Duct-drained versus duct-occluded pancreatic grafts: a personal view

I. B. Brekke

Rikshospitalet, The National Hospital, Department of Surgery B, Pilestredet 32, N-0027 Oslo 1, Norway

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The management of pancreatic graft exocrine secretion has been a major concern ever since the start of clinical pancreas transplantation. A variety of techniques have been utilized in an effort to reduce surgical complications related to the acinar pancreatic tissue and to enhance graft survival. After more than a decade's trials of performing pancreatic transplantation by various duct drainage (DD) systems [14, 15, 20, 22], Dubernard, in the late 1970s, introduced the duct occlusion (DO) technique [8]. In contrast to duct drainage, which aims at the preservation of functioning exocrine pancreatic tissue, duct occlusion results in exocrine tissue atrophy.

The technically simple and safe DO technique was adopted by several European and North American transplant centres during the 1980s and led to a rapid increase in pancreas transplantation activity (Fig. 1). Subsequently, some disadvantages of the DO technique were revealed. In the few weeks to a couple of months time from duct occlusion to total acinar atrophy [3], exocrine pancreatic fluid escaping from the graft frequently caused local fluid accumulation and fistulation [5, 18]. Moreover, vascular thrombosis was reported to be responsible for early loss of 15%-20% of the DO grafts. Multiple graft artery stenoses, observed in recipients over time [29], is supposed to be a result of fibrotic parenchymal derangement following duct occlusion. These changes may play a role in additional graft loss through late arterial thrombosis [9, 29] and, thus, contribute to the low, long-term survival rates of DO grafts (Fig. 2).

Because of these problems, an increasing number of transplant centres have during the last 6-7 years, again turned to transplant procedures that include duct drainage (DD). This has been especially true for North American centres, where pancreas transplants registered since 1987 have almost exclusively been performed by pancreatic duct drainage to the urinary bladder (BD) [38]. The evolution of the urinary drainage technique was based on the initial experience with pancreatic duct-to-ureter anastomosis reported by Gliedman et al. [14] in the early 1970s. A decade later, a duct-to-bladder technique was described for segmental pancreas [7, 12], followed by whole organ with duodenal patch [35], and finally by the pancreatoduodenal transplant with a duodenal segment drained to the bladder [27]. The Stockholm group has refined the technique of enteric drainage (ED), employing pancreatoduodenal transplants with a direct intestinal anastomosis [39]. This technique may be more physiological than the BD technique, but a high rate of surgical complications have been reported and the technique has so far not been widely adopted.

The refinements of the DD techniques, together with modifications of immunosuppressive protocols, have led to improved results and to continuous growth in the number of pancreas graft recipients each year, at least in the United States. In Europe, on the other hand, pancreas transplant activity seems to have stagnated (Fig. 1), and a consensus on which technique should be given preference has obviously not yet been reached.

After having transplanted 53 duct-occluded segmental grafts during a 5-year period (June 1983–March 1988), the pancreas transplant technique used at the Rikshospitalet, Oslo, was changed in April 1988 to BD pancreaticoduodenal grafting [2]. One reason for changing the technique was that a marker for graft rejection was required in order for us to be able to proceed with our program for transplanting isolated pancreatic grafts. The monitoring of graft function by measuring urinary output of amylase seemed to be feasible, judging from reports from several centres [30, 37].

Thirty-three BD whole pancreas transplantations have been performed at our institution thus far (i.e., up until March 1992). The distribution over the various patient categories is shown in Table 1. Mean recipient age was identical in the DO and BD groups. Triple drug immunosuppression was standard in both groups, although eight patients in the BD group received quadruple induction prophylaxis. The opinion I have formed regarding the two methods of pancreas transplantation, as expressed here, is based on my personal experience performing the surgery and following up on the recipients. In what follows, some pros and cons of the two methods are given, based on my personal experience and on reports from other centres.
Fig. 1 A, B. Annual number of pancreatic transplantations: A worldwide; B in European (■) and U.S. (□) centres (International Pancreas Transplant Registry)

Table 1. Number of pancreas transplantations performed by duct occlusion (1983–1988) and by bladder drainage (1988–March 1992) simultaneously with kidney, after kidney, or alone

<table>
<thead>
<tr>
<th>Method</th>
<th>Simultaneous Pancreas and Kidney</th>
<th>Pancreas after Kidney</th>
<th>Pancreas alone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duct occlusion</td>
<td>46</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>Bladder drainage</td>
<td>26</td>
<td>5</td>
<td>2</td>
</tr>
</tbody>
</table>

Surgical techniques

Organ retrieval

The retrieval of a pancreas segment is certainly easier and faster than that of a whole pancreas with a duodenal segment. Moreover, in simultaneous liver harvesting, the preference of most centres to leave the portal vein and coeliac axis with the liver has no impact on the segmental pancreas. For the pancreaticoduodenal technique, the absence of these vascular structures means time-consuming reconstructions when preparing the pancreas for transplantation. Approximately 80% of our whole pancreas donors were also liver donors. In agreement with reports from several other centres [6, 10] however, this did not seem to have any adverse effect on pancreas graft functional survival.

Complications related to the transplantation technique

Wound secretion was experienced in about 40%–50% of the patients with extraperitoneally placed DO segmental grafts. This problem was encountered less frequently when the grafts were placed intraperitoneally. All pancreaticoduodenal grafts were placed intraperitoneally through a midline incision. When changing from DO to DD grafting, an initial increase in postoperative complications and a change in the type of complications were observed. The most frequent types of postoperative complications in our two series (Table 2) are similar to those reported from other centres [5, 16, 18, 19, 36]. Several of the complications observed were chronologically associated with severe rejection episodes and intensified antirejection therapy. Rejection episodes tended to be more severe in BD than in DO grafts, and all recipients of BD grafts experienced at least one steroid-resistant rejection episode, which was treated with ATG, OKT3, or both. In the DO group, about 30% of the recipients had steroid-resistant rejections.

Extended immunosuppression was apparently partly responsible for an increased frequency and severity of cytomegalovirus (CMV) infections in these patients and for the occurrence of lethal, fungal sepsis in two patients. Fascial dehiscence, observed in three recipients of BD grafts 3–4 weeks postoperatively, did not occur after changing from absorbable to non-absorbable fascial sutures. Of eight reoperations in the BD group, five were among the first 15 recipients. Three were for resuturing after fascial dehiscence, two for a leak from the duodenal segment, one for diffuse peritonitis, one for hemorrhage, and in one