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ORIGINAL ARTICLE

# Isolated pancreatic injuries: An analysis of 49 consecutive patients treated at a Level 1 Trauma Centre



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## KEYWORDS

Pancreas;  
Injury;  
Resection;  
Morbidity;  
Mortality

## Summary

**Background:** This study interrogated a large prospectively documented institutional database to determine morbidity and mortality after an isolated pancreatic injury (IPI).

**Method:** Complications were graded according to the Clavien–Dindo classification and the International Study Group of Pancreatic Surgery (ISGPS) definitions. The degree of the pancreatic duct injury was graded using a modified Takishima duct injury classification. Primary endpoints were general and pancreas-specific morbidity and mortality.

**Results:** Four hundred and forty-eight consecutive patients were treated between 1990 and 2014 for pancreatic injuries of whom 49 (median age: 30, range: 13–68 years, 41 men, blunt injuries:  $n = 43$ ) had an IPI. Thirty-four (70%) patients underwent urgent surgery, 20 of whom had a distal pancreatectomy and 14 had external drainage of the pancreatic injury. Fifteen (30%) patients presented with a non-resolving pancreatic pseudocyst or fistula; five had grade 4A or 4B ductal injuries and underwent surgery, 10 with 3A and 3B ductal injuries were successfully managed endoscopically. Fifty-five percent had postoperative morbidity. Two patients (4%) died of non-pancreatic-related causes.

**Conclusion:** While overall mortality is low after an IPI, morbidity is high. Two thirds of patients required operative intervention and one third were treated endoscopically. The degree of pancreatic ductal injury determined whether endoscopic intervention was effective.

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## Introduction

Isolated injuries of the pancreas are uncommon and occur in less than 1% of patients with abdominal trauma [1,2]. Serious sequelae may follow if the magnitude of the pancreatic injury is underestimated or inappropriately treated [3,4]. Neglect of a main pancreatic duct injury invariably leads to major complications, which include pseudocysts, fistulas,

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intra-abdominal sepsis and delayed secondary haemorrhage. Although several substantial reports detailing the management of pancreatic injuries have been published in the past, including from our own institution [5–9], few series have specifically assessed outcome after isolated injuries of the pancreas [10].

A feature of previous publications assessing pancreatic injuries is the frequency of associated collateral visceral and vascular injuries, which profoundly influence outcome and hamper accurate comparative studies [7,8,11,12]. A further limitation of previous reports is the relatively small number of patients included and the absence of a detailed and precise subgroup analysis of isolated pancreatic injuries. Based on our previously published clinical experience [5–9], we hypothesized that much of the morbidity and mortality that occurs as a consequence of a major pancreatic injury is due to collateral damage to adjacent vital organs and in their absence, isolated pancreatic injuries should have a significantly lower complication and death rate. To test this hypothesis the present study used a large, high-quality surgical outcomes database in a cohort of consecutive patients using robust and reliable methodology with objective and reproducible endpoints to assess outcome and injury-specific factors associated with morbidity and mortality after an isolated pancreatic injury.

## Methods

### Study population

The study design was a retrospective cohort analysis using a large institutional database which prospectively documents all patients with pancreatic injuries treated at the Level 1 Trauma Centre and the Hepatopancreatobiliary and Surgical Gastroenterology units in Groote Schuur Hospital, Cape Town. Other aspects of pancreatic injury management using this database have been published previously [5–9]. The study protocol conforms to the ethical guidelines of the “World Medical Association Declaration of Helsinki – Ethical Principles for Medical Research Involving Human Subjects” adopted by the 18th WMA General Assembly, Helsinki, Finland, June 1964, as revised in Tokyo 2004. After approval by the University of Cape Town Human Research Ethics Committee, an analysis was done using data on consecutive patients who had isolated pancreatic injuries at Groote Schuur Hospital between January 1990 and April 2014.

### Data collection

Data were collected and validated by a trained surgical clinical reviewer. Standardized data definitions and reliability audits were conducted on a routine basis to ensure data quality. For the purposes of this study, all clinical records including operative, intensive care, radiology, endoscopic and multidisciplinary clinic reports of patients with pancreatic injuries were accessed from the database and reviewed [5–9]. Variables recorded in the database included patient demographic data, mechanism of injury, revised trauma score, associated intra- and extra-abdominal injuries, anatomic site and grade of pancreatic injury, operative findings and surgical management, presence and type of pancreas-related and other complications, ERP findings and intervention, duration of hospital stay and mortality [5–9]. Hospital length of stay and ICU length of stay were expressed in calendar days.

## Definitions

The severity of the pancreatic injury was graded according to the Organ Injury Scaling (OIS) of the American Association for the Surgery of Trauma (AAST) [13]. Morbidity was considered for systemic, intra-abdominal and specific complications directly related to the pancreatic injury. Pancreatic fistulas were evaluated according to the International Study Group of Pancreatic Fistula classification and used the ISGPS internet-based calculator (<http://pancreasclub.com/calculator/>) to analyze and record results [14]. Infectious complications were defined using the Society of Critical Care Medicine guidelines [15]. Septic shock was defined according to standard accepted criteria from the Society of Critical Care and Medicine consensus statement [16]. In order to quantify morbidity after surgery for pancreatic injuries, the Clavien–Dindo classification of postoperative complications was adapted to evaluate patients undergoing distal pancreatectomy or drainage of the pancreatic injury. Thus, complications were graded and recorded as grades I to VI. Grade III–VI complications were considered as severe. Mortality was defined as any cause of death in hospital after a pancreatic injury.

### Operative management of pancreatic injury

Initial resuscitation was according to Advanced Trauma Life Support (ATLS) guidelines. Urgent surgery was performed in patients who had an acute abdomen with signs of peritonitis, or evidence of major intra-abdominal bleeding or those in whom there was the clinical suspicion of a major pancreatic injury. Operative management of the pancreatic injury was according to a specific operative strategy based on the haemodynamic stability of the patient, the magnitude and extent of associated injuries and the location and severity of the pancreatic injury, strategic details of which have been published previously [5–9].

In brief, the operative technique involved full exposure of the pancreas and evaluation of the integrity of the main pancreatic duct, especially if clues of a pancreatic injury including a lesser sac fluid collection, retroperitoneal bile-staining or crepitus, fat necrosis, or haematoma overlying the pancreas were present [1,5]. If required, a cholangiogram was done using a 25-gauge butterfly needle in the common bile duct and 10 ml full-strength iodinated contrast injected under fluoroscopic control to assess the intrapancreatic bile duct and ampulla. If a duodenal injury was co-incidentally present a 5-Fr paediatric feeding tube was used for operative pancreatography by cannulating the ampulla of Vater. In complex injuries, intra-operative ultrasound and ERCP were used to evaluate duct integrity.

Minor lacerations of the body and tail of the pancreas remote from the pancreatic duct without visible duct damage were managed by external drainage [1,5]. Major lacerations of the body or tail of the pancreas with evidence of a likely duct injury were treated by a distal pancreatectomy. Injuries to the head of the pancreas without devitalization of pancreatic tissue were managed by external drainage. Combined injuries involving the pancreas and duodenum were treated on the merits of each individual case. Duodenal injuries were treated with debridement, single layer primary repair, intraluminal tube drainage and a feeding jejunostomy and the pancreatic injuries were treated with closed suction drainage. Pancreatoduodenectomy was restricted to stable patients with disruption of the ampulla of Vater or

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