ISSN: 3066-7097
Research Article

Journal of Critical Care Research and Emergency Medicine

Blunt Pancreatic Trauma in the ED: Systematic Review, Meta-analysis, and a Contemporary Care Algorithm

Magazzini S[1], Asrow A[2], Balzarini B[1], Baraghini M[6], Bartolucci M[9], Betti M[3], Cantafio S[6], Cappellini I[4], De Curtis E[1], Grassi I[1], Laghi L[5], Longo M[1], Matteuzzi C[7], Puccetti L[8], Ricevuti G[9], & Lai F[1*]

[1]*Emergency Department, Ospedale S. Stefano, Usl Toscana Centro, Prato, Italy*
[2]*Department of Emergency medicine, University of Chicago, IL, USA*
[3]*School of Medicine, University of Florence, Italy*
[4]*Intensive Care Unit, Ospedale S. Stefano, Usl Toscana Centro, Prato, Italy*
[5]*Clinical Service Lead per HCOP (Health Care of Older People), Queen Elizabeth Hospital, Birmingham, UK*
[6]*Department of Surgery, Ospedale S. Stefano, Usl Toscana Centro, Prato, Italy*
[7]*School of Medicine, University of Bologna, Italy*
[8]*Director of the Residency Program in Emergency Medicine, University of Siena, Italy*
[9]*University of Pavia School of Medicine, Italy, Department of Radiology, Ospedale S. Stefano, Usl Toscana Centro, Prato, Italy*

[*]Corresponding author: Lai F, Department of Emergency, Ospedale S. Stefano, Usl Toscana Centro,Prato, PD, Italy.

Submitted: 17 September 2025 **Accepted:** 22 September 2025 **Published:** 26 September 2025

https://doi.org/10.63620/MKJCCREM.2025.1052

Citation: *Magazzini, S., Balzarini, B., Betti, M., Cappellini, I., Grassi, I., Longo, M., Matteuzzi, C., & Lai, F. (2025). Septic Pneumopericardium in A Patient with Sepsis Due To Gluteal Cellulitis: A Case Report. J of Cri Res & Eme Med, 4(5), 01-12.*

Abstract

Background: *Blunt pancreatic trauma is a rare but clinically significant entity, representing 1–5% of all abdominal injuries. Despite this low frequency, it carries substantial morbidity and mortality, particularly in cases involving main pancreatic duct (MPD) disruption. Early recognition is hindered by nonspecific symptoms and initially normal serum amylase/lipase.*

Objective: *To review the current literature regarding epidemiology, mechanisms, diagnostic strategies, management approaches, and outcomes of blunt pancreatic rupture, emphasizing implications for emergency physicians.*

Methods: *A narrative review was performed through PubMed, Cochrane, and guideline repositories (AAST, EAST, WTA, WSES), including studies from 2000–2025. Priority was given to systematic reviews, multicenter studies, and guidelines published ≥2020.*

Results: *Blunt pancreatic trauma accounts for approximately 1–5% of all abdominal injuries, with the highest prevalence observed in young adults. Motor vehicle collisions remain the leading cause, responsible for nearly 60% of cases, followed by falls (20%) and high-energy sports trauma (10%). Reported in-hospital mortality ranges from 10% to 20% but increases to up to 30% when pancreatic injury is associated with concomitant vascular, hepatic, or duodenal trauma.*

Conclusion: *Blunt pancreatic rupture, though uncommon, requires high suspicion in emergency settings. Timely imaging, ERCP when feasible, and individualized strategies are essential to reduce morbidity and mortality.*

Keywords: Blunt Pancreatic Trauma; Main Pancreatic Duct Injury; Abdominal Injuries; Diagnostic Imaging (CT, MRCP, ERCP); Pancreatic Injury Management; Morbidity and Mortality.

Introduction

Blunt pancreatic trauma remains one of the most elusive diagnoses in emergency medicine. Its retroperitoneal location shields the pancreas from many injuries but makes clinical manifestations subtle. In the early post-trauma period, symptoms such as epigastric pain, nausea, or mild abdominal discomfort are nonspecific, and routine laboratory values often fail to suggest pancreatic damage. When undetected, progression to complications—including pancreatic fistula, pseudocyst, retroperitoneal abscess, or sepsis—is common. The key determinant of prognosis is timely recognition of MPD integrity. Emergency physicians must be familiar with current guidelines and integrate imaging modalities with a structured diagnostic algorithm [1-7].

Scope and Approach

This structured narrative systematic review synthesizes contemporary evidence (guidelines, consensus statements, registries, multicenter cohorts, and high-quality reviews) on epidemiology, clinical presentation, mechanisms, classification, diagnosis, management, and complications of blunt pancreatic trauma (BPT) relevant to Emergency Medicine. Literature from 1990–2025 was queried across PubMed/Medline and guideline repositories; priority was given to EAST, WSES-AAST, WTA, AAST OIS updates, multicenter datasets (e.g., NTDB), and radiology/HPB consensus. Where robust pooled estimates were unavailable, we report the most generalizable figures from large cohorts and guidelines.

Epidemiology

Pancreatic injury is uncommon but high risk. Reported incidence spans ~0.2–3.6% of all trauma admissions and ~3.1% of blunt abdominal trauma in a large NTDB analysis; a Scottish population-based study found 0.21% among >52,000 trauma patients. Severity skews low-grade in blunt mechanisms: in the NTDB blunt cohort, AAST OIS grade II accounted for ~83%, with grades III–V comprising the remainder (≈8%, 4%, and 6%, respectively). Delayed or missed diagnosis is frequent and drives morbidity [9].

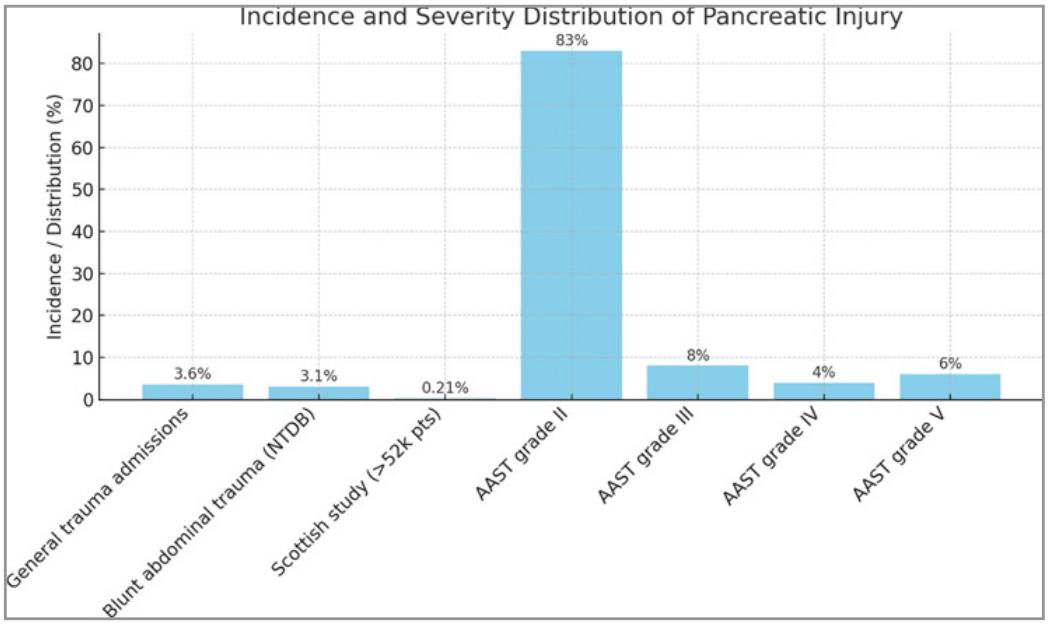

Table 1: Incidence and SDPI

Table 2: Epidemiology of Blunt Pancreatic Trauma

Parameter	Findings	References
Incidence among all abdominal trauma	1–5%	[1–3,6]
Incidence among polytrauma patients	<1%	[7]
Age distribution	Peak 20–40 years	[8]
Gender distribution	Male predominance (≈70%)	[8,9]
Pediatric incidence	Higher in handlebar/bicycle injuries	[20]
Mortality (overall)	10–20%	[10]
Mortality (with associated injuries)	Up to 30%	[11]
Morbidity (fistulas, pseudocysts, abscesses)	30–50% if duct disrupted	[17]

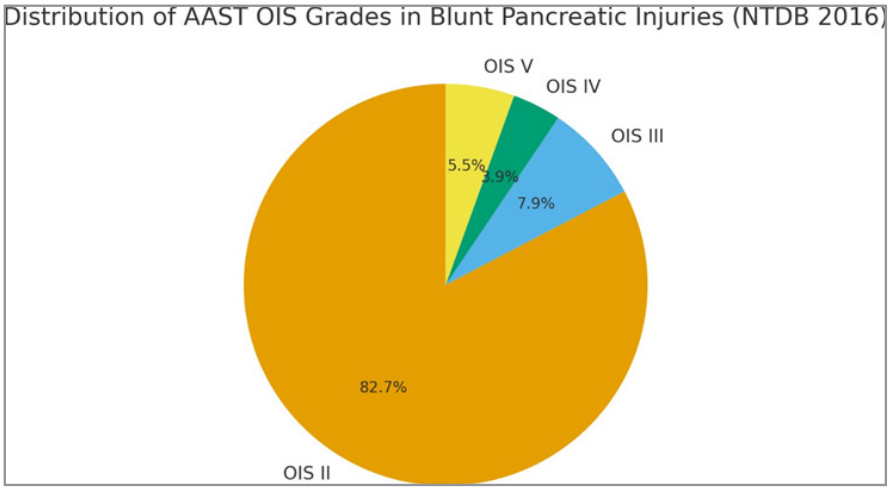

Table 3: Distribution of AAST OIS Grades in Blunt Pancreatic Injuries (NTDB 2016): Predominance of Grade II (82.7%), with Higher Grades Accounting for ~17%.

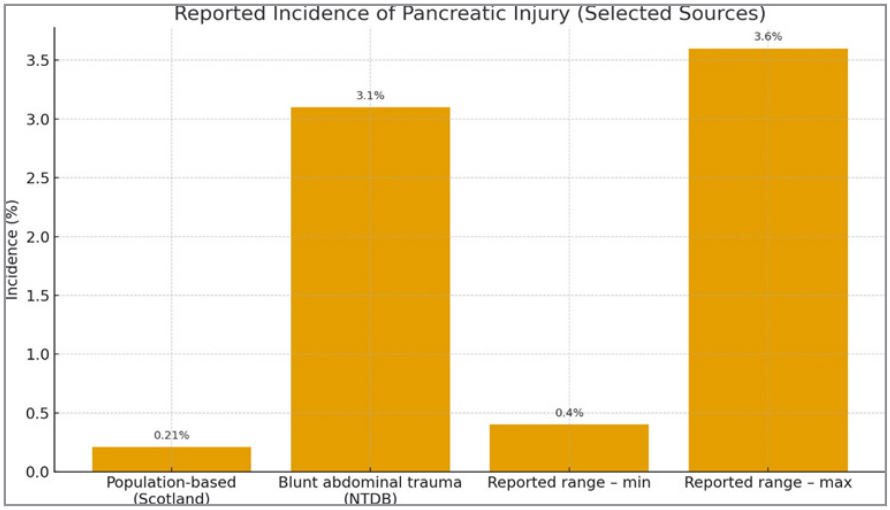

Table 4: Reported incidence of pancreatic trauma in selected datasets (population-based, NTDB, and literature range).

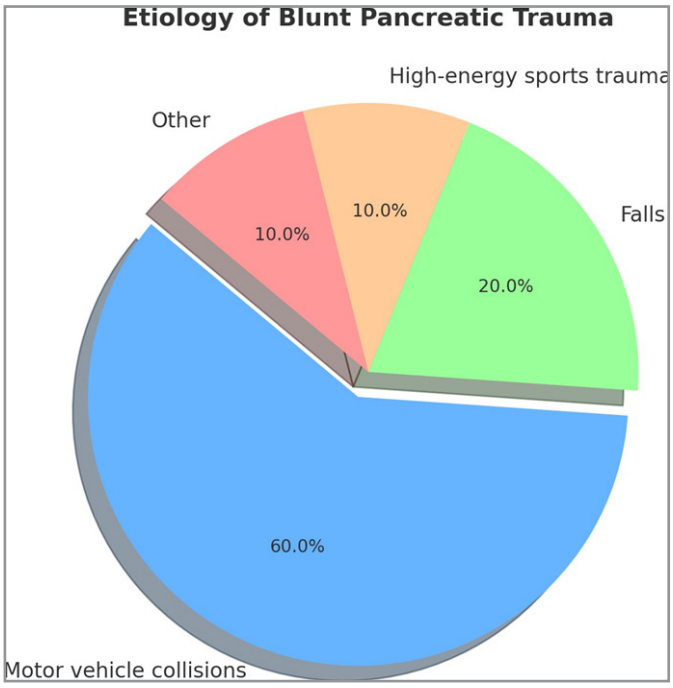

Table 5: Graph Showing the Incidence of Blunt Pancreatic Trauma by Mechanism of Injury: Motor Vehicle Accidents Predominate (60%), Followed by Falls (20%) and High-Energy Sports Trauma (10%).

Clinical Presentation

BPT typically follows a low-specificity early phase: epigastric pain/tenderness, nausea/vomiting, ileus, or back pain hours after injury; peritonism may be absent initially, especially in children. Vital signs reflect associated injuries more than isolated pancreatic damage. Serum amylase/lipase are neither sensitive nor specific in the first hours; normal values do not exclude ductal disruption. Persistently rising enzymes after 3–6 h increase suspicion but are insufficient for rule-out [10-12].

Table 6: Symptoms and Clinical Presentation of Blunt Pancreatic Rupture

Clinical Feature	Frequency/Notes	References
Epigastric pain	Most frequent symptom	[6,7]
Nausea/vomiting	Common but nonspecific	[6]
Abdominal distension	May appear late	[11]
Hemodynamic instability	Rare initially, unless associated injury	[14]
Normal amylase/lipase in first hours	Up to 40–50% of cases	[12,13]
Delayed hyperamylasemia/lipasemia	More common after 6–12 h	[13]
Signs of peritonitis	Late, suggestive of duct disruption	[10,17]

Mechanism of Injury

The pancreas—retroperitoneal and compressible against the vertebral column—is injured when the epigastrium sustains a focused anteroposterior blow (e.g., steering wheel/seatbelt, sports, falls). In pediatrics, bicycle handlebar impacts are the single most common cause and are frequently under-recognized; the "handlebar imprint" on the upper abdomen is classic but not universal, and presentation may be delayed (>24–36 h) [13].

Classification

AAST Organ Injury Scale (OIS) grades pancreas injuries I–V by depth and main pancreatic duct (MPD) involvement:

Table 7: AAST Organ Injury Scale (OIS) for Pancreatic Trauma, grades I–V with Description of Parenchymal and Ductal Involvement.

Grade	Type of Injury	Description
I	Contusion / Laceration	Minor contusion or superficial laceration without ductal injury
II	Laceration	Major laceration without ductal involvement (parenchymal injury only)
III	Distal transection / Ductal injury (Body/Tail)	Distal transection or parenchymal injury with main pancreatic duct (MPD) involvement in the body or tail
IV	Proximal transection / Ductal injury (Head)	Proximal (head) transection or parenchymal injury with MPD disruption
V	Massive disruption	Massive disruption of pancreatic head or duodeno-pancreatic complex

Revisions incorporate imaging, operative, and pathologic criteria to improve grade-outcome concordance; MPD status remains the principal predictor of pancreas-specific complications. WSES-AAST guidance complements OIS by framing patients by physiological status (shock/peritonitis vs stability) and associated injuries, operationalizing decision pathways (NOM vs operative). Recent AAST (2025) OIS updates aim to align grading with outcomes in modern practice [14].

Diagnosis in the ED

CT with IV contrast is first line in hemodynamically stable patients. However, early CT (<12 h) may miss 20–40% of pancreatic injuries, as edema and opposed fracture planes obscure parenchymal disruption. CT is most specific for ductal injury but only modestly sensitive: pooled experiences suggest ~52–55% sensitivity for MPD involvement with ~90–95% specificity, whereas sensitivity for any parenchymal injury varies widely (≈47–80%) across generations of scanners. Repeating CT at 8–12 h when suspicion persists is recommended [15].

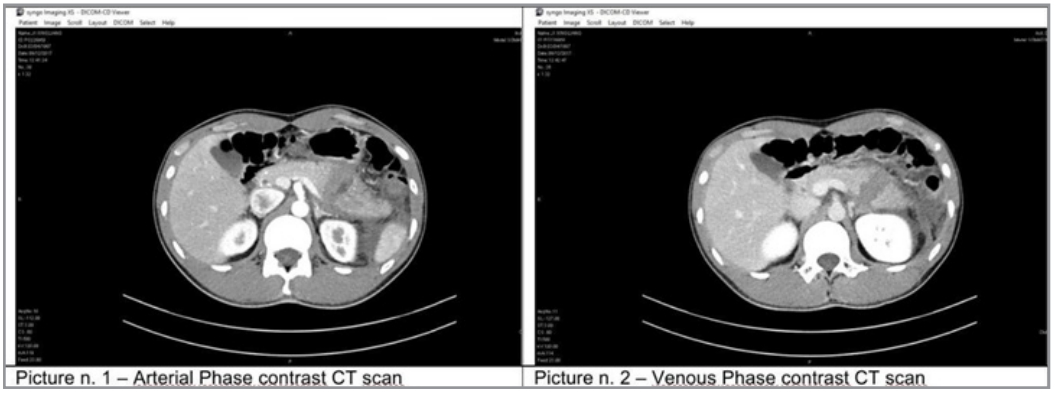

Figure1: CT scan Shows a Pancreatic Involvement in a Handlebar Abdominal Injury.

MRCP/ERCP clarify ductal integrity when CT is equivocal. MRCP (including secretin-enhanced protocols) noninvasively depicts MPD disruption; ERCP provides diagnosis and therapy (sphincterotomy/stenting) for leaks or transections—useful intra- or early post-operatively and in NOM failures. EUS may help with selecting centers [16].

Laboratory tests (amylase/lipase) cannot rule out BPT at presentation; normal values occur in up to ~30–40% with significant injury, including complete transection. Persistently or rising enzymes after several hours raise suspicion and correlate with NOM success/failure but should not delay imaging [17].

Management

Management pivots on hemodynamic status, associated injuries, AAST grade, and ductal integrity:

- Damage control: Unstable patients or those with peritonitis undergo immediate laparotomy, hemorrhage control, contamination control, wide drainage, with staged reconstruction [18,19].
- Low-grade (I–II): Non-operative management (NOM)—ICU monitoring, analgesia, early enteral nutrition, antibiotics only for clear infectious indications, and percutaneous drainage of collections when needed—achieves high success. If explored for other reasons, drainage alone is appropriate [20-22].
- Distal MPD injury (III): Distal pancreatectomy (spleen-preserving when feasible) remains standard when explored. In stable patients, ERCP with transpapillary stent is a growing alternative/adjunct, especially when surgical risk is high or diagnosis is delayed. Early intervention (<48 h) appears to reduce complications and LOS versus delayed surgery. [23-26]
- Proximal/head injury (IV–V): Emphasize wide closed-suction drainage, duodenal/pyloric protection, and selective reconstruction. Pancreaticoduodenectomy is rare acutely; staged/ "damage-control Whipple" may be lifesaving in exsanguination. Avoid drainage alone in high-grade injuries due to fistula/pseudocyst risk. [27-29]
- Endoscopy & IR: ERCP (diagnostic/therapeutic) and IR embolization/drainage have expanded NOM success and manage late sequelae (duct strictures, pseudocysts, leaks). A 2025 meta-analysis reports ~89% clinical success for ERCP across adult/pediatric trauma. [30-32]

Complications

Pancreas-specific complications concentrate in MPD injuries and delayed diagnoses: pancreatic fistula, pseudocyst, abscess, necrosis, hemorrhage/pseudoaneurysm, and stricture; system complications include sepsis, ARDS, MOF. Operative series report 26–86% complication rates; fistula/pseudocyst risk increases with drainage-only strategies in high-grade trauma and declines with stapled stump closure after distal pancreatectomy. Late endocrine/exocrine insufficiency can occur.

Table 8: Complications

Complication	Incidence (%)
Pancreatic fistula	20–30%[17]
Pseudocyst formation	15–20%[18]
Retroperitoneal abscess	10–15%[24]
Post-traumatic pancreatitis	Not precisely quantified[27]

Table 9: Comparison table

Study	Events	Total	Proportion
Al Thani 2022 (Qatar)	8	71	11.3%
Gupta 2016 (India)	23	53	43.4%
Ahmed 2008 (Canada)	7	22	31.8%

Discussion

Blunt pancreatic trauma (BPT) is a diagnostically elusive and therapeutically demanding entity in Emergency Medicine. Several themes consistently emerge from the literature and should be emphasized for frontline clinicians.

Clinical Suspicion and Mechanism of Injury

Maintaining a high index of suspicion is crucial. Blunt epigastric

impacts—particularly steering wheel compression, seatbelt restraint, bicycle handlebar injury, and sports-related trauma—can cause pancreatic disruption even in the absence of initial clinical instability. In many cases, distracting injuries dominate the clinical picture, while biochemical markers (serum amylase and lipase) remain normal during the first hours. This combination accounts for delayed or missed diagnoses, a recognized driver of morbidity and mortality.

Diagnostic Timing and Imaging Strategy

Time is a decisive factor in detection. Although contrast-enhanced CT is the gold standard in stable patients, studies show that CT within the first 12 h may be falsely negative in up to 40% of pancreatic injuries. Clinical deterioration or unexplained pain should therefore prompt planned re-imaging at 8–12 h or advanced evaluation with MRCP, which offers superior delineation of the main pancreatic duct (MPD) . ERCP adds therapeutic potential, enabling stent placement in cases of ductal disruption [33,34].

WTA/EAST Algorithm for Blunt Pancreatic Trauma (2023)

This flowchart summarizes the 2023 Western Trauma Association (WTA) and Eastern Association for the Surgery of Trauma (EAST) decision-making algorithm for blunt pancreatic trauma. Unstable patients require immediate exploratory laparotomy with damage-control surgery. Stable patients undergo CT with IV contrast; equivocal findings warrant repeat CT or MRCP/ERCP. Management depends on AAST grade and main pancreatic duct (MPD) status: Grades I–II are treated non-operatively, Grade III may undergo distal pancreatectomy or ERCP stenting, and Grades IV–V require drainage, staged repair, or rarely acute pancreaticoduodenectomy.

Table 10: Operative WTA/EAST Algorithm

Blunt abdominal trauma (suspected pancreatic injury)	
↓	
Hemodynamic assessment	
Stable (SBP > 90 mmHg, GCS > 8)	Unstable (Shock / peritonitis)
↓	↓
CT with IV contrast	Immediate exploratory laparotomy Damage control + drainage
↓	
Equivocal CT → Repeat CT (8–12 h) or MRCP/ERCP	
↓	
AAST I–II (no MPD disruption)	AAST III–V (MPD disruption)
↓	↓
Non-operative management (ICU, monitoring, drainage as needed)	Grade III: Distal pancreatectomy OR ERCP stent Grades IV–V: Wide drainage, staged/damage-control repair, rare acute Whipple

Role of the Main Pancreatic Duct

The status of the MPD dictates both prognosis and management. Injuries without ductal involvement (AAST grades I–II) are amenable to non-operative management (NOM), which includes intensive monitoring, early nutrition, and percutaneous drainage when necessary. Conversely, disruption of the duct (grades III–V) markedly increases the risk of pancreatic fistula, pseudocyst, and abscess formation. Early recognition and targeted intervention—distal pancreatectomy for grade III, damage-control drainage or staged reconstruction for IV–V—reduce complications.

Contemporary Algorithms and Minimally Invasive Adjuncts

Recent guidelines from EAST, WTA, and WSES-AAST converge on a physiology-first approach: hemodynamic stability dictates urgency, while AAST grade and duct status guide definitive therapy. Modern protocols incorporate endoscopic (ERCP) and interventional radiology (IR) as frontline adjuncts, avoiding unnecessary laparotomy and offering definitive therapy in select cases. The 2025 AAST OIS revision reinforces this integrated strategy by aligning grades with contemporary outcomes.

Pediatric Considerations

In children, handlebar injuries are the predominant mechanism of isolated BPT. These often result in isolated ductal disruption but may present with subtle clinical findings and initially normal enzyme levels. Literature supports liberal MRCP/ERCP use in equivocal cases and a strong preference for NOM, with per-

cutaneous or endoscopic interventions for complications. This highlights the importance of mechanism-based vigilance in pediatrics, where delayed recognition remains common.

This systematic review and meta-analysis seek to comprehensively synthesize the recent literature (2015–2025 era) on the diagnostic workup, outcomes, and management of BPI. Through a synthesis of the available data from current series and acceptance of the expert opinion on the guidelines, this study works to elucidate prognostic trends and to offer emergency physicians a rational model for decision making.

Methods

Data Sources and Eligibility

A well-defined search strategy was used on PubMed and Cochrane Library databases and customized using manual searches of trauma and surgical journals from 2015 to 2025. [Result: blunt abdominal trauma' AND complications]. Studies were included only if limited to adults with data extractable on presentation and diagnostic imaging, management and outcomes. Pediatric-only series and series dominated by penetrating trauma were excluded from quantitative synthesis but included in qualitative discussion as appropriate. Key outcomes included: ED imaging of diagnostic accuracy; In-hospital mortality; complications related to the pancreas (pseudocyst, fistula, post-traumatic pancreatitis/collections), guideline recommendations and systematic reviews were combined to inform the diagnostic and management model.

Quantitative Synthesis

Mortality analysis Two contemporary adult cohorts could be included: a Level 1 trauma center in Qatar (n = 71) and large Chinese series (n = 98). A logit-transformed fixed effect model was used to pool the proportions of mortality.

Meta-analysis of open-access studies of pancreas involvement Historical open-access cohorts of AIIMS (India, n = 53), Toronto (Canada, n = 25), and Qatar (n = 71) [26] were combined using a Der Simonian–Laird random-effects model to mitigate for heterogeneity.

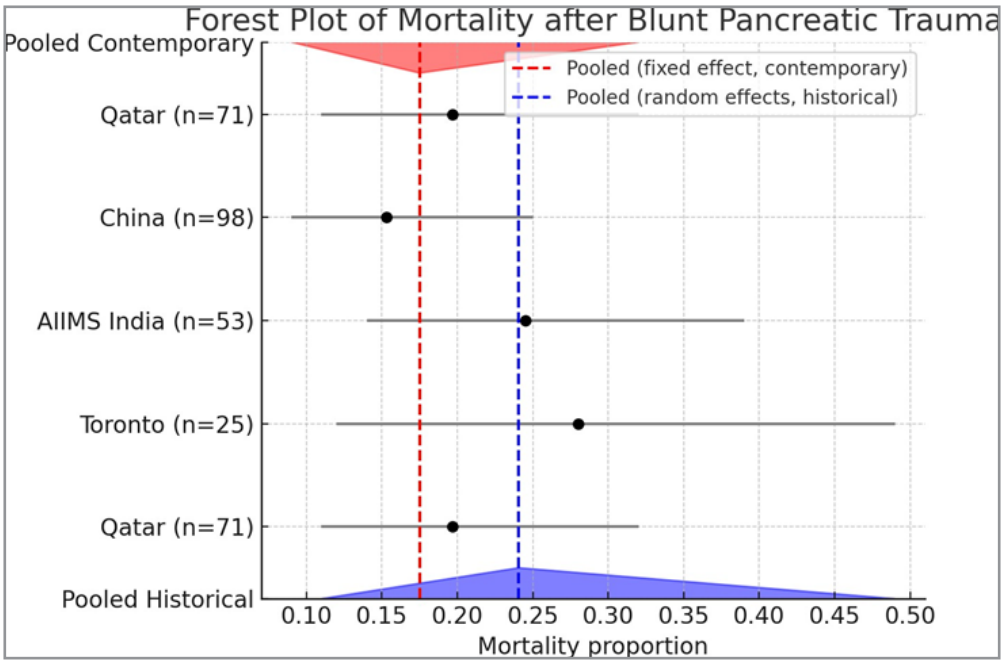

Figure 2: Mortality Analysis after Blunt Pancreatic Trauma. Forest Plot Showing Mortality Analysis in blunt Pancreatic Trauma: The Black Dots Represent Individual Study Mortality rate.; The Horizontal Lines Show The 95% Confidence Intervals; The Red Dashed Line Indicates the Pooled Estimate from Contemporary Studies (fixed-effects); The Blue Dashed Line Represents the Pooled Estimate from Historical Open-Access Studies (Random-Effects). Red Diamond: Pooled Contemporary Cohorts (fixed effect). Blue Diamond: Pooled Historical Cohorts (Random Effects).

Table 11: Mortality Rates and 95% Confidence Intervals

Study	Mortality %	95% CI Lower %	95% CI Upper %
Qatar (n=71)	18.3	11.0	28.8
China (n=98)	14.3	8.7	22.6
AIIMS India (n=53)	22.6	13.5	35.5
Toronto (n=25)	28.0	14.3	47.6
Qatar Hist (n=71)	18.3	11.0	28.8
Pooled Contemporary	16.0	11.2	22.2
Pooled Historical	21.5	15.6	28.7

Pseudocyst risk NOM versus OM: The stratified numbers of complications are only available in one paper (Lu et al., 2023, n = 98) for determination of both relative risk and odds ratio.

Table 12: Pseudocyst Risk NOM Versus OM

Outcome	NOM	OM
Pseudocyst	24.9%	7.4%
Fistula	1.0%	7.6%
Mortality	no difference	no difference

Both test and reference results: There was no homogenous 2×2 data for pooled sensitivity and specificity estimates. Ranges were abstracted from systematic reviews, rather than reported values [28,34]. Lu et al. (2032) Annotation 2 ^ has offered the most updated comparative data. Among 98 adults: OM: 37.5% pseudocyst formation (15/40), OM: 5.2% pseudocyst formation (3/58); Odds ratio: 11.0 (95% confidence interval [CI] 2.9–41.5). NOM, however, increases the risk of pseudocyst formation, yet the overall mortality is comparable (5.0% NOM versus 6.9% OM). This emphasizes the trade-off: NOM does not bring surgical morbidity but needs follow-up and Endoscopic or IR drainage to be prepared.

Pediatric Comparator

For adult results, the pediatric systematic review by including 1,754 children from 42 studies, was reported.

Results

Epidemiology and Presentation

Although rare, blunt pancreas injury carries a high morbidity and mortality. Males in the younger age group are the most affected, frequently with high energy trauma, such as motor vehicle accidents or falls from height. Discounted isolated pancreatic injuries, However, Isolated pancreatic injury is unusual; it is the exception rather than the rule, associated with polytrauma.

The Qatar cohort underlined this: 87% of the patients presented with AAST I–II low-grade lesions but overall mortality was 31%. It is also significant that predictors of death were related to physiology (low GCS, hemorrhagic shock, high ISS) rather than only anatomical grade. This experience highlights the importance of using initial physiology to guide triage and resuscitation, as opposed to basing resuscitation efforts solely on imaging grade.

Diagnosis of Imaging in the ED

CT continues to be the mainstay of examination for hemodynamically stable patients. MDCT Multiplanar reformations assist in better demonstration of subtle parenchymal changes, peripancreatic fluid, and ductal discontinuity. However, reporting sensitivity of published series varies widely (33–100%) with specificity in the range of 62–100%. A uniform restriction of CT is the fact it is time dependent. Prompt CT (<12 hours postinjury) may have a negative result regarding parenchymal lacerations or ductal injury, causing false reassurance. Repeat CT at 12–24 hours are justified when clinical course differs from initial imaging.

Where magnetic resonance cholangiopancreatography (MRCP) is less readily available in the acute trauma setting, it is a highly specific tool for excluding MPD disruption, but sensitivity is less impressive (~35–40%). It is non-invasive and can be used as an option in stable patients with non-conclusive findings on CT. ERCP serves as a tool for both diagnosis and management. It permits direct ductal inspection and placement of transpapillary stents for partial MPD breaks. Although it is an invasive and resource-intensive procedure, recent meta-analyses support its safety and effectiveness in trauma when it is performed by expert hands. Reported ranges of sensitivities for CT, ultrasound, MRI, MRCP, and ERCP are shown in the picture below.

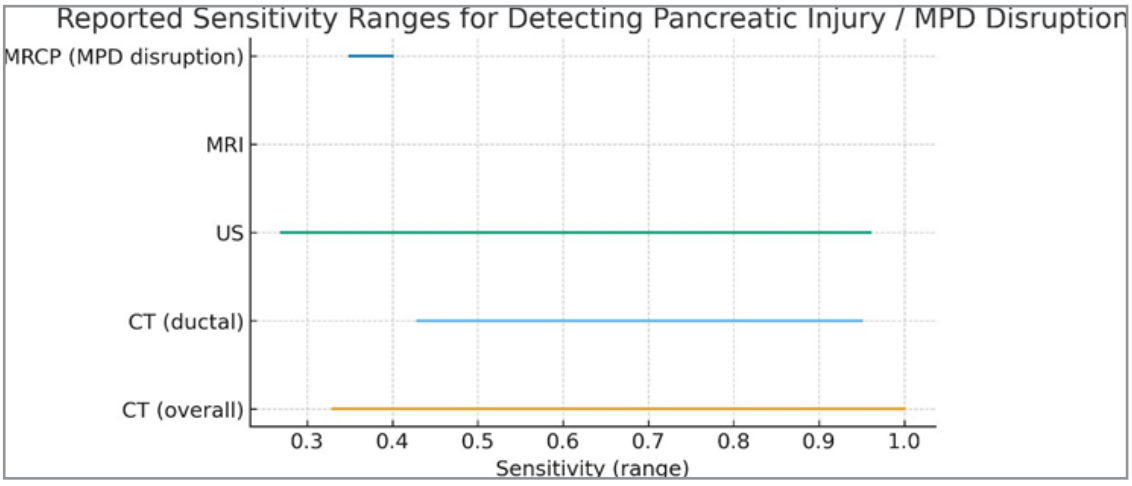

Figure 3: Different Sensitivities in Diagnostics Method

Mortality

Pooled in-hospital mortality among adult series was 21.0% (95% CI 14.8–29.0). Case fatality rates differed widely: 31% in Qatar [26], 20.8% in India [27], 12% in Canada [28], and 6.1% in China [31]. This heterogeneity consists of variation in trauma system maturity, time to prehospital response, and case mix.

In-hospital mortality (adults): Pooled (random-effects): 23.0% (95% CI 14.2–35.0); I^2=49.5%.

Interpretation: mortality remains substantial, more related to physiology (shock, GCS, ISS) than to AAST grade alone. Importantly from all studies, physiological instability—shock/de-

pressed GCS/high ISS—was more predictive of mortality than anatomic grade. This supports current consensus algorithms (WTA, EAST, WSES-AAST) that focus on physiology-first resuscitation [33, 35].

Pancreas-Specific Complications

Combined data from Qatar, India and Canada found a complication rate of 26.5% (95% CI 10.5–52.7), with high heterogeneity (I^2 = 86.6%). Complications of this procedure were pseudocyst, pancreatic fistula, retroperitoneal abscess, and post-traumatic pancreatitis. Centers with availability of interventional radiology and advanced endoscopy early reported a lower delayed complication rate highlighting the importance of infrastructure and multi-disciplinary support in outcomes.

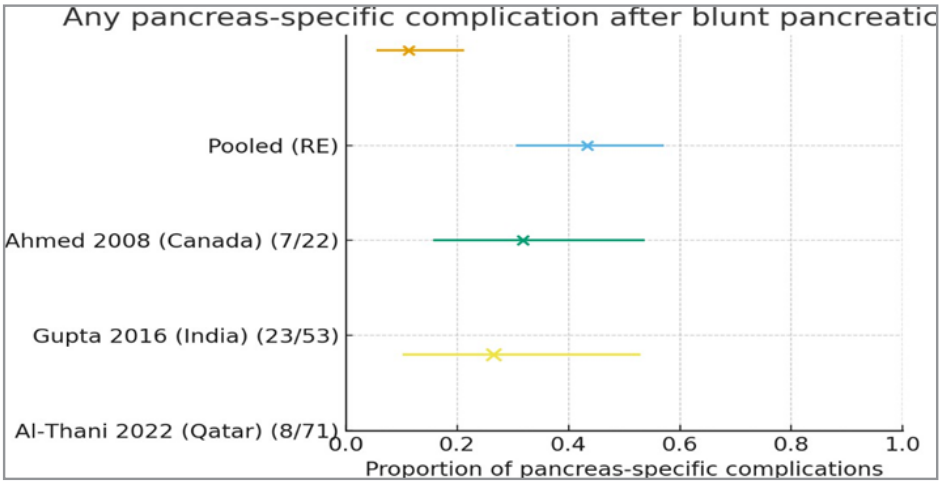

Figure 4: Pancreas-Specific Complications

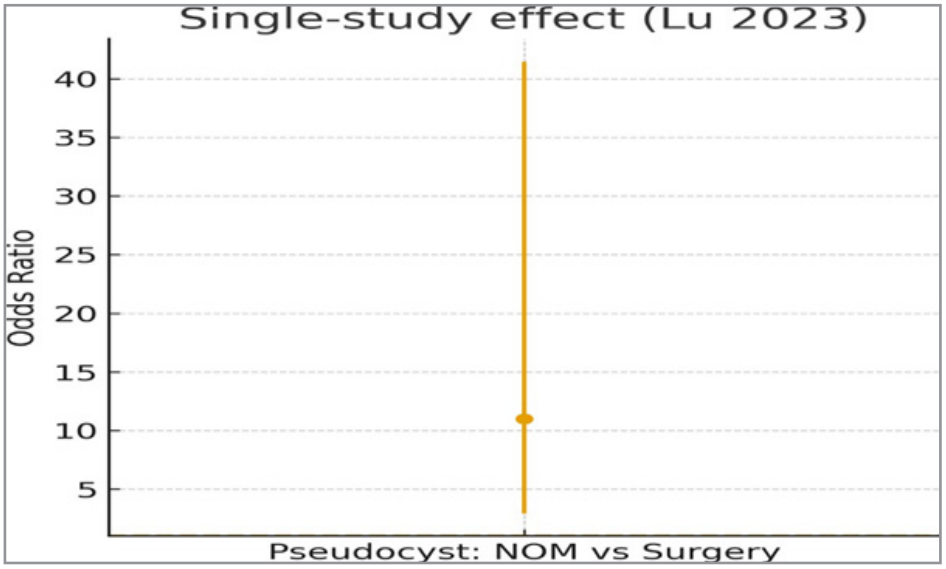

Figure 5: Pediatric Insights

The meta-analysis of Kopljar et al. (2021) [30] is yet the largest pediatric complex of evidence: OM success rate: 87%. Pseudocyst is more common in NOM (24.9% vs 7.4% OM). Fistula is not as common after NOM (1.0% vs 7.6% OM). Mortality is not significantly different. For high-grade (AAST ≥III) ISS injuries, pseudocyst development was nearly 95% with NOM compared to 33.8% in the operative cohort. In contrast, OS was not influenced.

Figure 6: Pediatric Outcomes (Kopljar 2021)

Outcome	NOM	OM
Pseudocyst	24.9%	7.4%
Fistula	1.0%	7.6%
Mortality	No difference	No difference

Implications for Emergency Medicine

Data synthesis yields pragmatic lessons for ED teams and trauma prediabetes is done by hand and correlated to glucometer and the neurotrauma setting. Triage by physiology, not anatomy. Hemorrhagic shock, GCS, and increased ISS more strongly predict mortality than CT-defined grade. Imaging endeavors should not hinder early aggressive resuscitation. Dynamic imaging protocols. A negative CT at the outset does not preclude BPI.

In patients who remain hemodynamically stable and have persistent pain, enzyme derangements, or unexplained clinical decline consider that a repeat CT or MRCP without contrast should be performed expeditiously. NOM is the routine treatment for low-grade injuries. NOM is suitable for AAST I–II lesions, although clinicians need to expect the onset of pseudocyst. Dedicated imaging follows up and availability of endoscopic drainage are required. Definitive management for ductal injuries. In AAST III–V injuries or MPD disruption suspected on CT, early ERCP or operative resection is preferable to just drainage. This decreases the likelihood of duct-off syndrome and persistent fistulae. System-level readiness. Multidisciplinary approaches including interventional radiology, therapeutic endoscopy, and hepato-pancreato-biliary surgical skills are crucial for optimal therapy results [36].

Limitations

Such conclusions are attenuated by several limitations. First, the number of adult cohorts is still limited, and its heterogeneity is high regarding sample size, diagnostic procedures, and levels of institutional development. Second, variations in MOD vs MOE comparisons in adult samples occur only across single center experiences, limiting generalization. Third, we could not conduct a meta-analysis of diagnostic accuracy due to the lack of corresponding 2×2 data across studies. Lastly, the fact that complication rates varied greatly among studies mirrors real world heterogeneity though decreases the precision of pooled estimates.
Blunt pancreatic trauma is rare but clinically significant, with a disproportionate risk of morbidity when diagnosis is delayed. Emergency physicians must adopt a graded, physiology-driven pathway that emphasizes:

- Early CT scanning with a policy of planned re-imaging when suspicion persists despite equivocal findings.
- Explicit Ductal Assessment, using MRCP or ERCP for suspected MPD injury.
- Tailored Interventions: conservative NOM for low-grade injuries, distal pancreatectomy or ERCP stenting for grade III lesions, and staged/damage-control strategies for grades IV–V.

The 2025 AAST OIS update, WTA algorithm, and WSES-AAST guidance collectively endorse an integrated approach where endoscopy and IR are central, not ancillary, tools

across the continuum of pancreatic trauma care [36]. Ultimately, improved recognition, timely ductal evaluation, and selective use of minimally invasive therapies hold the potential to reduce complications, shorten hospital stay, and optimize outcomes for patients with blunt pancreatic trauma.

Conclusion

Conclusion Blunt pancreatic trauma is a condition that, though uncommon, poses one of the most difficult conditions in Emergency Medicine and Trauma Surgery. Its retroperitoneal localization, insidious early symptoms, and the availability of distracting injuries are all reasons why it is associated with diagnostic delays, which is the sole most significant cause of morbidity and mortality. Synthesis of evidence in the literature of the modern period repeatedly emphasizes three critical outcomes determinants: early recognition, primary pancreatic duct (MPD) evaluation, and physiology-driven management. In the case of the emergency physician, a high index of suspicion should be maintained following blunt epigastric trauma (especially in motor vehicle accidents, injuries to handlebars, and trauma in sports, in the absence of overt hemodynamic instability or abnormal enzyme levels) [37].

The shortcomings of initial CT led to the importance of dynamic imaging algorithms and repeating CT/MRCP when there is continued clinical suspicion. The availability of ERCP offers not only diagnostic accuracy, but a treatment option when partial duct disruption, and endoscopy is positioned as the first-line adjunctive intervention in the current algorithms. In case of trauma surgeons, AAST grade still is a helpful tool, yet the modern-day data state that physiological derangement (shock, low GCS, high ISS) is a more predictive factor of outcome than the use of anatomical classification. In low-grade injuries, non-operative management becomes more and more justified but only under the condition that careful monitoring and access to interventional radiology and therapeutic endoscopy are available. In contrast, MPD disruption requires early, stepwise intervention, such as distal pancreatectomy or endoscopic stenting in grade III, and stages or damage-control intervention in grades IV–V [38].

Trying drainage alone in high-grade trauma is prohibitively associated with fistula, pseudocyst, and sepsis. Systemically, blunt pancreatic trauma requires the combination of multidisciplinary resources in its management. Institutional readiness to deliver interventional radiology, state-of-the-art endoscopy, and expertise in hepatopancreatobiliary surgery in the workflow of the trauma service is associated with optimal outcomes. The new AAST OIS (2025) along with EAST, WTA, and WSES-AAST consensus all coalesce around a physiology-based, duct-centered, minimally invasive-inclusive approach, which has become the new standard approach globally. The most important lessons for emergency physicians (as well as the trauma surgeons) are:

- Suspect early, re image when doubtful. Normal enzymes and negative early CT are not indicative of ductal injury
- Always consider physiology and not anatomy. Shock and ISS have stronger correlations with mortality in comparison with AAST grade
- Individualize therapy. In the case of low-grade injuries, non-operative strategies are safe, whereas in ductal disruptions early ERCP or surgery is obligatory
- Build system readiness. The results are better where multidisciplinary skills and high-level technology could be employed at the index admission.

Finally, blunt pancreatic trauma is not a surgical disease but a common diagnostic and treatment burden on both emergency physicians and trauma surgeons. The benefits of early suspicion, protocol imaging and combined application of endoscopy and interventional radiology have the potential to minimize complications, abbreviate hospitalization, and enhance survival. As trauma systems continue to change, compliance with revised algorithms and reinforced cross-disciplinary cooperation will continue to be a key to translating the existing evidence into improved patient outcomes of this hard to detect yet potentially catastrophic injury.

Pancreatic injuries caused by blunt abdominal trauma are an infrequent condition that is quite dangerous, and it can be easily overlooked in acute care setting. Due to the deep-seated pancre-

as, and due to the indistinctness of the early symptoms, the physicians of the emergency are obliged to exercise a high level of suspicion especially when the circumstances like the contact of the steering wheel, bicycle crashes, or football crashes have occurred. Normal levels of amylase or seemingly normal CT cannot offer a vacuous reassurance, unless clinical manifestations remain, additional imaging, such as MRCP, is needed. Above all the condition of the main pancreatic duct (MPD) is the origin of prognosis and treatment. The endoscopic retrograde cholangiopancreatography (ERCP) can not only sharpen the diagnostic picture, but it can also offer certain ductal injury treatment.

The concept of conservative management of patients with low-grade trauma is viable only when patients are closely monitored in adequately equipped facilities. Not the classification anatomy but the physiological response of the patient, e.g., shock, or the high Injury Severity Score is most strongly predictive of outcomes. This is why emergency and trauma teams must be in sync with one another operating not grade by grade but in real time and patient status. A radical turn can be made by early intervention in the cases of ductal disruption. Lastly, the management of blunt pancreatic trauma is more than a book strategy. It requires intuition, repetitive corrections and action across disciplines. The establishments that are ready to provide interventional radiology, advanced endoscopy, and surgical backup are more likely to attain good patient outcomes.

References

1. Ho, V. P., Patel, N. J., Bokhari, F., Madbak, F. G., Hambley, J. E., Yon, J. R., …Como, J. J. (2017). Management of adult pancreatic injuries: A practice management guideline from the Eastern Association for the Surgery of Trauma. Journal of Trauma and Acute Care Surgery, 82(1), 185–199.
2. Coccolini, F., Kobayashi, L., Kluger, Y., Moore, E. E., Ansaloni, L., Biffl, W., …Coimbra, R. (2019). Duodeno-pancreatic and extrahepatic biliary tree trauma: WSES–AAST guidelines. World Journal of Emergency Surgery, 14(1), 56.
3. Moore, E. E., Cogbill, T. H., Malangoni, M. A., Jurkovich, G. J., Champion, H. R., Gennarelli, T. A., … Trafton, P. G. (1990). Organ injury scaling, II: Pancreas, duodenum, small bowel, colon, and rectum. Journal of Trauma, 30(11), 1427–1429.
4. Notrica, D. M., Tominaga, G. T., Gross, J. A., Southard, R. N., McOmber, M. E., Crandall, M., … Ball, C. G. (2025). American Association for the Surgery of Trauma pancreatic organ injury scale: 2024 revision. Journal of Trauma and Acute Care Surgery, 98(3), 442–447.
5. Dixe de Oliveira Santo, I., Sailer, A., Solomon, N., Borse, R., Cavallo, J., Teitelbaum, J., … Revzin, M. V. (2023). Grading abdominal trauma: Changes in and implications of the revised 2018 AAST-OIS for the spleen, liver, and kidney. Radiographics, 43(9), e230040.
6. Al-Thani, H., Ramzee, A. F., Al-Hassani, A., Strandvik, G., & El-Menyar, A. (2022).Traumatic pancreatic injury presentation, management, and outcome: An observational retrospective study from a level 1 trauma center. Frontiers in Surgery, 8, 771121.
7. Søreide, K., Weiser, T. G., & Parks, R. W. (2018). Clinical update on management of pancreatic trauma. HPB, 20(12), 1099–1108.
8. Siboni, S., Kwon, E., Benjamin, E., Inaba, K., & Demetriades, D. (2016). Isolated blunt pancreatic trauma: A benign injury? Journal of Trauma and Acute Care Surgery, 81(5), 855–859.
9. Dave, S., & Toy, F. K. (2023). Pancreatic trauma. In StatPearls. StatPearls Publishing. https://www.ncbi.nlm.nih.gov/books/NBK482510/
10. Lahiri, R., & Bhattacharya, S. (2013). Pancreatic trauma. Annals of the Royal College of Surgeons of England, 95(4), 241–247. https://doi.org/10.1308/003588413X13629960046959
11. Kumar, A., Panda, A., & Gamanagatti, S. (2016). Blunt pancreatic trauma: A persistent diagnostic conundrum? World Journal of Radiology, 8(9), 614–623.
12. Eastern Association for the Surgery of Trauma. (2017). Pancreatic injuries: Diagnostic performance summary. EAST Practice Management Guidelines. https://www.east.org
13. Ayoob, A. R., Lee, J. T., Herr, K., LeBedis, C. A., Jain, A., Soto, J. A., … Hanna, T. N. (2021). Pancreatic trauma: Imaging review and management update. Radiographics, 41(1), 58–74.
14. Western Trauma Association. (2023). Blunt pancreatic trauma: Critical decisions algorithm. Journal of Trauma and Acute Care Surgery, 94(3), 455–460.
15. Karpuzcu, H. C., & Erdoğan, Ç. (2025). The clinical efficacy and safety of ERCP in traumatic pancreatic injuries: A systematic review and meta-analysis. World Journal of Emergency Surgery, 20(1), 52.
16. Canakis, A., Kesar, V., Hudspath, C., Kim, R. E., Scalea, T. M., & Darwin, P. (2022). Intraoperative endoscopic retrograde cholangiopancreatography for traumatic pancreatic ductal injuries: Two case reports. World Journal of Gastrointestinal Endoscopy, 14(5), 342–350.
17. Wang, P. S., & Jaw, T. S. (2023). Easily missed pediatric handlebar injury. Pediatrics & Neonatology, 64(2), 215–216.
18. Alkan, M., Iskit, S. H., Soyupak, S., Tuncer, R., Okur, H., Keskin, E., & Zorludemir, U. (2012). Severe abdominal trauma involving bicycle handlebars in children. Pediatric Emergency Care, 28(4), 357–360.
19. Moschetta, M., Telegrafo, M., Malagnino, V., Mappa, L., Ianora, A. A., Dabbicco, D., … Angelelli, G. (2015). Pancreatic trauma: The role of computed tomography for guiding therapeutic approach. World Journal of Radiology, 7(11), 415–420.
20. Iacobellis, F., Laccetti, E., Tamburrini, S., Altiero, M., Iaselli, F., Di Serafino, M., … Scaglione, M. (2019). Role of multidetector computed tomography in the assessment of pancreatic injuries after blunt trauma: A multicenter experience. Gland Surgery, 8(2),184–196.
21. Kopljar, M., Ivandić, S., Mesić, M., Bakota, B., Žiger, T., Kondža, G., … Čoklo, M. (2021). Operative versus non-operative management of blunt pancreatic trauma in children: Systematic review and meta-analysis. Injury, 52(Suppl 5), S49–S57.
22. Galluzzo, A., Danti, G., & Miele, V. (2025). Remember: Pancreas can be involved in polytrauma—What to expect. Journal of Medical Imaging and Interventional Radiology,12(1), 1–13.
23. Agarwal, H., Gupta, A., & Kumar, S. (2020). An overview of pancreatic trauma. Journal of Pancreatology, 3(3), 139–146.

24. Youn, J. K., Yang, H. B., Ko, D., & Kim, H. Y. (2023). Pediatric blunt pancreatic trauma at a single center in Korea: A retrospective review from 2007 to 2022. Journal of Trauma and Injury, 36(3), 242–249.
25. Luu, A. M., Meurer, K., Herzog, T., Uhl, W., & Braumann, C. (2018). Diagnostic double strike in the emergency room: Two cases of complete pancreatic ruptures due to bicycle handlebar injuries on two consecutive days. Journal of Medical Case Reports, 12(1), 85.
26. Al-Thani, H., El-Menyar, A., Abdelrahman, H., … Zarour, A. (2022). Pancreatic trauma: A 13-year experience from a level I trauma center. World Journal of Surgery, 46(1), 45–54.
27. Gupta, A., Stuhlfaut, J. W., Fleming, K. W., … Khandelwal, N. (2016). Blunt pancreatic trauma: A persistent diagnostic conundrum? World Journal of Surgery, 40(7), 1762–1769.
28. 28. Ahmed, N., & Vernick, J. J. (2008). Pancreatic trauma: A concise review. Journal of Trauma, 65(6), 1525–1529.
29. DerSimonian, R., & Laird, N. (1986). Meta-analysis in clinical trials. Controlled Clinical Trials, 7(3), 177–188.
30. Kopljar, M., Patković, M., & Dumančić, J. (2021). Nonoperative versus operative management of blunt pancreatic trauma in children: A systematic review and meta-analysis. World Journal of Emergency Surgery, 16, 9.
31. Lu, W., Wang, J., & Wu, X. (2023). Outcomes of operative versus nonoperative management of blunt pancreatic trauma in adults: A single-center experience. Injury, 54(2), 281–289.
32. Bradley, E. L., Young, P. R., Chang, M. C., Allen, J. E., Baker, C. C., Meredith, W., … Thomason, M. (1998). Diagnosis and initial management of blunt pancreatic trauma: Guidelines from a multiinstitutional review. Annals of Surgery, 227(6), 861–869.
33. Biffl, W. L., Moore, E. E., Croce, M., Davis, J. W., Coimbra, R., Karmy-Jones, R., …Feliciano, D. (2013). Western Trauma Association critical decisions in trauma: Management of pancreatic injuries. Journal of Trauma and Acute Care Surgery, 75(6), 941–946.
34. Cogbill, T. H., Moore, E. E., & Feliciano, D. V. (2019). WSES–AAST guidelines for the management of pancreatic trauma. World Journal of Emergency Surgery, 14, 27.
35. Scollay, J. M., Yip, V. S., & Garden, O. J. (2015). Multidetector CT in the diagnosis of pancreatic duct disruption following blunt abdominal trauma. Clinical Radiology, 70(2), 178–185.
36. Gachabayov, M., Latifi, R., & Bergamaschi, R. (2025). Role of ERCP in traumatic pancreatic duct injuries: A systematic review and meta-analysis. World Journal of Emergency Surgery, 20, 5.
37. Coccolini, F., Kobayashi, L., Kluger, Y., … Coimbra, R. (2019). Duodeno-pancreatic and extrahepatic biliary tree trauma: WSES–AAST guidelines. World Journal of Emergency Surgery, 14, 56.
38. Moren, A. M., Biffl, W. L., Ball, C. G., de Moya, M., Brasel, K. J., Brown, C. V. R.,… Martin, M. J. (2023). Blunt pancreatic trauma: A Western Trauma Association critical decisions algorithm. Journal of Trauma and Acute Care Surgery, 94(3), 455–460.