



## Promising Technique for Traumatic Pancreatic Injury Management

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### Abstract

**Introduction:** Pancreatic injuries in children are relatively uncommon. The precise location of the injury, the status of the main pancreatic duct, and the time between diagnosis and intervention are a potentially useful guide for management decisions. We report a successful endoscopic simple primary repair with the pancreatic preservation even with transected main pancreatic duct without duct stenting.

**Patients and Methods:** Between May 2017 and December 2019, 3 patients with pancreatic trauma and duct transection underwent endoscopic (laparoscopic and robotic) repair. Demographics, operative data, postoperative complications, and clinical outcomes were documented and analyzed.

**Results:** Three patients with pancreatic fractures, 2 patients with grade IV, and one patient grade III injury. The median age was 11 years, the median time of hospital admission after the trauma was 72 h. The median time of surgical intervention was 24 h. Average operative time was 160 min and the average hospital stay was 9 days with no recorded postoperative or follow up complications till now.

**Conclusion:** Primary simple pancreatic repair is a promising and plausible technique for the management of pancreatic trauma, especially with duct transection it maybe instead of all other modalities of pancreatic trauma treatment. We implore all pediatric surgery centers to espouse this technique.

**Keywords:** Pancreatic trauma; Endoscopic (Laparoscopic and Robotic) simple primary pancreatic repair; Postoperative somatostatin

### Introduction

Pediatric Pancreatic Injuries (PI) are uncommon compared to the other abdominal organ injuries [1]. Furthermore, the main pancreatic duct transection is fraught with high morbidity and mortality rate [2,3]. Conservative management or distal pancreatectomy with the internal drainage procedure of the remaining pancreas is currently the benchmark of management. Recent studies have advocated the trend of treatment simplification. Rather, damage control surgery is gaining greater acceptance [4]. From this point of contingency, minimally invasive primary pancreatic repair comprises a reliable method of meticulous management of PI. Intimate alignment of transected edges is a substantial step in the healing of the injured tissues. Based on the notion that repairing of the two edges of the transected pancreas with proper opposition of two margins will consequently allow the duct edges to heal similarly without repair [5]. Likewise in this study, we have attempted primary simple repair of the transected pancreas and its duct by the minimal access approach resulting in a good outcome in all patients.

### Material and Methods

This study amended and strictly followed the ethical guidelines of the Helsinki declaration, between May 2017 and December 2019, 3 patients who had abdominal trauma including pancreatic injury and main duct transection were surveyed in this study retrospectively. Diagnoses of pancreatic fracture and the transected duct were based on contrast CT of the abdomen in addition to clinical presentation in the form of abdominal pain, distension, and epigastric tenderness with

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preemptive laboratory investigations. [Complete blood picture, amylase, lipase, and indicators of septicemia]. The patients were classified according to the pancreatic injury scale (Table 1) based on the CT finding of pancreatic transection, duct injury, hematoma, and ascitic fluid collection in the lesser sac. A flow sheet of patients was done containing all paramount data which analyzed precisely (Table 2, 3). Informed consent was obtained from all patients.

### Preoperative preparations

Pre-operative optimization, ensuring hemodynamic stability, precise examination of all other organs, dealing with emergent fractures are the main task in the first hours of admission. Proper antibiotics, laboratory investigation, blood grouping, and imaging investigation were done preemptively. Informed consent was obtained from all patients.

### Operative technique

10 mm umbilical port inserted by open technique and 5 mm additional ports placed in each Iliac Fossa respectively. Gastro-colic omentum was opened to access the lesser sac. The stomach was hitched up to the anterior abdominal wall and fluid was drained from the lesser sac. Head of the pancreas identified and traced distally along the body of the pancreas till the site of injury and thorough wash done. Full-thickness suturing of pancreatic parenchyma with 4-0 PDS in an interrupted manner and hemostasis confirmed. The drain was kept in the lesser sac and somatostatin was given as an infusion for the first 48 h and then given subcutaneously for 3 weeks. Drain removed once the output of fewer than 50 ml.

### Results

There were three patients with pancreatic fractures and complete transection of the main pancreatic duct (two patients with grade IV and one patient grade III. After abdominal trauma (two cases due to motor vehicle accidents and one patient due to blunt abdominal trauma), with a median age of 11 years, the median time for

admission into the hospital after the trauma was 72 h and the median time for surgical intervention was 24 h after admission, to make sure of hemodynamic stability as mean blood pressure was 87.78 mmHg, pulse 87 bpm, and temperature 38.1°C. Concerning radiological investigations for elucidating concomitant organ injuries, they comprised of a right clavicle fracture treated with an arm sling in the first case and right tibia fracture treated by a simple leg cast in the second case. All patients presented by abdominal pain, distention, and peritonism. As per the existing departmental protocol for stable acute abdomen cases, two cases underwent exploratory laparoscopy and one case underwent exploratory robot-assisted laparoscopy. All cases displayed a considerable amount of ascites in the lesser sac with various degrees of omental saponification and transection of the main pancreatic duct. As mentioned in the operative technique simple primary repair of properly opposed edges of the pancreas was done with average operative time was 160 min.

### Post-operative sequela and follow up course

After a successful surgery, all patients were started with early mobilization protocol within the first 6 h post-operatively except the 3<sup>rd</sup> patients due to her right leg cast. There no need for opioids analgesia only NSAID in the form of paracetamol as a pain killer and 3<sup>rd</sup> generation cephalosporin given to all patients. Rather, anti-secretory therapy, somatostatin informs of intravenous infusion in dose 1 mg/kg/day in the first 48 h and was continued subcutaneously till the end of 21 days. Expediently patients started oral feeding in day 2 posts the surgery and the average period of drain removal was 9 days [5 to 21 days]. Amylase values improved dramatically post-operatively on average 193 U/L. Moreover, the average hospital stay period was 9 days. Up-to-date, patients were followed up optimally with no complications in the form of intraperitoneal or lesser sac fluid collection, pseudocyst formation, dilatation of pancreatic duct, or formation of a pancreatic fistula. All patients on follow up had normal ultrasound examination along with normal Sr. Amylase & C-Peptide levels.

**Table 1:** Data of Pancreatic Injury.

	Case No 1	Case No 2	Case No 3
Age	9 years	7 years	17 years
Sex	Female	Male	Male
Mechanism of injury	Motor vehicle accident	blunt abdominal trauma	Motor vehicle accident
Time passed till the admission	5 days	2 days	2 days
Time passed till intervention	2 days	1 day	1 day
Pulse	85 bpm	90 bpm	85 bpm
Temperature	37.8°	38°	38.5°
Blood Pressure	100/60 mmHg	90/60 mmHg	110/70 mmHg
Clinical Picture	Abdominal pain and distention	Abdominal pain and distention and guarding	Abdominal pain, distention, and epigastric tenderness
Associated Injury	RT clavicle fracture	No	RT tibia fracture
Operative Time	2 hours	3 hours	3 hours
Postoperative Antibiotic	3rd generation cephalosporin	3rd generation cephalosporin	3rd generation cephalosporin
Postoperative Analgesia	NSAID	NSAID	NSAID
Postoperative Mobilization	6 hour postoperative	6 hours postoperative	no
First Oral Intake	Day 2 postoperative	Day 2 postoperative	Day 2 postoperative
Drain Removal	Day 5 postoperative	Day 5 postoperative	day 5 postoperative
Complication	No	No	No
Hospital Stay	7 days	13 days	8 days

**Table 2:** Investigation of cases of pancreatic injury.

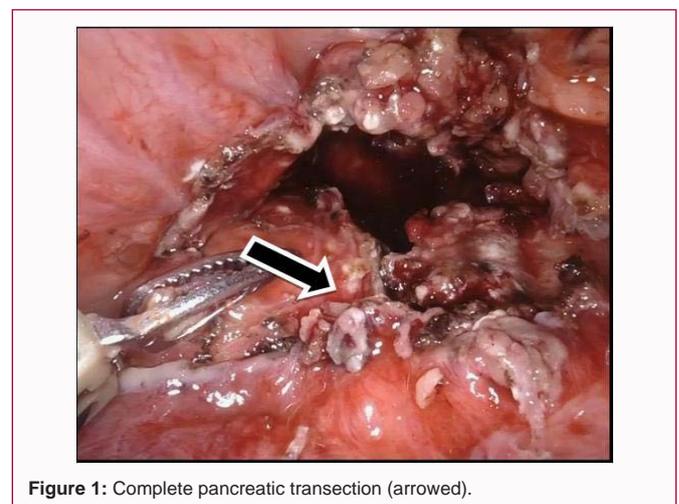
Investigations	Case No 1	Case No 2	Case No 3
Hemoglobin	9.9 gm.	11.5 gm.	7.8 gm.
White Blood Cells x 10 <sup>3</sup>	19.1	17.63	9.47
Hematocrit Value	29.80%	32.60%	29.90%
Amylase at admission	207 U/L	1162 U/L	673 U/L
Lipase at admission	708.8 U/L	1629 U/L	911 U/L
CT Findings	An incomplete transection between body and tail	Complete transection of the pancreas at level pancreatic neck	Complete transection of the pancreas at level pancreatic body and tail
Pancreatic injury scale	Grade III	Grade IV	Grade IV
Intraoperative Findings	Massive calcification + omentum stuck to pancreas + 500 cc in the lesser sac	Moderate saponification and about 200 ccs of ascites in the lesser sac	marked Saponification + omental Calcification + about 100 ccs of Ascites in the lesser sac
Follow Up Amylase	100 U/L	355 U/L	124 U/L
The outpatient US	Normal pancreas without IPF or Cyst formation	Normal pancreas without IPF or Cyst formation	Normal pancreas without IPF or Cyst formation
Outpatient Amylase	120 U/L	241 U/L	204 U/L

**Table 3:** Results data.

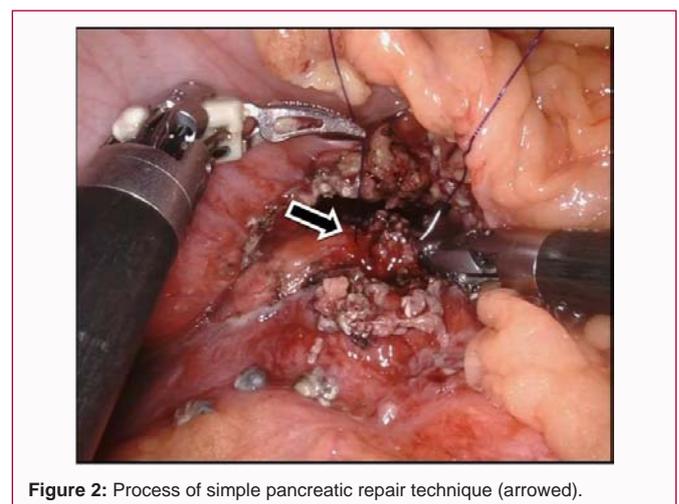
Variable	Median
Age	11 years
The period between trauma and hospital admission	72 hours
Period for surgical intervention	24 hours
Vital data:	Pulse: 87 bpm
	Temperature; 38.1°
	Mean BP: 87.78 mmHg
Admission amylase	690 U/L
Admission Lipase	1082 U/L
Complete blood picture at admission	Hemoglobin : 9.7 gm
	White blood cells ; 15.4 x 10 <sup>3</sup> cells
	Hematocrit value ; 38.1%
Operative time	2.67 hours
Drain Removal Post-Operative	9 days
Hospital Stay	9 days
Follow up Amylase	193 U/L

## Discussion

Historically, there were many speculations concerning dealing with the pancreas itself due to many wrong concepts around its healing process, and for fear of touching its main duct. Till now, no agreed criteria for advancing to repair the traumatic pancreas is available, many surgeons are proponents of deliberate conservative management which nonetheless results in the inevitable formation of pancreatic pseudocyst which increases the morbidity, surgical intervention, hospital stay and economic cost [6]. In Recent years, Minimal Invasive surgery especially laparoscopy, preferentially pursued in all medical domains and acquisition of the pediatric surgery field. A proclivity to treat the pancreatic injury laparoscopically nowadays is becoming more popular, laparoscopic distal pancreatectomy, and internal drainage of its remaining portion represents a formidable challenge for leakage, postoperative complication and increase the operative time [7]. Looking to all these ramifications performing primary pancreatic repair without stenting or repair the main transected duct and relay on accurate alignment of pancreatic transected parts imposing the tissue healing principles can



**Figure 1:** Complete pancreatic transection (arrowed).

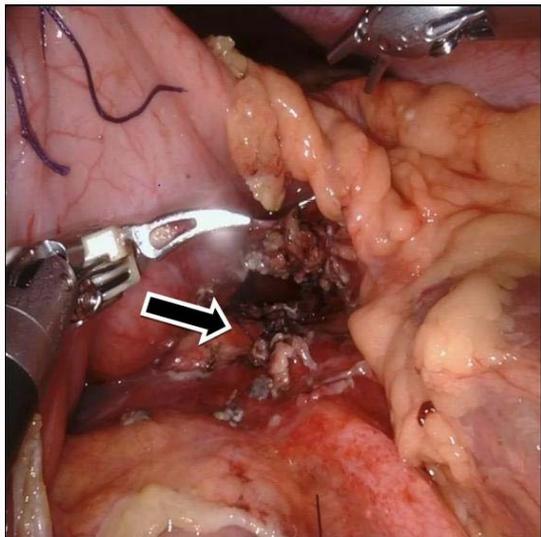


**Figure 2:** Process of simple pancreatic repair technique (arrowed).

be successfully done with satisfactory and robust long term results.

## Conclusion

The restoration of the normalcy in pediatric major trauma patients is elusive, especially with Major pancreatic trauma. From this point, we do our best for alleviating the burden and rescuing the child and the family by presenting this new and promising technique. For



**Figure 3:** Simple pancreatic repair completed (arrowed).

the establishment of the minimally invasive surgical simple primary pancreatic repair procedure as described previously we encourage all pediatric surgery centers to begin to render it as the first line in the management of pancreatic injury.

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