Technetium-99m Sulfur Colloid Spleen Imaging Following Partial Pancreatectomy and Splenic Artery and Vein Resection

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We retrospectively studied the records and [^{99m}Tc]sulfur colloid (TSC) spleen studies of 38 patients who underwent distal pancreatectomy with splenic artery and vein resection for donation to HLA-compatible relatives. The spleens in immediate postoperative TSC studies were normal in 11% of cases, showed no uptake in 16%, showed diffusely decreased uptake in 50%, and showed focal defects in 26%. Twenty of the patients, all with abnormal initial TSC studies, had repeat studies 2 wk to 3 yr later; 15% showed no change, 35% showed some improvement, and 45% became normal. One of six patients with no TSC uptake required splenectomy 2 days after pancreatectomy for splenic infarction. These data suggest that the spleen usually survives splenic artery and vein resection. Absent splenic TSC uptake raises the possibility of splenic infarction.

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Pancreas transplantation has been advocated as therapy for diabetes mellitus complicated by severe nephropathy, retinopathy, and neuropathy (*1*). Transplanted whole pancreases are obtained from cadavers, or pancreatic tails are removed from HLA-compatible living related donors. The splenic artery and vein are removed with the donor pancreas fragment for anastomosis to recipient vessels, resulting in interruption of the major perfusion pathway of the donor's spleen (*2*). To assess the effect of devascularization on splenic function, we reviewed the medical records and technetium-99m sulfur colloid (TSC) spleen studies of 38 donors who underwent distal pancreatectomy.

MATERIALS AND METHODS

The patients in this study underwent distal pancreatectomies over a 50-mo period; only those with available records and technically adequate scintigrams were included. All donors were healthy and had no history of significant illness. There were 17 males and 21 females ranging in age from 21 to 72 yr. Surgery consisted of *en bloc* resection of the distal pancreatic tail along with the adjacent splenic artery and vein. Imaging was done following the intravenous administration of 3–4 mCi TSC. In most cases, a large field-of-view camera fitted with a low-energy, all-purpose collimator was used. In a few cases, a small field-of-view camera was used with a similar collimator. Three hundred thousand count anterior, posterior, and oblique views were obtained. Twenty-five patients had preoperative baseline TSC studies. All patients had at least one TSC study within the first 3 wk after surgery; 20 had additional studies from 8 days to 3 yr after the initial one.

RESULTS

All of the preoperative TSC studies were normal. Postoperative studies were normal in four patients (11%), showed no splenic uptake in six (16%), showed diffusely decreased uptake in 19 (50%), and showed focal defects in 10 (26%). One patient's spleen showed both focal defects and diffusely decreased uptake. These findings are summarized in Table 1.

Each of the 20 patients who had more than one postoperative TSC study had an abnormal initial postoperative study. Three (15%) showed no change, seven (35%) showed partial improvement, nine (45%) re-

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TABLE 1
Distribution of Patients in the Study

	Normal	No uptake	Diffuse decrease	Focal defects	Totals
Initial TSC only	4	1	8	5	18
Initial and repeat TSC	0	5	11*	5*	20
Totals (%)	4 (11)	6 (16)	19 (50)*	10 (26)*	38

* One patient had both diffusely decreased uptake and focal defects.

TABLE 2
Outcomes in 20 Patients with Repeat TSC Studies

	No uptake	Diffuse decrease	Focal defects	Totals (%)
No change	0	2	1	3 (15)
Partial improvement	3	2	2	7 (35)
Improvement to normal	1	7*	2*	9 (45)
Splenectomy	1	0	0	1 (5)

* One patient had both diffusely decreased uptake and focal defects.

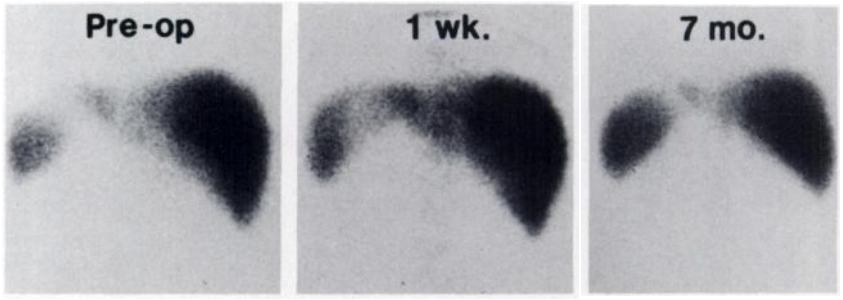

FIGURE 1
Twenty-yr-old female, posterior views. Except for minor differences in patient positioning, the spleen appears unchanged from the preoperative study at one week and at seven months.

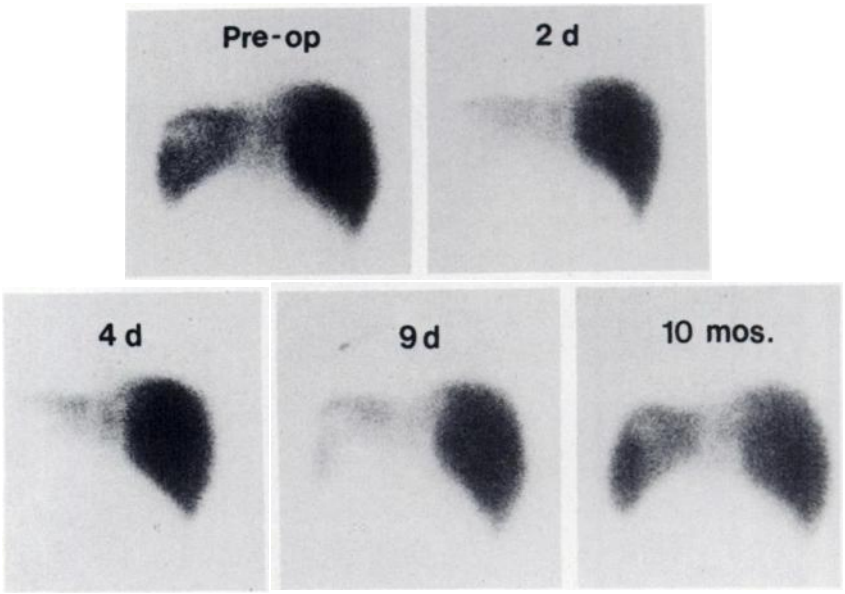

FIGURE 2
Twenty-two-yr-old female, posterior views. Splenic function is absent at two days after surgery but returns during the ensuing weeks.

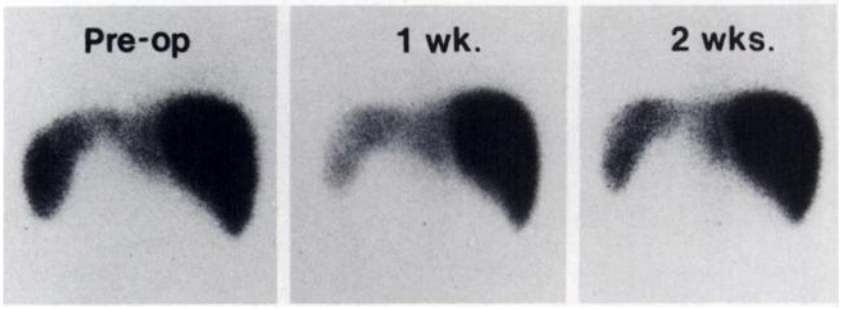

FIGURE 3
Twenty-seven-yr-old male, posterior views. One week postoperatively splenic function is diffusely decreased but returns to normal at 2 wk.

FIGURE 4
Thirty-one-yr-old female, posterior views. At 1 wk after surgery, the spleen shows a focal defect and diffusely decreased function. At three weeks the spleen appears normal. (Patient positioning differs slightly in the three studies.)

turned to normal, and one patient underwent splenectomy. A subgroup of 12 of these 20 patients had repeat studies at least three months after the initial one. In this subgroup, return of normal splenic appearance was seen in 10 (83%) compared with 45% in the entire group of 20 in which the times to follow-up were as short as 8 days. The results for patients with repeat studies are summarized in Table 2, and representative cases are shown in Figures 1–4.

One patient, a 23-yr-old woman, required splenectomy on the second day after pancreatectomy because of extreme left upper quadrant pain. Pathologic examination of the excised spleen revealed massive infarction. Her initial postoperative TSC study showed no splenic function (Fig. 5). All other patients have experienced no permanent clinical sequelae of splenic devascularization.

DISCUSSION

Interruption of the splenic artery has been used without splenectomy to treat hypersplenism, and scintigraphy has demonstrated the resulting decrease in splenic function (*3*). The splenic artery has also been diverted to bypass diseased arteries, leaving the portal system as the spleen's source of perfusion (*4*). In these settings, the spleen usually survives. In pancreatectomy for transplantation, however, the donor's spleen is initially normal, and both the splenic artery and vein are removed. A previous report of four transplant donors (*5*) suggests that their spleens usually survive. Our results confirm that while removal of the splenic artery and vein typically results in abnormal TSC studies (34/38 = 89% of patients), splenic function frequently improves over the ensuing weeks.

Only one patient required splenectomy. While her initial postpancreatectomy TSC study showed no splenic function, five other patients with similar initial TSC studies had no lasting adverse effects of splenic devascularization. Four of these five had improvement on TSC studies; the fifth had no follow-up study but had no clinical indications of splenic or left upper quadrant disease.

From the limited number of patients in this investigation we conclude that resection of the splenic artery and vein probably only infrequently results in infarction

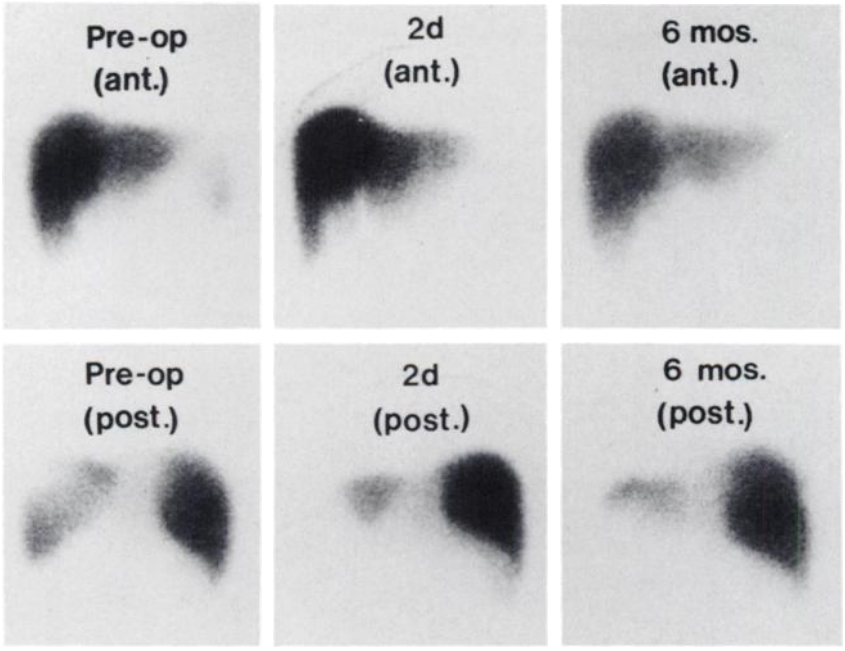

FIGURE 5
Twenty-three-yr-old female, anterior and posterior views. Two days after pancreatectomy, splenic function is absent. Splenectomy was performed on the next day because of pain. Except for minor differences in patient positioning, the left upper quadrant appears unchanged from 2 days to 6 mo after pancreatectomy, confirming the absence of splenic uptake at 2 days.

of the entire normal spleen. Return to normal appears to be most likely at follow-up times of 3 mo or greater. Most patients undergoing this procedure experience transient (days to weeks) abnormality in splenic appearance that improves, often to normal, over the following months. Even when the initial TSC study shows no splenic function, some degree of splenic recovery usually occurs.

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