MIDDLE PANCREATECTOMY – OWN EXPERIENCE*

BEATA JABŁOŃSKA, DYMITR ŻAWORONKOW, DARIA DRANKA-BOJAROWSKA, PAWEŁ MUSIAŁSKI, PAWEŁ LAMPE
Department of Gastrointestinal Surgery, Silesian Medical University in Katowice
Kierownik: prof. dr hab. P. Lampe

The aim of the study was to analyse early results after middle pancreatectomy based on our experience.

Material and methods. During the period between 2008 and 2009, 154 pancreatic resections were performed at the Department of Gastrointestinal Surgery, Silesian Medical University in Katowice. The following procedures were performed: 109 (70.78%) pancreatoduodenectomies, 32 (20.78%) distal pancreatectomies, 9 (5.84%) middle pancreatectomies, 3 (1.94%) total pancreatic resections, and 1 (0.65%) subtotal pancreatic resection. Early results in case of nine middle pancreatectomies were subject to analysis.

Results. Average hospitalization period amounted to 24.28 days (ranging between 8 and 57 days). Mean hospitalization period after surgery amounted to 20.71 days (ranging between 6 and 54 days). Average duration of the surgical procedure amounted to 3.6 hours (ranging between 2.25 and 4 hours). Wirsung’s duct required drainage in 4 (44.4%) patients. Pancreateoenterostomy was performed in 5 (55.5%) patients. Early postoperative complications were observed in three (33.3%) patients. The most common complications included wound suppuration and intra-abdominal abscess development observed in two (22.2%) patients. Pancreatic fistula development during the postoperative period was observed in case of one (11.1%) patient. Other early postoperative complications included peritoneal cavity hemorrhage (1-11.1%) and pancreatic necrosis (1-11.1%). Two (2.22%) reoperations were required. Early postoperative mortality amounted to 0%.

Conclusions. Middle pancreatectomy operations performed in experienced centers are considered as safe procedures with a low rate of complications. The most common indication for middle pancreatectomy is the diagnosis of a benign pancreatic tumor.

Key words: middle pancreatectomy, middle segment pancreatectomy, central pancreatectomy, median pancreatectomy

The most common standard pancreatic resections, such as pancreatoduodenectomy and distal pancreatectomy are burdened with the risk of postoperative exocrine and endocrine pancreatic insufficiency, as well as complications connected with splenectomy (in case of distal resection). The presence of the above-mentioned complications is connected with the depletion of the healthy pancreatic parenchyma during these procedures. Therefore, minimally invasive procedures play an increasing role in surgery, sparing the normal pancreatic parenchyma. In case of benign or borderline malignancy tumors middle pancreatectomies are performed more and more often (1-17).

* This work was supported by the European Community from the European Social Fund within the RFSD 2 project.
Middle pancreatectomy (central pancreatectomy, median pancreatectomy; middle segment pancreatectomy) consists in the excision of the middle segment of the pancreas. The above-mentioned procedure is performed in case of benign or border-line malignancy tumors located within the isthmus and body of the pancreas, where enucleation is not possible, due to the depth or large size of the lesion (>2 cm) (2, 4).

Middle pancreatectomy was first described by Guillemin et al. (1957), who performed the procedure, in case of a patient with chronic pancreatitis (18). Dagradi et Serio performed the first middle pancreatectomy in 1982, in case of a patient diagnosed with an insulinoma. The above-mentioned method was described and widespread for the very first time in 1984 by Dagradi et Serio, and Serio et Iacono (19). Thus, the nomenclature of the method: surgery by means of the Dagradi-Serio and Dagradi-Serio-Iacono methods (20).

In literature data there are many reports concerning middle pancreatectomy. In Poland, the method is still not very widespread and rarely used. Therefore, we decided to present our experience concerning the matter.

The aim of the study was to analyse early results after middle pancreatectomy, based on the material and experience obtained from the Department of Gastrointestinal Surgery, Silesian Medical University in Katowice.

MATERIAL AND METHODS

During the period between 2008 and 2009, 154 pancreatic resections were performed at the Department of Gastrointestinal Surgery, Silesian Medical University in Katowice. The following procedures were performed: 109 (70.78%) pancreatectoduodenectomies, 32 (20.78%) distal pancreatectomies, 9 (5.84%) middle pancreatectomies, 3 (1.94%) total pancreatic resections, and 1 (0.65%) subtotal pancreatic resection. Early results in case of nine middle pancreatectomies were subject to analysis. The study group comprised 3 (33.3%) male and 6 (66.6%) female patients. Average patient age amounted to 47.55±13.94 years (ranging between 26 and 68 years). Patients were qualified for surgery on the basis of laboratory parameters (complete blood count, CRP, and coagulation parameters), and imaging examinations (ultrasonography, CT, and MR of the abdominal cavity). Most of the patients were assigned to the II degree risk of general anesthesia, according to the ASA classification (American Society of Anesthesiologists) – 5 (55.6%) (ASA I – in 3 (33.3%) patients, while ASA III – in 1 (11.1%) patient). The decision concerning the qualification of the patient for surgery and extent of the operation was based on preoperative imaging examinations (most often abdominal CT), and the intraoperative image. In most cases (except one) the decision concerning the need to perform surgery was based on the presence of a tumor of the body of the pancreas (tab. 1 presented the diagnosis).

Operative technique

The peritoneal cavity was opened by means of the median incision. The omental sac was opened after the incision of the gastrocolic ligament. The body of the pancreas was prepared sparing the splenic and mesenteric vessels. Afterwards the prepared middle segment of the pancreas was incised by means of electrocoagulation. After the excision, the head of the pancreas was supplied by an interrupted or continuous suture. In case of two patients the Ni-Ti compression anastomosis clip was used to close the proximal stump of the pancreas. The tail of the pancreas was Anastomosed to the Roux-Y jejunal loop. In case of one patient the Ni-Ti compression clip was used to close the distal stump of the pancreas.

The compression anastomosis clip (Ni-Ti clip) is a device in the shape of a biganglionic elliptical ring made of a nickel-titanic alloy. The compression clip may be used in case of digestive tract surgery, due to its minimally invasive character, reliability of the method, relatively low cost of the implants, and small number of anastomosis complications. The clip is most often used in case of digestive tract anastomoses (entero-enterostomy and gastro-enterostomy). In order to supply the stump of the pancreas the following method was used. In temperatures below \( M_f \) (nearly 0°C) the ganglions of the elliptical ring are opened to an angle of 30-40°, and each ganglion is introduced through the incision into each anastomosed intestinal loop. When the elliptical rings are warmed by the heat of the human body two ganglions constrict and exert pressure on the anastomosed intestinal walls. Continuous
pressure exerted on the intestinal walls by the compression clip leads towards tissue necrosis during a period of 5 to 10 days. Afterwards, the clip is detached from the tissues and excreted in the feces. The new scar tissue is created during the period of necrosis development. Thus, complete intestinal anastomosis is obtained. The advantage of the compression clip is the shorter period needed to maintain the suture.

When the stump of the pancreas is supplied, the compression clip is sutured to the peritoneal drain, in order to remove the above-mentioned during drain removal. Due to the ineffective removal of the clip by means of the above-mentioned method (with the drain through the integuments) one patient was subject to minilaparotomy, during which the clip was removed (tab. 1).

After jejunal loop preparation and section its distal segment was transferred retrocolonically (through the hole in the transverse colon mesentery) to the upper abdomen. Afterwards, a section of the pancreas was anastomosed to the jejunal loop by means of end-to-end or end-to-side methods using two layers of interrupted sutures-5-0. At a distance of about 40 cm from the pancreatoenterostomy an enterenterostomy (side-to-side) was performed, in order to restore the continuity of the gastrointestinal tract. In case of 4 (44.4%) patients Wirsung’s duct was sutured by means of a thin bronchial catheter, which was conducted through the pancreatoenterostomy and jejunal loop by means of Witzel’s method. One (11.1%) patient was subject to two pancreatoenterostomies, where the proximal and distal pancreatic stumps were anastomosed to the Roux-Y jejunal loop. After hemostasis and introduction of the peritoneal cavity drain the abdominal integuments were closed.

The removed sample was subject to histopathological examination at the Chair and Department of Pathomorphology, Silesian Medical University in Katowice.
The following were subject to analysis: hospitalization period (total and after the surgical procedure), duration of the procedure, volume of blood loss during surgery, cause of pancreatic resection (histopathological type and size of the tumor, or other pathology), as well as early complications, reoperations, and postoperative period mortality.

RESULTS

Mean hospitalization period amounted to 24.28±17.6 days (ranging between 8-57 days). Mean hospitalization period after the surgical procedure amounted to 20.71±17.6 days (ranging between 6-54 days). Mean duration of the surgical procedure amounted to 3.6±1.38 hours (ranging between 2.25-4 hours). Wirsung’s duct was drained in 4 (44.4%) patients. Pancreateoenterostomy was performed in 5 (55.5%) patients. Average blood loss during surgery amounted to 216.67±116.9 (100-400 ml). Early postoperative complications were observed in 3 (33.3%) patients. The following complications were observed: wound suppuration and intraabdominal abscess – 2 (22.2%) patients, pancreatic fistula – 1 (11.1%), peritoneal cavity hemorrhage – 1 (11.1%) and pancreatic necrosis – 1 (11.1%). The bacteriological examination in case of wound suppuration showed the presence of Klebsiella pneumoniae.

Three (33.3%) reoperations were performed including two (22.2%) relaparotomies, and one (11.1%) mini-laparotomy; 1 relaparotomy was performed, due to peritoneal cavity bleeding from the splenic and retroperitoneal vessels (relaparotomy, removal of blood, and peritoneal cavity setonage); 1 relaparotomy and 1 mini-laparotomy- in order to remove the compression clip from the distal stump of the pancreas. Early postoperative mortality amounted to 0% (tab. 1).

Tumors of the body of the pancreas were the most common indications for surgical intervention – 5 (55.6%). Less frequent indications were as follows: tumors of the head and body of the pancreas – 1 (11.1%), pancreatic cyst- 1 (11.1%), chronic pancreatitis (with inflammatory tumor) – 1 (11.1%), and cistern after distal pancreatectomy – 1 (11.1). The average size of the tumor amounted to 3.6±1.39 (2.5-6) cm. The histopathological result was as follows: Microcystadenoma serosum – 1 (11.1%), Adenoma multici-

DISCUSSION

The most commonly performed resections of the pancreas include proximal (pancreatoduodenectomy) and distal (peripheral) pancreas resections (16). Considering the study material the above-mentioned procedures were the most commonly performed operations – 141 (91.5%). In our center pancreatoduodenectomy was performed more often during the two-year study period – 109 (70.78%).

Although, classical pancreatic resection procedures performed in experienced centers are connected with a low mortality rate (0.5-3%), they often lead to exocrine and endocrine pancreatic insufficiency, due to the depletion of a significant amount of healthy parenchyma (16, 21, 22). Furthermore, the excision of the duodenum during pancreatoduodenectomy (PD) impairs proper intestinal passage, as well as hormonal regulation, and digestion and absorption of the upper gastrointestinal tract. Distal choledochectomy with reconstruction of biliary confluence to the digestive tract by means of biliary-intestinal anastomosis during pancreatoduodenectomy is connected with the increased risk of ascending cholangitis and liver abscesses development. Literature data presented a 30% occurrence of intestinal membrane ulcerations in patients without PPI (proton pump inhibitors) treatment after the above-mentioned pancreatic resections (16, 23).

In case of patients with tumors located in the body of the pancreas many surgeons prefer distal pancreatectomy, as compared to pancreatoduodenectomy, due to fewer complications. However, splenectomy is often required in case of these procedures, burdened with the risk of sepsis, impaired immunity and portal vein thrombosis (16, 24, 25).

Due to the extent and potential complications after classical resections in case of benign and border-line malignancy tumors middle pancreatectomy operations are performed more and more often, in order to save healthy pancreatic parenchyma, and reduce the risk of postoperative complications. According to
Iacono et al. middle pancreatectomy is performed in case of the following: tumors 2-5cm in diameter which cannot be subject to local enucleation (due to risk of Wirsung duct damage), small tumors located deeply in the pancreatic parenchyma, benign and borderline tumors (neuroendocrine, serous and mucinous cystadenomas, non-invasive intraductal mucinous producing tumors, solid pseudopapillary tumors), non-neoplastic cysts (lymphoepithelial, dermoid and hydatid cysts) impossible to enucleate, isolated metastatic lesions (renal carcinoma), and chronic pancreatitis with segmental stenosis of Wirsung's duct. Due to the limited oncological radicality (without lymphadenectomy) middle pancreatectomy is not indicated in case of patients with histopathological diagnosis of malignant carcinoma, including pancreatic adenocarcinoma (16, 20).

Crippa et al. described middle pancreatectomy results in patients with IPMNs (intraductal papillary mucinous neoplasms). Five of seven patients were diagnosed with positive resection margins during the histopathological examination. In case of two patients recurrence was observed 67 and 9 months after the surgical procedure. The first patient was subject to pancreatectoduodenectomy by means of Whipple's method, while the second patient underwent palliative surgery and died ten months, thereafter (4). Thus, patients diagnosed with malignant tumors should be subject to more radical operations, such as pancreatectoduodenectomy or distal pancreatectomy, depending on the location of the tumor. Middle pancreatectomies were performed in case of benign lesions (16, 20). In case of doubts concerning the nature of the tumor or oncological radicality (uneven contours, suspicion of infiltration, doubtful resection margins), intraoperative histopathological examinations were performed. In case of malignancy the operation was extended by proximal or distal pancreatic resection. These cases were not described in our study, due to the different classification of pancreatic resections (distal, subtotal, total resections), which was not the issue of this publication. In case of the known character of the tumor (based on preoperative fine-needle biopsy) and clear demarcation from the healthy pancreatic parenchyma, the intraoperative histopathological examination was not performed.

Middle pancreatectomy procedures are connected with a higher incidence of pancreatic fistula during the postoperative period, as compared to classical resections. This is connected with the presence of the so-called „soft pancreas”, narrow pancreatic duct, and need to supply two stumps of the pancreas by means of anastomosis or section closure (11, 16, 26).

The undeniable advantages of middle pancreatectomy include the preservation of the healthy pancreatic parenchyma, and reduction of the postoperative risk of exocrine and endocrine pancreatic failure, as well as better quality of life. This seems important since the occurrence of diabetes mellitus after pancreatectoduodenectomy ranges between 15-40%, while in case of distal pancreatectomy-72%.

Exocrine failure after pancreatectoduodenectomy and distal pancreatectomy was observed in 22-55% of cases. Pancreatic insufficiency after middle pancreatectomy occurs significantly less often, in comparison to pancreatectoduodenectomy and distal pancreatectomy (16).

Many studies have been published, aimed at determining the relationship between the volume of the removed pancreatic parenchyma and secondary endocrine failure of the organ. Jones demonstrated, after examining 300 patients with pancreatic injuries that the excision of 80% or 12 cm of the pancreatic parenchyma lead towards pancreatic failure (27).

Yasugi et al. showed that diabetes mellitus did not develop in case of patients subject to <70% of pancreatic parenchyma excision (28).

Early postoperative complications were observed in case of 3 (33.3%) patients. Infectious complications were most often observed: intra-abdominal abscess (22.2%) and wound suppuration (22.2%). Pancreatic fistulas were observed in 11.1% of patients. Pancreatic fistula presence was diagnosed when the amylase level in the peritoneal cavity was three-fold higher than the normal blood level on the third postoperative day (according to the definition of the International Study Group on Pancreatic Fistula (29). In our material the above-mentioned postoperative complication was not the most frequent. Relaparotomy was performed in 22.2% of patients. In case of one patient the compression clip was removed during minilaparotomy. Mortality during the postoperative period amounted to 0%. The obtained results correspond to literature data concerning middle pancreatectomy. Sperti et al. performed a meta-analysis of middle pancreatectomy results on the basis of literature.
data between 2001 and 2009. Considering the 529 patients the average incidence of postoperative complications was 48% (ranging between 0-92%). Pancreatic fistula was the most common postoperative complication diagnosed in 31.6% (0-63%) of patients. Reoperations were performed in 4.2% (0-25%) of patients. Perioperative mortality amounted to 0.7% (0-4%). Mean hospitalization period was 11 days (ranging between 5-30 days) (2).

In literature data one may find publications concerning laparoscopic middle pancreatectomy. The published results refer to a small material and require investigations on a larger group of patients. However, the past results are satisfactory and comparable with classical surgery. A shorter hospitalization period is observed in case of middle pancreatectomy, and comparable occurrence of complications (33-44%), including pancreatic fistulas (22-33%) (2, 30, 31).

The operative technique used in case of middle pancreatectomy is worth discussing. Considering our patients the proximal stump was closed most often, while the distal stump was anastomosed to the Roux-Y jejunal loop (55.5%). In case of one patient with the Roux-Y loop, both the proximal and distal pancreatic stumps were anastomosed. Considering 33.3% of patients pancreatoenterostomies were not performed. Literature data mentions most often the use of one pancreatoenterostomy in case of distal pancreatic stumps. Some authors prefer to perform panreatogastrostomy, pancreatoenterostomy by means of Beger’s method, and or do not perform anastomoses supplying the pancreatic stump by means of sutures. All the above-mentioned techniques enable to obtain satisfactory treatment results (2, 32, 33).

In conclusion, considering patients diagnosed with benign and border-line malignancy tumors one should bear in mind the possibility of middle pancreatectomy, as a healthy pancreatic parenchyma sparing procedure, as compared to classical resections.

CONCLUSIONS

1. Middle pancreatectomies performed in experienced centers are considered as safe procedures burdened with a low risk of complications.
2. Benign tumors of the body of the pancreas are the most common indication for middle pancreatectomy.

REFERENCES


