Pancreatic Injury

- Confounding factors

- Location
  - Central
  - Retroperitoneal

- Incidence 0.6%
  - Practice pattern
  - 3-6% of all Laparotomies

- Complications
  - Mortality
  - Morbidity

- Mechanism
  - Blunt
  - Penetrating
Pancreatic Injury

- Confounding factors
- Location
  - Central
  - Retroperitoneal
- Incidence 0.6%
  - Practice pattern
  - 3-6 % of all celiotomies
- Complications
  - Mortality
  - Morbidity
- Mechanism
  - Blunt
  - Penetrating
### Pancreatic Trauma Mortality

<table>
<thead>
<tr>
<th>Series</th>
<th>Total Patients (% Penetrating)</th>
<th>Stab Wound Died/Total (%)</th>
<th>Gunshot Died/Total (%)</th>
<th>Penetrating Died/Total (%)</th>
<th>Blunt Died/Total (%)</th>
<th>Overall Died/Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Houston 1978</td>
<td>448 (78)</td>
<td>5/75 (7)</td>
<td>53/273 (19)</td>
<td>58/348 (17)</td>
<td>15/100 (15)</td>
<td>73/448 (16)</td>
</tr>
<tr>
<td>Atlanta 1981</td>
<td>283 (79)</td>
<td>2/32 (6)</td>
<td>27/192 (14)</td>
<td>29/224 (13)</td>
<td>10/59 (17)</td>
<td>39/283 (14)</td>
</tr>
<tr>
<td>Dallas 1985</td>
<td>500 (72)</td>
<td>4/76 (5)</td>
<td>74/286 (28)</td>
<td>78/362 (22)</td>
<td>26/138 (19)</td>
<td>104/500 (21)</td>
</tr>
<tr>
<td>New York 1990</td>
<td>103 (100)</td>
<td>7/32 (22)</td>
<td>20/71 (28)</td>
<td>33/103 (32)</td>
<td>—</td>
<td>33/103 (32)</td>
</tr>
<tr>
<td>Memphis 1991</td>
<td>131 (76)</td>
<td>31 (ch32fn4)</td>
<td>68 (ch32fn4)</td>
<td>16/99 (16)</td>
<td>5/32 (16)</td>
<td>21/131 (16)</td>
</tr>
<tr>
<td>Durban 1995</td>
<td>152 (85)</td>
<td>5/66 (8)</td>
<td>15/63 (24)</td>
<td>20/129 (16)</td>
<td>5/23 (22)</td>
<td>25/152 (16)</td>
</tr>
<tr>
<td>Memphis 1997</td>
<td>134 (81)</td>
<td>? (ch32fn5)</td>
<td>? (ch32fn5)</td>
<td>108 (ch32fn5)</td>
<td>26 (ch32fn5)</td>
<td>17/134 (13)</td>
</tr>
<tr>
<td>Seattle 2003</td>
<td>193 (39)</td>
<td>29 (ch32fn5)</td>
<td>47 (ch32fn5)</td>
<td>76 (ch32fn5)</td>
<td>117 (ch32fn5)</td>
<td>24/193 (12)</td>
</tr>
<tr>
<td>Overall</td>
<td>2174 (75)</td>
<td>23/281 (8)</td>
<td>189/885 (21)</td>
<td>234/1265 (18)</td>
<td>61/352 (17)</td>
<td>363/2174 (17)</td>
</tr>
</tbody>
</table>
Pancreatic Injury Pattern

- Injury – usually not in isolation
  - Liver 46%
  - Stomach 41%
  - Vascular 28%
  - Spleen 26%
    - Duodenum 16%
- # of concomitant injuries: 2-4
  - Higher ISS
- Mortality rate 2x with associated duodenal injury
  - 29%
- Mortality
  - 75% within 48 hours
  - Hemorrhage
- Morbidity 25-50% of patients
Associated structures at risk of injury

- Aorta 5%
- Vena cava 17%
- Common bile duct 5%
- Stomach 24%
- Pancreas 28%
- Small bowel 29%
- Superior mesenteric vessels 7%
- Miscellaneous 17%

Gall bladder 9%
Right kidney 21%
Liver 38%
Renal vessels 5%
Transverse colon 30%
Ureter 8%
# Mortality timing

<table>
<thead>
<tr>
<th>Series</th>
<th>Total Patients</th>
<th>Deaths (%)</th>
<th>Early Deaths Due to Hemorrhage/CNS (%)</th>
<th>Late Deaths Due to Sepsis/MOF/Other (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WTA 1990&lt;sup&gt;6&lt;/sup&gt;</td>
<td>164</td>
<td>30 (18)</td>
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<td>Memphis 1991&lt;sup&gt;12&lt;/sup&gt;</td>
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<td><strong>Overall</strong></td>
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<td><strong>154 (17)</strong></td>
<td><strong>113 (73)</strong></td>
<td><strong>41 (27)</strong></td>
</tr>
</tbody>
</table>
Pancreatic anatomy

- Replaced Right Hepatic Artery
  - 15%
- Aberrant proper Hepatic Artery
  - 5%
- CBD anatomy
- Duct of Santorini
  - Proximal location to the papilla
- SMV
  - Associated injury
- IMV
  - Mobilization of duodenum

- Gallbladder
  - A friend
# AAST Pancreas Organ Injury Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Injury Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Hematoma, Major contusion without duct injury or tissue loss</td>
</tr>
<tr>
<td></td>
<td>Laceration, Major laceration without duct injury or tissue loss</td>
</tr>
<tr>
<td>II</td>
<td>Hematoma, Involving more than one portion</td>
</tr>
<tr>
<td></td>
<td>Laceration, Disruption &lt;50% of circumference</td>
</tr>
<tr>
<td>III</td>
<td>Laceration, Distal transection or parenchymal injury with duct injury</td>
</tr>
<tr>
<td>IV</td>
<td>Laceration, Proximal (to right of superior mesenteric vein) transection or parenchymal injury</td>
</tr>
<tr>
<td>V</td>
<td>Laceration, Massive disruption of pancreatic head</td>
</tr>
</tbody>
</table>

*aAdvance one grade for multiple injuries to the same organ.*
Grading the severity of pancreatic injury: grade I – minor contusion or laceration with no duct injury, grade II – major contusion or laceration with no duct injury, grade III – transection or major laceration with duct disruption in distal pancreas, grade IV – transection of proximal pancreas or major laceration with associated injury to the ampulla, grade V – Massive disruption of the pancreatic head
Diagnosis

- Penetrating injury
  - Exploration
  - Imaging
- Blunt Trauma
  - Imaging
  - Exploration for other injuries
- Pitfalls with delay in diagnosis
  - 6-24 hrs – 23%
  - >24 hrs - 20%
- Isolated pancreatic injury
  - Time to exploration --- 9 days

- Adjuncts
  - Amylase serum -- > 3 hrs from TOI
  - Physical exam unreliable
Imaging

- CT
  - Not ideal but the best modality currently utilized
- Correlation with ductal injury
  - 43-70% when followed by confirmatory procedure
- Single institution study
  - Sensitivity 68%
  - PPV 100%
  - AAST grade underestimated – 31%
- Multi-institutional AAST study
  - 16-64 MDCT
  - Ductal injury 54 and 52% sensitivity
  - Inter-operator variability
  - Protocols for image acquisition
- MRCP
- ERCP

**Diagnostic criteria on CT**

*Imaging findings in pancreatic injuries*

**Direct findings:**
- Laceration (linear region of nonenhancement)
- Diffuse or focal pancreatic enlargement
- Heterogenous enhancement

**Indirect findings:**
- Peripancreatic fat stranding or fluid
- Fluid between the splenic vein and the pancreas
- Peripancreatic hemorrhage
- Injuries to adjacent organs or vessels
- Trajectory of penetrating injury through the region of the pancreas
WBCT

**Fig. 1** Graph demonstrates time after injection versus contrast enhancement of the aorta, liver, and pancreas. Peak contrast enhancement of the aorta is 30–35 s; pancreatic parenchyma, 35–45 s; and hepatic parenchyma, 55–60 s. The pancreas enhances to a slightly greater extent than the liver. Pancreatic curve is hypothetical. Aortic and hepatic curves are based on simulations in Bac, KT. [54]
Figure 1. Western Trauma Association management algorithm for pancreatic injuries.
Exposure - Kocher
Exposure – Cattell Braasch
Exposure – ligament of Trietz
Exposure

Kocher Maneuver

Sharp dissection of peritoneum

SMV SMA

Duodenum

Pancreas

SMV SMA

Aorta

IVC
Intraoperative evaluation of pancreas

- Direct inspection
  - Ductal injury
  - Transection
  - Laceration >50%
  - Central perforation
  - Maceration

- Patton et al
  - No intra-operative pancratography
  - Complication rate of 30%
  - Pancreas specific mortality of 1.6%

- Sharp et al
  - Validation in 2012
Validation of intra-operative evaluation by Sharp et al
Pancreatic injury surgical approach

- Grade I and II
  - Debridement
  - Closed suction drainage
  - No need to suture pancreas

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<td>II</td>
<td>Laceration Disruption &lt;50% of circumference</td>
</tr>
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</table>
## Pancreatic injury surgical approach

- **Grade III**
  - Distal pancreatectomy
  - Mortality of 9%
  - Complication of 19%
  - Main pancreatic duct ligated if possible
  - Roux en Y Pancreato-jejunostomy avoided if possible

| III | Laceration | Distal transection or parenchymal injury with duct injury |
Pancreatic injury surgical approach

- Grade IV and V
  - Little data for optimal approach
- Closed suction drainage
- Aim for controlled pancreatic fistula

<table>
<thead>
<tr>
<th>IV</th>
<th>Laceration</th>
<th>Proximal (to right of superior mesenteric vein) transection or parenchymal injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>Laceration</td>
<td>Massive disruption of pancreatic head</td>
</tr>
</tbody>
</table>
Pancreatic injury surgical approach

• Grade IV and V

• Combined pancreatic and duodenal injuries
  • Triple drainage – Stone 1979 – 237 patients
  • Pyloric exclusion

• Feliciano et al
  • 24% simple repair
  • 61% complex repair +/- pyloric exclusion
  • 10% Pancreaticoduodenectomy

Mortality
• Simple 25% vs PD 46%

<table>
<thead>
<tr>
<th>IV</th>
<th>Laceration</th>
<th>Proximal (to right of superior mesenteric vein) transection or parenchymal injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>V</td>
<td>Laceration</td>
<td>Massive disruption of pancreatic head</td>
</tr>
</tbody>
</table>
Pancreatoco-duodenectomy indications

- Massive disruption of pancreatic head
  - Uncontrolled hemorrhage
  - Severe combined injuries
  - Related or proximity vascular injuries

- Complete the injury
- Damage control
- Second look for completion of resection
Non operative management

- Grade I and II
  - NPO
  - TPN
  - Amylase
  - Vigilance for higher grade of injury

- NOM with pancreatic duct injury
  - Complication in 48%
  - Psuedocysts
  - Fistula

- Octreotide
- Pasireotide
EAST guidelines 2009

- Delay in diagnosis of main Pancreatic duct injury causes morbidity
- CT suggestive but not diagnostic of injury
- Amylase and lipase are suggestive but not diagnostic of injury
- Grade I and II = Drainage alone
- Grade III = resection and drainage
- Closed suction drainage
Outcomes

- Mortality

- Early
  - Hemorrhage
  - Associated injuries

- Late
  - Sepsis
  - MSOF
  - Respiratory failure
## Pancreatic Trauma outcomes 1997 onward

<table>
<thead>
<tr>
<th>Study</th>
<th>Injury Type</th>
<th>Penetration %</th>
<th>Overall Rate</th>
<th>PRM Rate</th>
<th>Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patton et al. [10]</td>
<td>Penetrating</td>
<td>81 %</td>
<td>13 %</td>
<td>1.6 % PRM</td>
<td>31 % Overall&lt;br&gt;15 % Fistula&lt;br&gt;14 % Pancreatic abscess&lt;br&gt;8 % Pancreatitis&lt;br&gt;3 % Drain tract infection&lt;br&gt;1.6 % Pseudocyst</td>
</tr>
<tr>
<td>Vasquez et al. [7]</td>
<td>Penetrating</td>
<td>100 %</td>
<td>27.4 %</td>
<td></td>
<td>29.7 % Overall&lt;br&gt;15 % Intra-abdominal abscess&lt;br&gt;11 % Fistula&lt;br&gt;9 % Postoperative hemorrhage&lt;br&gt;4 % Pseudocyst&lt;br&gt;4 % Pancreatitis</td>
</tr>
<tr>
<td>Lin et al. [31]</td>
<td>Blunt</td>
<td>100 %</td>
<td>15.5 %</td>
<td></td>
<td>46.7 % Overall&lt;br&gt;24.4 % Intra-abdominal abscess&lt;br&gt;13.3 % Sepsis/MSOF&lt;br&gt;8.9 % Pancreatic duct stricture&lt;br&gt;4.4 % Pseudocyst&lt;br&gt;4.4 % Pancreatitis&lt;br&gt;2.2 % Fistula</td>
</tr>
<tr>
<td>Krige et al. [16]</td>
<td>Blunt</td>
<td>100 %</td>
<td>16.4 %</td>
<td></td>
<td>74.5 % Overall&lt;br&gt;14.5 % Fistula&lt;br&gt;13.6 % Pseudocyst&lt;br&gt;2.7 % Pancreatic ascites&lt;br&gt;50.9 % Nonpancreatic abdominal</td>
</tr>
<tr>
<td>Heuer et al. [17]</td>
<td>Blunt</td>
<td>95.5 %</td>
<td>19 %</td>
<td></td>
<td>50 % Organ failure&lt;br&gt;32.9 % Multiple organ failure&lt;br&gt;14.6 % Sepsis</td>
</tr>
<tr>
<td>Sharpe et al. [28]</td>
<td>Penetrating</td>
<td>69 %</td>
<td>16 %</td>
<td>No PRM</td>
<td>8.5 % Pancreatic fistula&lt;br&gt;8.1 % Pancreatic abscess</td>
</tr>
</tbody>
</table>
Morbidity

- Grade I - 9%
- Grade II - 17%
- Grade III - 36%
- Grade IV - 50%
  Smego et al 1985

- Pancreatic fistula
  - Up to 15% of patients
  - Independent predictor with PD injury

- Pancreatic abscess
  - Colon and PD injury independent predictors
Morbidity

- Pancreatic pseudocysts
  - Missed injury
  - Non-operative management

- Post traumatic pancreatitis
  - Nausea vomiting
  - Hyperamylasemia

- Exocrine insufficiency
  - Unlikely due to trauma related resection

- Hemorrhage – delayed
  - Erosion
Cleft. ERCP with intact duct
At exploration, no injury identified
IVC Fluid
Pancreatic duct injury missed due to being sealed by hematoma, central perforation, vertical laceration or severe contusion in the tail.
Duodenal Injury

- Incidence
  - 5%
- Blunt
  - Blow to the mid-section
  - Causes
- Penetrating
  - GSW
  - Stab
- Diagnostic workup
  - Physical exam
  - Imaging/Blood
- Intervention
  - Timing
  - Non-operative management
## Duodenal Trauma Mortality

<table>
<thead>
<tr>
<th>Series</th>
<th>Total Patients (% Penetrating)</th>
<th>Stab Wound Died/Total (%)</th>
<th>Gunshot Died/Total (%)</th>
<th>Penetrating Died/Total (%)</th>
<th>Blunt Died/Total (%)</th>
<th>Overall Died/Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Houston 1977</td>
<td>175 (87)</td>
<td>2/18 (11)</td>
<td>16/134 (12)</td>
<td>18/152 (12)</td>
<td>6/23 (26)</td>
<td>24/175 (14)</td>
</tr>
<tr>
<td>Atlanta 1979</td>
<td>321 (92)</td>
<td>0/31 (0)</td>
<td>37/263 (14)</td>
<td>37/294 (13)</td>
<td>4/27 (15)</td>
<td>41/321 (13)</td>
</tr>
<tr>
<td>Dallas 1980</td>
<td>247 (78)</td>
<td>0/23 (0) (^\text{ch32fn1})</td>
<td>18/157 (11)</td>
<td>31/193 (16)</td>
<td>12/54 (22)</td>
<td>43/247 (17)</td>
</tr>
<tr>
<td>New York 1985</td>
<td>100 (100)</td>
<td>5/30 (17)</td>
<td>20/70 (29)</td>
<td>25/100 (25)</td>
<td>—</td>
<td>25/100 (25)</td>
</tr>
<tr>
<td>Los Angeles 1987</td>
<td>115 (82) (^\text{ch32fn2})</td>
<td>0/42 (0) (^\text{ch32fn2})</td>
<td>4/52 (8) (^\text{ch32fn2})</td>
<td>4/94 (4) (^\text{ch32fn2})</td>
<td>0/11 (0) (^\text{ch32fn2})</td>
<td>14/115 (12)</td>
</tr>
<tr>
<td>WTA 1990</td>
<td>164 (62)</td>
<td>2/31 (6)</td>
<td>22/71 (31)</td>
<td>24/102 (24)</td>
<td>6/62 (10)</td>
<td>30/164 (18)</td>
</tr>
<tr>
<td>Detroit 2004</td>
<td>222 (88)</td>
<td>8/34 (24)</td>
<td>38/162 (23)</td>
<td>46/196 (23)</td>
<td>4/26 (15)</td>
<td>50/222 (23)</td>
</tr>
<tr>
<td><strong>Overall</strong></td>
<td><strong>1344 (85)</strong></td>
<td><strong>17/209 (8)</strong></td>
<td><strong>155/909 (17)</strong></td>
<td><strong>185/1131 (16)</strong></td>
<td><strong>32/203 (16)</strong></td>
<td><strong>227/1344 (17)</strong></td>
</tr>
</tbody>
</table>
Duodenal Trauma associated injuries

<table>
<thead>
<tr>
<th>Organ Injury</th>
<th>Patients (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major vascular</td>
<td>596 (48)</td>
</tr>
<tr>
<td>Liver</td>
<td>543 (44)</td>
</tr>
<tr>
<td>Colon</td>
<td>378 (31)</td>
</tr>
<tr>
<td>Pancreas</td>
<td>368 (30)</td>
</tr>
<tr>
<td>Small bowel</td>
<td>363 (29)</td>
</tr>
<tr>
<td>Stomach</td>
<td>279 (23)</td>
</tr>
<tr>
<td>Kidney</td>
<td>237 (19)</td>
</tr>
<tr>
<td>Gallbladder/biliary tree</td>
<td>176 (14)</td>
</tr>
<tr>
<td>Spleen</td>
<td>41 (3)</td>
</tr>
</tbody>
</table>

Based on combined data from references 1–3, 5–7.
# Combined mortality

## Table 32-5 Combined Pancreaticoduodenal Trauma: Mortality by Mechanism of Injury in Large (>100 Patients)

<table>
<thead>
<tr>
<th>Series</th>
<th>Total Patients</th>
<th>Duodenum Alone Died/Total (%)</th>
<th>Pancreas Alone Died/Total (%)</th>
<th>Combined Pancreaticoduodenal Died/Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles 19875</td>
<td>115</td>
<td>10/89 (11)</td>
<td>—</td>
<td>4/26 (15)</td>
</tr>
<tr>
<td>Detroit 20047</td>
<td>222</td>
<td>26/147 (18)</td>
<td>—</td>
<td>24/75 (32)</td>
</tr>
<tr>
<td>Atlanta 19819</td>
<td>283</td>
<td>—</td>
<td>22/228 (10)</td>
<td>17/55 (31)</td>
</tr>
<tr>
<td>Dallas 198510</td>
<td>500</td>
<td>—</td>
<td>75/409 (18)</td>
<td>29/91 (32)</td>
</tr>
<tr>
<td>Boston 200916</td>
<td>230</td>
<td>4/60 (7)</td>
<td>14/132 (11)</td>
<td>9/38 (24)</td>
</tr>
<tr>
<td>Overall</td>
<td>40/296 (14)</td>
<td>111/769 (14)</td>
<td>—</td>
<td>83/285 (29)</td>
</tr>
</tbody>
</table>
# Timing of Death

<table>
<thead>
<tr>
<th>Series</th>
<th>Total Patients</th>
<th>Deaths (%)</th>
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# AAST Duodenal Organ Injury Scale

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<td>Vascular: Devascularization of duodenum</td>
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</table>
Diagnosis

- **CT**
  - Sensitive
  - Peri-duodenal fluid
  - Wall thickening
  - Extravasation

- **Upper GI**
  - Corkscrew appearance
  - Extravasation
Operative management

• Wide exposure
Exposure - Kocher
Exposure – Cattell Braasch
Exposure – ligament of Trietz
Operative management

- Wide exposure
  - D1
  - D2
  - D3
  - D4
- Biliary Tree
- Pancreas

- Dye instillation
  - One and done

Table 1 Duodenal Injury Location (n = 46)

<table>
<thead>
<tr>
<th>Location</th>
<th>No. Wounds (%)</th>
</tr>
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<tbody>
<tr>
<td>D1</td>
<td>4 (9)</td>
</tr>
<tr>
<td>D2</td>
<td>30 (65)</td>
</tr>
<tr>
<td>D3</td>
<td>9 (20)</td>
</tr>
<tr>
<td>D4</td>
<td>3 (7)</td>
</tr>
</tbody>
</table>

Forty-six wounds were discovered in 29 patients. The majority of these (65%) were contained in the second portion of the duodenum.
Duodenal Laceration – not hematoma

• Grade I and II Injury
  Primary repair
  • <50% of circumference
  • Transverse closure
    • 2 layer – choice of suture
  • Serosal patch to buttress
  • Omental patch

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Closed suction Drain
Duodenal Injury

- Resection/Reconstruction
  - Primary repair
  - Debridement
  - Billroth II
    - D1
  - Duodeno-jejunostomy
    - D3 D4
- External drainage

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Duodenal injury

- Pancreaticoduodenectomy (PDT)
  Destruction of Biliary pancreatic Duodenal axis
- Damage control Surgery

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Duodenal injury

- **Diversion**
  - Pyloric exclusion
  - Technique
    - Marginal ulcer 10%
  - NTDB

- **Triple drainage**
  - Technique
  - Jejunostomy
  - Retrograde duodenal tube
  - Gastric decompression tube

- **External drainage**
  - Closed suction drain
Duodenal wall hematoma

- **Exploration** – large – AAST grade II
  - Make the injury worse?

- **Technique**
  - Longitudinal incision
  - Evacuation
  - Serosal repair

- **External drainage**

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PD for Trauma

- Complete the injury
- Timing of repair
  - Hemodynamics
  - Hemostasis
  - Ligation of CBD and PD
- Cholangiogram
  - Approach
- Pancreatogram
  - Increases morbidity
- Revisit need to proceed
  - Consider Triple drainage
  - Closed suction drainage
  - Primary repair
Non-Operative management
Duodenal Hematoma

- NPO
- NGT decompression
- TPN
- Length of treatment
  - 3 weeks
- Index of suspicion
  - Associated injuries
- Repeat Imaging

- Consider post-pyloric feeding tube
- Pyloric exclusion
- AAST Grade III IV V
  - No PDT

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<tr>
<th>Table 3. Adjusted Odds Ratio for Mortality and Complications (Pyloric Exclusion vs Primary Repair)</th>
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<tr>
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<tr>
<td>Deaths</td>
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<tr>
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<tr>
<td>Dehiscence</td>
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<tr>
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<td>Wound infection</td>
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## Biliary Trauma

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- Injury <50% - primary repair
- Delayed repair after resuscitation
- T-tube ?
- Closed suction drainage
Complications

• Abscess
  • 30% occurrence
  • IR drainage
  • antibiotics

• Enterocutaneous fistula
  • Controlled drainage
  • Nutrition
    • Distal Feeding (J-tube)
    • TPN

• Associated injuries
  • Pancreas
  • Biliary Tree
Algorithm for Duodenum Injury

Patient has Urgent Indications for Laparotomy
- Hemodynamic Instability
  (+) Ultrasound
- Peritonitis
  (+) CT (Free Air, Extravasation)

Patient Requires Workup For Injury Assessment
- CT with Suggestive Findings
- Contrast Duodenography

Laparotomy

Grade I & II
1. Duodenal Hematoma
   - Small – observe
   - Med – NCJ
   - Large – Duodenotomy & Evacuation, NCJ
2. Laceration
   - Single Layer Repair, NCJ

Grade III
1. Primary Repair & Pyloric Exclusion & NCJ
2. Roux-en Y Jejunoduodenostomy

Grade IV & V
- Damage Control Surgery
- Reassess (?) Whipple

Duodenal Hematoma
- NG Suction
- TPN
- ? Late Decompression

Source: Mattox KL, Moore EE, Feliciano DV: Trauma, 7th Edition:
www.accesspharmacy.com
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Pancreatic and Duodenal Injury

22nd Annual Trends in Trauma
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