



Pancreatic Injuries Following Blunt Injury Abdomen – A Prospective Study

KEYWORDS

Blunt injury abdomen, pancreatic injury

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ABSTRACT

Blunt injury to the abdomen is a common surgical emergency which can lead to internal organ injury. Injury to the pancreas, though rare, can lead to significant morbidity and mortality. Diagnosis and management of pancreatic injuries has always been a topic of discussion with several studies done without any fixed results. This study is an analysis of patients with pancreatic injuries and attempts to forward the observations pertaining to surgical management of pancreatic trauma with special reference to complications.

INTRODUCTION:

Pancreatic injury is an enigma even in modern practice with availability of advanced technology and diagnostic methods. Although isolated pancreatic injury is uncommon, it is generally associated with other organ injuries and the surgeon managing any patient with abdominal trauma must consider the possibility of pancreatic injury. Blunt injuries of abdomen amount to roughly one third of all pancreatic injuries.

The pancreas is a relatively protected organ being positioned high in the retro peritoneum and relatively less injured in typical blunt injuries compared with hepatic and splenic counter parts. Accordingly, many pancreatic injuries are missed and end up causing higher morbidity and mortality. Typical blunt injury to pancreas results from mid upper abdominal trauma by diverse objects.

The effects of pancreatic disruption can be devastating and it is important to realize that subtle findings seen with pancreatic injury makes diagnosis difficult especially in those individuals who have no obvious indication for laparotomy. Prognosis is indicated by the complexity of pancreatic injury, the amount of blood loss, the duration of shock, speed of resuscitation and quality and nature of surgical intervention.

REVIEW OF LITERATURE:

Pancreas is projected to be the 10th most injured structure in trauma. The proximity of pancreas to other vital structures and high energy mechanism involved in pancreatic trauma make isolated pancreatic injuries relatively uncommon. Multi-organ injury is suggests the possibility of a pancreatic injury. Blunt trauma to the pancreas usually results from transmission of high energy force to the retro-peritoneum. Common mechanism involves crushing of the body of the pancreas between a rigid structure such as a steering wheel or a seatbelt and the vertebral column. A history of blunt trauma to the epigastrium along with examination findings of seatbelt marks and flank ecchymosis alert the physician to the potential of pancreatic injury.

While many studies have stressed the significance of a timely diagnosis of pancreatic duct injury, this remains an elusive goal. **Ultrasound** can show free abdominal fluid.

The assessment of pancreas per se is difficult because of retroperitoneal position and the presence of overlying transverse colonic gas². **Amylase** levels elevation in serum or lavage fluid is not sensitive or specific for pancreatic injury but mandates further investigations².

Helical multi-slice CT represents one of the best methods for diagnosis of pancreatic injury. CT findings include: extra-peritoneal fluid, fluid in the lesser sac, pancreatic edema, hematoma and thickening of anterior renal fascia. **ERCP** is accurate by demonstrating extravasation of contrast medium from the duct system and also if a stent is placed in the same session, it is possible to carry out definitive treatment. **MRCP** is non-invasive and is replacing ERCP as the first line investigation. It is particularly useful for patients with pancreatic injuries managed by drainage subsequently developing a persistent pancreatic fistula².

Operative Techniques in Pancreatic Trauma: In most patients, pancreatic injury is suspected at laparotomy by the presence of lesser sac fluid collection, retroperitoneal bile staining and hematoma overlying pancreas. Ductal damage can be determined by direct visualization of ductal violation, complete transection and laceration of more than half the diameter of pancreas, central perforation and severe maceration². Surgical decisions in the presence of severe pancreatic trauma:

1. **Contusions and lacerations without duct injury:** Treated with hemostasis and drainage as attempts to repair capsular lacerations may result in pseudocyst formation.
2. **Distal injury with duct disruption:** Best treated by distal pancreatectomy and splenectomy.
3. **Combined pancreatic and duodenal injuries:** Minor injuries can be managed with primary duodenal repair and pancreatic drainage. In more severe injuries, duodenal decompression is beneficial. In massive destruction of pancreas, duodenum and CBD, pancreaticoduodenectomy is unavoidable.

Complications after Pancreatic Trauma: These are seen in 20-40% of surgically treated patients, especially high in patients with pancreaticoduodenal injuries. These include: pancreatic fistula, abscess, secondary hemorrhage,

pseudocyst formation, pancreatitis, endocrine and exocrine deficiency.

PATIENTS AND METHODS:

A prospective study was conducted in a span of 30 months from June 2012 to October 2014 in patients with pancreatic injuries following blunt trauma in Osmania General Hospital, Hyderabad. They were followed up for a period of 6 months. A total of 24 patients with pancreatic injury following blunt trauma are included in the study.

All the patients were first received at Casualty Department and general survey done to identify emergency conditions and attended to. After securing Airway and Breathing, an intravenous line is secured and resuscitative measures started. Blood samples are drawn for routine blood investigations.

A brief history about the date and time of injury, mode of injury, and the presenting complaints is taken with a special reference to pain abdomen, vomiting and distension of the abdomen. Specific abdominal examination is done with special reference to tenderness, guarding, rigidity and bowel sounds.

INCLUSION CRITERIA:

All patients who are admitted in Osmania General Hospital with pancreatic and associated injuries following blunt trauma to the abdomen are included in the study.

EXCLUSION CRITERIA:

Patients who had associated head and neck injuries and spine injuries are excluded from the study.

Diagnostic workup: After the initial resuscitation and blood investigations, all patients with blunt injury abdomen are taken for plain X-ray of the abdomen and if necessary plain X-rays of other parts of the body are taken. USG and CT scan is done to the patients who are hemodynamically stable.

Patients who were taken up for surgery were taken so after reasonable time of resuscitation.

Management: 22 patients were operated and 2 were managed conservatively. During laparotomy, the hemoperitoneum is evacuated by suction and the injury evaluated and graded using the Pancreatic organ injury scale.

Various Procedures Adopted:

Procedure 1: For Grade I injuries (contusions without duct injuries): control of the bleeding done and drain placed in lesser sac.

Procedure 2: For disrupted pancreatic tissue with or without duct injury, drains were placed. Due to pancreatic edema, repair of pancreatic tissue was not attempted.

Procedure 3: For patients with duct injury, repair of the pancreatic duct was attempted with 5-0 prolene.

Procedure 4: In injuries to neck, body and tail of pancreas with major lacerations or transections and associated pancreatic duct injury, distal pancreatectomy and splenectomy was done.

Procedure 5: Whipple's procedure done in cases of

- Extensive devitalization of head of the pancreas and duodenum.

- Ductal disruption of head of pancreas with injuries to duodenum or distal CBD.
- Injury to the ampulla of Vater.

OBSERVATIONS:

Pancreatic injury due to blunt trauma of abdomen was found to be most common in the age group of 21-30 and 31-40 years (33.3% each) with a male to female ratio of 3.2:1. The time interval between injury and admission ranged from 3.5 hours to as long as 6 days. Most patients took 2-24 hours to reach the hospital. 14 patients presented with unstable vital parameters and needed resuscitation. The time lapse between admission and surgery ranged from 3 hours to 6 days.

Majority (79.16%) of the patients had Road Traffic Accidents as the primary cause of injury followed by fall from height (12.5%) and objects falling on the abdomen (8.33%). Majority (83.33%) of patients presented with pain abdomen with/without Distension of abdomen. The other presenting features included tenderness (75%), guarding and rigidity (58.33%) and vomiting (25%). More than 50% of the patients had associated chest injury. Splenic injury was seen in 37.5% of patients.

Serum Amylase levels were estimated in 18 of the 24 cases of the study and was found to be elevated in 17 cases. Serum lipase levels were estimated in 9 cases and were found elevated in all the cases. 23 of the 24 patients had preoperative ultrasound of abdomen and pelvis. Of the 23 patients, pancreas was visualized only in 6 patients. The findings in these patients were consistent with operative findings. 17 of the 24 patients had a preoperative CT scan abdomen detecting pancreatic injury in 16 cases (94.1%).

41.6% had Grade III injury, followed by Grade II (25%), Grade I (12.5%), Grade V (12.5%) and Grade IV (8.33%). While 2 of the 24 patients were managed conservatively, 22 patients were operated. Most of the patients had either drains placed in lesser sac (33.33%) or distal pancreatectomy (41.66%). Whipple's procedure was done in 2 cases. 62.5% (15 of 24) patients suffered with complications. The most complication was wound infection (5/24). Other complications were pancreatic pseudocyst (4/24), anastomotic leak (2/24), Pancreatitis (2/24), pancreatic fistula (2/24), pancreatic pleural effusion (1/24) and respiratory tract infection (1/24).

DISCUSSION:

The timely diagnosis of pancreatic injury has always been challenging, particularly in blunt trauma patients considering the unreliable physical findings. The precarious location of the pancreas can also cause increased mortality due to associated injury to the adjacent vascular structures. Diagnosis has relied on amylase levels, CT scans and ultrasound with varied levels of success. The optimal management of pancreatic injury once a diagnosis has been reached is also not well established. Conservative management, repair with sutures, non-drainage or drainage of injury have all been employed with varying degrees of success. The literature is filled with several series' describing the experiences of doctors who have had to cope with the rarity of the disease process⁴.

Presentation

The mean age group in the present series was recorded as 33 years with males 95.4% and females 4.6%. Sami et al recorded the mean age group 15 years with males 87.5%

and females 12.5%.

The most common mode of injury in the present series was Road traffic accidents (79%), similar to the study by Bradley et al.

Abdominal pain (83.3%) and tenderness (75%) were the most common symptoms in the present series. Bradley et al, in their study, also recorded abdominal pain and tenderness as the most common presentation.

20 of the 24 patients (83.33%) in the present series had associated injuries. In the study of Bradley et al, 59% of the patients had associated injuries. The presence of associated injuries was linked with increased morbidity and mortality.

Delay in treatment after Injury:

In the present series, 10 patients were operated within 12 hours of injury, 10 between 12-24 hours and 1 after 24hrs. Time delay was not known in one patient and two patients underwent conservative management. Of the patients who were operated within 12hrs of injury, 50% survived. Of those operated between 12-24 hours, 40% survived. 1 patient who had been operated 24 hours after injury due to stable vital data was discharged without any complication.

Bradley et al conducted a retrospective review from 6 institutions and observed that there was an increase in mortality in patients who had a delay in operation¹. **Lin et al** observed that complication rates increased with delay in treatment. **Wisner et al** observed a complication rate of 45% in those operated after 6hrs and 18% in those operated within 6hrs.

This difference in observation of the complication rates with delay in treatment between the previous studies and the present series can be attributed to the difference in severity and mode of injury, the associated injuries and to the small size of the present study.

Imaging

In the present study, sensitivity of USG was recorded as 26%. Sensitivity of USG was recorded as 56% by **Stone et al** and 68% by **Ivatury et al**.

70.83% of the patients (17/24) in the present series had preoperative CT scan abdomen. CT scan was sensitive in detecting pancreatic injury in 16 of the 17 cases (94.1%).

Study	CT Sensitivity
Akhrass et al	47%
Bradley et al	71.4%
Canty et al	70%
Ilahi et al	68%
Present series	94%

In a study done by Akhrass et al, they concluded that

CT often missed or under-graded pancreatic injuries that needed operative intervention implying that a normal CT scan cannot be relied upon. However, in our study, CT was found to be 94% sensitive.

Grade of Injury

In the present series, of the three Grade I injury patients, two developed pseudocysts as a pancreas specific complication. Of the 6 Grade II injury patients, one died (associated duodenal injury was present). Pancreas specific complications were seen in 4 (pancreatitis in two and pseudocyst of pancreas in one and fistula in one). Of the 10 Grade III injuries, only 4 survived. Associated small bowel injury was present in 3 of the 6 patients who died. All the patients with Grade IV and V injuries succumbed to death.

Grade of injury	Bradley et al	Lin et al	Akhrass et al	Ivatury et al	Present Series
I	50.5%	Nil	25%	13.7%	12.5%
II	17.82%	Nil	45%	23.9%	25%
III	29.7%	66.67%	22%	30.4%	41.66%
IV	1.98%	29.16%	7%	18.8%	8.33%
V	Nil	4.16%	11%	13.04%	12.5%

Bradley et al found that there was an increased pancreas specific morbidity and mortality for patients who had main pancreatic duct injury. **Lin et al** observed a complication rate of 60.6% in Grade III injury patients, 53.8% complication rate in Grade IV injury patients and 50% mortality in Grade V injury patients.

The mortality pattern in the present series is comparable with other studies. Increased pancreas specific complications in Grade I injuries can be attributed to the more number of survivors in that group.

Management Strategies:

Stone et al, in their study, concluded that drainage without debridement is adequate for minor injuries and that sump drains should be used.

In the study of **Akhrass et al**, among the grade I and Grade II injuries, 5/13(38.5%) patients who underwent exploration and drainage had complications, as opposed to 2/19 (10.5%) who underwent exploration and no drainage.

It can be suggested that drainage alone suffices for grade I/II injuries while grade III and higher injuries should undergo a resection procedure and drainage in order to reduce morbidity.

Procedure	Stone et al	Jones et al	Ivatury et al	Akhrass et al	Present series

Conservative	12%	20.3%	15.2%	10.7%	8.33%
Drains in lesser sac	23.3%	23.7%	30.4%	18%	33.33%
Duct repair	22%	23.7%	23.1%	5.5%	8.33%
Distal Pan-createctomy	36.3%	27.1%	26.8%	32%	41.66%
Other procedures	6.4%	5.2%	4.5%	33.8%	8.33%

Complications:**Comparison of complications of different studies**

Study	Bradley et al	E. Robey et al	Lin et al	Akhrass et al	Present Series
Pancreatic pseudo-cyst	2.08%	1%	4.16%	3%	16.66%
Pancreatic fistula	18.75%	15%	2.08%	11%	8.33%
Pancreatitis	4.16%	Nil	4.16%	7%	8.33%
Abscess	10.4%	7%	23%	8%	Nil

Mortality:

Early mortality resulted from uncontrolled or massive bleeding due to associated vascular and adjacent organ injuries while late mortality is usually a consequence of infection or multi organ failure.

Mortality rates were recorded as Bradley et al 18.1%, Sami et al 22.7% and Ivatury et al 53%. In our study, mortality rate was 50%. These differences can be attributed to difference in severity and mode of injury, associated injuries and to the small size of the present study.

SUMMARY:

Pancreatic injuries account for 0.2-3% of abdominal trauma. Age and sex of the patients has no association in the outcome of management. Time interval between injury and management has significant association with the outcome. The Grade of injury and the associated injuries both had an impact on the morbidity and mortality of the patients. Overall, Pancreatic injuries of Grade I/II have better outcome out of surgical or conservative management and can be treated by hemostasis and drains. Grade III injuries are better treated by distal pancreatectomy, but the outcome is affected by associated injuries. The outcome of Grade IV/V injuries is poor despite radical resection procedures. Wound infections, pancreatic pseudocysts and pancreatitis are the commonly seen complications. With careful assessment of the injury, pancreas specific complications can be reduced without the need for complex surgical procedures. The mortality rate is high in Grade III or above injuries.

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