Radiology of the Human Segmental Pancreatic Transplant

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Abstract. Twenty-three segmental pancreatic transplants have been performed for treatment of diabetes mellitus between July 1978 and March 1981 at the University of Minnesota. The radiologic evaluation of the transplants included ultrasonography, \(^{15}\)Se-methionine isotope scanning, angiography, and CT scanning. Transplants of normal appearance by these studies had normal endocrine function. Pathologic findings are presented and their significance discussed.

Key words: Pancreas – Pancreas transplantation – Diabetes

The high morbidity and mortality of the insulin-dependent diabetic is well known. Segmental pancreatic transplants have been investigated as a possibly more efficacious therapy than insulin in preventing the complications of diabetes. Sutherland [1] has stated that by the end of 1980 only 135 pancreas transplants had been reported in the world literature. Thirty-six of these transplants were performed at the University of Minnesota [2-4]. This paper reports the radiology of the transplanted pancreas in a series of 23 patients operated since 1978 by Sutherland et al. [4]. Evaluation of these allografts included ultrasound, \(^{13}\)Se-methionine isotope scanning, \(^{99m}\)Tc-vascular flow studies, angiography, and CT scanning. The role of ultrasound in pancreatic evaluation is well known and has been summarized by Lawson [5]. Miale et al. [6] have described the current status of the nuclear medicine scan. Svahn and associates [7] applied this technique as well as angiography in a group of 4 pancreatic transplants. Although computed tomography was mentioned as the definitive method for pancreatic examination by Haaga et al. [8], CT found only limited use in the transplanted pancreas in our series.

Materials and Methods

Between July 1978 and January 1981, 23 segmental pancreatic transplants were performed. The clinical aspects of the first 20 of these have been reported previously by Sutherland et al. [4], but several technical factors are worthy of repetition here. Most of our patients also had renal transplants. Pancreatic transplantation was performed by the segmental technique; the graft included approximately 50% of the distal pancreas from living relatives or cadaver donors. Vascular anastomoses were between the recipient iliac vessels and the donor splenic artery and vein (celiac artery and portal vein if cadaver donor) [9, 10].

Grafts were placed intraperitoneally in the left lower quadrant. The first 13 cases had open pancreatic ducts [10]. In cases 14-17 the ducts were injected with prolamine (Ethiblock, Ethincon GmbH), and the remainder were injected with silicone rubber (Silastic 382, Dow Corning). Prolamine was found by Sutherland's group [4] to induce intense pancreatic fibrosis and graft failure. Radiotherapy of the transplant to reduce exocrine function was utilized in the last 6 open duct group patients.

Forty-three ultrasound studies were performed in 16 patients. These evaluations were performed by a physician sonographer utilizing a 3.5 MHz medium focus transducer; scans were obtained at 1 cm intervals in sagittal and transverse planes with oblique scans obtained as needed. Realtime scanning utilized a 3 MHz transducer. Both are digital gray scale units and are commercially available. The TGC was set to optimize pancreatic visualization.

Twenty-six pancreatic nuclear scans were obtained in 16 patients. We used 250-300 mCi of \(^{75}\)Se-methionine. The initial image was obtained with 100,000 counts; sequential scans at 10 minute intervals were obtained for 1 hour utilizing the same scanning time as the initial scan. Imaging was performed with an HP-5 gamma camera using both \(^{75}\)Se-photopeaks. Ten mCi of \(^{99m}\)Tc-DTPA was injected as a bolus, images were recorded at 1-2 second intervals.

Angiography was performed in 3 patients. First 40 ml of 60% contrast material was injected via an 18 gauge Amplatz sheath into the left femoral artery. The leg vessels were occluded by a thigh tourniquet. Filming was done at a rate of 2/second in the AP, with oblique projections added as needed.

CT scanning was performed in 3 patients early in our experience using second-generation equipment with 18 second scanning time. Neither contrast enhancement nor glucagon premedication was utilized.
Results

Ultrasound

Ultrasound was the most frequently utilized study: 43 examinations were performed in 16 patients between the first and 125th postoperative day. All 11 patients who had normal pancreatic transplant echograms had normal endocrine function at the time of the examination (Fig. 1). The most common abnormal finding, seen in 24 examinations, was peripancreatic fluid collection. This ranged in size from a minimal halo about the transplant (Fig. 2) to tense pancreatic ascites. Pancreatic endocrine function was intact in these patients.

Pseudocysts or loculated collections were seen in 4 cases (Fig. 3). In the majority of cases the content was sterile pancreatic juice with amylase levels over