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Pancreaticoduodenectomy for pediatric and adolescent pancreatic malignancy: A single-center retrospective analysis☆

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ABSTRACT

Purpose: While pancreaticoduodenectomy (PD) has been extensively studied in adults, there are few data pertaining specifically to pediatric patients. We retrospectively analyzed PD-associated morbidity and mortality in pediatric patients.

Methods: Our analytic cohort included all consecutive patients ≤18 years of age treated at our institution from 1993 to 2015 who underwent PD. Patient data (demographics, disease characteristics, surgical and adjuvant treatment, length of hospital stay, and postoperative course) were extracted from the medical records.

Results: We identified 12 children with a median age of 9 years (7 female, 5 male). Final diagnoses were pancreatoblastoma (n = 3), solid pseudopapillary tumor (n = 3), neuroblastoma (n = 2), rhabdomyosarcoma (n = 2), and neuroendocrine carcinoma (n = 2). Four patients underwent PD for resection of recurrent disease. 75% (9/12 patients) received neoadjuvant therapy. The median operative time was approximately 7 hours with a mean blood loss of 590 cm^3. The distal pancreas was invaginated into the posterior stomach (n = 3) or into the jejunum (n = 5) or was directly sewn to the jejunal mucosa (n = 4). There were no operative deaths. There were 4 patients (34%) with grade II complications, 1 with a grade IIIb complication (chest tube), and 1 with a grade IV complication (reexploration). The most common long-term morbidity was pancreas exocrine supplementation (n = 10; 83%). Five patients (42%) diagnosed with either solid pseudopapillary tumor or rhabdomyosarcoma are currently alive with a mean survival of 77.4 months.

Conclusion: Pancreaticoduodenectomy is a feasible management strategy for pediatric pancreatic malignancies and is associated with acceptable morbidity and overall survival. Long-term outcome is mostly dependent on histology of the tumor.

Level of evidence: Level IV; retrospective study with no comparison group.

Pancreatic and biliary pathologies are very rare among the pediatric population [1–3]. Even rarer is the small patient subset that requires a pancreaticoduodenectomy (PD) to treat the disease process. The majority of patients are diagnosed with malignancy of the head of the pancreas, either a primary tumor or a metastatic lesion. Other less common lesions include benign pancreatic lesions or distal biliary abnormalities. In either case, the only option for treatment in these patients is a PD.

The overall morbidity and mortality rates associated with PD in adults have been extensively studied [4–6]. Reported rates have decreased over the years with improved surgical techniques and have now seemingly stabilized at a rate of 30%–40% for morbidity and 1%–3% for mortality [7–9]. Common complications include pancreatic, gastric or jejunal fistula, anastomotic stricture, delayed gastric emptying, and loop syndromes. In the adult population, some investigators have developed algorithms to stratify complications and the risk of complications, according to patient and tumor characteristics [9–11]. The infrequent use of PD in pediatric patients hampers accurate prediction of short- and long-term morbidity in this population [12,13] and also precludes prediction of which patients are at increased risk for complications.

We analyzed our experience with PD in pediatric patients treated at our tertiary referral center to identify the morbidity and mortality associated with this procedure. We hypothesized that our pediatric patients have decreased morbidity and mortality compared to the adult population; such a finding would be consistent with previous speculations that reduced morbidity and mortality are attributable to the generally better health status of the patients, the consistency of pediatric pancreatic

Abbreviations: PD, pancreaticoduodenectomy; SPT, solid pseudopapillary tumor; PNET, pancreatic neuroendocrine tumor.

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Table 1
Demographics, tumor histology, surgical data, and complications for patients who underwent pancreaticoduodenectomy (N = 12).

Pt	Age (y)	Sex	Pre-op diagnosis	Prior surgery	Neoadj. RT or chemo	Status	Survival (months)	Additional procedures	Lymph node dissection	Length of procedure (hours)	Est. blood loss	Transfusion	Hospital days	ICU days	Post-op complications	Chronic medications	Chronic disability
1	2	F	Recurrent neuroblastoma	Yes	Yes	DOD	5	CVC, liver biopsy	Yes	3.06	750	Yes	10	10	None	Pancrealipase	None
2	1	M	Neuroblastoma	No	Yes	DOD	6	CVC, liver biopsy, colon resection, Mediport	Yes	6.59	800	Yes	7	6	None	Pancrealipase, loperamide	Diarrhea
3	9	M	Pancreatoblastoma	Yes	Yes	DOD	19	CVC	No	7.23	1200	Yes	6	3	None	Pancrealipase	None
4	11	F	Recurrent islet cell tumor	Yes	Yes	DOD	136	None	No	8.05	300	No	7	0	None	Pancrealipase	Delayed gastric emptying
5	7	M	Pancreatoblastoma	No	Yes	DOD	12	Liver biopsy, IORT, G-tube	Yes	10.07	700	No	6	2	None	None	None
6	10	F	Pancreatoblastoma	Yes	Yes	DOD	70	None	No	–	500	No	7	3	Ileus	Pancrealipase	None
7	10	M	Recurrent PNET	Yes	Yes	DOD	48	None	Yes	–	–	–	13	3	Bacteremia	None	None
8	6	M	RMS	No	Yes	Alive	22	Liver resection	Yes	5.59	550	Yes	14	4	*C difficile*	Pancrealipase	None
9	18	F	SPT	No	No	NED	50	None	No	5.53	675	No	28	25	Large pleural effusions, abdominal wall abscess, wound dehiscence, pancreatic leak	Pancrealipase	Diarrhea
10	2	F	Recurrent RMS	Yes	Yes	Alive	144	G-tube	No	7.02	200	No	5	3	None	Pancrealipase	None
11	15	F	SPT	Yes	No	NED	168	None	No	7.4	600	Yes	12	0	Bilateral pleural effusion, abdominal abscess	Pancrealipase, loperamide	Abdominal pain
12	13	F	SPT	No	No	NED	3	None	No	6	250	No	13	3	Delayed gastric emptying, pancreatitis	Pancrealipase, metoclopramide	Delayed gastric emptying

CVC = central venous catheter placement; DOD = died of disease; ICU = intensive care unit; IORT = intraoperative radiation therapy; NED = no evidence of disease; PNET = pancreatic neuroendocrine tumor; RMS = rhabdomyosarcoma; RT = radiation therapy; SPT = solid pseudopapillary tumor.