by a paramedic ambulance crew in December 1982. She was complaining of severe lower abdominal pain and vaginal bleeding. The first impression was a diagnosis of threatened or incomplete abortion. Her last menstrual period was seven weeks earlier and she had a positive pregnancy test. The patient collapsed in the emergency room and her blood pressure dropped from 100/70 to 60/0 mmHg. A culdocentesis was performed after fluids were started, and blood was ordered. Five mL of nonclotting blood was secured. An antigravity suit was put on the patient and she was moved into surgery. The preoperative diagnosis was ruptured tubal pregnancy with gross hemoperitoneum and hypovolemic shock. Blood was started and the exploratory laparotomy followed. The blood in the peritoneal cavity, most of it unclotted, was estimated at 3,000 mL. The blood was siphoned out of the pelvis and an intensive and systematic search was begun to find the point of bleeding. The size of the uterus indicated seven weeks' pregnancy, in keeping with the period of amenorrhea. The tubes and ovaries were intact with no evidence of any active bleeding. There was no history of trauma. When the upper abdomen was explored, the organ most likely to be causing the bleeding was considered to be spleen. The incision was quickly extended up to the rib cage and on examination the spleen was found to be lacerated and bleeding from both surfaces. A total splenectomy was performed by a general surgeon. By this time the patient had received one unit of plasma and two units of whole blood and was fairly stable. Her admitting hemoglobin was 7.3 g/dL; hematocrit was 21.0 percent. She left the operating room in stable condition. The blood loss

during surgery was estimated at 200 mL. The blood contained within the abdominal cavity was considered to be about 3,000 mL. During this period the patient received three units of packed cells, plasma, and intravenous fluids.

Postoperatively, the patient volunteered information regarding her involvement in an altercation with some boys who attacked her brother. She sustained a blow on her left side over the spleen four days before admission to the hospital. The pathological diagnosis of the spleen was lacerated spleen with early organizing internal and external hemorrhages.

The patient left the hospital on the tenth postoperative day, her course having been complicated by a low-grade fever that responded to triple antibiotic therapy.

ETIOLOGY OF SPLENIC RUPTURE

Trauma

In its position behind the rib cage, cushioned under the left hemidiaphragm, the spleen is protected from most forms of direct trauma. The pathogenesis of rupture has been explained by Schamaun[6] as a contrecoup mechanism in which the spleen, because of its relative mobility, is driven against the vertebral column and ruptures. Another mechanism explains the rupture on the basis of the ligamentous suspension of the spleen, which allows a limited degree of motion and then sudden fixation and laceration.

Schönwerth[7] described the deep inspiration at the instant of trauma (the fright mechanism) displacing the superior pole downward, while the lower pole is relatively fixed by the phrenocolic ligament causing flexion of the spleen. Trauma over the rib cage then results in capsular laceration on the stretched convex surface.

Underlying Splenic Disease

The medical literature is replete with cases of spontaneous rupture of the diseased spleen. Cases have been reported associated with malaria,[8] Banti's syndrome,[9] hemangioma,[10] subacute bacterial endocarditis,[11] leukemia,[12] and typhoid fever.[13] Buchsbaum[5] reported spontaneous rupture in four cases of diseased spleens. Hemangiomas were present in two cases and splenitis in two.

Spontaneous Rupture

Opinion is divided as to whether the normal spleen ever ruptures spontaneously. Many authors deny the possibility,[14] while others accept it as a rare occurrence.[15] Zuckerman and Jacobi[16] reviewed the world literature up to 1937 and were able to accept only 21 cases as authentic spontaneous rupture of the normal spleen.

These patients often have abdominal pain and distention. Progressive blood loss produces sudden and profound hypovolemic shock, manifested by loss of consciousness, a fall in blood pressure, and a rapid pulse. The physician first excludes hemophilia or anticoagulant medication as a cause. Often the precise diagnosis depends on a careful history, eg, a young woman with a missed period, pelvic pain, and positive pregnancy test probably has a ruptured ectopic pregnancy. At times, determination of the source of spontaneous abdominal hemorrhage ultimately requires exploratory laparotomy.

No creditable experimental work could be found to describe changes in the spleen during pregnancy. Nelson and Hall[17] reported a markedly diminished and almost total absence of germinal centers in lymph nodes of pregnant women at term. Until there is clarification of the splenic changes in pregnancy, several other suggested mechanisms of spontaneous rupture will have to be considered.

Intraperitoneal Hemorrhage

Intraperitoneal bleeding follows laceration of the spleen, liver, intestinal tract, bladder, mesentery, omentum, and diaphragm. In women, laceration of the uterus, tubes, or ovaries also produces intraperitoneal bleeding. Arteries and veins may rupture intraperitoneally or retroperitoneally to cause bleeding. Table 1 lists some reported causes of spontaneous hemorrhage.[17-28]

TABLE 1. CAUSES OF SPONTANEOUS INTRAPERITONEAL HEMORRHAGE

Liver tumor rupture[18]
Cholecystitis—erosion of cystic artery[19]
Appendicitis—erosion of appendiceal artery[20]
Ovarian rupture[21]
Small bowel tumor rupture[21]
Ectopic pregnancy[22]
Pancreatitis[23]
Ectopic endometrial tissue[24]
Ruptured arteriosclerotic aneurysm[25]
Ruptured varicose veins[26]
Anticoagulant therapy[27]
Splenic rupture[28]

THE GRAVITY SUIT

The concept of external counterpressure was first described and successfully employed by George Crile in 1903.[29] He used a suit made of India rubber to overcome postural hypotension that developed during neurosurgical operations in patients placed in the sitting position. Later he found it beneficial for patients in hemorrhagic shock.

Since then, the garment used to accomplish external counterpressure has been referred to as the gravity suit, G suit, MAST suit (Military Anti-Shock Trousers), and antishock suit. Its extensive use in the Vietnamese War provided time to transport severe trauma casualties to base hospitals and saved many lives. Paramedics now use it in prehospital care of trauma victims with similar life-saving results.[30]

In general, the gravity suit can be used on any patient in shock. It has been employed successfully in a wide variety of conditions that produce hypotension. Its clinical application in obstetrics and gynecology is primarily treating hemorrhagic shock.

Patients with ectopic pregnancy ruptures are often brought to emergency rooms in shock with continued blood loss. The immediate application of a gravity suit restores blood pressure and diminishes or stops blood loss.[31] This allows the team time to correct hypovolemia, to type and cross-match blood, and to carefully prepare the patient for surgery.

The author's experience with this suit over the last ten years supports the belief that the gravity suit is a valuable adjunct in managing the varied emergency complications that confront the obstetrician-gynecologist.

DISCUSSION

In most earlier works pregnancy was thought to predispose the spleen to rupture. Therefore, pregnancy was listed as an etiologic factor in splenic rupture. This view completely disregarded Barcroft's work,[32] in which he demonstrated on a small number of dogs that the exteriorized spleen shrinks markedly during pregnancy. Furthermore, examination of the spleen at autopsy in eight pregnant female dogs with normal spleens failed to reveal any correlation between splenic weight and duration of pregnancy.

The diagnosis of a ruptured spleen should be considered in any case of abdominal trauma, regardless of degree, and in the differential diagnosis of intraperitoneal hemorrhage. The traumatized patient must be kept under surveillance for longer periods of time than is customary. A good history, a thorough physical examination, and sound clinical judgment are more reliable in establishing the diagnosis in pregnancy than are peritoneal tap, an x-ray examination, or laboratory tests.

The treatment of ruptured spleen is splenectomy. Since delay can result in the death of mother and fetus, a high degree of suspicion alone is an indication for early surgery.

More frequent examination of the surgical specimen will reveal pathologically changed spleens. The high incidence of secondary rupture in this series[5] indicates that as more adequate histories are obtained and reported, more cases of minor trauma forgotten by the patient during the long latent period will be revealed. These two factors will markedly lower the number of cases designated as "spontaneous rupture of the normal spleen in pregnancy."

In any case of abdominal trauma, regardless of degree, and in the differential diagnosis of intraperitoneal hemorrhage, the high incidence of biphasic or delayed rupture dictates that the traumatized patient be kept under close surveillance for longer periods of time. In seven of eight cases the latent period will exceed one week.

The incision of choice is a left subcostal or left paramedian. The patient is often seen first by the obstetrician, with diagnosis of pelvic pathology, and the most common incision is a lower abdominal. In the 71 cases of spontaneous rupture of the normal spleen reviewed by Orloff and Peskin,[2] 75 percent of the cases that resulted in splenectomy were opened through an inadequate incision. Some patients needed extensions, some a new incision, and in the balance, the surgery was made extremely difficult by the original incision.

CONCLUSIONS

As evidenced in this paper, if surgical findings are inconsistent with the clinical picture in cases of intra-abdominal hemorrhage, the possibility of rupture high in the abdomen, namely, the spleen, must be considered and sought. Further, there is no evidence to indicate a causal relationship between pregnancy and splenic rupture.

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