Delayed Splenic Rupture: A Suggestion for "Predictive Monitoring"

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Two cases of delayed splenic rupture are presented. In one, splenic damage was demonstrated on Day 29 following trauma, and rupture of the organ occurred 2 days later. In the second patient, splenic trauma was documented 1 day after an accident, and rupture occurred on Day 26. Each case was marked by the fact that only one spleen scan had been performed (in the first case because of discovery only long after the trauma, and in the second case because of the patient's failure to return). That is, while damage to the spleen was evident, there was no follow-up to document healing. Based on this, it is suggested that spleen imaging be carried out soon after trauma. If a trauma-related defect is shown, then a repeat study may be mandatory to document healing. Lack of such healing, or failure to progress at a normal rate, may be an alerting sign to impending splenic rupture. Hence, "predictive monitoring" by early and then repeat imaging at a later date, is proposed.

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Splenic damage is fairly common after trauma. However, the incidence of delayed splenic rupture (that occurring 2 or more days later) is uncommon. We present two cases in which delayed splenic rupture occurred. These cases are used to develop a proposal concerning monitoring by early and delayed imaging in an effort to predict which patients may go on to splenic rupture.

CASE REPORTS

Case 1

An 18-yr-old woman, following an automobile accident, was admitted with multiple sites of trauma. She had sustained fractures of her right femur and humerus, and showed several areas of soft-tissue injury. The patient was quite unstable and could not be moved. She developed respiratory distress and a fever. On the 26th day of admission, 5 mCi of gallium-67 citrate were administered i.v., to search for an occult infection. Seventy-five hours later, whole-body imaging revealed no abnormal accumulation above the diaphragm, a slight focus of lower abdominal uptake, and a photon deficient area in the spleen (Fig. 1, left). This did not accumulate radiogallium. Because of the clinical question of subphrenic collection, a combined radiocolloid-lung scan was performed [3 mCi of technetium-99m (^{99m}Tc) sulfur colloid and 3 mCi of [^{99m}Tc] macroaggregated albumin (MAA)]. The posterior image confirmed that the previously noted defect was in the spleen. Two days following this, the patient developed acute abdominal symptoms. She was taken to the operating room, where a ruptured spleen was demonstrated.

Case 2

A 23-yr-old man was admitted following an automobile accident. There were multiple facial and scalp lacerations. The hematocrit was 46, WBC 17,500. Hematuria was present, with several RBCs per high power microscopic field. Radiographs of the skull and long bones were negative. An i.v. pyelogram was interpreted as being within normal limits. On the following day, the hematocrit fell to 32. A radiocolloid study was performed. This revealed several small defects in the spleen (Fig. 2). The hematocrit stabilized, and the urinalysis also became normal. He was discharged 4 days later (5 days post-trauma). He did not return for follow-up. On the 26th day after his trauma, he noted the sudden onset of left upper quadrant and left shoulder pain. The day previously, he had played golf for the first time since his injury. He appeared pale; pulse was 100, BP 150/90 and hematocrit 43. There was upper abdom-

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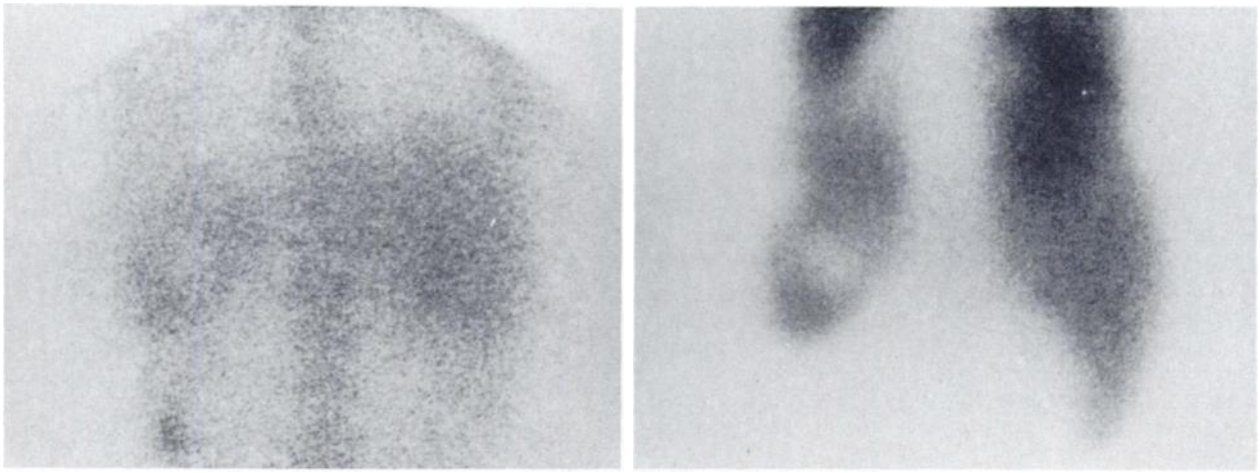

FIGURE 1
Left: Posterior view of radiogallium study (72 hr after administration). There is photon deficient area in splenic region. Right: Posterior image of lung-liver scan. Defect, on this radiocolloid study, is confirmed as being in spleen

inal tenderness. Subsequently, his blood pressure fell to 100/60, the hemocrit decreased to 32, and peritoneal tap revealed gross blood. He was taken to the operating room where a 220-g spleen with a disruption of the anterolateral capsule, covered with a 4-cm adherent clot, was removed. There was blood present in the peritoneal cavity.

DISCUSSION

A recurring medical quandry is determination of which patients with a particular disorder will progress to a second problem. In our situation, we are interested in determining which patients with splenic damage (due to trauma) develop delayed splenic rupture. There are two components to this problem.

1. Patients who have splenic damage, following trauma, must be accurately determined.
2. Patients with injury who may progress to rupture must be ascertained.

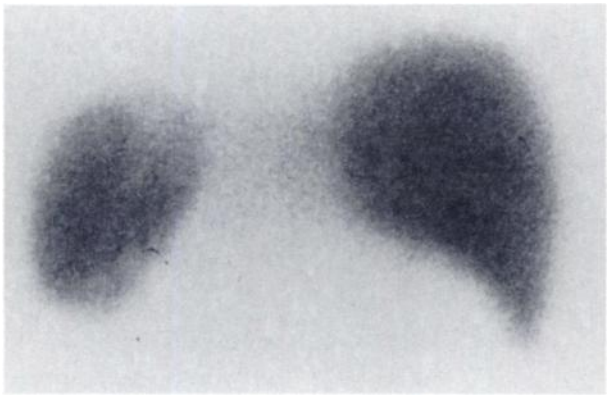

FIGURE 2
Posterior radiocolloid image in Case 2. Spleen (left) can be noted to contain several defects

The key to the second part of the problem may be to determine which patients are not healing (or not repairing the splenic damage at or near a normal rate). "Predictive monitoring" must, therefore, have at least two image sequences, with one immediately after the trauma. Which techniques should be used for the splenic imaging after trauma, and what of the time interval? The utility of ultrasound is compromised by (a) difficulties in placing the transducer because of either damage to the body surface or pain, and (b) increased echoes developing during the healing phase, possibly related to scar tissue formation (*2*).

Beyond this, we do not have definitive criteria as yet. If radionuclide images demonstrate splenic damage due to trauma, the technique should likely be repeated in order to follow healing. Computed tomographic scanning has reportedly done well in demonstrating splenic damage (*3*), and might be equally successful in monitoring reparative events.

The spleen, like most organs, can apparently undergo repair after damage from trauma or other causes. The literature has commented on this reparative phenomenon and its rate (*4*,*5*). In Case 1, the severity of the patient's injuries prevented moving until nearly 4 wk had elapsed from the time of trauma. Demonstration of a large defect within the spleen should have been a marker of the failure of trauma-related damage to heal. The spleen ruptured 2 days after this. In the second case, the patient did not return for a follow-up, after initial study showed splenic damage, and healing was thus not confirmed. The most generally appropriate time for repeat imaging has not been clearly demonstrated. We suggest the following as a reasonable first approach, pending the accumulation of a larger data base, possibly from a multi-center survey.

1. The initial study should be as soon as feasible after

trauma. There are no data, as yet, on whether intrasplenic defects can increase in size after the first few hours post-trauma.

2. Timing of the second study is less certain, but an initial suggestion of a week appears to have merit. This is because of the apparent healing of one such defect within 6 days (*6*), and the demonstration of considerable improvement in others within the first 7 days. If the initial reimaging does not show beginning resolution, further follow-up imaging might be scheduled. These two cases are examples of exceptions that prove the rule that delayed rupture is an uncommon sequel to splenic injury. The literature documents the rarity of such rupture and the inability to make any statement about individual risk in the absence of follow-up imaging. Lutzger has summarized much of the literature on radionuclide studies of the injured spleen (*7*). Her Table 2 summarizes three literature reports covering adults and children. Of the 78 patients with image demonstrated splenic trauma, 14 did not have a follow-up study (18%). Of the 64 patients who did have a second spleen scan, only eight (13% of those reimaged) showed no change in the intrasplenic defect. "Predictive monitoring" will be needed to determine if it is this group that is at risk of splenic rupture.

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