SURGICAL TREATMENT
AND TECHNICAL IMPROVEMENTS

PANCREATOGASTROSTOMY AFTER PANCREATODUODENECTOMY

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Pancreatoduodenectomy has almost a hundred years of history. After resection, the pancreatic stump requires an anastomosis with the digestive tract. There is ongoing discussion about the optimal standard of digestive tract reconstruction. Two major groups of pancreatic anastomosis are used: pancreatogastrostomy and pancreatojejunostomy, but after some randomized and several other documented series there is no agreement on the superiority one over another method.

The important feature related to pancreatic anastomosis’ complication rate is the number of procedures performed each year in a facility.

This manuscript summarizes the experience of the Gdansk Surgical Department with pancreatogastrostomy.

Key words: pancreatoduodenectomy, pancreatogastrostomy, technique

Pancreatoduodenectomy was first performed by Kauch in 1909, and popularized by Whipple in 1935. The pancreas was thought to be an inaccessible organ for a surgeon in the beginning of 20th century, because of its location and proximity to large blood vessels.

Pancreatic resection availability resulted in the development of pancreatic stump management techniques. Pancreatoduodenectomy is the procedure performed in patients with chronic pancreatitis and malignancies of pancreatico-biliary region. After resection, the pancreatic isthmus stump appears. There are several methods of pancreatic stump anastomosis with the digestive tract, where two major types are pancreatogastrostomy and pancreato-jejunostomy.

PANCREATOGASTROSTOMY
TECHNIQUE

The study presents the surgical technique of pancreatogastrostomy used in the Department of General Endocrine and Transplant Surgery Medical University in Gdańsk. The steps used in this technique are based on the objectives of Heidelberg University group (1). The technique uses the stomach instead of the small intestine as a pancreatic stump partner.

Pancreatic transection followed by pancreatoduodenectomy is typically performed with a surgical blade. The pancreatic duct is identified within the transection plane and a metal probe is inserted. Bleeding interstitial vessels are managed with selective hemostatic monofilament absorbable 5-0 stitches without clamping. Two 4-0 silk leading stitches are placed on the upper and lower pancreatic stump margin, about 1 cm from the cut-line. The pancreatic stump (4-5 cm) is gently liberated from the retroperitoneal space. The pancreatogastrostomy is the first step in the reconstructive part of the procedure.

The position of anastomosis is indicated on the posterior stomach wall. The anastomosis is performed with 4-0 monofilament absorbable sutures. Needles are removed after all one
layer of stitches have been positioned. First, two to four stitches are introduced from the pancreatic duct lumen through the anterior pancreatic capsula 2 mm from cut-line. Then, single stitches are situated through the stomach seromuscular layer and pancreatic capsula 1–1.5 cm from the cut-line, parallel to the pancreatic stump axis (fig. 1). Stitch-to-stitch distance is 4-5 mm. The layer is knotted after all stitches have been placed. This sequence guarantees optimum visual control of anastomosis until the last stitch is placed. The second anastomosis layer gathers together the anterior margin of the pancreatic stump and the stomach mucosa (fig. 2). As with the first anastomosis, knotting is performed after all stitches have been positioned. Close to the pancreatic duct, stitches are situated as in the first step, and two posterior layers are performed using the same steps. The direction and sequence of how the stitches are positioned should allow knotting outside the anastomosis lumen (fig. 3 and 4). Stomach resection facilitates pancreatogastrostomy control. Two suction drains are routinely left close to pancreatogastrostomy.

One-hundred-and-sixty patients were operated on using the described technique. Postoperative pancreatic fistula, general complications and mortality rate are usually considered in pancreatic surgery. Postoperative pancreatic fistula is defined as a three-fold incre-

Fig. 1. First layer of pancreatogastrostomy. Surgical stitches are placed through stomach serosa and anterior pancreatic capsula. Stitches situated on Wirsung duct edge are visible

Fig. 2. Second layer stitches situated through the pancreatic stump edge and stomach mucosa. Several stitches are placed from the lumen of Wirsung duct

Fig. 3. Third layer of pancreato-gastro anastomosis. Stitches are situated through posterior edge of pancreatic stump and posterior wall of Wirsung duct

Fig. 4. Posterior stitches layer placed through posterior pancreatic capsula and stomach serosa
ase of amylase concentration and 30 ml or more of drainage from the site at the third postoperative day or later. Postoperative complication is defined as any clinical situation requiring a new or different treatment within 30 postoperative days.

Complications observed in the presented group of patients were wound infection, n=28 (17.50%); respiratory tract infections, n=11 (6.88%); upper GI bleeding, n=7 (4.38%); pancreatic fistula, n=7 (4.38%); urinary infection, n=3 (1.88%); intra-abdominal abscess, n=3 (1.88%); intra-abdominal bleeding, n=3 (1.88%); metabolic abnormalities, n=3 (1.88%); biliary fistula, n=2 (1.25%); pancreatic necrosis, n=2 (1.25%); pulmonary artery embolization, n=2 (1.25%); renal insufficiency, n=1 (0.63%); and intestinal anastomosis dehiscency, n=1 (0.63%). Complications occurred in a total of 59 patients (35%); 47 patients had a single complication and 12 patients had two or more.

Thirty days’ postoperative mortality was 3.75% (n=7). The causes of death were pancreatic fistula (n=1), biliary fistula (n=1), intra-abdominal hemorrhage (n=2), sepsis (n=1), and heart infarct (n=2).

DISCUSSION

Pancreateoenteral anastomosis is still an Achilles heel of pancreatoduodenectomy (2-5). In light of this, it seems reasonable to establish the optimal standard of this part of the procedure. Each author who evaluates the results of a pancreatoduodenectomy describes the details of the operative technique of pancreateoenteral anastomosis. Several authors prefer two layers of anastomosis. Digestive tract mucosa stitched to the pancreatic duct is usually called “duct-to-mucosa” technique (6, 7). Several surgeons join the full thickness of the pancreatic stump to the digestive tract (1, 8). Others prefer selective circumferential anastomosis of the pancreatic duct with the digestive tract mucosa. The rest of pancreatic isthmus transection is left in submucosal space (7, 9). Although many surgeons prefer single stitches, some use a continuous one (1, 5, 7).

Use of mattress stitches placed perpendicular to the pancreatic remnant axis is also rarely described (7, 10). The preferable material for pancreateoenteral anastomosis is monofilament non- or absorbable thread (1, 7, 11); silk is rarely used (4). Some centers use 2-0 and 3-0 sutures because thin thread has the potential to damage tissue. Centers with a large volume of patients usually use 4-0 thread (1). Many centers, including ours, use the technique based on Z’Graggen et al.’s method (1). Pancreatic anastomosis is based on full thickness invagination into the digestive tract. Internal stitches layered in this method partially join the pancreatic duct wall and the enteral mucosa.

The stomach and jejunum are two major targets for pancreatic stump anastomosis, where the discussion of the superiority of one over another is ongoing. Numerous bibliographies that compare pancreatojejunostomy (PJ) to pancreatogastrostomy (PG) seem to favor the former method (12, 13). However, large series’ cohort studies showed no statistically significant difference between PJ and PG (3). On the other hand, small departments favor PG as a better method of pancreatic stump management (8, 14, 15).

The effectiveness of pancreateoenteral anastomosis is estimated by the frequency of pancreatic stump-related complications, especially fistula (2, 3, 5, 8). There are more than 20 definitions of postoperative pancreatic fistula (PPF) in the literature. Therefore, study comparisons might be difficult (10). Large series use the volume and postoperative day as crucial points in PPF definition, usually 10 to 50 ml of amylase rich fluid at the 5th to 11th postoperative day (10). More rigorous criteria produce a higher rate of PPF (from 9.9% up to 69%) (10), while another objective of PPF is fistulous tract visualization (5, 15).

In analyzing large numbers of pancreatoduodenectomies, it was found that reference centers with “high volume” have a significantly lower rate of PPF and mortality (16, 17). In summary, healing the pancreateoenteral anastomosis depends on the words “Lost in Translation” of surgical technique description. The surgical skill, atraumatic technique, and experience seem to be detrimental.

CONCLUSION

Pancreatogastrostomy may be a reasonable option in pancreatic surgery.
REFERENCES