Complications of Whipple procedure in a pediatric patient with pseudopapillary tumor of the pancreas

María C. Martínez Riccetti^a , María L. Bergamini^a, Estefanía Astori^b, Miriam Marchisella^b, Susana Noriega^b

ABSTRACT

Pancreatic neoplasms are rare in pediatrics; the pseudopapillary tumor (PPT) of the pancreas is the most common. PPTs of the pancreas are usually located in the head of the pancreas. A pancreaticoduodenectomy or Whipple procedure is the technique of choice for the treatment of benign or malignant pancreatic tumors. Although mortality for this cause has decreased in recent years, due to the greater experience of surgeons and improved pre- and postoperative care, morbidity has remained high secondary to associated complications. These include delayed gastric emptying, intra-abdominal collections, pancreatic fistula, surgical site restenosis, and post-pancreatectomy hemorrhage. Here we describe the clinical case of a 13-year-old girl diagnosed with PPT of the pancreas who underwent an effective surgery in terms of cancer treatment, but who required a prolonged hospitalization secondary to surgical complications.

Keywords: pancreatic neoplasms; surgeries; pancreaticoduodenectomy; pancreatic fistula; gastric emptying.

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^a Pediatric Cardiovascular Care Unit, Department of Pediatric Cardiovascular; ^b Department of Pediatric Surgery; Hospital Nacional Profesor Alejandro Posadas, El Palomar, Argentina.

Correspondence to María C. Martínez Riccetti: mcmriccetti@gmail.com

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INTRODUCTION

The PPT of the pancreas is an infrequent disease in pediatrics, accounting for 1-2% of exocrine pancreatic neoplasms.^{1,2} It is a tumor of low malignant potential, although it may cause local invasion and metastasis. It predominates in females.¹ Its growth is gradual and slow. These tumors are usually large masses at the time of diagnosis and their clinical characteristics include abdominal pain, vomiting, and palpable mass.^{1–4} Diagnosis is made with abdominal ultrasound and computed tomography (CT) of the abdomen with contrast and pathological examination.³ The treatment is surgical and it rarely requires adjuvant therapy.⁵ Although mortality is low, morbidity associated with postsurgical complications extends the length of hospital stay. Here we describe the clinical case of a 13-year-old girl diagnosed with PPT of the pancreas with surgical resolution and its complications.

CASE REPORT

A 13-year-old female patient diagnosed with a tumor in the pancreatic head was admitted to the hospital referred by a gastroenterologist. She reported clinical symptoms for the past 2 months, characterized by abdominal pain in the right upper quadrant and epigastric region, sporadic vomiting, and asthenia. Her family and personal history was normal. On physical examination, her weight was 70 kg, her height was 1.55 m, her body mass index was 29, and she had soft, depressible, non-tender abdomen without masses.

The abdominal ultrasound showed a rounded image of dense cystic appearance that measured $72 \times 61 \times 63$ mm in the area adjacent to the lower pole of the right kidney. The CT with intravenous contrast (*Figure 1*) showed a heterogeneous hypodense image in the head of the pancreas, which measured 63×64.5 mm, without dilatation of the pancreatic duct and absence of lymph node enlargement. The analysis of tumor markers (beta-hCG and alpha-fetoprotein) was negative.

A multidisciplinary grand round was held, during which it was decided to perform a surgery; a modified Whipple procedure was done: right subcostal laparotomy, cholecystectomy, mobilization of the colon and duodenal exposure; a tumor was observed in the head of the pancreas that measured 7.5 × 6 × 6 cm in diameter. Pyloruspreserving cephalic pancreaticoduodenectomy. Biliary-pancreatic and digestive reconstruction by means of end-to-side pancreaticojejunal anastomosis, choledochojejunal anastomosis, and duodenojejunal anastomosis (Figure 2). Two drains, a transanastomotic feeding tube, and a nasogastric tube (NGT) were placed. Tumor and lymph node specimens were sent for pathological examination, which reported pseudopapillary tumor of the pancreas, margins with no infiltration, and tumor-free lymph nodes (Figure 3).

FIGURE 1. Tumor (T) observed in computed tomography of the abdomen, axial section



FIGURE 2. Pylorus-preserving Whipple procedure: a-choledochojejunal anastomosis, b-duodenojejunal anastomosis, c-remnant pancreas anastomosis to distal jejunal loop, d-Mikulicz pyloroplasty



Source: Developed by the authors.

The patient stayed in the pediatric intensive care unit for 11 days and developed a complication of febrile syndrome with diagnosis of grade A pancreatic fistula and right basal pneumonia. She was started on parenteral nutrition (PN) and enteral feeding by transanastomotic tube on day 2 and day 11, respectively.

She showed a progressive increase of bile output via the NGT, reaching 3000 mL/ day. Intestinal obstruction was suspected,

FIGURE 3. Revision surgery: a-jejunal stenosis due to extrinsic fibrosis, b-distal enteroanastomosis



Source: Developed by the authors.

so a gastrointestinal series with contrast was performed and delayed gastric emptying was diagnosed. She persisted with difficulties in enteral feeding, so an esophagogastroduodenoscopy was scheduled; the pancreatic duct and duodenojejunal anastomosis were observed to be patent, but it was difficult to pass the endoscope beyond the duodenojejunal anastomosis. It was decided to perform a surgical re-exploration; extrinsic compression secondary to fibrosis was observed 20 cm distal to the duodenojejunal anastomosis. Due to the difficult release of the affected loop with risk for lesion, it was decided to perform an entero-enteroanastomosis by bypassing the obstructive area (*Figure 3*).

The patient had a torpid course after the revision surgery. She developed the following complications: 1) delayed gastric emptying, for which she received prokinetics; 2) grade B pancreatic fistula, fasting for 5 days, and vacuum-assisted wound closure; 3) *Klebsiella pneumoniae* infection at the site of surgery, which required drainage and antibiotic therapy for 14 days; and 4) suprapubic abdominal collection.

Progressive oral feeding was started with good tolerance. She had a favorable course with closure of the fistula and wound by secondary intention, without collections.

She was discharged from the hospital after 59 days of hospitalization, with prokinetics, gastric protection, and exclusive enteral feeding.

DISCUSSION

A PPT of the pancreas is the most frequent type of pancreatic tumor in pediatrics. They are benign, although 10–15% may be locally invasive and even result in metastasis.¹ The World Health Organization defines it as a tumor of low malignancy capable of metastasizing.6 Its origin is uncertain,¹ although it is believed to derive from neural crest cells.7 The most frequent location in children is in the head of the pancreas, whereas in adults, it is in the body and tail of the pancreas.⁶ Complete surgical resection is curative in more than 95% of patients.^{1–3} The surgical technique depends on tumor location: the Whipple procedure is used for tumors located in the head of the pancreas and distal pancreatectomy for those in the body and tail of the pancreas.¹⁻⁵ Adjuvant therapy is reserved for cases with locally disseminated or unresectable tumors.

The Whipple procedure or pancreaticoduodenectomy has been the typical

treatment for pancreaticoduodenal cancer. It consists of performing a distal gastrectomy, surgically removing the head of the pancreas, duodenum, and the first 15 cm of the jejunum. Due to its high morbidity and mortality, it has undergone modifications, such as antral and pyloric preservation, which reduces surgical time, bile reflux, and accelerated gastric emptying (modified Whipple procedure).⁸

Surgical mortality is less than 5%, but is associated with high morbidity, between 30% and 50%,⁵⁻⁹ and is related to age, malnutrition, and obesity. Its main complications are delayed gastric emptying, pancreatic fistula, surgical site restenosis, and postoperative hemorrhage.⁵ Biliary fistula, bile duct stenosis, pancreatitis, and thrombosis have also been reported. The most relevant complications are described below.

Delayed gastric emptying (DGE).⁹ It is a frequent complication that extends the length of stay and hospital costs. Its incidence varies between 5% and 75%. Its origin is multifactorial. It is defined by the need for NGT for more than 3 days or NGT insertion as of 4 days after surgery, as well as intolerance to oral feeding at the end of the first week after surgery. It is classified into 3 grades depending on clinical consequences (*Table 1*). The recommended treatment is NGT or PN associated with proton pump inhibitors.

Pancreatic fistula.9 Dehiscence in the pancreatic anastomosis causes the outflow of pancreatic fluid with activated enzymes into the abdominal cavity, which causes secondary complications, such as intra-abdominal collections and sepsis. Its definition is established by the volume of fluid collected from the intra-abdominal drainage on the third day after surgery with an amylase content 3 times higher than the serum amylase level. Pancreatic fistulas are classified according to their severity into grade A, without clinical consequences; grade B, associated with changes in clinical management (requiring PN or drainage) without hemodynamic consequences; or grade C, deterioration of the general condition with hemodynamic consequences and potentially life-threatening. The associated risk factors are obesity, malnutrition, advanced age, diabetes, prolonged surgery, intraoperative transfusion, pancreatic duct of less than 3 mm and soft texture.¹⁰ Treatment depends on the grade: A, no clinical management; B, persistence or placement of drainages and PN; C, repair.

Surgical site restenosis. It is associated with the surgical technique and the surgeon's

DGE	Grade A	Grade B	Grade C
Clinical condition	Good	Good/regular	Poor
Comorbidities	No	Possible (fistula, dehiscence, intra-abdominal abscess)	Possible (fistula, dehiscence dehiscence, intra-abdominal abscess)
Specific treatment	Possible (prokinetics)	Yes (prokinetics, NGT reinsertion)	Yes (prokinetics, NGT)
Artificial feeding (enteral or parenteral)	Possible	Yes	Yes
Diagnostic procedure	No	Possible (endoscopy, transit, CT)	Yes (endoscopy, transit, CT)
Interventional treatment	No	No	Possible (abscess drainage, relaparotomy)
Extended length of stay	Possible	Yes	Yes
Delayed adjuvant treatment	No	No	Yes

TABLE 1. Delayed gastric emptying (DGE). Grade based on clinical complications

CT: computer tomography; NGT: nasogastric tube.

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experience. A revision surgery is often necessary.

Post-pancreatectomy hemorrhage (PPH).⁹ This is the most serious complication, with a frequency of 5% to 16% and a mortality between 14% and 24%. It is classified as follows:

Based on time: a) early, within the first 24 hours, secondary to perioperative coagulopathy or hemostasis failure; b) late, after the first 24 hours, associated with postoperative complications, especially pancreatic fistula that erodes peripancreatic vessels.

Based on location: intraluminal or extraluminal. Based on severity: mild, moderate, or severe.

Late PPH has the worst prognosis, with an incidence of 3% to 10% and a high mortality. It is diagnosed with a gastrointestinal endoscopy. In case of intraluminal bleeding, embolization is performed with possible stent placement. A CT angiography is reserved for extraluminal bleeding in stable patients. In case of hemodynamic instability or treatment failure, a surgical exploration is indicated.

The overall survival of patients with PPT of the pancreas is 98.8%.^{4.6.7} The main sites of metastasis are the liver, peritoneum, omentum, and regional lymph nodes.⁶ The characteristics of malignancy are capsular invasion, high expression of Ki-67 in immunohistochemical staining, lymphovascular invasion, high degree of nuclear atypia, high mitotic index, tumors larger than 5 cm, and large necrotic areas.¹³ Risk factors for recurrence include tumor larger than 5 cm, lymphovascular invasion, distant or regional metastasis, and positive margins. ■

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