



ISOLATED PANCREATIC INJURIES: A CASE SERIES

Surgery

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ABSTRACT

Context: Pancreatic injuries constitutes a set of rare abdominal solid organ injuries. Isolated pancreatic injuries are even more rare injuries and are often missed in initial clinical and radiological evaluation. Such injuries present late and definitive guidelines to manage such injuries are lacking, considering rarity of such injuries. Unpredictable course involves traumatic pancreatitis, pancreatic necrosis, peripancreatic collections, infective complications and extra abdominal complication. **Aims:** The aim of this study is to present clinical details and management outcomes of such cases at our institute. **Settings and Design:** This study is a retrospective analytical study. **Methods and Material:** In this retrospective study medical records of all the admissions were collected from trauma registry from may 2016 to april 2022 at Thanjavur medical college. All these records were screened for patients with isolated pancreatic injuries. **Statistical analysis used:** All continuous variables were analyzed with descriptive statistics and their mean, median, mode, range and frequencies were calculated. All categorical data are analyzed with frequencies. Comparison of data is done using: all nominal data is analyzed with parametric tests (Chi-square test, unpaired t test) and non-nominal data is analyzed with non-parametric tests (Fischer's exact test and Mann-whitney U test). **Results:** In our study a total of 22 cases were included. Mean age being 33.91 years among which 81.8% were males. 72.7% of the patients suffered road traffic accidents. 77.3% of the patients had BMI less than 25. Main pancreatic duct (MPD) involvement was noticed in 22.7% patients. median levels of serum amylase levels were 390U/L. 22.7% patients underwent operative management were as rest were managed non-operatively. Two patients died due to severe pancreatitis. **Conclusions:** Isolated pancreatic injuries in patients where surgery is otherwise not indicated due to other causes needs management tailored to the clinical needs of the patient. Diagnostic ambiguity is best resolved by combining computed tomography (CT) and Magnetic resonance cholangiopancreatography (MRCP). Patients with distal MPD injury are usually operated when presented early and pancreatic stenting is considered when proximal ductal injury is noticed. In selected cases conservative approach is not a contraindication, even in patients with MPD injury, considering high fistula and peripancreatic collection rates in distal pancreatectomy.

KEYWORDS

Abdominal Trauma, Non-operative Management, Isolated Pancreatic Trauma, Pancreas, Distal Pancreatectomy

INTRODUCTION:

Pancreatic injuries are rare abdominal visceral injuries due to their retroperitoneal, far to reach, location in the abdomen and when involved usually have associated injuries. Occasionally isolated pancreatic trauma is present in otherwise benign looking patients. High index of suspicion is required to diagnose such patients as initial imaging evaluation is often normal. Real world data on isolated pancreatic injuries is not robust and requires further studies to strengthen the current literature.

MATERIALS AND METHODS:

STUDY DESIGN

The data of all trauma admissions from may 2016 to April 2022 at Thanjavur medical college trauma and surgical wards were reviewed from trauma registry and evaluated for abdominal trauma. Records of all those patients were retrieved and analyzed.

STATISTICAL ANALYSIS

All continuous variables were analyzed with descriptive statistics and their mean, median, mode, range and frequencies were calculated. All categorical data are analyzed with frequencies. Comparison of data is done using: all nominal data is analyzed with parametric tests (Chi-square test, unpaired t test) and non-nominal data is analyzed with non-parametric tests (Fischer's exact test and Mann-whitney U test).

RESULTS:

Patient characteristics:

This retrospective study included 22 patients with isolated pancreatic injuries. All continuous variables data is presented. The mean age being 33.91 years with standard deviation of 10.198. There were eighteen (81.8%) males and four (18.2%) females. All the patients in the study suffered blunt trauma and none had history of penetrating trauma with mechanism of injury being road traffic accident in sixteen (72.7%) patients and causes other than road traffic accidents in

six (27.3%) patients. Seventeen (77.3%) of these patients had BMI of less than 25 whereas five patients (22.7%) had BMI of greater than 25. Grade I and grade II injuries were noted in two (9.1%) and fifteen (68.2%) patients respectively. Main pancreatic duct involvement was seen in five (22.7%) patients and all of them were grade III injuries. Four out of five patients with MPD injury had BMI <25 but there was no statistically significant difference between BMI and MPD involvement (p=0.869). Head of the pancreas is involved in seven (37.8%) patients whereas body/tail involved in fifteen (68.2%) patients. Only two (9.1%) out of 22 patients were hemodynamically unstable. Mean serum amylase levels were 615 mg/dl whereas median levels were 390mg/dl because of presence of outliers.

Management and outcomes:

All the patients underwent CT and MRCP to assess the grade of injury and were initially admitted in to surgical intensive care unit for observation. In our study patients underwent both operative and non operative management. Five patients underwent operative management which included necrosectomy, distal pancreatectomy and laparotomy-lavage in two (9.1%), two (9.1%) and one (4.5%) respectively. Seventeen (77.3%) of the patients underwent non-operative management, among which two (9.1%) underwent percutaneous external drainage. Ten (45.5%) patients had uneventful recovery whereas peripancreatic collection, pancreatic/ peripancreatic necrosis and pseudocyst developed in six (27.3%), three (13.6%) and three (13.6%) patients respectively.

Extra-abdominal complications were seen in six (27.3%) which were pulmonary complications. There were two (9.1%) hospital deaths. Both of them had severe pancreatic necrosis and underwent surgical intervention in the form of necrosectomy. Mean duration of hospital and ICU stays were 13.14 and 3.82 days respectively, when compared between non operative management group and operative management group, mean duration of 14.12 and 9.8 days (p=0.2).

Serum amylase levels were not significantly related to outcomes($p=0.205$) but statistically significant relationship noticed with that of involvement of MPD($p=0.049$). Mean serum amylase levels in patients with intact MPD is 452.94mg/dl whereas in MPD involved group it is recorded as 1166.80mg/dl. Extra abdominal complications noted in 80% of the patients with MPD injury and 23.53% patients with intact MPD. The relationship between MPD status and extra-abdominal complications is statistically significant.($p=0.39$)

DISCUSSION

Pancreas is rarely affected organ in abdominal injuries and often associated with other solid organ injuries. Incidence of pancreatic injury in our study is 0.58% of all trauma admissions and isolated pancreatic injuries were seen in 0.16%. if only abdominal trauma is considered then pancreatic trauma accounted for 3.8%.and isolated pancreatic trauma accounted for 1.05%. Literature reported incidence is 0.4% to 6% [1,2].

Mechanism of injury in this study is predominantly road traffic accident (72.4%) where as the rest of the injuries were predominantly by physical assault. This finding is supported by the existing studies [3].

All the injuries were blunt trauma to the abdomen and none of the injuries were penetrating type. This is because of the compression of pancreas over the vertebra causing isolated pancreatic injury and penetrating injury causing such isolated injury is less likely considering the viscera surrounding the pancreas keeps it less accessible to the penetrating objects [4].

Contrary to the findings of Herman et al. that serum amylase levels were not associated with MPD involvement [5], our study has shown significance in the relationship between serum amylase levels and MPD involvement. Median serum amylase levels in our study were 390mg/dl.

All the patients underwent CT and MRCP. Though CT abdomen can pick up features of pancreatitis, associated other organ injury and collections ,MRCP was required to diagnose or rule out MPD involvement [6]. Ultrasound is usually less sensitive to diagnose isolated pancreatic injuries.

ERCP can also be used to diagnose pancreatic injuries in centers having such expertise and has the advantage of having potential to image guided therapy. ERCP based classification of pancreatic injuries has also been described [7,8]. We don't have the expertise of pancreatic stenting in our centre and hence we did not consider our patients for ERCP.

Classification of pancreatic injuries- ERCP

Grade Description

- I Normal main pancreatic duct on ERCP
- IIa Injury to branches of main pancreatic duct on ERCP with contrast extravasation inside the parenchyma
- IIb Injury to branches of main pancreatic duct on ERCP with contrast extravasation into the retroperitoneal space
- IIIa Injury to the main pancreatic duct on ERCP at the body or tail of the pancreas
- IIIb Injury to the main pancreatic duct on ERCP at the head the pancreas

Mean age of our patients is 33.91years (interquartile range- 25.75 to 40). Proportion of male (81.8%) patients is significantly higher than female patients(18.2%). Hemodynamical unstable patients had higher risk of mortality in our study and the risk associated was statistically significant($p=0.04$). Most of the patients were referred to our hospital as missed pancreatic injury or with complications due to pancreatic injury. body/tail involved in 68.2% patients consistent with the literature and the reason for this being the location of body/neck over the vertebral bodies. Body and tail of pancreas injuries are easily managed compared to head of pancreas injuries, in view of their complex vascular anatomy and proximity to duodenum [9,10].

Patients with MPD injury had higher risk of extra-abdominal complications than those with out MPD injury. This finding can be attributed to the local collection under the diaphragm leading leading

to pulmonary complications or those that can be related to pancreatitis. Most of these complications were pulmonary and only one patient had associated AKI secondary to severe necrotizing pancreatitis.

Management of pancreatic injuries is based on delay in presentation, hemodynamical stability, intra abdominal collections and status of MPD. Although MPD status is the most defining entity to decide on treatment modality and outcomes [11,12]. In our study patients underwent both operative and non operative management. In our study there five patients underwent operative management which included necrosectomy (two) for severe necrotizing pancreatitis, distal pancreatectomy(two) for and laparotomy-lavage(one). None of the patients underwent trauma Whipple procedure , considering the high mortality(30-40%) of the procedure [13].77.3%of the patients underwent non-operative management, among which two cases were grade III injuries. The reason for managing them conservatively is delayed presentation beyond 48 hrs. conservative management protocol includes bowel rest, adequate pain relief , monitoring by physical examination and blood investigations, and nutritional support [14]. Both cases developed pseudocysts which were drained percutaneously and did not develop any complication after a follow up of one year. Percutaneous catheters were removed after output is nil for a period of at-least 72 hours after radiological confirmation of absence of underlying collection. Out of the patients who underwent operative management for grade III injuries two underwent distal pancreatectomy and one underwent necrosectomy for complete pancreatic necrosis. Both the patients who underwent distal pancreatectomy developed pseudocyst ,which eventually required drainage in one person and spontaneously resolved in another. Both the patients who underwent distal pancreatectomy had fluid collection postoperatively. One among those two required external drainage and other patient had spontaneous remission of pseudocyst. Hence considering significant risk of peripancreatic collection and postoperative pancreatic fistula, conservative management in hemodynamically unstable patients with grade III pancreatic injuries is not an option that should be ruled out. Though the available data is inconclusive, in the real world scenario significant number of pancreatic surgeons consider conservative management in selected set of patients.

Mortality rates of up to 30% and morbidity rates of 45% is documented in studies related to pancreatic injuries [1,12,15].Our study had two patients who died of pancreatic necrosis and both underwent surgery. The decision to operate in one patient was grade III injury and in another was due to hemodynamical instability and strong suspicion of missed bowel injury. Surgical intervention did not alter the course of the patient.

Limitations

Our study suffers from a serious drawbacks like small sample size, derived data is mostly non nominal with wide usage of non-parametric tests in statistical analysis. Although statistically significant conclusions and strong associations can not be drawn from our study, considering the rarity of the condition the number of cases and outcomes can not be ignored.

CONCLUSION

Rare injuries like pancreatic trauma should be managed by centres of expertise. Isolated pancreatic injuries, where laparotomy is unwarranted due to other causes needs management tailored to the clinical needs of the patient. Diagnostic ambiguity is best resolved by combining CT and MRCP. Patients with distal MPD injury are usually operated when presented early and pancreatic stenting is considered when proximal ductal injury is noticed. In selected cases conservative approach is better even in MPD injury, considering high fistula and peripancreatic collection rates in distal pancreatectomy.

Table

Statistics						
		Age(y ears)	Presentati on(hours)	Serum amylase(U/L)	Hospital stay(days)	ICU stay(days)
N	Valid	22	22	22	22	22
	Missi ng	0	0	0	0	0
Mean		33.91	27.68	615.18	13.14	3.82
Medi an		32.50	18.50	390.00	14.50	4.00

Std. Deviation	10.198	21.799	721.340	6.512	1.435	
Range	37	72	3455	26	4	
Minimum	18	6	45	2	2	
Maximum	55	78	3500	28	6	
Percentiles	25	25.75	11.75	261.75	7.75	2.00
	50	32.50	18.50	390.00	14.50	4.00
	75	40.00	39.00	813.00	17.25	5.00

ICU: intensive care unit

Group Statistics					
	MPD status	N	Mean	Std. Deviation	Std. Error Mean
Serum amylase	MPD intact	17	452.94	332.025	80.528
	MPD injury	5	1166.80	1341.104	599.760

MPD: main pancreatic duct

P value is 0.049(unpaired t test)

MPD status * extaabdnomial Crosstabulation			
Count		extaabdnomial	
		yes	no
MPD status	MPD intact	4	13
	MPD injury	4	1

MPD: main pancreatic duct

Chi-Square Tests						
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	5.324	1	.021	.039	.039	
Continuity Correction ^b	3.164	1	.075			
Likelihood Ratio	5.287	1	.021	.115	.039	
Fisher's Exact Test				.039	.039	
Linear-by-Linear Association	5.082	1	.024	.039	.039	.037
N of Valid Cases	22					

a. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.82.

b. Computed only for a 2x2 table

c. The standardized statistic is -2.254.

Intervention				
		Frequency	Percent	Cumulative Percent
Valid	Conservative	15	68.2	68.2
	external drainage	2	9.1	77.3
	Surgery	5	22.7	100.0
	Total	22	100.0	

Group Statistics					
	NOM vs OM	N	Mean	Std. Deviation	Std. Error Mean
Hospital stay	NOM	17	14.12	6.163	1.495
	OM	5	9.80	7.259	3.247

NOM: non-operative management, OM: operative management

P-value is 0.2(unpaired t t

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