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RESEARCH ARTICLE

ROLE OF 128 SLICE MDCT IN PANCREATIC TRAUMA DIAGNOSIS AND MANAGEMENT

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Abstract

Aims and Objectives: This study aimed to detail how multi-detector computed tomography (MDCT) can be utilised to the study diagnosis of pancreatic trauma and its management.

Material and Methods: This Hospital-based prospective study was carried out over 10 months from December 2020 to SEP 2021 at the Department of Radiodiagnosis, Narayana medical college, Nellore. 30 patients with pancreatic injury were included in study. All patients underwent Contrast enhanced computed tomography abdomen on128 slice CT(GE OPTIMA 660).Grading of pancreatic injury done using American Association for the surgery of trauma organ injury scale .One patient underwent MRI abdomen and MRCP. 20 patients are treated conservatively. 10 out of 30 patients underwentsurgery.Intraoperative findings noted.

Results:

1. According to American Association for the surgery of trauma organ injury scale 19/30 patients are of grade I &grade II injury. 6/30 in grade III and 5/30 were grade IV injuries.
2. Grade I &II patients were managed conservatively and improved remarkably on followup.
3. Grade III&IV patients underwent surgery and CT findings are confirmed intraoperatively.
4. 6 patients with grade III injury undergone Distal pancreatectomy + Splenectomy and 4 patients undergone Spleen preserving Distal Pancreatectomy.
5. Grade IV patients initially managed conservatively in which 4 patients developed pseudocyst they were treated with cystogastrostomy and one patient developed fistula .This fistula was initially controlled with Percutaneous catheter drainage followed by roux -en- y fistulojejunostomy .

Conclusion:

1. CT represents an accurate tool for diagnosing pancreatic trauma, it provides useful information to plan therapeutic approach .

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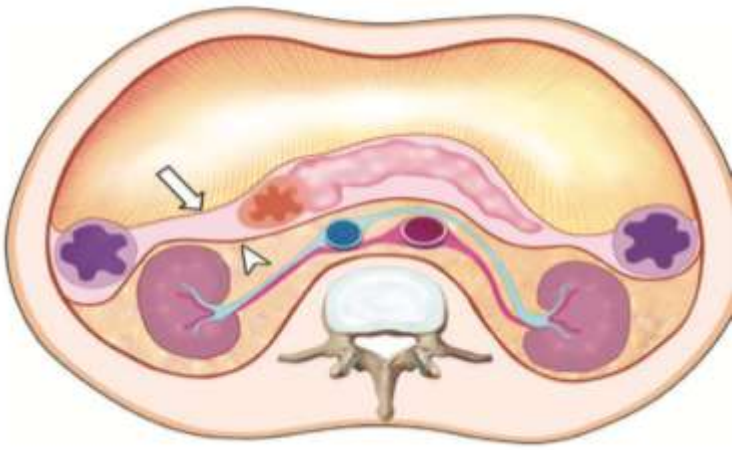
Introduction:-

Pancreas is shielded retroperitoneal location, pancreatic injuries occur in only about 2% of all patients with trauma injuries and in 10%of those with other intra-abdominal injuries

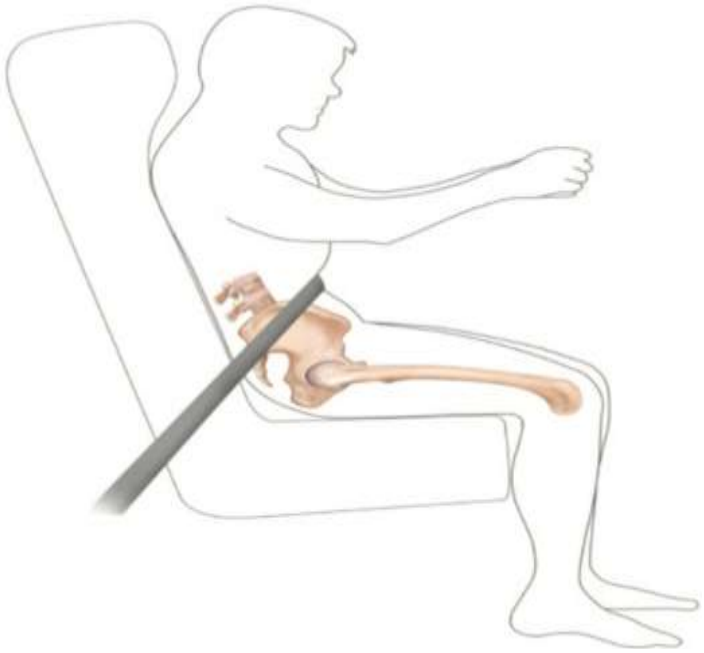
In a recent large 5-year retrospective study, Kuza et al (6), using the National Trauma Data Bank, found pancreatic trauma to have a prevalence of 0.3%, with 61% of cases due to a blunt trauma mechanism and 39% of cases due to penetrating injury.

In the setting of trauma, fluid and/or hemorrhage in the anterior pararenal space should raise suspicion for pancreatic injury.



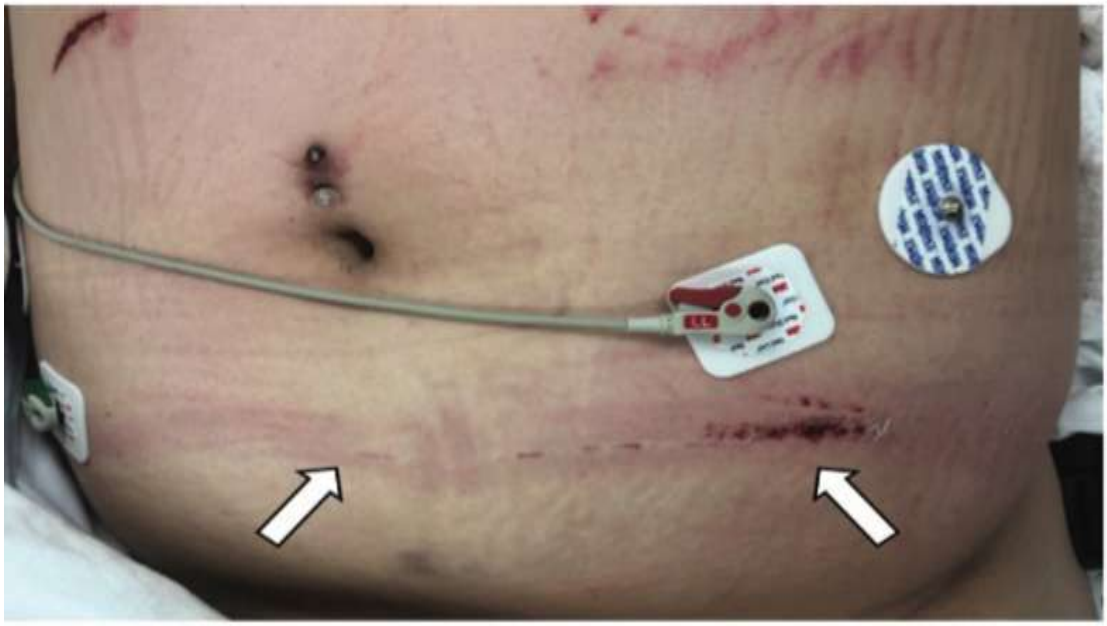
Mechanism of injury

1. Most blunt injuries are caused by deep anterior to posterior intrusive forces compressing the pancreas against the spine, as evidenced by most injuries occurring in the pancreatic body .
2. In adults, steering wheel injuries or lap belt injuries from cranial malpositioning are common.
3. Handlebar injuries and nonaccidental trauma are relatively unique to the pediatricpopulation .
4. In penetrating trauma, the tract and depth of penetration often predict the likelihood of pancreatic injury



Clinical features:

1. Physical examination findings such as the seat belt sign and flank hematoma may be present, but they are not specific
2. . Furthermore, laboratory results, such as serum amylase levels, may be normal in the acute setting
3. . Fever, upper abdominal pain, and leukocytosis can be associated with pancreatic injury.
4. However, these are nonspecific signs, and, thus, their absence does not reliably exclude injury
5. As a result, the diagnosis relies heavily on imaging findings



Imaging

1. For hemodynamically stable patients, contrast- enhanced CT is the initial step in the pancreatic trauma imaging pathway. CT remains the primary initial imaging modality of choice for patients with blunt or penetrating trauma, as it facilitates rapid image acquisition with near-isotropic voxels.
2. This acquisition permits the construction of multiplanar reformatted images, which are particularly valuable in evaluating for MPD injury

MRI/MRCP

1. In the setting of pancreatic trauma, combined MRI and MRCP (MRI/MRCP) is used as a problem-solving tool for noninvasive assessment of MPD integrity or to better define parenchymal injury, typically in hemodynamically stable patients who have equivocal CT findings or negative initial CT findings but high clinical suspicion for pancreatic injury. MRCP can depict the MPD
2. In the pancreatic body in up to 97% of cases and in the pancreatic tail in up to 83% of cases
3. Protocol commonly used includes acquisition of
   a. axial T1- and T2-weighted MR images,
   b.an axial and coronal fast spoiled gradient-echo imaging with steady-state free precession and single-shot fast spin-echo T2-weighted MRI sequence,and
   c.heavily T2-weighted three-dimensional MRI sequences for MRCP.
   d.Contrast- enhanced T1-weighted fat-saturated MRI also may aid in delineating pancreatic parenchymal injuries and associated fluid collections
   ERCP:
   1. ERCP is considered the most accurate diagnostic tool for MPD evaluation
   2. This imaging examination involves the advancement of a duodenoscope from the oropharynx to the second part of the duodenum to directly visualize the major papilla. Once a cannula is inserted into the major papilla and MPD via a catheter, contrast material is injected under fluoroscopic guidance.
   3. Ductal injury is confirmed at ERCP with evidence of abrupt MPD termination or contrast material extravasation.
   4. The major advantage of ERCP, as compared with MRCP, is the capability for direct image- guided intervention in hemodynamically stable patients . In the presence of MPD injury, ERCP can be used for stent placement. It can also assist in the management of MPD injury–related late complications (eg, pseudocyst and fistulas)

Table 1: Definitions and CT Findings of Pancreatic Injuries

Injury Feature	Definition or CT Findings
Term	
Contusion	Indistinct area of parenchymal edema
Laceration	Discrete linear or branching area of parenchymal tear or injury
Proximal pancreas	Tissue to right of SMV–portal vein axis
Distal pancreas	Tissue to left of SMV–portal vein axis
Tissue loss	Nonsalvageable geographic region of tissue destruction characterized by loss of identifiable architecture at imaging and/or traumatic displacement from pancreas
Direct CT findings	Pancreatic swelling or enlargement
	Laceration
	Transection
	Parenchymal hematoma
	Inhomogeneous enhancement

Indirect CT findings	Thickening of anterior renal fascia Induration of peripancreatic fat Extraperitoneal or intraperitoneal fluid Fluid in lesser sac Peripancreatic fluid and fluid interdigitating between splenic vein and pancreas Associated left upper quadrant (eg, splenic), hepatobiliary, or duodenal injuries

Table 2: AAST-OIS Grading of Pancreatic Trauma

Grade*	Description*	Injury Morphology
I	Minor contusion without ductal injury	Contusion
	Superficial laceration without ductal injury	Laceration
II	Major contusion without ductal injury or tissue loss	Contusion
	Major laceration without ductal injury or tissue loss	Laceration
III	Distal pancreatic transection (through-and-through laceration)	Laceration
	Deep parenchymal injury with ductal injury (can involve tissue loss)	Laceration
IV	Proximal pancreatic transection (through-and-through laceration)	Laceration
	Deep parenchymal injury involving the ampulla (can involve tissue loss)	Laceration
V	Massive disruption of pancreatic head	Combination†

Grade I

CT findings can be delayed, with approximately 20%–40% of parenchymal injuries being occult at CT performed within 12 hours after the injury

In contrast, peripancreatic oedema is almost always present with pancreatic contusion.Therefore, the possibility of pancreatic contusion should be raised when peripancreatic oedema is present

Given that injury to surrounding structures, such as the liver and spleen, is common in pancreatic trauma, it may be difficult to attribute the source of peripancreatic fluid specifically to the pancreas. In such cases, correlation with pancreatic enzyme levels may be helpful

The AAST-OIS group advises advancing the injury grade byone grade in cases of more thanone discrete injury grade, without exceedinggrade III.

As the presence of two gradeI injuries would represent a grade II organinjury and a combination of grade I and grade II injuries would constitute a grade III injury.

Grade II

While the distinction between minor injury and major injury is not well established, major laceration is usually considered when the injury involves 25%–50% of the pancreatic depth.

Grade III:

A grade III pancreatic injury is defined as a deep pancreatic laceration with MPD injury or distal pancreatic transection (occurring to the left of the SMV–portal vein axis)

In addition, a grade III injury may be diagnosed on the basis of a combination of separate grade I and grade II injuries,

If CT findings are equivocal, MRI/MRCP can be used to further define the parenchymal injuries, evaluate MPD integrity, and confirm the injury grade.

According to the 2019 World Society of Emergency Surgery guidelines, contrast-enhanced CT should be performed in hemodynamically stable patients, with follow- up CT in 12–24 hours considered when thereis high suspicion for MPD injury with negative initial CT results.

Grade IV:
Injuries to the proximal pancreas that involve the MPD are considered to be grade IV injuries.

A grade IV injury is defined as proximal transection or parenchymal injury involving the ampulla

Compared with distal pancreatic injuries, proximal pancreatic injuries are associated with a worse prognosis and higher mortality rates. Poor outcomes of higher-grade injuries are likely to be due to concomitant vascular injuries, the high likelihood of additional solid organ and hollow viscus injuries, and the anatomy of the proximal pancreas (ie, its intimate relation- ship with the vital mesenteric root vasculature, ampulla, distal common bile duct, and second portion of the duodenum), limiting surgical and other treatment options

Grade V:
Grade V injuries are associated with the highest morbidity and mortality

A grade V pancreatic injury, as compared with a grade IV injury, is defined as a massive disruption in to the pancreatic head and is associated with a higher likelihood of concomitant duodenal and/or vascular injury .

A grade V injury can be conceptualised as a “shattered” pancreas

Vascular injury:
Although vascular injury is not included in the AAST-OIS classification, the radiologist needs to report it in a timely manner because it can affect the treatment and prognosis,

Complications:
The most common complications of pancreatic trauma include pancreatic fistula (20%–35% of cases), abscess (10%–18%), post- traumatic pancreatitis (10%), and pseudocyst (5%).

Less common com plications include vascular injury, MPD stricture resulting in chronic obstructive pancreatitis, septicemia, and multiorgan failure

In addition, because severe pancreatic trauma is often associated with multiorgan injury, it may be managed via an open abdomen.

After longer periods of this management, the intra-abdominal contents may become encased by granulation tissue, leading to a “frozen abdomen”

MRCP to assess the integrity of the MPD is helpful for guiding the management of post traumatic pseudocyst, because an intact MPD is usually responsive to percutaneous drainage, whereas a disrupted MPD requires endoscopic stent placement

Erosions caused by free pancreatic enzymes can result in arterial pseudoaneurysm, most often involving the splenic, gastroduodenal, or common hepatic arteries.

Management:
Management of traumatic pancreatic injuries depends on multiple factors, including mechanism of injury (blunt versus penetrating trauma), AAST- OIS injury grade, hemodynamic status of the patient, and extent of associated organ damage

In the setting of abdominal trauma, the initial management is based on the patient’s stability, with priority given to controlling bleeding and intestinal content spillage. Unstable patients are often managed immediately with exploratory laparotomy and damage-control surgery. Peri- pancreatic fluid collections can be managed with closed-suction drainage systems

Patients with low-grade (grades I and II) pancreatic injuries are typically managed nonsurgically, as these injuries do not involve the MPD

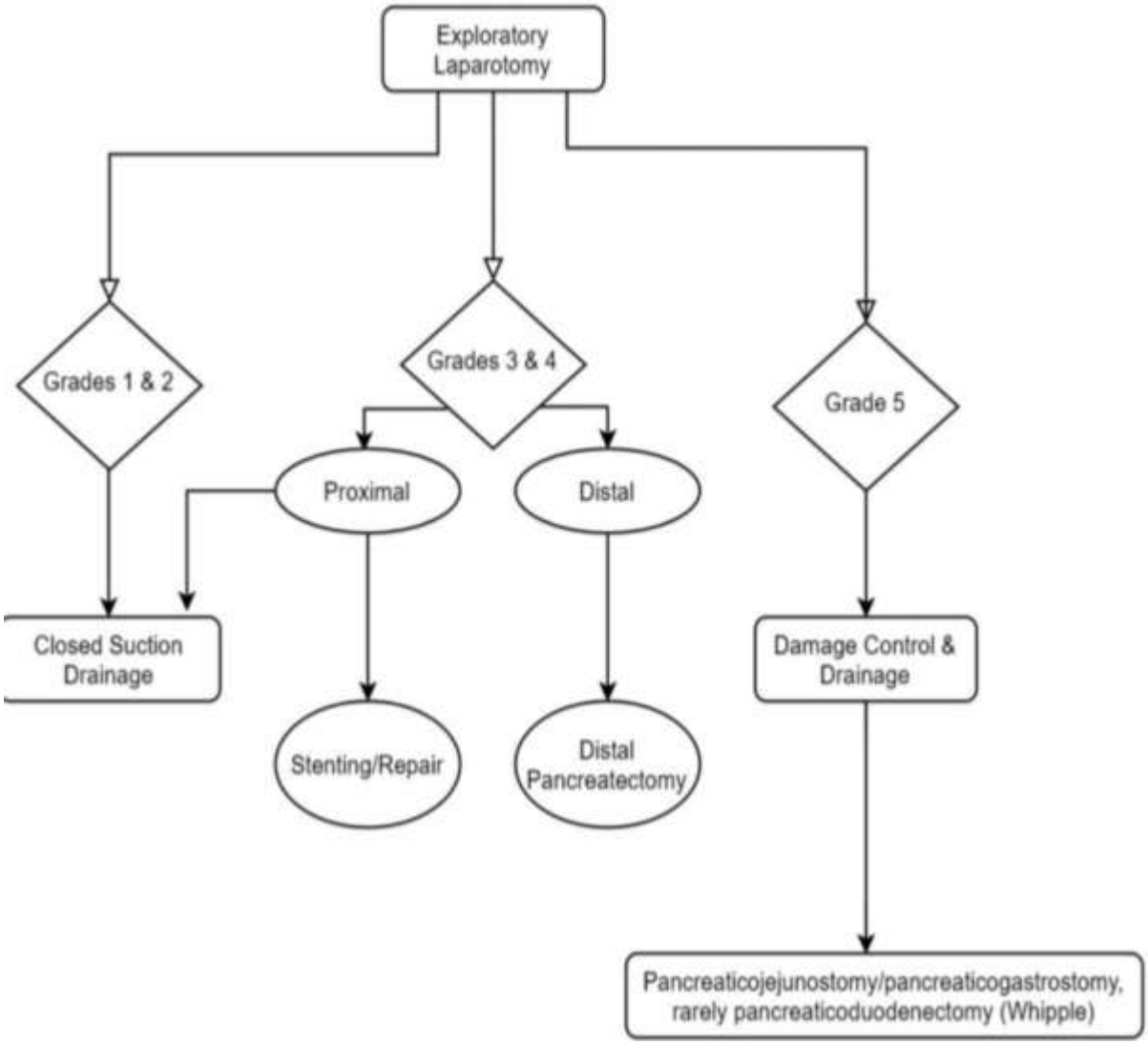
Management options include supportive care (fluid resuscitation, analgesia, and close monitoring of vital signs and laboratory values), surgical hemostasias, and/or closed-suction drainage

Grade III and grade IV pancreatic injuries are commonly managed surgically to prevent pancreatic ascites or a major fistula .

Proximal MPD injuries (to the right of the SMV–portal vein axis) can be managed with closed-suction drainage, with or without endoscopically guided stent placement.

Distal MPD injuries (to the left of the SMV– portal vein axis) are often treated with distal pancreatectomy

Grade V pancreatic injuries typically lead to damage-control surgery with drainage. Because duodenal injuries often coexist with this grade of injury, gastric diversion is accomplished with pancreatojejunostomy or pancreaticogastrostomy, with the latter more preferred



Aims and Objectives:-

This study aimed to detail how multi-detector computed tomography (MDCT) can be utilised to the study diagnosis of pancreatic trauma and its management.

Materials and Methods:-

Place of study:
Department of Radiodiagnosis, Narayana Medical college and Hospital, Nellore.

Type of study:
Prospective study

Sampling method:
Patients with clinical suspicion of pancreatic trauma are sent for CECT abdomen

Inclusion criteria
1) Patients with strong suspicion for pancreatic injury.
2) All age groups.
3) Both sexes.

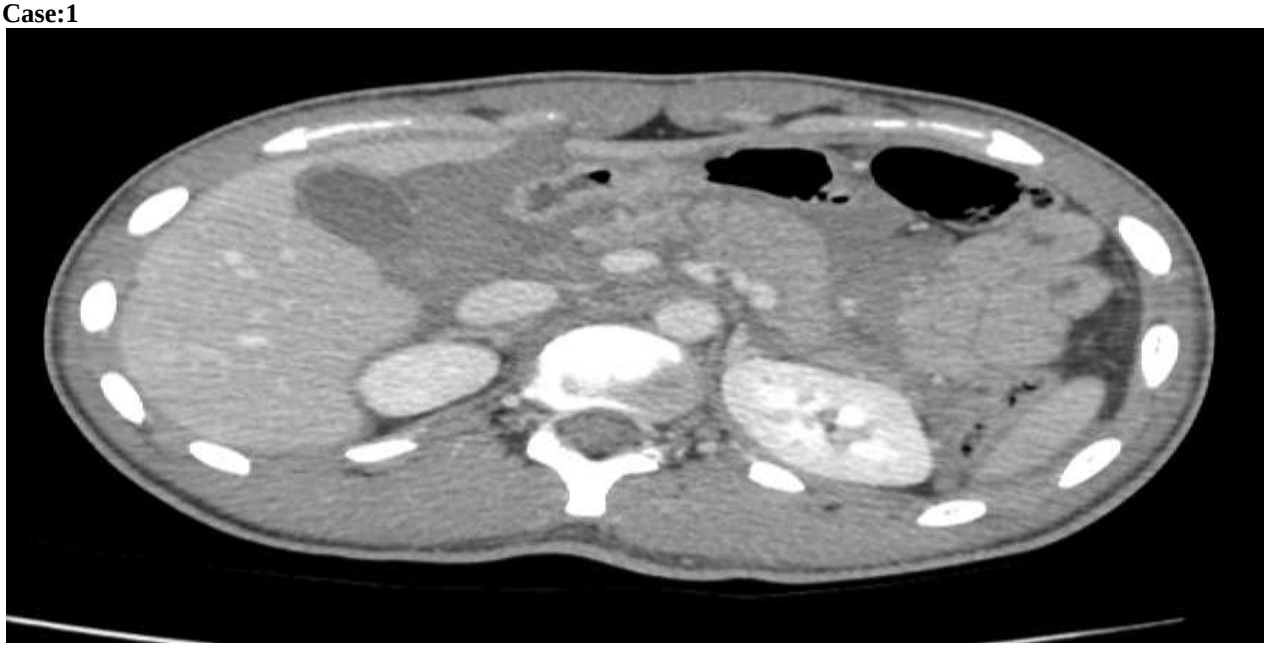
Exclusion criteria
1) Patients with hypersensitivity reaction to contrast .
2) Patients with metallic stents or implants

Technique:
All CT examinations were performed by using a 128-slice CT scanner (Somatom 660; Siemens Healthcare).Before undergoing scanning all patients being assessed for trauma should receive an intravenous bolus(100-150ml [350 mg of iodine per mililiter; total iodine load ,35.0-52.5g] of contrast material ,injected at 3-5 ml per second via an 18 or 20 gauge cannula. Ideally,the cannula would be placed in a large peripheral vein.With the use of dual syringe power injector ,the contrast material injection can be immediately followed by a 30-70ml saline bolus injected at 3-5ml per second.The use of oral contrast material contributes to delay in CT scanning and is not used in patients with blunt trauma ;however its use in the setting pf penetrating trauma remains controversial.

It is common to acquire primary axial 0.6-2.5mm thick images with a pitch of 1.0-1.8.

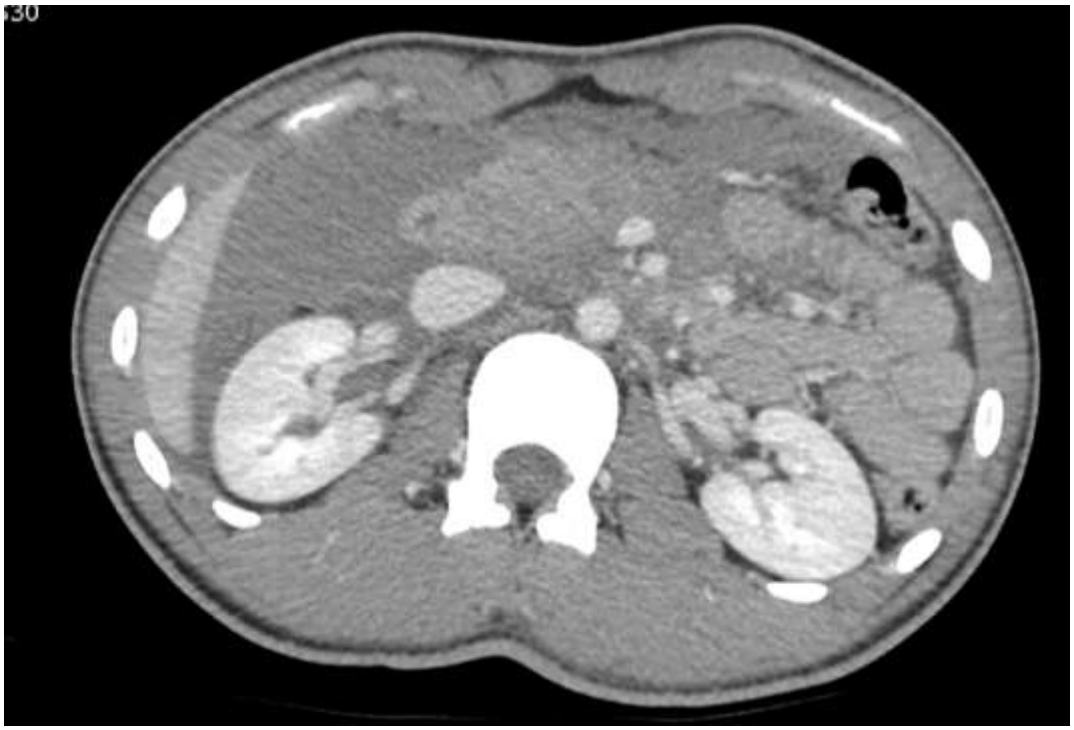
The standard trauma protocol has included portal venous phase abdominal and pelvic CT sequence performed 65-80 seconds after the administration of contrast material. The mean attenuation value for the pancreatic parenchyma peaks (82.1-85.2HU) at 35-45 seconds after the start of the injection. Peak pancreatic arterial attenuation and venous attenuation occur at 25-40 seconds and 55-60 seconds respectively.

Case:1



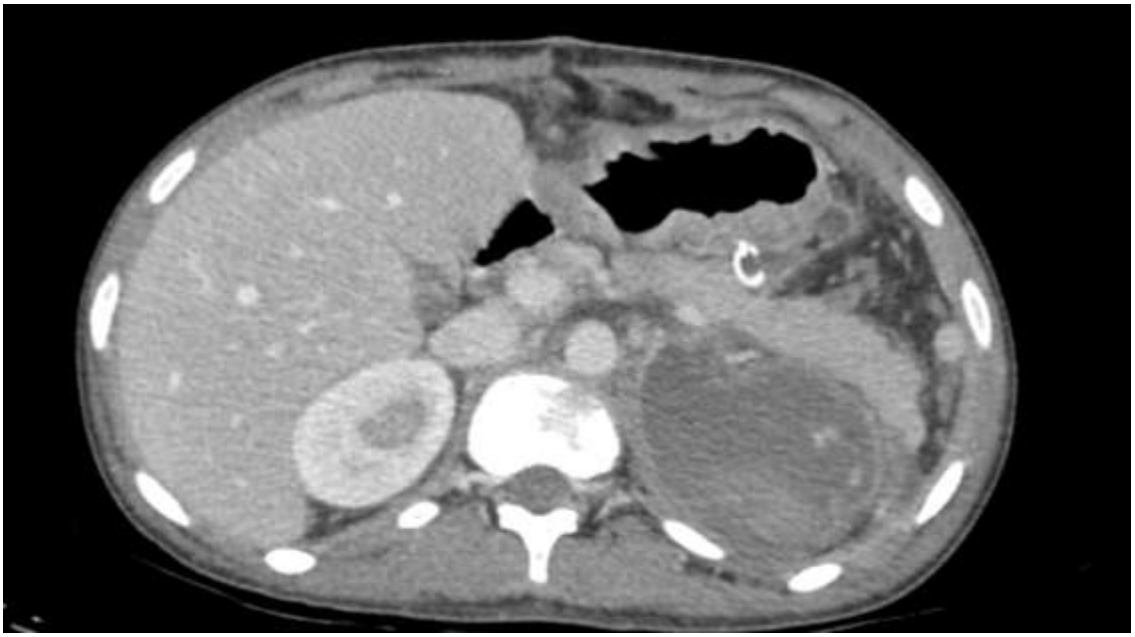
A linear laceration involving the neck of pancreas noted. No active extravasation of contrast at the laceration sites noted.

Another linear laceration involving the proximal one third of body is noted.
MPD is not visualised in head and body of pancreas. Intra pancreatic CBD appears normal.
-AAST Grade II/III.



Gross haemo peritoneum and gross haemo retroperitoneum were found in this case.

Case 2:



A thin hypodense linear area noted in the superior aspect of body of pancreas communicating with MPD.

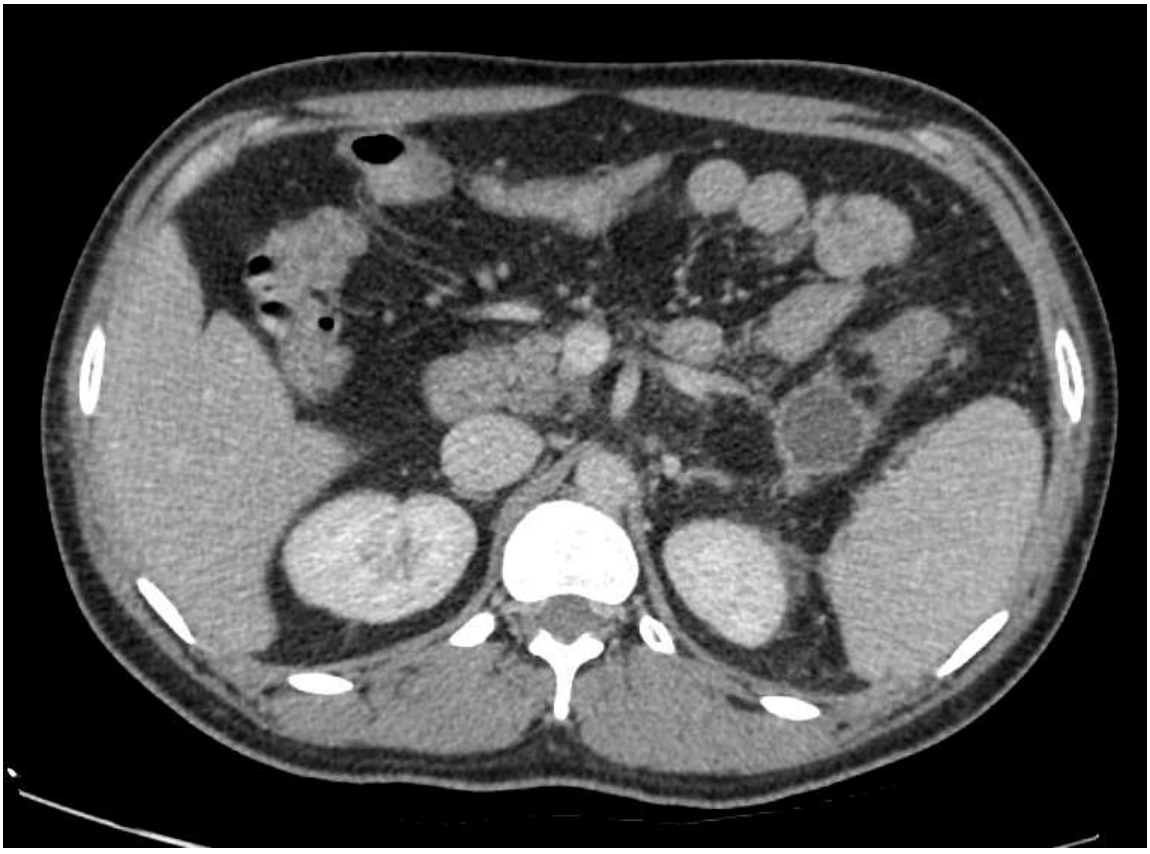
-Laceration.

MPD is normal in caliber.

-AAST Grade-I

Left kidney shows parenchymal haematoma in upper pole in this case.

Case 3:

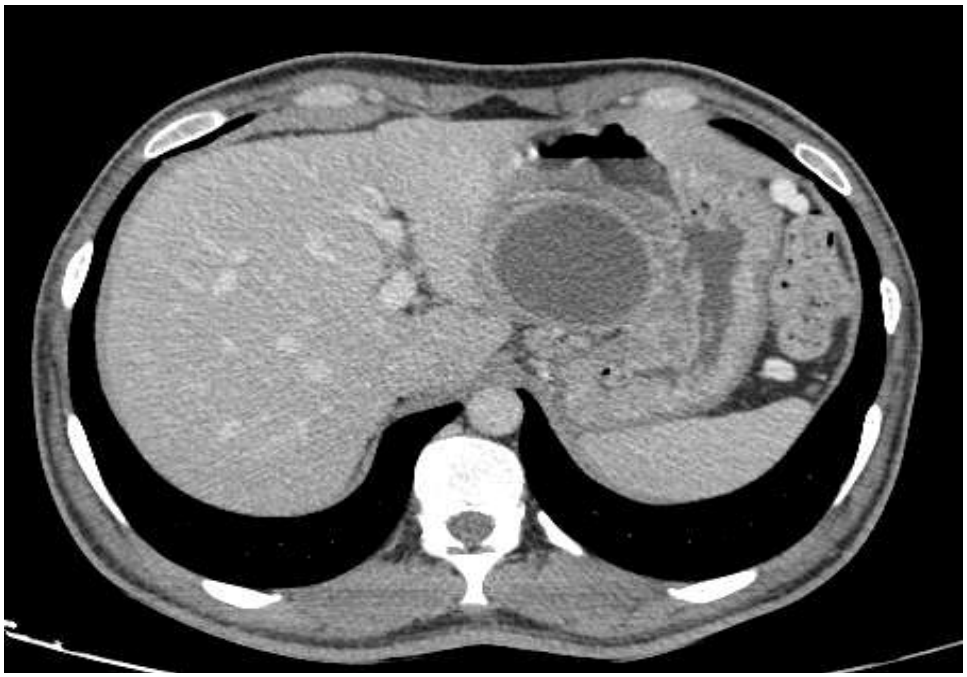


A well defined hypodense collection with enhancing thin wall noted in tail region.

The collection is tracking along the mesentery into perisplenic and left perinephric region with surrounding fat stranding .

This is a pseudocyst which occurred as a complication as a previous history of pancreatic trauma.

Case 4:



A well defined cystic lesion with peripheral wall enhancement and displacing the stomach anteriorly noted in the region of body of stomach.

This is a pseudocyst which occurred as a complication with previous history of blunt trauma to abdomen.

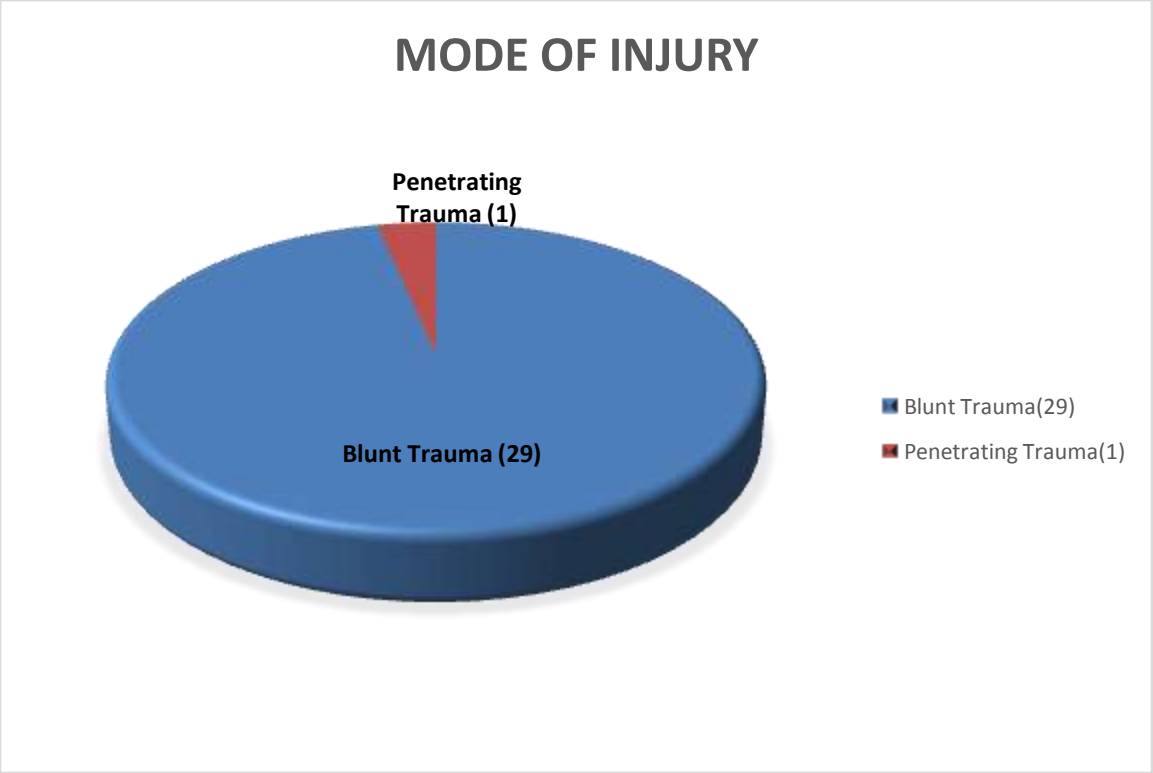
Case 5:

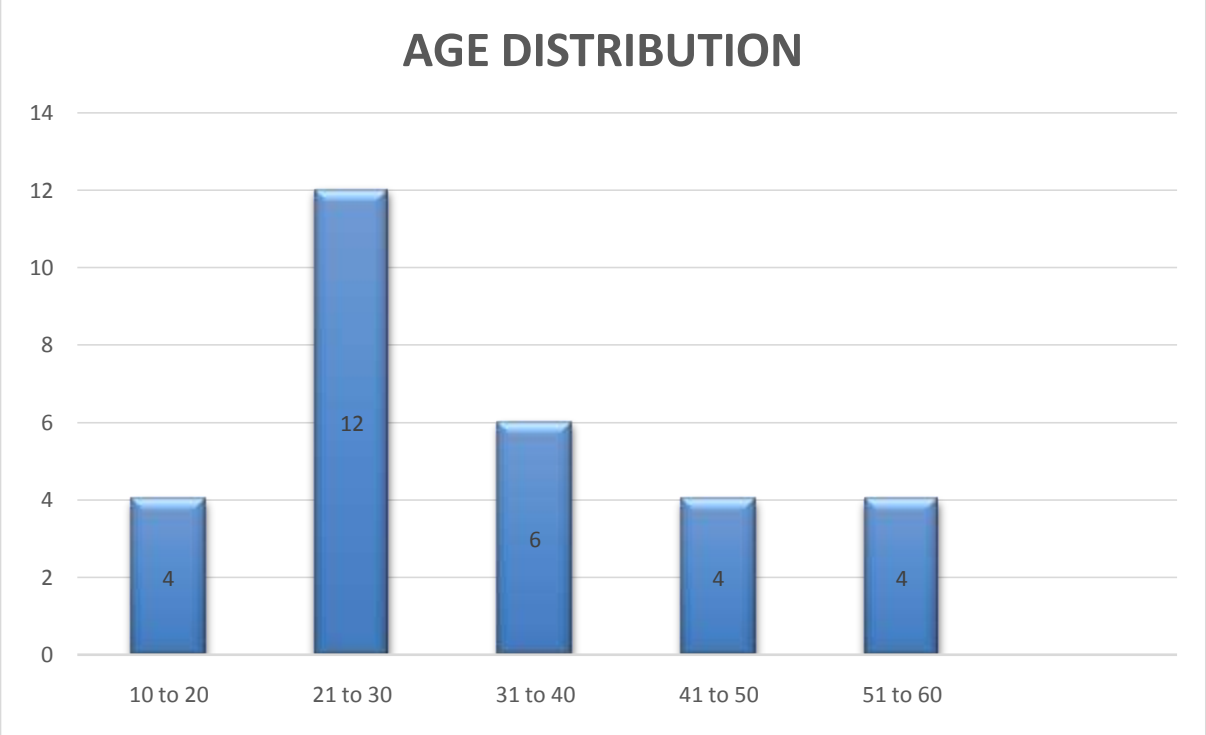
Head ,body and tail of pancreas shows loss of normal feathery contour and appears bulky with mild peripancreatic fat stranding.

This is a case of acute pancreatitis which occurred as a complication in pervious history of blunt abdominal trauma.

Results:-

1. According to American Association for the surgery of trauma organ injury scale 19/30 patients are of grade I &grade II injury. 6/30 in grade III and 5/30 were grade IV injuries.
2. Grade I &II patients were managed conservatively and improved remarkably on followup.
3. Grade III&IV patients underwent surgery and CT findings are confirmed intraoperatively.
4. 6 patients with grade III injury undergone Distal pancreatectomy + Splenectomy and 4 patients undergone Spleen preserving Distal Pancreatectomy.
5. Grade IV patients initially managed conservatively in which 4 patients developed pseudocyst they were treated with cystogastrostomy and one patient developed fistula .This fistula was initially controlled with Percutaneous catheter drainage followed by roux -en- y fistulojejunostomy .


MODE OF INJURY
Penetrating Trauma (1)
Blunt Trauma (29)
Blunt Trauma(29)
Penetrating Trauma(1)


AGE DISTRIBUTION
14
12
10
8
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0
4
12
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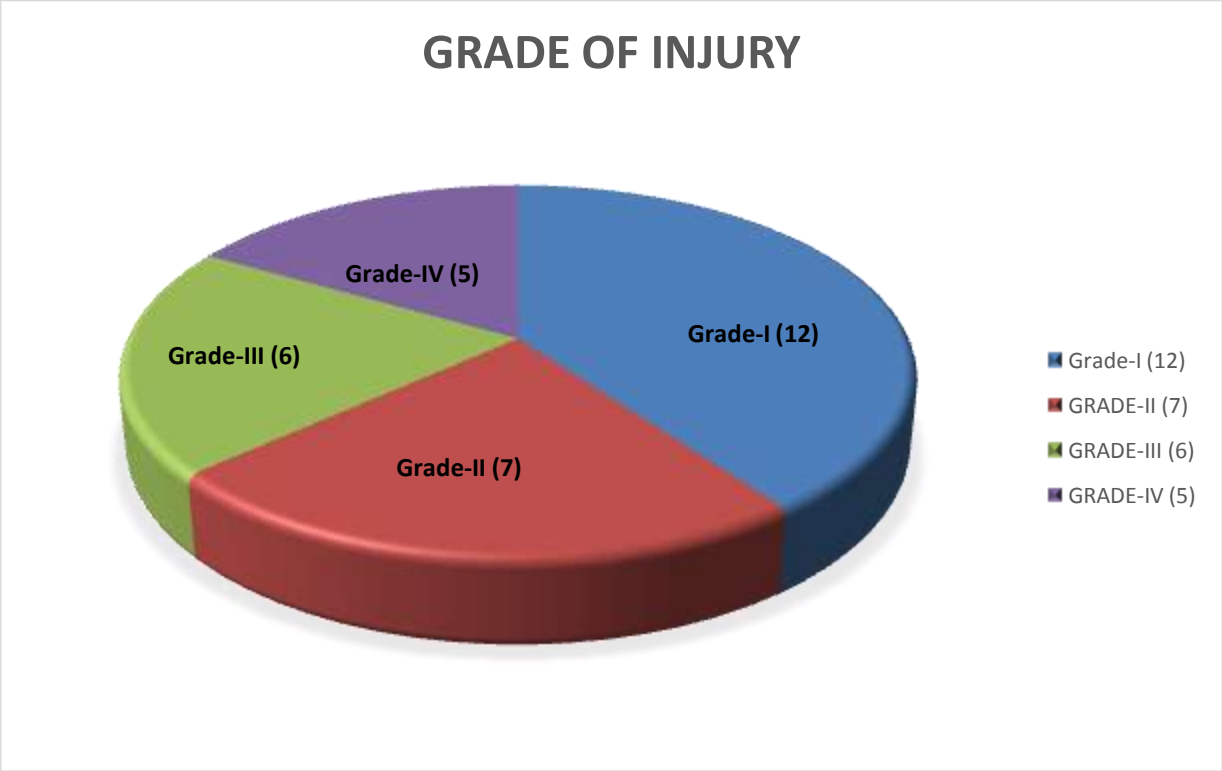
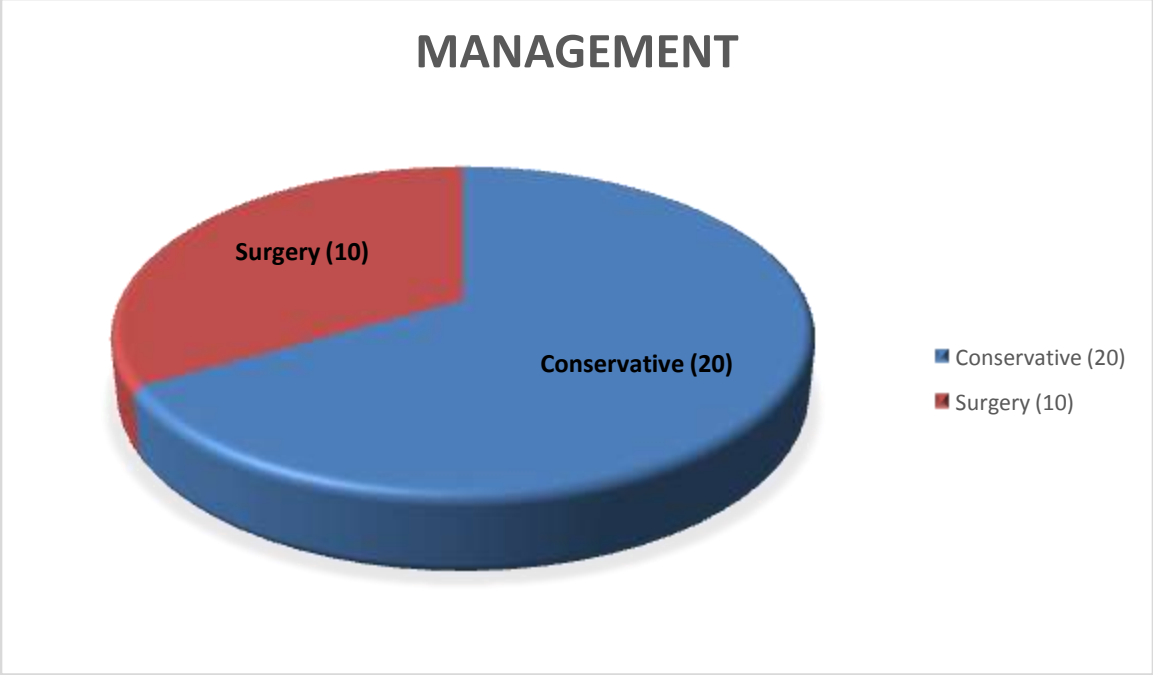
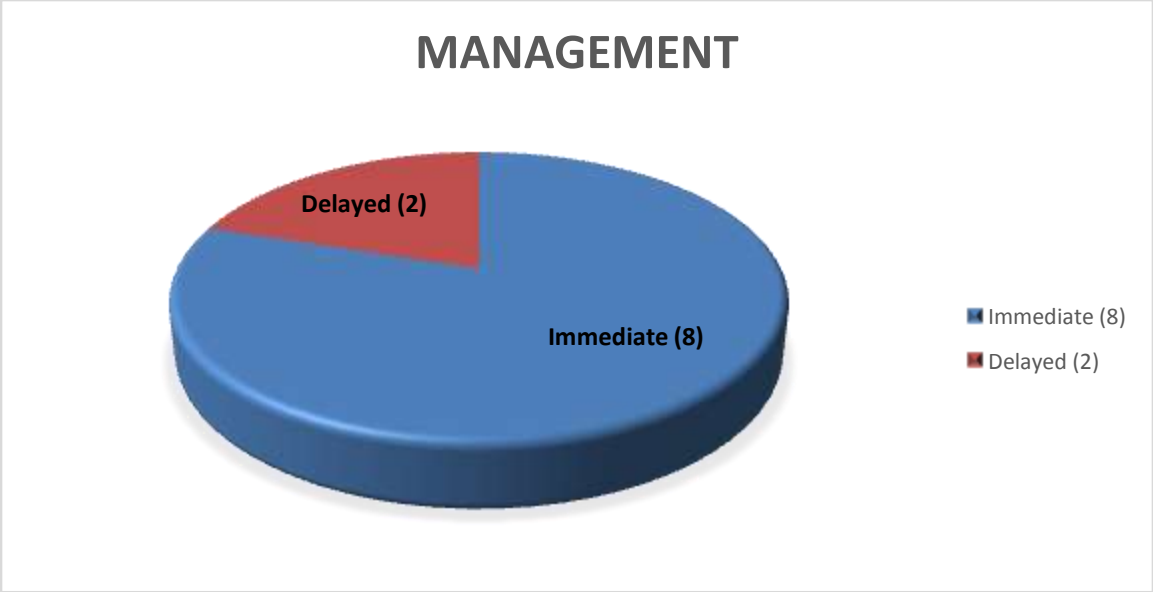
4
4
10 to 20
21 to 30
31 to 40
41 to 50
51 to 60


GRADE OF INJURY
Grade-IV (5)
Grade-I (12)
Grade-III (6)
Grade-II (7)
Grade-I (12)
GRADE-II (7)
GRADE-III (6)
GRADE-IV (5)


MANAGEMENT
Surgery (10)
Conservative (20)
Conservative (20)
Surgery (10)



Discussion:-

In recent years, the nonoperative approach adopted in solid organ injuries in trauma management has achieved good outcome.[3,4]

1. Early contrast multidetector CT scan is vital to the recognition or exclusion of these injuries.
2. Grade I and II injuries responded to conservative line of management
3. Controversy surrounds management of Grades III and IV injuries
4. In our series patients with ductal injuries involving body and tail (grade III), underwent immediate distal pancreatectomy with minimal morbidity and reduced hospital stay.
5. For proximal ductal injuries (grade IV), due to complex high risk surgery around the head of pancreas, we followed non operative care with delayed definitive surgery of the expected pseudocyst or persistent fistula.

Conclusion:-

1. Multiphasic contrast-enhanced CT is the initial imaging modality of choice for suspected pancreatic trauma.
2. The type and location (proximal versus distal) of injury are used to assign an AAST-OIS grade.
3. CT can lead to underestimation of the degree of pancreatic injury, particularly in the early period after the trauma, and has limitaions in the assessment of the MPD.
4. The integrity of the MPD is the major determinant of patient outcome, predicting morbidity and mortality. MRI/MRCP facilitates noninvasive assessment of MPD integrity.
5. Although not included in the AAST-OIS classification, vascular injury, such as active contrast material extravasation , is important for determining patient management and predicting outcomes and must be reported in a timely manner
6. Management of traumatic pancreatic injuries depends not onlyontheinjurymechanismandAAST-OIS grade but also on the hemodynamic status of the patient and the extent of other organ damage.
7. Low-grade pancreatic injuries (grades I and II) are typically managed non surgically, whereas high-grade injuries (grades III–V) may require resection with possible reconstruction and/or drainage procedures.

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