https://doi.org/10.48047/AFJBS.6.Si1.2024.304-309

African Journal of Biological Sciences

Journal homepage: http://www.afjbs.com

Research Paper Open Access

Predictive Factors for Morbidity and Mortality in Patients with Blunt Pancreatic Trauma in a Tertiary Hospital in Egypt

Hazem A. Megahed[1.2.3], Abdulaziz Saud Altala[2], Al Faisal M. Majhad[2], Ahmed Mohammed A. Alkhars[2], Rakan Abdulkarim A. ALEtebi[2], Rakan Awadh Alemies[2], Abdulrahman fahad Al-solahim[4], Hala Abdulkarim ALEtebi[2], Masoud Kh El-Syed Ibrahim[1], Abdel-monem A. Mohamed[5], Ashraf Ali Abdel Aziz[6], Hatem A. Megahed[7], Mona F. El Wakeel[2,8], Ahmed yousef[9]

(1) Department of General surgery, Faculty of Medicine for Boys, Al-Azhar University, Damietta, Egypt.
(2) College of medicine- Dar Al Uloom University, Saudi-Arabia.
(3) Riyadh Hospital (Saudi- Arabia)
(4) Vision college of medicine, Saudi-Arabia.
(5) Department of General surgery, Faculty of Medicine, Al-Azhar University, Assiut, Egypt.
(6) Department of General surgery, Al Ahrar teaching hospital, Zagazig, Egypt.
(7) Department of Vascular surgery, Faculty of Medicine for girls, Al-Azhar University, Cairo, Egypt.
(8) Higher institute for computers information and management technology, Tanta, Egypt
(9) Department of Public Health and Community Medicine, Faculty of Medicine for boys, Al-Azhar University, Egypt.

Email:doctor_hazem_m@yahoo.com

Article History

Volume 6, Special Issue 1, April-July

Received: 10July2024

Accepted: 31 July 2024

Published: 31July 2024

doi:

10.48047/AFJBS.6.Si1.2024.304-309

Abstract:Background:Background: Pancreatic trauma, though infrequent, is a significant clinical concern with mortality rates between 9% and 34%. It accounts for 0.21-0.32% of all trauma incidents, 1-2% of blunt abdominal injuries, and 5-7% of penetrating abdominal traumas. Isolated pancreatic trauma is rare, representing less than 1% of abdominal trauma cases. These injuries pose unique and complex challenges for healthcare professionals. This study aimed to identify factors predicting the outcome of blunt pancreatic trauma by comparing various preoperative, operative, and post-operative variables.

Patients and Methods: This retrospective study covered two years, from January 2018 to December 2019, including patients with blunt pancreatic trauma at the Department of Surgery, Al-Azhar University Hospital, Damietta, Egypt. Data were extracted from hospital records, including variables such as age, gender, mechanism of injury, referral source, Revised Trauma Score (RTS), AAST pancreatic injury grade, hemodynamic status, concomitant abdominal injuries, ICU admission duration, interval between the accident and hospital admission, surgical procedures, need for blood transfusion, and hospital stay length.

Results: Significant predictive factors for the prognosis of blunt pancreatic injury included the patient's age (P = 0.032), RTS (P = 0.0006), hemodynamic status on admission (P = 0.0007), presence of associated abdominal injuries (P = 0.048), and need for ICU admission (P = 0.004).

Conclusions: Preoperative hemodynamic instability, lower RTS, presence of associated abdominal injuries, longer ICU admissions, and advanced age are significant predictors of mortality in blunt pancreatic trauma. These findings underscore the need for prompt and effective management strategies tailored to the identified risk factors to improve patient outcomes

Keywords: Pancreatic trauma, blunt abdominal injury, prognostic factors, hemodynamic status, Revised Trauma Score (RTS).

Introduction

Pancreatic trauma, though infrequent, poses a significant clinical challenge, with mortality rates spanning from 9% to 34% (1,2,3,4). It comprises 0.21-0.32% of all trauma incidents, encompassing a mere 1-2% of cases attributed to blunt abdominal trauma and 5-7% of incidences associated with penetrating abdominal injuries. The occurrence of isolated pancreatic injury is exceedingly uncommon, constituting less than 1% of all abdominal trauma incidents. Despite significant advancements in medical science, the prognosis for these patients remains bleak. This poor outcome is attributed to the severity of the pancreatic injury, its anatomical location, the extent of concomitant organ damage, and the duration elapsed since the injury occurred [(6)].

The management of pancreatic trauma presents unique and multifaceted challenges for healthcare professionals [(7)]. In 2017, the EAST promulgated extensive practice management guidelines specifically focusing on the management of pancreatic injuries in adult patients. [(8)]According to the classification system of the AAST, non-operative management is recommended for pancreatic injuries classified as grades I and II. For pancreatic duct injuries classified as grades III and IV, resection is conditionally advised, whereas no specific recommendations are provided for the most severe grade V injuries. An escalating number of patients with lower-grade pancreatic injuries are undergoing conservative management.

Conversely, individuals presenting with high-grade pancreatic trauma and hemodynamic instability necessitate immediate surgical intervention. The paucity of comprehensive clinical studies on pancreatic trauma complicates clinicians' efforts to ascertain the optimal timing for surgical interventions. Moreover, there exists a constrained understanding of the prognostic determinants for morbidity and mortality following laparotomy in this patient population [(9)].

This study aims to elucidate the prognostic determinants affecting morbidity and mortality in patients suffering from blunt pancreatic trauma. The cohort consists of individuals admitted to the Department of Surgery at Al-Azhar University Hospital, Damietta, Egypt, during the period from January 2018 to December 2019. The outcomes of this analysis are anticipated to elucidate prognostic risk factors in patients with pancreatic trauma and contribute to the formulation of efficacious management strategies.

Patients and methods

Patients

Given the lack of precise data on the incidence of blunt pancreatic trauma within the general population, this study will retrospectively gather information from hospital records. Comprehensive data will be amassed for all patients, regardless of age or gender, who were admitted to the Department of Surgery at Al-Azhar University Hospital in Damietta, Egypt, during the interval from January 2018 to December 2019.

Study design.

A retrospective study will be conducted using hospital records for all patients admitted to the Department of Surgery at Al-Azhar University Hospital, Damietta, Egypt, between January 2018 and December 2019.

The data collection

Includes age, gender, mechanism of injury, patient referred directly to the hospital or from other hospital, revised trauma Score (RTS), associated abdominal injuries, hemodynamics, need of admission to ICU in days, period between accident and hospital entry (in hours), AAST pancreatic injury grade, surgical procedure done, need for blood transfusion, and period of hospital stay.

Definitions

The AAST criteria were employed to independently classify the severity of pancreatic injuries. A diagnosis of pancreatic trauma made more than 24 hours post-injury was considered delayed. Shock was delineated as a condition characterized by a systolic blood pressure measurement falling below 90 mmHg, occurring either preoperatively or intraoperatively. Mortality was assessed based on the number of fatalities within the hospital. Morbidity encompassed any complications, including pancreatic fistula, pancreatic abscess,

abdominal hemorrhage, shock, and multiple organ dysfunction syndrome, with the presence of any of these conditions being indicative of morbidity.

Inclusion and exclusion criteria

Both patients who underwent surgical intervention and those who received conservative management were included in the study. Notwithstanding, this study omitted individuals who were expectant or whose medical records and imaging data were incomplete.

Sample size and technique

Sample size is 23 (at least) patients according to Raosoft Sample size calculator http://www.raosoft.com/samplesize.html - prevalence of pancreatic trauma is 1 to 2 % (average 1.5 %) of blunt abdominal trauma - Convenient sample technique

Statistical analysis

Data analyses were executed using SPSS software package version 20.0 (Prentice-Hall, Chicago, IL, USA). Qualitative data were articulated in terms of frequencies and percentages. Quantitative data comparisons were conducted through the application of the student's t-test. Categorical variables between the two groups were analyzed using the Chi-square (X^2) test. Statistical significance will be determined by a p-value threshold of less than 0.05. Furthermore, univariate analysis were applied to selected variables, with a p-value below 0.05 signifying statistical relevance.

Results:

A total of 30 patients were collected, the data were collected and analyzed **(table 1)**

In the present study, there were significant differences as predictive factors for prognosis of blunt pancreatic injury in relation to age of the patient (P = 0.032), his revised trauma score (P = 0.0006), his hemodynamics status on admission (P = 0.0007), presence of associated abdominal injuries (0.048) and his need for ICU admission (p = 0.004). The survival rate was significantly higher in younger patients, in patients who had higher revised trauma scores, in hemodynamically stable patients, in presence of associated abdominal injuries and in patients who did not need or needed shorter periods of ICU admission. The survival rate was non-significantly higher in patients with Grade I than grade II or III pancreatic trauma, in patients who referred directly to the hospital than those transferred from other hospitals and in patients to whom simple drainage or distal pancreatectomy was done than those who needed damage control surgery **(table 1)**

Table (1): Univariate Analysis of the Risk Factors of Surgical Prognosis in pancreatic trauma

Clinical parameters	Survivor	Non-Survivor	P-value
Age (Years)	23.9 ∓ 9.7	35.7 ∓ 15.2	0.032*
Gender (F/M)	5/20	0/5	0.283
Mechanism of Injury (Pedestrian/Fall from height/Motor vehicle accident)	4/5/16	0/2/3	0.467
Patient Referred Directly to The Hospital or From Other Hospital (Transferred/direct)	8/17	2/3	0.733
Period Between Accident and Hospital Entry (Hours)	42.5 ∓ 91.04.	14.4 ∓ 14.7	0.503
Hemodynamic Status (Unstable/Stable)	5/20	5/0	0.0007*
Revised Trauma Score	12.6 ∓ 0.6	11.2 ∓ 1.3	0.0006*
Associated Abdominal Injuries (0 organ / one organ / ≥ 2 $organs$)	7/12/6	0/1/4	0.048*
AAST Pancreatic Injury Grade (I/II/III)	7/11/7	0/1/4	0.079
Amount of Blood Infusion (No/Yes)	16/9	2/3	0.326
Surgical Procedure (Simple drainage/Distal pancreatectomy/Damage control surgery)	9/10/6	1/1/3	0.276
Need of Admission to ICU (By Days)	7 ∓ 8	22 ∓ 17	0.004*
Hospital Stay (By Days)	14 ∓ 7	17 ∓ 8	0.412

F/M: Female/Male, AAST: American Association for the Surgery of Trauma, ICU: Intensive Care Unit, * Means significant.

Discussion

In the current investigation, we identified five prognostic indicators of early mortality in cases of blunt pancreatic trauma: patient age, Revised Trauma Score (RTS), hemodynamic status on admission, presence of associated abdominal injuries, and the need for ICU admission. Survival rates were significantly higher in younger patients, those with higher RTS, hemodynamically stable patients, those who required shorter ICU admissions, and those without associated abdominal injuries.

Although the survival rate was non-significantly higher in patients with grade III or grade II pancreatic trauma compared to grade I, in patients referred directly to the hospital compared to those transferred, and in patients who underwent simple drainage or distal pancreatectomy compared to those requiring damage control surgery, these differences were not statistically significant. Identifying these prognostic factors is crucial for developing effective treatment strategies for managing blunt pancreatic trauma. Mortality following pancreatic injury is influenced by various factors, including sex, age, trauma type, higher AAST grades of pancreatic injury, hemodynamic status, the need for damage control surgery, concurrent abdominal and vascular injuries, and delays in diagnosis, as evidenced by multiple studies (10-15).

Four factors—RTS, hemodynamic status, ICU admission necessity, and patient age—were significantly associated with in-hospital mortality in this study, as revealed by multivariable logistic regression analyses. The predictive model, which included only these four factors, demonstrated exceptional performance in predicting outcomes. Although the AAST Pancreatic Injury Grade and associated abdominal injuries appeared to affect mortality rates, their impact was statistically insignificant, likely due to the study's limited sample size.

Keita Shibahashi et al. (2019) found that age, RTS, pancreatic injury grade (AAST), severe associated injuries, significant vascular damage, severe mesenteric damage, and a high ISS strongly correlated with in-hospital mortality rates. The chosen management strategy also significantly correlated with in-hospital mortality (16). Jensen SD et al. determined that preoperative hemodynamic instability is an independent prognostic indicator for surgical outcomes in pancreatic trauma cases, primarily due to traumatic hemorrhage (17). Cole E et al. (2019) hypothesized that hemorrhagic shock, combined with pancreatic trauma, may lead to the erosion of adjacent blood vessels due to pancreatic enzyme extravasation, with recurrent intraperitoneal hemorrhage being a significant mortality risk factor (18).

In our study, the mortality rate was higher in hemodynamically unstable patients. The overall mortality rate of 23% aligns with reported ranges (10-11, 19-25), although the small sample size and exclusion of patients with incomplete data may contribute to this relatively high rate and the non-significant appearance of other predictive factors, such as associated abdominal injuries.

According to Eastern Association for the Surgery of Trauma guidelines, nonoperative management is recommended for pancreatic injuries that do not involve the pancreatic duct (26), while operative intervention is advised for those that do. However, research has not consistently shown that surgical treatment is superior to non-operative management for both grade I/II and grade III/IV injuries (27). Increasing evidence suggests that non-operative management may be safe and viable for patients with pancreatic duct injuries (28). Studies have shown that endoscopic interventions, including transpapillary pancreatic duct stenting and sphincterotomy, significantly reduce the need for surgical procedures by occluding the leaking duct, facilitating pancreatic secretion drainage into the duodenum, and minimizing inflammatory sequelae (29,30).

The importance of surgical intervention for immediate hemostasis, infection control, and cases where non-operative treatment fails should not be underestimated. The choice of surgical procedure was not significant in this study. Pavlidis ET and colleagues assert that pancreatic trauma, though rare, requires a tailored treatment approach. Conservative management is typically sufficient for minor injuries, while severe cases involving the pancreatic duct remain contentious. In such scenarios, damage control surgery is preferred and

should be employed as necessary. Advances in modern radiologic and endoscopic techniques have facilitated the avoidance of reoperation in select patients (31).

Conclusion

Preoperative hemodynamic instability, lower RTS, presence of associated abdominal injuries, longer ICU admissions, and advanced age are significant predictors of mortality in blunt pancreatic trauma. These findings underscore the need for prompt and effective management strategies tailored to the identified risk factors to improve patient outcomes.

Conflict of interest

None to declare.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Acknowledgments

None.

Ethical Approvals

The study protocol was reviewed and approved by the Institutional Review Board of the Damietta Faculty of Medicine, Al-Azhar University, Damietta, Egypt (Registration number: DFM-IRB 00012367-23-005-018).

Conflict of Interests

Non

References:

1. Shibahashi K, Sugiyama K, Kuwahara Y, Ishida T, Okura Y, Hamabe Y. Epidemiological state (2022): predictive model for mortality, and optimal management strategy for pancreatic injury: a multicentre nationwide cohort study. Injury; 51:59- 65.
2. Jurkovich GJ (2020): Pancreatic trauma. J Trauma Acute Care Surg; 88:19-24.
3. Shetty BN, ObalanarasimhaiahS ,Swamigowda NN, Kumar MM , Jena J (2020): Management of pancreatic trauma in adult patients: a single centre experience, Int Surg J. ;7(3):705-709
4. Debi U, Kaur R, Prasad KK, Sinha SK, Sinha A, Singh K. (2013): Pancreatic trauma: a concise review. World J Gastroenterol. Dec 21;19(47):9003-11.
5. Addison P, Iurcotta T, Amodu LI, et al. (2016): Outcomes following operative vs. nonoperative management of blunt traumatic pancreatic injuries: a retrospective multi-institutional study. Burns & trauma; 4:39.
6. Rozich NS, Morris KT, Garwe T, et al. (2019): Blame it on the injury: trauma is a risk factor for pancreatic fistula following distal pancreatectomy compared with elective resection. J Trauma Acute Care Surg; 87:1289- 1300.
7. Soreide K. (2015): Pancreas injury: the good, the bad and the ugly. Injury ;46: 827- 829.
8. Ho VP, Patel NJ, Bokhari F, et al (2017): Management of adult pancreatic injuries: a practice management guideline from the Eastern Association for the Surgery of Trauma. J. Trauma. Acute Care Surgery.; 82:185-199.
9. De Simone B, Sartelli M, Coccolini F, et al (2020): Intraoperative surgical site infection control and prevention: a position paper and future addendum to WSES intraabdominal infections guidelines. World J Emerg Surg; 15:10.
10. Scollay JM, Yip VS, Garden OJ, Parks R (2006): A population-based study of pancreatic trauma in Scotland. World J Surg; 30:2136–41
11. O'Reilly DA, Bouamra O, Kausar A, Malde DJ, Dickson EJ, Lecky F (2015): The epidemiology of and outcome from pancreatoduodenal trauma in the UK, 1989-2013. Ann R Coll Surg Engl; 97:125–30.
12. Antonacci N, Di Saverio S, Ciaroni V, Biscardi A, Giugni A, Cancellieri F, et al (2011): Prognosis and treatment of pancreaticoduodenal traumatic injuries: which factors are predictors of outcomes? JHepatobiliaryPancreat Sci; 18:195–201.
13. Heitsch RC, Knutson CO, Fulton RL, Jones CE (1976): Delineation of critical factors in the treatment of pancreatic trauma. Surgery 1976; 80:523–9.
14. Bradley 3rd EL, Young Jr. PR, Chang MC, Allen JE, Baker CC, Meredith W, et al (1998) : Diagnosis and initial management of blunt pancreatic trauma: guidelines from a multiinstitutional review. Ann Surg 1998; 227:861–9.
15. Chinnery GE, Krige JE, Kotze UK, Navsari a P, Nicol A (2012): Surgical management and outcome of civilian gunshot injuries to the pancreas. Br J Surg; 99:140–8

16. Keita Shibahashi, Kazuhiro Sugiyama, Yusuke Kuwahara, Takuto Ishida, Yoshihiro Okura, Yuichi Hamabe (2019) : Epidemiological state, predictive model for mortality, and optimal management strategy for pancreatic injury: A multicentre nationwide cohort study. Injury, Int. J.8271, seven pages, https://doi.org/10.1016/j.injury.2019.08.009.
17. Jensen SD, Cotton BA (2017): Damage control laparotomy in trauma. Br J Surg; 104:959e961.
18. Cole E, Weaver A, Gall L, et al (2019): A decade of damage control resuscitation: new transfusion practice, new survivors, new directions. Ann Surg. 2019. https:// doi.org/10.1097/SLA.0000000000003657.
19. Englum BR, Gulack BC, Rice HE, Scarborough JE, Adibe OO (2016) : Management of blunt pancreatic trauma in children: review of the National Trauma Data Bank.JPediatr Surg ;51:1526–31.
20. Kumar A, Panda A, Gamanagatti S (2016): Blunt pancreatic trauma: a persistent diagnostic conundrum? World J Radiol ;8:159–73.
21. Soreide K, Weiser TG, Parks RW (2018): Clinical update on management of pancreatic trauma. HPB (Oxford) ;20:1099–108.
22. Ho VP, Patel NJ, Bokhari F, Madbak FG, Hambley JE, Yon JR, et al (2017) : Management of adult pancreatic injuries: a practice management guideline from the Eastern Association for the Surgery ofTrauma. J TraumaAcute Care Surg ;82:185–99.
23. Recinos G, DuBose JJ, Teixeira PG, Inaba K, Demetriades D(2009) : Local complications following pancreatic trauma. Injury ;40:516–20.
24. Seamon MJ, Kim PK, Stawicki SP, Dabrowski GP, Goldberg AJ, Reilly PM, et al (2009): Pancreatic injury in damage control laparotomies: is pancreatic resection safe during the initial laparotomy? Injury;40:61–5.
25. Al-Ahmadi K, Ahmed N (2008) : Outcomes after pancreatic trauma: experience at a single institution. Can J Surg; 51:118–24.
26. Ho VP, Patel NJ, Bokhari F, Madbak FG, Hambley JE, Yon JR, et al (2017): Management of adult pancreatic injuries: a practice management guideline from the Eastern Association for the Surgery of Trauma. J Trauma Acute Care Surg; 82:185–99.
27. Keita Shibahashi , Kazuhiro Sugiyama, Yusuke Kuwahara, Takuto Ishida, Yoshihiro Okura, Yuichi Hamabe (2019): Epidemiological state, predictive model for mortality, and optimal management strategy for pancreatic injury: A multicentre nationwide cohort study, Injury, Int. J. Care Injured. doi.org/10.1016/j.injury.2019.08.009
28. Mohseni S, Holzmacher J, Sjolin G, Ahl R, Sarani B(2018): Outcomes after resection versus non-resection management of penetrating grade III and IV pancreatic injury: a trauma quality improvement (TQIP) databank analysis. Injury; 49:27–32
29. Rogers SJ, Cello JP, Schecter WP (2010): Endoscopic retrograde cholangiopancreatography in patients with pancreatic trauma. J Trauma; 68:538–44.
30. BeckerA,KoltunL, SayfanJI (2010): Intraoperative cholecystocholangiopancreatography in the evaluation of pancreatic duct injury. Am Surg ;76: E142–3.
31. Pavlidis ET, Psarras K, Symeonidis NG, Geropoulos G, Pavlidis TE (2022): Indications for the surgical management of pancreatic trauma: An update. World J Gastrointest Surg; 14(6): 538-543 [PMID: 35979422 DOI: 10.4240/wjgs.v14.i6.538]