Brief report

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A technique of pancreas transplantation in the rat securing pancreatic juice for monitoring

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Abstract. In order to study exocrine pancreas graft function and cytological findings, a technique of vascularized pancreas transplantation with special reference to a pancreatic juice collecting system has been developed in the rat model. For this purpose, a catheter is introduced into the common bile duct, which is ligated close to the duodenum, thus covering all pancreatic ducts. This catheter is connected to a reservoir implanted subcutaneously, from which pancreatic juice can easily be aspirated. The amount of 0.7–1.2 cc of juice produced over a 24-h period has proven to be sufficient for various analyses and cytological examination.

Key words: Pancreas transplantation, technique, in the rat – Exocrine secretion monitoring, in pancreatic transplantation, in the rat

Klempnauer and Settje very elegantly described various techniques of vascularized pancreas transplantation in the rat model [1]. They focused primarily on the handling of the graft's exocrine secretion, including duct occlusion and ligation, as well as enteric, urinary, and free intraperitoneal drainage. Measurements of pancreatic juice and its enzymes, as well as pancreatic juice cytology, have proved to be reliable and early rejection markers [2, 3]. A prerequisite for these relatively simple tests, however, is the availability of pancreatic juice. We have therefore devised a technique of pancreatic transplantation in the rat that provides pure pancreatic secretion.

After median laparotomy the major omentum is dissected from the anterior aspect of the pancreas. Left gastric, gastroepiploic, and short gastric vessels are then ligated and cut. Mobilization of the duodenum is followed by dissection of the entire pancreas. Next, middle and right colic vessels are severed. Superior mesenteric vessels are then dissected and looped. Preparation of the liver hilum is started by ligating the proper hepatic artery. The common bile duct is then ligated close to the liver. Through a small incision just distal to the ligation, a ca-

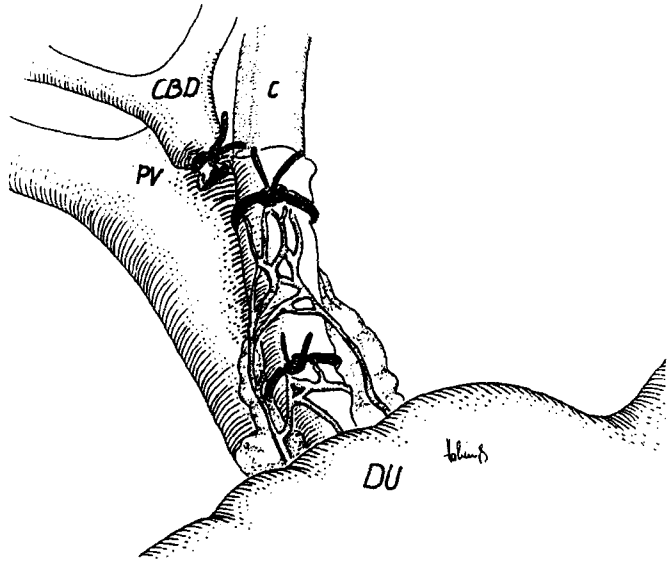

Fig. 1. Plastic catheter inserted and fixed in the common bile duct. *PV*, Portal vein; *CBD*, common bile duct; *C*, catheter; *DU*, duodenum

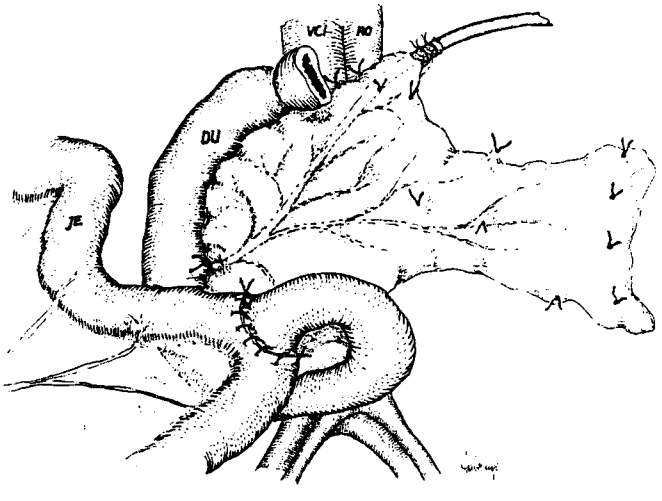

Fig. 2. Completed pancreas transplant. *VCI*, Inferior vena cava; *AO*, aorta; *DU*, duodenum; *JE*, jejunum

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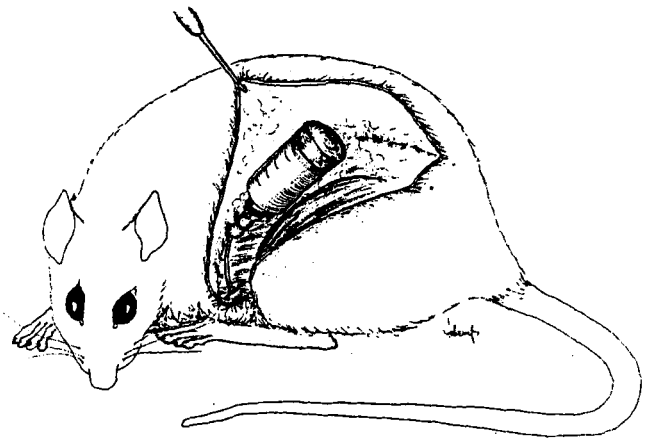

Fig. 3. Reservoir in place and connected to pancreas transplant

theter (Portex-plastic catheter 0.8 mm) is inserted and advanced to the level of the upper margin of the duodenum where, in the rat, the first pancreatic duct joins the common bile duct. Leaving the tip of the catheter above this level ensures that none of the pancreatic ducts are blocked by the catheter. In order to avoid necrosis of the common bile duct, special care is taken when fixing the catheter at two different levels by means of a ligature (Fig. 1). The bifurcation of the portal vein is then freed. Using a dorsal approach, the common bile duct is then ligated below the duodenum and distal to the last pancreatic duct in order not to lose pancreatic juice into the duodenum. Aorta and right renal artery are dissected next. After ligation and severance of the splenic and superior mesenteric vessels peripheral to the pancreaticoduodenal arcade and after ligation of the right renal artery, a needle for perfusion with 5 cc of chilled saline is introduced into the aorta, which is cross-clamped above the coeliac axis. For release of the pancreas, both branches of the portal vein are transected. The portal bifurcation is preserved for use as a patch. After transection of the duodenum above and below the pancreas, the graft is removed together with the abdominal aorta, using the spleen as a handle.

In the recipient, the portal vein is anastomosed to the inferior vena cava and the donor aorta with the coeliac axis and superior mesenteric artery to the abdominal aorta of the recipient. The aboral end of the duodenum is then attached to the jejunum in one layer (Fig. 2). Preservation of the duodenum provides several advantages. The pancreas can be removed and transplanted without ever being touched. Furthermore, this is technically easier and faster and possibly provides better vascular supply of the common bile duct. Finally, the pancreas is held in a certain position by the duodenal fixation. The bile duct catheter is kept as short as possible and led to a subcutaneous pouch at the back, where it is connected to a reservoir (Fig. 3). This self-made reservoir consists of a 5 cc plastic syringe that is cut at 3 cc and closed with a rubber plug. This allows percutaneous aspiration of pancreatic juice, something which is done under general anesthesia. A low subpressure in the system, which may facilitate better filling of the reservoir, is created by aspiration during removal of the syringe. On the average, 0.7–1.2 cc of pancreatic juice is produced over a 24-h period.

The reservoir was left in situ for the entire study period. Thus, our longest survivor carried it for 6 weeks without any complication.

The method described has proved to be simple, safe, and practical and is therefore recommended to those interested in exocrine pancreas graft function in the rat.

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