

# Arterial Mycotic Aneurysm and Rupture

## A Potentially Fatal Complication of Pancreas Transplantation in Diabetes Mellitus

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● **Mycotic aneurysm at the site of a Carrel patch arterial anastomosis occurred in four patients who had undergone whole pancreas transplantation 2.5 to 14.5 months previously. In all patients, the graft had been removed, leaving the Carrel patch on the iliac artery. The aneurysms ruptured into the intestine or the extraperitoneal space. The ruptures were sudden and life-threatening in three of four cases. This diagnosis must be suspected in patients with a history of pancreas transplantation in the immediate or distant past if they present with unexplained hypotension, cardiac arrest, or gastrointestinal tract bleeding.**

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Pancreas transplantation has been performed with increasing frequency in patients with diabetes mellitus, often at the same time as renal transplantation.<sup>1-5</sup> Mycotic arterial aneurysms developed in four patients at the site of the Carrel patch, which was used to rearterialize the whole pancreas homograft. This life-threatening complication could be confused with cardiac arrhythmias or myocardial infarction, the most common causes of sudden death in advanced diabetes.

### PATIENTS AND METHODS

The four complications occurred in 16 patients who received 17 pancreas grafts between 1983 and 1985 in a pilot study of whole pancreas transplantation at the University of Pittsburgh (Pa).<sup>6</sup> The 4 patients were 24 to 36 years of age and had type I diabetes mellitus and a history of ketosis for 18 years or more. All patients had neuropathy and retinopathy. All but 1 had renal failure, which was treated earlier or at the same time with cadaveric kidney transplantation.

A pancreaticoduodenal graft was used in each case. The donor celiac axis and origin of the superior mesenteric artery were included in a Carrel patch of the donor aorta, which was anastomosed to the side of the recipient common iliac artery.<sup>6,7</sup> The end of the graft portal vein was anastomosed to the side of the common iliac vein of the recipient. The graft exocrine secretions were directed into the recipient jejunum by anastomosing the duodenum directly into the recipient jejunum (cases 1 and 2) or through a defunctionalized Roux-en-Y limb of jejunum (cases 3 and 4), with techniques that have been described elsewhere.<sup>6,7</sup> Immunosuppression was achieved with cyclosporine and prednisone, supplemented with azathioprine and monoclonal antibody (OKT3, Orthoclone), as indicated.

Perioperative antibiotics administered at the time of transplantation consisted of cefazolin in patients 1 and 2, cefotaxime in patient 3, and cefotaxime and ampicillin in patient 4.

### RESULTS

#### Clinical Presentation

Failed pancreatic grafts had been removed 5 days to 14 months before the aneurysm ruptures occurred (Table). In patients 1, 2, and 3, the ruptures occurred, fortunately, while the patients were in the hospital. Patient 1 had a peripancreatic abscess drained 1 week before pancreatectomy. No abscess was encountered in patient 2. There was no disruption of the enteric anastomosis. Both patients became pulseless at the same time that they developed swelling in the area of the

graft and bleeding through the graft pancreatectomy incision. The incisions were opened at the bedside, and the bleeding was controlled as the patients were rushed to the operating room.

The graft in patient 3 had been removed 2½ months previously because of venous thrombosis, 10 days after the transplantation. The reason for his hospitalization was persistent serous wound drainage. A few hours after admission he had a cardiac arrest after suddenly developing abdominal pain and distention. The diagnosis was obvious, and the patient was resuscitated as he was brought to the operating room.

Patient 4 presented with upper gastrointestinal tract bleeding 1 year after graft pancreatectomy for pancreatitis. Upper and lower gastrointestinal tract endoscopy, technetium bleeding scanning, ultrasound examination, and arteriography of the abdominal aorta and iliac and visceral arteries did not reveal a bleeding source. She was discharged. Two months later, another episode of massive upper and lower gastrointestinal tract bleeding occurred. She was readmitted and collapsed within a few hours. At emergency operation, a rupture was found of the arterial anastomosis site into the tip of the Roux-en-Y loop previously used for enteric drainage.

#### Bacterial Cultures

The bacteria cultured from the rupture sites are listed in the Table. Results of cultures were negative in patient 4 but were considered to be falsely negative because there was communication with the intestine.

#### Surgical Treatment

All patients underwent ligation of the proximal and distal common iliac artery. In all but patient 4, crossover femoral-femoral bypass was performed immediately. In patient 4, the extremity seemed well perfused, and the limb was not revascularized. Ten months later, she developed intermittent claudication in the left leg. At the time of this writing, she is scheduled for arterial bypass.

The patients are all alive and well and are currently receiving exogenous insulin. Renal function, if it was present before, was not adversely affected by the complication (Table).

#### COMMENT

Since the advent of immunosuppression with cyclosporine, 1-year graft survival has improved and is currently reported to be 50% or more.<sup>1-6</sup> Breakdown of the constructed anastomoses for exocrine drainage has been common and has often been ascribed to the proteolytic activities of the pancreatic juices, or less often to infections.

Both factors could have contributed to the aneurysm formation and rupture in our four patients. The bacteria cultured from the rupture site in three patients were indigenous to the gastrointestinal tract, and in the patient with a negative culture, the rupture was into the intestine. Thus, we classified all of the pseudoaneurysms as mycotic.

Mycotic aneurysm and rupture may be a relatively specific complication of whole pancreas transplantation. Although Carrel patches to the iliac vessels are almost always used for kidney transplantation at the University of Pittsburgh, only one mycotic aneurysm was observed after 1375 cadaveric

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Clinical Characteristics of Patients With Arterial Aneurysms After Pancreatic Transplantation\*

Patient/ Age, y/Sex	Time of Kidney Transplant	Time Between Pancreas Transplant and Removal	Aneurysm Rupture, Time After Pancreas Transplant Graft Removal	Findings	Arterial Site Culture Results	Repair	Current Status
1/30/M	Previous	15 mo (rejection)	5 d	Pseudoaneurysm of LCIA	<i>Citrobacter freundii</i> , <i>Bacteroides melaninogenicus</i> , <i>Enterobacter aerogenes</i> , <i>Clostridium subtermini</i>	Femoral-femoral, bypass ligation of LCIA	Alive and well; functional kidney transplant
2/28/M	Previous (10 nonfunctional transplants)	2.5 mo (rejection)	1 wk	Pseudoaneurysm of LCIA	<i>Bacteroides fragilis</i> , <i>Fusobac- terium nucleatum</i>	Femoral-femoral, bypass ligation of LCIA	Alive and well; dialysis
3/36/M	Simultaneous	10 d (venous thrombosis)	2.5 mo	Pseudoaneurysm of LCIA	<i>C freundii</i> , microaerophilic philic strept <i>Viridans</i>	Femoral-femoral, bypass ligation of LCIA	Alive and well; functional kidney transplant
4/24/F	None	3 wk (pancreatitis)	14 mo	Pseudoaneurysm of LCIA	Negative	Ligation of LCIA	Alive and well; native renal function

\*LCIA indicates left common iliac artery.

renal transplantations between 1981 and 1988. In contrast, mycotic aneurysms developed after 4 of our 17 whole pancreas transplantations between 1983 and 1986. At the University of Iowa, Iowa City, aneurysm rupture was seen in 3 of 80 cases (Robert Corry, MD, oral communication, September 1988). The same incidence of 3 in 80 cases has been seen at the Karolinska Institute in Stockholm (Carl G. Groth, MD, oral communication, September 1988). In all 10 cases of the Pittsburgh-Iowa City-Stockholm collection, exocrine pancreatic drainage had been into the gastrointestinal tract. This complication was not seen in 3 other patients in our series who had failed grafts removed. Two of these patients' grafts were grossly infected. A fourth patient has had a failed graft left in situ for 3 years without this complication.

Intraperitoneal placement of the pancreatic allograft offers a theoretical advantage of having the arterial anastomosis exposed to the peritoneal cavity rather than the closed extraperitoneal space. Patient 4 had the only intraperitoneal pancreas graft in our series.

Whether this frightening complication will be minimized with the increasingly popular techniques of exocrine drainage into the less contaminated bladder<sup>8,9</sup> remains to be seen. Walstra et al<sup>10</sup> have reported a successfully treated mycotic aneurysm after bladder drainage, which has also been observed with a fatal outcome (D. Nghiem, MD, oral communication, June 1988).

The most important lesson from this cumulative experience is the necessity for a high index of suspicion in the event of wound complications, unexplained shock syndromes, gastrointestinal tract hemorrhage, or unexplained abnormalities with examination performed physically or by imaging techniques. Appropriate surgical care then can be planned, sometimes electively instead of under the catastrophic circumstances that existed in all of our cases. In our patient 4, in whom a wound infection with *Candida stellatoidea* and *Candida albicans* was documented at the time the pancreas was removed for pancreatitis, prophylactic ligation of the common iliac artery was seriously considered but not done. This proved to have been an error when the aneurysm ruptured into the intestine more than 1 year later.

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## Editorial Comment

This concise article describes a devastating complication (mycotic aneurysm at the arterial suture line) that has occurred with surprisingly high frequency in patients with pancreatic transplantation at the University of Pittsburgh. There have also been a significant number of identical complications reported by the Iowa City and Stockholm groups. The common denominator in all of these cases has been drainage of the pancreatic secretions into the gastrointestinal tract. There is little general recognition even in the transplant community as to the prevalence of this complication, even though the danger of gastrointestinal tract contamination in the immunosuppressed patients is well known. The authors' recommendation for a high index of suspicion of this complication and for its aggressive treatment by ligation of the iliac artery and extra-anatomic bypass is well taken, as is their suggestion that ligation of the artery should even be considered prophylactically in instances where contamination of the suture line is recognized.

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