DRAINS IN PANCREATIC SURGERY

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There has been a great deal of progress made over the last two to three
decades in the performance of the pancreaticoduodenectomy and all
pancreatic resections.

Many studies have been published exploring the different technical aspects of
the operation. As a consequence, pancreas head resection has become an
operation with a low mortality (3%) but high morbidity (20-40%). We have a
better understanding of a number of aspects including; there is no real
difference between the pyloric preserving vs the traditional resection; there is
no difference between the pancreaticojejunostomy vs the
pancreaticogastrostomy. It appears as if an anticolic gastrojejunostomy
results in less delayed gastric emptying (DGO) than a retrocolic anastomosis.

The emergence of fast track surgery has been felt by pancreatic surgeons.
The drive is related to patient safety and improved outcomes and economic
factors, driving the need for a shorter hospital stay. However the issues are
less well defined in the pancreaticoduodenectomy. Early removal or no
insertion of Nasogastric tubes (NGT) is uncertain. The role of this chapter is to
explore the role of drains in this procedure.

The literature has seen an explosion of data discussing the role of drains in
pancreatic surgery. There seems to be a need to separate proximal
resections from distal resections. The morbidity and the consequences of the
complications in the two different settings seem to be different. Hence the
reliance of drains differs.
Furthermore the debate hinges on two main issues; firstly, can this operation be safely performed without the use of drains and, secondly, can we better determine if it is safe to remove drains earlier.

Drains are thought to remove excess fluid that may accumulate after this large dissection and multiple anastomosis in the reconstruction, following the resection for either malignant, potentially malignant or benign disease. Drains however are also thought to be a route for the introduction of infection into these collections. They are thought to erode into anastomosis, result in leaks and, in the case of closed suction drains, also erode into bowel. As a result there are many who believe that the drains themselves are the cause of significant complications.

The role of cross sectional imaging and the skills of the interventional radiologist have also meant that when fluid does accumulate and, when clinically relevant, the percutaneous placement of a drain in that circumstance will be adequate. As the majority of patients do not develop leaks or complications the routine use of drains seems to be unnecessary.

The most significant complication in pancreatic resections is the pancreatic fistula. This is better defined today and we have a better common description of what is meant by pancreatic fistula. The International Study Group on Pancreatic fistulas (ISGPF) defined a three tiered approach in 2005. This is a well-accepted definition.

The pancreatic anastomosis leak is the cause of much of the severe morbidity resulting in Delayed Gastric Emptying (DGO), haemorrhage especially from the mesenteric arteries. And it is the cause of severe intra-abdominal sepsis. There are three circumstances that are linked to the development of Pancreatic operative fistula (POF). A soft parenchyma, a small duct and delayed removal of the drains.
While evidence does exist linking these three scenarios to a greater chance of developing a leak, more evidence in this regard is needed. However, identifying these risks has not been adequately met by solutions to prevent the leak. The type of anastomosis seems to have no influence. Much has been published regarding the role of peri-operative somatostatin analogues in preventing POF. Unfortunately the level of evidence and the outcomes of these studies do not provide conclusive evidence for the value of their routine use or even their use in those considered to be high risk scenarios. As such the discussion, regarding the routine use of drains, remains important.

Table 1. The International Study Group on Pancreatic Fistulas (ISGPF) – definition of a post-operative pancreatic fistula.

<table>
<thead>
<tr>
<th>Grade</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical conditions</td>
<td>Well</td>
<td>Often well</td>
<td>Ill appearing/bad</td>
</tr>
<tr>
<td>Specific treatment*</td>
<td>No</td>
<td>Yes/no</td>
<td>Yes</td>
</tr>
<tr>
<td>US/CT (if obtained)</td>
<td>Negative</td>
<td>Negative/ positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Persistent drainage (after 3 weeks)†</td>
<td>No</td>
<td>Usually yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Reoperation</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Death related to POPF</td>
<td>No</td>
<td>No</td>
<td>Possibly yes</td>
</tr>
<tr>
<td>Signs of infections</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Sepsis</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Readmission</td>
<td>No</td>
<td>Yes/no</td>
<td>Yes/no</td>
</tr>
</tbody>
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Conceptually, avoiding drains makes significant sense, however most pancreatic surgeons know that the rate of POF remains high and that the consequences are severe and, as such, leaving them hidden until clinically apparent seems counter intuitive. However, we have all had patients who seem to do extremely well for the first five days and then suddenly the drains demonstrate a significant leak. There are also those patients who seem to do really well and just before discharge present with the feature of a massive bleed precipitated by a POF.

DGO also seems to be higher in patients who have drains.
So the first question is; should we routinely be using drains? The evidence for this has, up until recently, been based on an RCT published in the 2001 where Conlon from the MSK demonstrated a higher complication rate in patients with drains. He recommended that routine drainages were not required.

However, in 2013 the same institution published a retrospective study which identified that half of their patients continued to have drains despite confirming the data from the 2001 study. So strong is the intuitive sense of the surgeon that drains save lives, that they could not effect an institutional change in the routine use of drains. However there have been a number of studies, largely retrospective, that have shown that the complication rate in patients with drains is higher than with no drains. Some of these studies are large but mainly single centre studies. A Meta-analysis published in 2013 reported on one randomised and two non-randomised studies.

Their conclusion was that there was no conclusive difference. However, a study from France, published in 2013, demonstrated that there was no difference between drain and no drain in terms of complications, post-operative haemorrhage and pancreatic fistula rates. Hospital stay and mortality also did not differ and it was concluded that there was no role for routine post-operative drainage.
Table 3.  Trend of pancreatic fistula over time.

![Graph showing trend of pancreatic fistula over time.](image)

Very recently a multicentre randomised study was published in the *Ann of Surg* (2014) reporting their results.

This study initially set out to look at all pancreatic resections. An interim review demonstrated a 12x increase in mortality in patients where drains were not used (which was not considered a primary outcome) and the study in proximal resections was terminated. The study continues to recruit patients with a distal resection and will publish these results in the future. However this study clearly demonstrated that there was a statistically significant increase in major complications in patients where no drains were used. The authors suggest that their methodology, the multicentre nature of their study and the experience of the centres recruiting the patients that these data should therefore support the view that drains should remain routine in proximal pancreatic resections.

The group from Verona lead by Bassi have published widely on the issue of when to remove the drains. Their arguments are premised on the view that drain output can predict which patient will develop a POF (drain amylase on post-operative day 1 > 5000u/l). They concur with the view that drains left in for too long result in complications. As mentioned operative factors suggesting a higher risk for POF, need further evidence and their NPV are not adequate to omit the placement of drains in some patients considered to be low risk. Bassi has described that the value of the drain fluid amylase concentration on POD 1 has been significant (<5000 u/l).
On day three the absence of a fluid collection on ultrasound can safely predict which patients will not develop a POF. They have however, recently published their study looking at the value of the sonographic imaging on day three. They concluded that the presence of a fluid collection on sonar was highly specific but poorly sensitive and therefore the amylase value in the drain was all that was required to determine if a drain could be removed on or before POD 3. They therefore conclude that if drains are placed they should be removed before POD 5 to decrease morbidity and shorten hospital stay.

This author therefore makes the following recommendation in patients undergoing proximal pancreatic resections. I continue to use drains routinely. What is not clear is the value of one or two drains. I continue to place my right drain into the subhepatic space which has the intention of identifying leaks from the biliary anastomosis.

These are usually identified earlier and so, if there is no bile in the drain and the fluid volume is persistently low, I will remove this drain on day 3-5. I place a second drain on the left into the lesser sac in the region of the pancreaticogastostomy (my routine method of reconstruction). This drain fluid is analysed on POD 1. If less than 5000u/l I do a sonar on day three and if there is no collection I remove the drain. However if the volume of the drain remains over 150-200mls/ day I am hesitant to remove the drain. It is not uncommon to have chyle leaking from these drains and once a drain has been inserted I am concerned that the chyle collection may become infected.

If I miss this window phase and the drain remains in-situ then I leave it in until the volume is less than 20mls for two consecutive days before removing it.

What I am not clear about is the type of drain I use. I have fluctuated between closed suction drains, and open pensil drains. I remain concerned that the closed suction drains have two problems. Firstly, the nursing staffs are not always consistent with re-arming the suction, and I am concerned that the drain without suction is not effective.
Secondly, I am concerned that the suction, even with a soft tip of the drain, can result in erosion into the bowel or through anastomosis. Currently I am using pensil drains in my PDs and most commonly two drains.

If I demonstrate a patient with at least two high risk factors for the development of a POF, particularly a soft pancreas and a non-dilated duct, I do give somatostin analogues on the table and follow this up for three days post-operatively. However I remain unconvinced that this does change the fate of the pancreatic reconstruction. In the rare case when a total pancreatectomy is performed I use a single drain to the subhepatic space on the right.

In distal resections I routinely use drains. I believe the leak rate to be higher in distal resections and the risk of erosion, in particular resulting in haemorrhage, to be less and so routinely use drains in these patients.

**RECOMMENDED READING**