Blunt Pancreatic Trauma: A Retrospective Analysis of 38 Consecutive Patients Treated at Level 1 Trauma Center

Amit Kumar Singh[1], *Prabhakar Mishra*[2], *Ankit Kumar*[3]

[1]Department of Trauma Surgery, SGPGIMS, Lucknow, India

[2]Department of Biostatistics and Health Informatics, SGPGIMS, Lucknow, India

[3]Department of Forensic Medicine, SGPGIMS, Lucknow, India

Correspondence to: Amit Kumar Singh; email: amitps2011@gmail.com

Received: 17 Feb 2025; Revised: 24 Sep 2025; Accepted: 27 Sep 2025; Available online: ***

Abstract

Objective: In contrast to penetrating trauma, blunt pancreatic trauma poses numerous challenges for treating surgeons, mainly due to the different clinical manifestations. **Methods:** This is a retrospective observational study of all blunt pancreatic traumas admitted between July 2018 and June 2024. Data analyzed include demographic profiles, types of injury, duration of injury, types of treatment, transfusion requirements, need for mechanical ventilation, complications, and mortality. **Results:** Thirty-eight patients with blunt pancreatic injuries were studied, 73.6% of whom were male. The average age at presentation was 29 years (range: 22–42 years). The most common cause of trauma in 74% of patients was a road traffic accident. Head injury was the most common associated extra-abdominal injury seen in 41% patients. The requirement for blood transfusion was found in 38.4% of patients. There was a significant correlation between mortality and the degree of injury, ventilator requirements, and blood transfusions (p = 0.02). **Conclusion:** Complex pancreatic trauma (grade IV, V) always requires surgical treatment. Concomitant injuries play a crucial role in the final outcome. Therefore, all patients who have sustained a blunt injury to the pancreas should be fully and rapidly investigated, regardless of severity, as a delay in diagnosis leads to higher morbidity and mortality**.**

Keywords: Pancreas, Trauma, Accident, Blunt, Pseudo pancreatic cyst

Ann Afr Surg. 2026; 23(2): **-**
DOI: http://dx.doi.org/10.4314/aas.v23i2.3

Conflict of interest: None
Funding: None

Introduction

With a frequency of <2% of all trauma cases and 3–12% of all abdominal trauma, blunt injuries to the pancreas are relatively uncommon (1-4). Isolated pancreatic trauma is rare, as associated intra- or extra-abdominal injuries are found in 90% of cases (5). Road traffic accidents account for approximately 60% of pancreatic injuries, followed by falls and sports injuries (6). Patients with pancreatic injuries have a morbidity rate of 50–64% and a mortality rate of 12–33%, mainly because of the retroperitoneal location of the pancreas, the unclear clinical presentation, and the high frequency of multiple organ involvement (7-9). According to published studies, in 50.5% of cases of pancreatic injury, multiple pancreatic sites are affected, with the head of the pancreas affected in 17.3% of cases, the body of the pancreas in 9.6% of cases, and the tail in 22.6% of cases

(10). Apart from hemodynamic stability, the management of pancreatic injury depends on whether the main pancreatic duct (MPD) is disrupted or not. An unstable patient is more likely to require an early laparotomy to control the damage and assess the pancreas. Conversely, a stable patient may initially be treated by non-operative management (NOM), and a firm treatment plan can be decided after further diagnostic investigations. Pancreatic fistula, pseudocyst, post-traumatic pancreatitis, and pancreatic abscesses are common complications following blunt pancreatic injuries. Less common complications include peritonitis, gastrointestinal hemorrhage, and splenic vein thrombosis (11). Most deaths occur in the early phase of injury, mainly due to hemorrhagic shock associated with combined vascular or organ injury. Sepsis and multi-organ failure are the reasons for delayed mortality.

This study is designed to analyze the outcome of consecutive 37 patients of blunt pancreatic trauma and to evaluate our surgical experience and management since 2018.

Materials and Methods

A retrospective observational analysis of data from the 210-bed level 1 trauma center was conducted to evaluate the outcome of patients admitted with blunt pancreatic injuries hospitalized from July 2018 to June 2024. The institute's Ethics Committee approved the study protocol (approval no. PGI/BE/514/2024, date: September 24, 2024). The study adheres to the STROBE guidelines of reporting observational studies. Patient-informed consent was obtained for the study. All patients with blunt abdominal trauma with pancreatic injuries were included in the study. Penetrating abdominal injuries, patients who were brought dead or died during resuscitation, and patients having incomplete records or lost to follow-up were excluded from the study.

Case records were examined to identify demographic information, including age, gender, mechanism of injury, hemodynamic status, transfusion requirements, computed tomography (CT) scan results, time elapsed between the initial diagnosis and surgery, length of hospital and intensive care unit (ICU) stay, number of days spent on a ventilator, complications, concomitant intra- or extra-abdominal injuries, and final outcome. Based on radiologic and surgical findings, the American Association for the Surgery of Trauma (AAST) pancreatic injury severity score was determined for each patient. The diagnosis and grading of post-operative pancreatic fistula were based on the 2016 update of the International Study Group on Pancreatic Surgery (12)

All patients received initial treatment in accordance with the Advanced Trauma Life Support guidelines and the principles of Damage Control Resuscitation. In each patient, focused assessment with sonography in trauma was performed by the radiologist on duty. The decision regarding immediate surgery or further imaging studies was made, taking into account the patient's hemodynamic status. All hemodynamically unstable patients underwent CT of the torso to determine the extent of pancreatic injury and other important findings. Depending on the CT results, patients were either treated with NOM or managed surgically. Patients with hemodynamic instability were first resuscitated in the emergency bay. For resuscitation, 1 L of Ringer's lactate fluid was initially administered, followed by a transfusion of cross-matched packed red blood cells and fresh frozen plasma in a 1:1 ratio. To maintain a mean arterial pressure of >70 mmHg, norepinephrine infusion was started and titrated accordingly. These patients were then transferred to the operating room without a CT scan for damage control surgery. If required, a relook laparotomy was performed after 48 hours once the patient's condition improved. Surgical management was performed according to the AAST grading for pancreatic injuries. All operations were performed by an experienced trauma surgeon. The clinical signs of pancreatic fistula, pancreatic abscess, or abdominal abscess were confirmed by abdominal CT. In surgically operated patients, any detectable volume of fluid in the drains with an amylase value greater than three times the upper limit was considered a biochemical leak. CT-guided pigtail insertion was performed for external drainage of pseudo pancreatic cysts or abdominal abscesses.

Table 1. Distribution of the demographic variables between the study outcomes (**N**=38)

Variables	**Total (N=38)**	**Death (N=6)**	**Alive (N=32)**	***p* Value**
Sex				
Female	10 (26%)	2 (33.33%)	8 (25%)	0.644
Male	28 (74%)	4 (66.67%)	24 (75%)	
Mechanism of injury				
RTA	28 (74%)	3 (50%)	25 (78.13%)	0.103
Assault	6 (16%)	1 (16.67%)	5 (15.63%)	
Fall from height	4 (11%)	2 (33.33%)	2 (6.25%)	
Grade of injury				
Grade 1	1 (2.6%)	0	1 (3.13%)	0.035
Grade 2	7 (18.4%)	1 (16.67%)	6 (18.75%)	
Grade 3	18 (47.4%)	3 (50%)	15 (46.88%)	
Grade 4	10 (26.3%)	0	10 (31.25%)	
Grade 5	2 (5.3%)	2 (33.33%)	0 (0)	
Hemodynamic status				
Stable	16 (42.1%)	0	16 (50%)	0.03
Unstable	22 (57.9%)	6 (100%)	16 (50%)	
Transfusion requirements				
No	12 (31.6%)	0	12 (37.5%)	0.149
Yes	26 (38.4%)	6 (100%)	20 (62.5%)	
Any associated injury				
No	10 (26.3%)	1 (16.7%)	9 (28.1%)	0.99
Yes	28 (73.7%)	5 (83.3%)	23 (71.9%)	
Any complications				
No	25 (65.8%)	2 (33.3%)	23 (71.9%)	0.154
Yes	13 (34.2%)	4 (66.7%)	9 (28.1%)	
Procedure				
Nil	6 (16.2%)	0	6 (19.4%)	0.016
Conservative	4 (10.8%)	1 (16.7%)	3 (9.7%)	
Distal spleen open cortectomy	24 (64.9%)	3 (50%)	21 (67.7%)	
Whipple	2 (5.4%)	2 (33.3%)	0	
Spleen-preserving distal pancreatectomy	1 (2.7%)	0	1 (3.2%)	
Initial diagnosis to operative time				
<24 hours	15 (39.5%)	3 (50%)	12 (37.5%)	0.663
>24 hours	23 (60.5%)	3 (50%)	20 (62.5%)	
Mechanical ventilation				
No	19 (50%)	0	19 (59.38%)	0.02
Yes	19 (50%)	6 (100%)	13 (40.63%)	

RTA, road traffic accident

Data presented in median (interquartile range), compared using the Mann–Whitney *U* test. Number (%) compared by using the Fisher exact test. *p* Value <0.05 is significant

Table 2. Distribution of the clinical variables between the study outcomes (N=38)

Variables	Total (N=38)	Death (N=6)	Alive (N=32)	p Value
Mean age (years)	29	36.5	28.5	0.645
Range of age (minimum age–maximum age) (years)	22–42	26–42	21–43	0.645
Mean operative time (hours)	3	3	3	0.463
Range of operative time (minimum–maximum) (hours)	0[a]–4	3–4	0[a]–4	0.463
Mean ICU stay (days)	4.5	4	5	0.089
ICU stay (minimum–maximum) in days	3–7	2–5	3–9.5	0.089
Mean hospital stay in days	15	4	16	<0.001
Hospital stay (minimum–maximum) in days	12–28	2–9	12.5–30	<0.001

ICU, intensive care unit.

[a]0 (Zero) operating time denotes conservative management. Data presented in median (interquartile range), compared using the Mann–Whitney U test. Number (%) compared by using the Fisher exact test. p Value<0.05 is significant.

Statistical analysis

Descriptive statistics of the continuous variables are presented as median (interquartile range), whereas categorical variables are presented as frequency (%). To compare the medians between two groups, the Mann–Whitney *U* test was used; whereas among three or more groups, the Kruskal–Wallis *H* test was used. The Fisher's exact test was used to test the association between the groups. A p value <0.05 was considered statistically significant. Statistical analysis was performed using IBM SPSS version 23 (IBM, Chicago, IL, USA).

Results

A total of 3705 patients visited our trauma emergency bay. Forty-five (1.21%) of them were diagnosed with an injury to the pancreas. As five patients had penetrating injuries to the pancreas, they were excluded from the study. Two patients died during resuscitation and were also excluded from the study. There were more men than women, 28 vs. 10, respectively. The median age was 29 years (range: 22–42 years) (Tables 1 and 2).

The most common type of injury was a road traffic accident, seen in 28 (74%), followed by assault in 6 (16%) and fall from height in 4 (11%). As this is a level 1 trauma center, the majority of patients (29 [79%]) were referred from other hospitals. At the time of admission, 16 (42.1%) patients were hemodynamically stable, while 22 (57.9%) presented in a state of hemodynamic instability. Twenty-six (38.4%) patients required a blood transfusion in the trauma emergency bay itself. Nineteen (50%) patients with a low Glasgow Coma Scale were immediately intubated in the trauma emergency bay. NOM was done in 11 (28.9%), while 27 (71.1%) patients underwent exploratory laparotomy either for damage control surgery or as part of definitive management. Nine patients underwent magnetic resonance cholangiopancreatography to rule out injury to the MPD. Of these nine patients, five underwent endoscopic retrograde cholangiopancreatography (ERCP) and stent placement for grade 3 pancreatic injury, while no MPD injury was detected in four. Of these five patients, two developed a pseudocyst in the pancreas, for which CT-guided pigtail insertion was

performed. Both patients recovered completely and have been in follow-up for the last 6 months. Patients who were hemodynamically stable and had a lower grade (1, 2) of pancreatic injury with subtle clinical signs of acute pancreatitis received broad-spectrum antibiotics, analgesics, and octreotide 150–300 µg subcutaneously for 10 days. These patients also received early aggressive nutritional support, either total parenteral or enteral nutrition.

Surgical management was performed in 27 (71.1%) patients. Most of these patients presented either with features of peritonitis or in a state of shock (Figure 1).

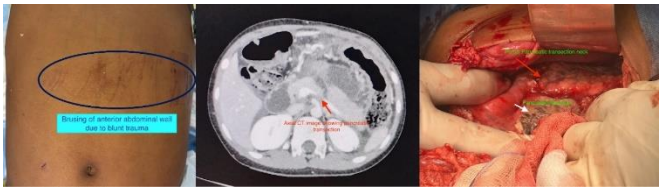

Figure 1. (A) Abdominal bruises in blunt abdominal trauma. (B) Axial computed tomography (CT) image showing pancreatic transection. (C) Grade 3 pancreatic injury with necrosis

The diagnosis of pancreatic injury was made during exploratory laparotomy in 8 (21%) patients, as these patients were shifted for surgery without any imaging. Distal pancreatectomy with splenectomy was performed in 24 (64.9%) patients, while spleen-sparing distal pancreatectomy was performed in 2 patients. Two (5.4%) patients with grade 5 pancreatic injury involving the head of the pancreas and duodenal injuries underwent damage control surgery followed by the Whipple procedure. Three (7.8%) patients with grade III pancreatic injury presented with gross extra-luminal air on CT (Figure 2).

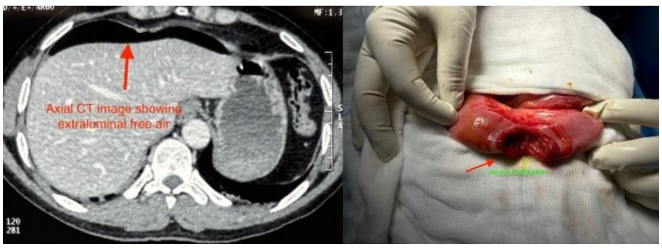

Figure 2. (A) Axial computed tomography (CT) image showing free air. (B) Intraoperative

One of these three patients was found to have a perforation of the transverse colon extending from the center of the transverse colon to the splenic flexure. The perforation was repaired primarily with a Vicryl 2-0 round body suture, and a covering ileostomy was performed. In the remaining two patients, distal jejunal and cecal perforations were found, which were repaired primarily without a covering stoma. Associated intra-abdominal organ injury was found in 12 (31.5%) patients. The liver (51.3%) was the most commonly injured organ, followed by the spleen (21.6%), kidney (13.4%), duodenum (8.1%), sigmoid colon (5.4%), and small bowel (0.2%). Non-anatomic resection was performed in three patients with grade IV liver injuries, while two patients with grade V injuries were treated by perihepatic packing. Abdominal gel foam was used for hemostasis along with Tisseel glue (fibrin sealant) 4 mL. Extra-abdominal injuries were noted in 28 (73.7%) patients: head injury in 11 (41%), followed by thoracic injuries in 9 (32.1%) and long bone fractures in 8 (28.5%) patients. Mechanical ventilation was needed in 19 (50%) patients. Of these 19, 6 (31.5%) died, while 13 (68.4%) survived. The mortality rate was significantly higher in patients who needed mechanical ventilation. The difference was statistically significant with a p value of 0.02. In the NOM group, five complications were observed: pseudo pancreatic cyst in two, acute renal failure in two, and abdominal abscess in one patient (Figure 3).

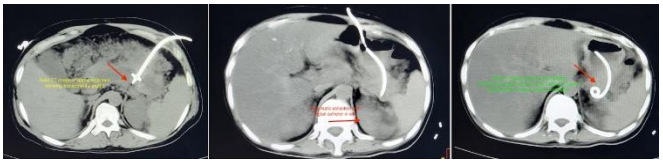

Figure 3. (A) Axial computed tomography (CT) image of the upper abdomen showing transomental pigtail catheter. (B) Axial CT image showing pancreatic collection. (C) Axial CT image showing a transgastric locking loop pigtail catheter.

In the surgically treated group, complications occurred in eight (28.5%) patients. These included pancreatic fistula in three, surgical wound infection in two, anastomotic leak in two, and multi-organ failure in one. The total mortality rate was 15.7%, with two patients

succumbing after NOM due to associated severe head trauma, while four died due to post-surgical complications.

Initial diagnosis to operative time of less than 24 hours was seen in 15 (39.5%) patients, while more than 24 hours was seen in 23 (60.5%) patients. The median length of hospitalization was calculated to be 15 days (range: 10–28 days). Patients undergoing NOM tend to have longer hospital stays compared to those receiving surgical intervention (Table 3).

Table 3. Distribution of the hospital stay as per the characteristics (N=38)

Variables		**Mean hospital stay (in days)**	**Range of hospital stay (minimum–maximum, in days)**	***p* Value**
Sex	Male	15	10–28	0.442
	Female	18	13–31	
Mechanism of injury	RTA	15	12–29	0.844
	Assault	15	10–17	
	Fall from height	15	6–29	
Grades	One	37	37–37	0.170
	Two	15	10–31	
	Three	15	12–19	
	Four	18	13–28	
	Five	6	2–9	
Hemodynamic stable	Stable	16	12–31	0.234
	Unstable	15	9–27	
Transfusion given	Yes	15	10–27	0.79
	No	15	12–34	
Initial diagnosis to operative time	<24 hours	15	10–27	0.428
	24 hours	16	12–29	
Mechanical ventilator	Yes	14	7–27	0.108
	No	15	12–31	
Any complications	Yes	27	15–37	0.058
	No	14	12–17	
Any associated injury	Yes	16	12–30	0.158
	No	13	10–16	

RTA, road traffic accident.

[a]Data presented in median (interquartile range), compared between two or more than two groups using the Mann–Whitney *U* test or the Kruskal–Wallis *H* test, respectively. *p* Value <0.05 is significant.

However, the mortality rate was higher in the surgical group compared to the NOM group, with a p value of 0.016. This observation indicates that surgical management might result in reduced hospitalization periods, potentially lowering healthcare expenses and enhancing patient outcomes, but it had a greater mortality due to post-surgical complications. Gaining insight into these variations could assist healthcare professionals in making more informed choices regarding treatment approaches for their patients.

Discussion

Among the organs affected by blunt abdominal trauma, the pancreas is the least frequently injured. Despite established treatment protocols for pancreatic injuries, the high incidence of concurrent injuries often necessitates case-specific management approaches. Prompt identification of pancreatic damage is crucial to avert severe complications. Healthcare providers must maintain a high level of suspicion when treating patients with abdominal injuries, even if initial imaging fails to

reveal pancreatic involvement. Our research indicates that pancreatic injuries predominantly affect young males. The demographic profile observed in our study aligns with previous findings reported in the literature (13). Our study's outcomes underscore the higher occurrence of pancreatic injuries in young male patients, suggesting the importance of focused screening and observation for this particular demographic group.

Motor vehicle accidents account for approximately 42% of pancreatic injuries in adults, while direct blows to the epigastrium from bicycle handlebars are the most common mechanism in children (14). In this study, the most common cause of pancreatic injury was road traffic accidents. Fleming et al. in their[7]study of 38 patients found blunt trauma to be the cause of pancreatic injury in 30 (78.9%) patients, with 20 (52.6%) patients having a motor vehicle accident (15). Similar results were observed by Scollay et al. and Thomas et al. (16, 17). However, there are conflicting reports in the literature from America and Africa that penetrating trauma is more common compared to blunt trauma (12, 18). The treatment of pancreatic injuries depends not only on hemodynamic stability but also on various other factors, particularly MPD status, AAST pancreatic injury grading, and the presence of concomitant injuries. A study conducted by Bradley et al. described a correlation between AAST grade and outcome. They also concluded that MPD status was an important predictor of outcome (19). Our research found a significant correlation between the grade of pancreatic injury, hemodynamic stability, the need for mechanical ventilation, and mortality. In the absence of MPD injury, NOM is the most effective treatment modality, especially in patients with grades I and II pancreatic injuries (20). Therefore, the non-surgical treatment of low-grade pancreatic injuries has become the practice of modern surgeons (13, 21).

In our study, 28.9% of patients with AAST grades I and II pancreatic injuries were treated non-operatively. According to our institute's protocol, octreotide acetate 150–300 µg/day was administered prophylactically along with a total parenteral diet for 10 days. Amirata et al. observed in their study that 7 patients (AAST grade 2, 3) out of 28 who had received octreotide acetate did not develop any pancreatic complications (22). However, Nwariaku et al. observed that 21 patients (26.2%) who received octreotide developed higher fistula formation (48% vs. 40%), had longer hospital stays, and had a longer duration of fistula drainage (23). Among 11 patients treated by NOM, 5 had AAST grade 3 injuries, and all underwent ERCP and stenting. ERCP is used not only as a diagnostic tool but also as a therapeutic tool to place a bridge prosthesis in the damaged duct. Studies done by Rogers et al. showed promising results after ERCP stenting, but concerns about the long-term ductal structure remain (4). In our study, distal pancreatectomy with splenectomy was the most common surgical procedure performed in 24 patients with AAST grades III and IV pancreatic injuries. Two patients with grade V injuries were treated with the Whipple procedure, but both patients died in the post-operative period due to sepsis and multi-organ failure. The cause of sepsis was leakage of the anastomosis with subsequent infection. Wynn et al. concluded in their study that patients with grade V pancreatic injuries have a high mortality rate due to the complexity of the associated injuries (24). Associated intra- and extra-abdominal injuries are the main cause of mortality following pancreatic trauma, with a reported incidence of 9–46%. In two-thirds of patients, the cause of early mortality is hemorrhagic shock. In the current study, 73.7% of associated extra-abdominal injuries were found. The most common injury was a head injury, followed by thoracic and long bone fractures. Our results are in contrast to the reports of Thomas et al., who found that 53% of their patients had thoracic injuries and only 35% had craniocerebral injuries (17). Complications are seen in 30% of pancreatic trauma, with pancreatic fistula being the most common, with an incidence rate of 10–18% (25). We observed a complication rate of 34.2% which is in agreement with the existing literature (25). A pancreatic fistula occurred in 7.8% of patients and was managed conservatively with antibiotics, octreotide, and nutritional support. One patient developed a retroperitoneal abscess, which was amenable to radiological drainage. In the current study, two patients had a pseudo pancreatic cyst, which required external drainage by insertion of a pigtail. Two

patients developed acute renal failure requiring several cycles of hemodialysis. Both presented with features of hemorrhagic shock and received massive blood transfusions during the resuscitation process. At the time of admission, hemorrhagic shock requiring transfusion is a significant predictor of mortality. Krige et al. found a similar result with a mortality rate of 29% in patients with a systolic blood pressure of 90 mmHg. Our research found that 38.4% of patients required blood transfusion, with a mortality rate of 23.7%, which is comparable with the study by Krige et al. (25).

The mortality rate for grades I, II, III, and IV in our series was 11%, with an overall mortality rate of 15.7%. The analysis of different series showed a mortality rate of 5–30% (5).

Limitations

Our study has several limitations. First, because of a single-center study, the sample size was small, thereby limiting generalizability. Second, the study was a retrospective observational design with a short duration. Third, all cases were managed by a single experienced trauma surgeon with a vast interest in management of abdominal injuries.

Conclusion

Even though it is uncommon, pancreatic trauma can be life-threatening, especially the high-grade ones with associated injuries. The emergency trauma team should remain more vigilant while assessing blunt abdominal trauma, as a delay in diagnosis may have catastrophic effects on the injury outcome

Author contributions

AKS led in conceptualization, data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, software, supervision, validation, visualization and in writing, reviewing & editing of the original draft. All other authors equally contributed.

References

1. Chinnery GE, Krige JE, Kotze UK, et al. Surgical management and outcome of civilian gunshot injuries to the pancreas. Br J Surg. 2012; 99(Suppl 1): 140-8.
2. Kao LS, Bulger EM, Parks DL, et al. Predictors of morbidity after traumatic pancreatic injury. J Trauma. 2003; 55(5): 898-905.
3. Lin BC, Chen RJ, Fang JF, et al. Management of blunt major pancreatic injury. J Trauma. 2004; 56(4): 774-8.
4. Rogers SJ, Cello JP, Schecter WP. Endoscopic retrograde cholangiopancreatography in patients with pancreatic trauma. J Trauma. 2010; 68(3): 538-44.
5. Vasquez JC, Coimbra R, Hoyt DB, et al. Management of penetrating pancreatic trauma: an 11-year experience of a level-1 trauma center. Injury. 2001; 32(10): 753-9.
6. Jurkovich G, Bulger EM. Duodenum and pancreas. In: Mattox KL, Moore ME, Feleciano DV (eds). Trauma. McGraw Hill Companies. 2004: 709-34.
7. Cirillo RL Jr, Koniaris LG. Detecting blunt pancreatic injuries. J Gastrointest Surg. 2002; 6(4): 587-98.
8. Gupta A, Stuhlfaut JW, Fleming KW, et al. Blunt trauma of the pancreas and biliary tract: a multimodality imaging approach to diagnosis. Radiographics. 2004; 24(5): 1381-95.
9. Venkatesh SK, Wan JMC. CT of blunt pancreatic trauma: a pictorial essay. Eur J Radiol. 2008; 67(2): 311-20.
10. Ragulin-Coyne E, Witkowski ER, Chau Z, et al. National trends in pancreaticoduodenal trauma: interventions and outcomes. HPB (Oxford). 2014; 16(3): 275-81.
11. Dave S, Toy FK, London S. Pancreatic trauma. In: StatPearls [Internet]. StatPearls Publishing. 2025. Available from https://www.ncbi.nlm.nih.gov/books/NBK459365/.
12. Degiannis E, Glapa M, Loukogeorgakis SP, et al. Management of pancreatic trauma. Injury. 2008; 39(1): 21-9.
13. Bassi C, Marchegiani G, Dervenis C, et al; International Study Group on Pancreatic Surgery (ISGPS). The 2016 update of the International Study Group (ISGPS) definition and grading of postoperative pancreatic fistula: 11 years after. Surgery. 2017; 161(3): 584-91.
14. Sharpe JP, Magnotti LJ, Weinberg JA, et al. Impact of a defined management algorithm on outcome after traumatic pancreatic injury. J Trauma Acute Care Surg. 2012; 72(1): 100-5.
15. Fleming WR, Collier NA, Banting SW. Pancreatic trauma: Universities of Melbourne HPB Group. Aust N Z J Surg. 1999; 69(5): 357-62.
16. Scollay JM, Yip VS, Garden OJ, et al. A population-based study of pancreatic trauma in Scotland. World J Surg. 2006; 30(12): 2136-41.
17. Thomas H, Madanur M, Bartlett A, et al. Pancreatic trauma—12-year experience from a tertiary center. Pancreas. 2009; 38(2): 113-6.
18. Rickard MJ, Brohi K, Bautz PC. Pancreatic and duodenal injuries: keep it simple. ANZ J Surg. 2005; 75(7): 581-6.
19. Bradley EL 3rd, Young PR Jr, Chang MC, et al. Diagnosis and initial management of blunt pancreatic trauma:

guidelines from a multiinstitutional review. Ann Surg. 1998; 227(6): 861-9.
20. Smego DR, Richardson JD, Flint LM. Determinants of outcome in pancreatic trauma. J Trauma. 1985; 25(8): 771-6.
21. Petrone P, Moral Álvarez S, González Pérez M, et al. Pancreatic trauma: management and literature review. Cir Esp. 2017; 95(3): 123-30.
22. Amirata E, Livingston DH, Elcavage J. Octreotide acetate decreases pancreatic complications after pancreatic trauma. Am J Surg. 1994; 168(4): 345-47.
23. Nwariaku FE, Terracina A, Mileski WJ, et al. Is octreotide beneficial following pancreatic injury? Am J Surg. 1995; 170(6): 582-5.
24. Wynn M, Hill DM, Miller DR, et al. Management of pancreatic and duodenal trauma. Am J Surg. 1985; 150(3): 327-32.
25. Krige JE, Kotze UK, Setshedi M, et al. Prognostic factors, morbidity and mortality in pancreatic trauma: a critical appraisal of 432 consecutive patients treated at a level 1 trauma centre. Injury. 2015; 46(5): 830-6.