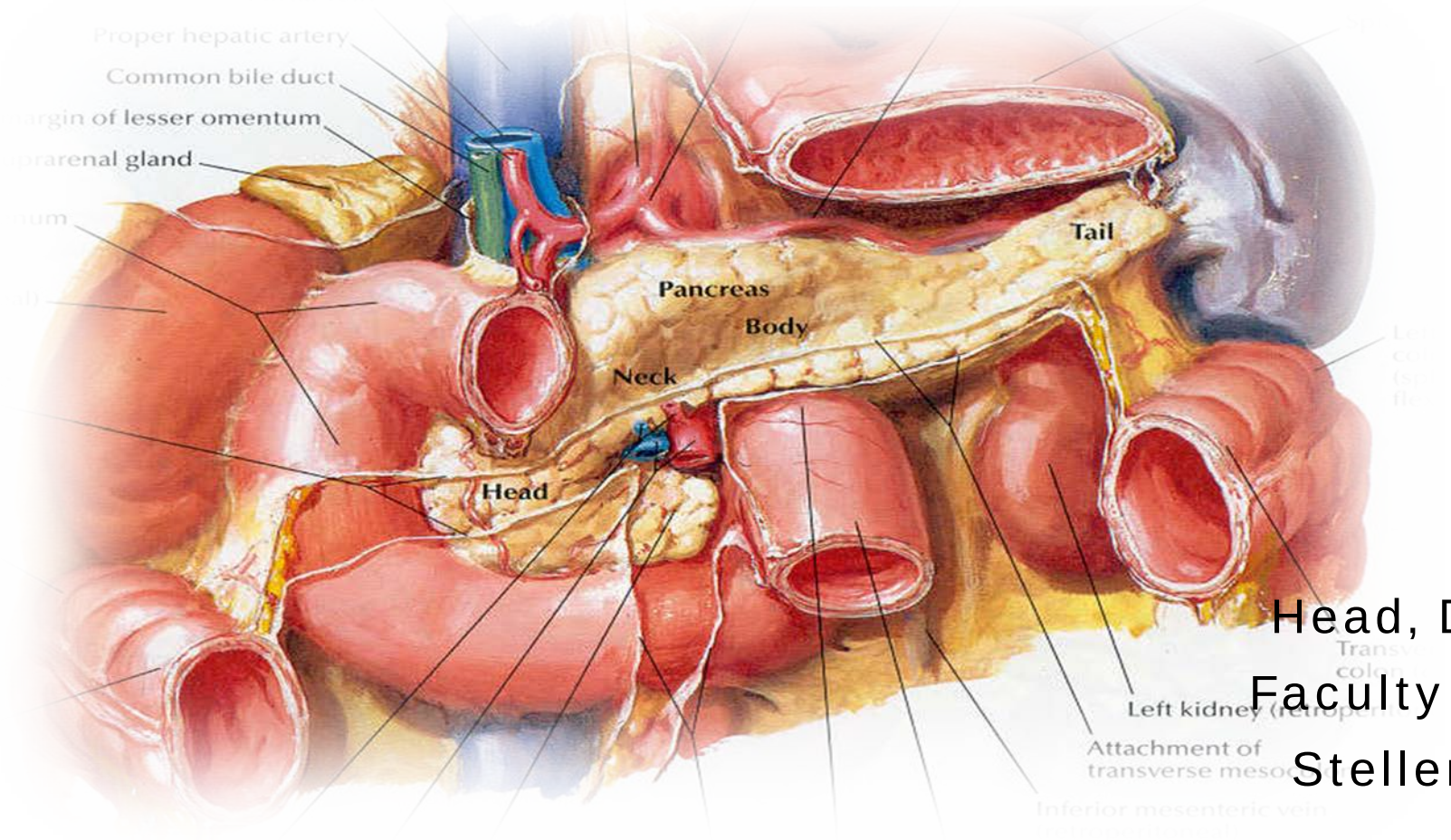
Complex pancreatico- duodenal injuries



Elmin Steyn
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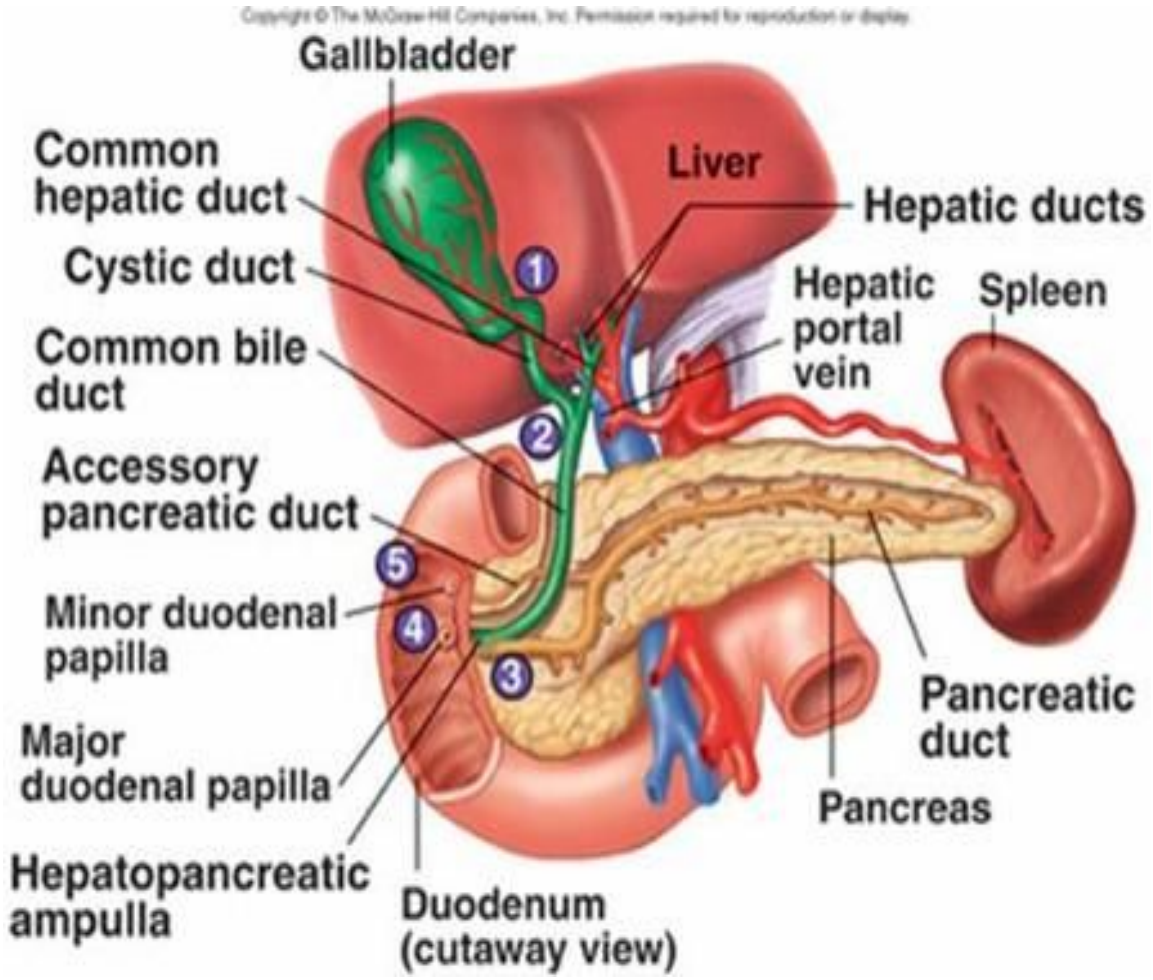
Pancreatic and duodenal trauma: daunting or simply confusing?

- 2-4% of abdominal injuries
- 40% morbidity (30 – 70%)
- 20% mortality (12 – 46%)
- 46-95% associated injuries
- Often missed
- Classification flawed

- Complex surgical decisions
- Confusing algorithms



AAST Pancreatic Injury Grading

Grade	Injury	Description
I	Hematoma	Small contusion without duct injury
	Laceration	Small laceration without duct injury
II	Hematoma	Major contusion without duct injury
	Laceration	Major laceration without duct injury
III	Laceration	Distal parenchymal laceration with duct injury
IV	Laceration	Proximal laceration with involvement of the ampulla
V	Laceration	Extensive disruption of the pancreatic head

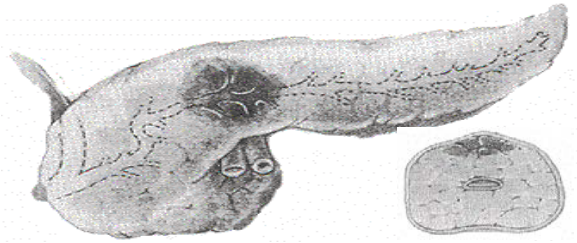
Adapted from Moore EE, Cogbill TH, Malangoni MA, et al. Organ injury scaling, II: pancreas, duodenum, small bowel, colon, and rectum. J Trauma 1990;30(11):1427.

Pancreas neck / body / tail injury

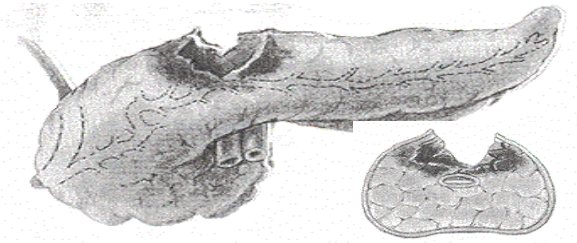
Check for

- Likelihood of duct injury
- Central perforation
- Visible duct injury
- Spleen injury

I



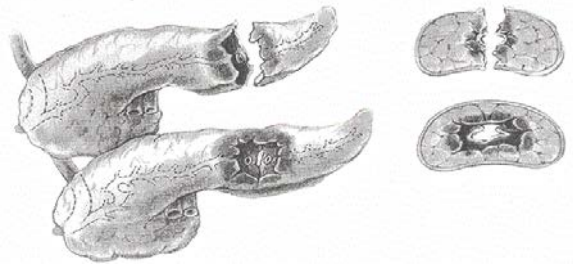
II



Gr I, II Drainage only

Gr III Distal pancreatectomy
+/- splenectomy

III



Pancreatic head injuries

Check

- IVC, SMV, PV, Duodenum
- CBD, Pancreatic duct, Ampulla
- Consider imaging via cystic duct

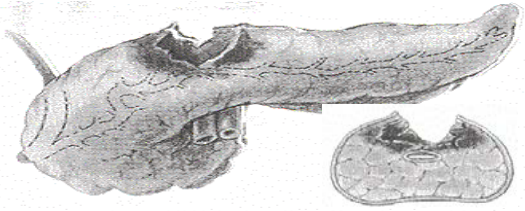
Gr I, II: Drain

Gr III – V

- Drainage & delayed surgery or
- Immediate definitive surgery

Gr I

Gr II



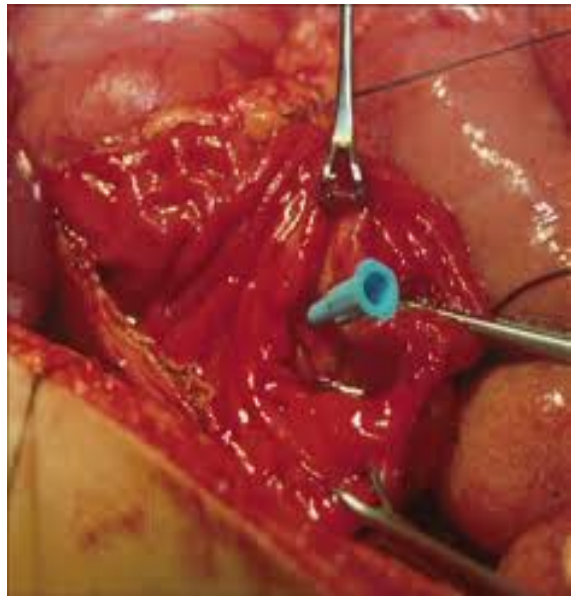
Gr IV

Gr V

Assessment of likelihood of ductal injury

Intra op assessment

- Eyeball test
- Cholangio-pancreaticogram via CBD or cystic duct (needle)
- Pancreaticogram via ampulla if accessible
- Intra operative ERCP – logistically challenging



Staged surgery: drainage, temp closure & ERCP

- Prox injury : stent, drain or pancr-duodenectomy
- Distal injury: sphincterotomy/ distal pancreatectomy

Brooks et al Pancreatic trauma. *Trauma* 2003;5:1-8.
Gupta et al. *Radiographics* 2004;24:1381-95.

EAST guidelines 2009: Pancreatic injury

Level III evidence

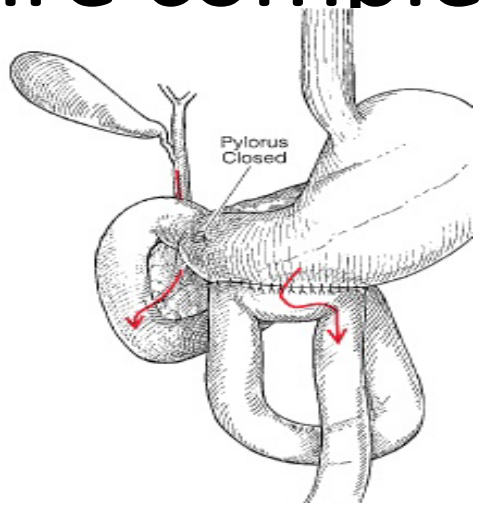
- CT suggestive but not diagnostic
- Amylase/Lipase suggestive, not diagnostic
- Grade I and II: drainage alone.
- Grade III: resection, and drainage.
- Closed suction is preferred to sump suction.
- Conflicting evidence on benefits of octreotide

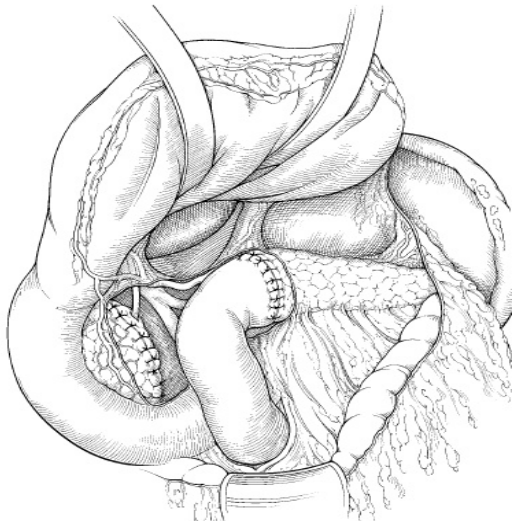
Nwariaku et al. Is octreotide beneficial following pancreatic injury? Am J Surg. 1995 Dec;170(6):582-5.

Amirata et al. Octreotide acetate decreases complications after pancreatic trauma. Am J Surg. 1994 Oct;168(4):345-7.

Pancreatic injuries rarely require complex procedures

- Combined pancreas-duodenal injuries:
  consider pyloric exclusion





- Extensive tissue loss of pancreas head/neck:
  ?consider R-Y pancreatico-jejunostomy
  "central pancreatectomy" risks!

- Gr V pancreas & Gr 5 duodenal & ampulla/bile duct injury:
  ? Immediate or staged or delayed pancreaticoduodenectomy

- Severe pancreas head injuries: ducts difficult to assess, may be intact: drainage alone may be sufficient

Seamon et al. J Trauma 2007;62: 829-833

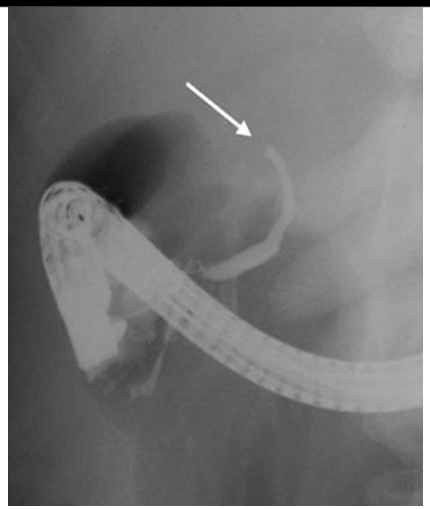
What about selective non-operative management?

Selective non-operative management

Stable patient with localised minor injury – expectant management

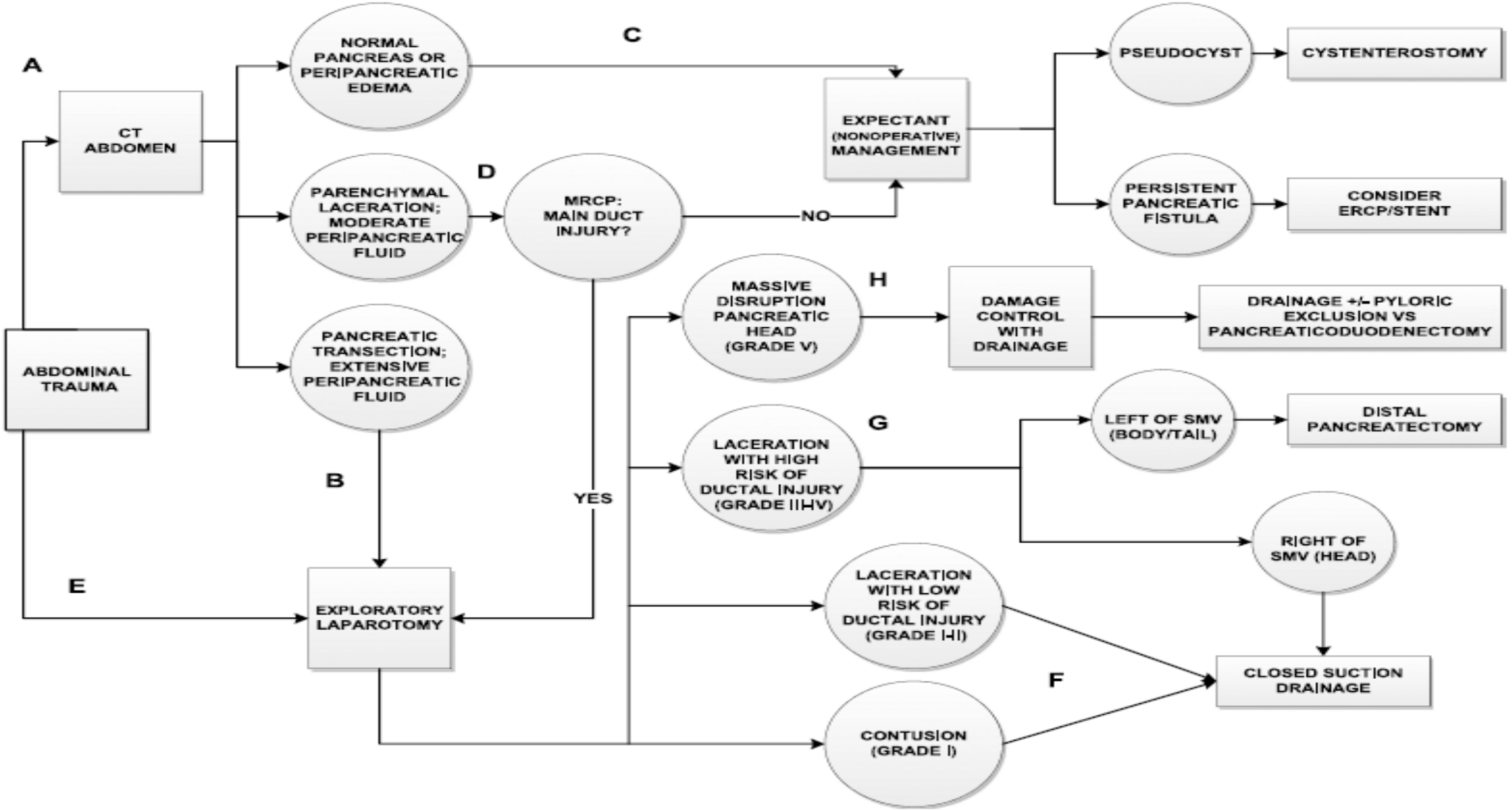
Fluid collections: ERCP

- Stent past duct injury or
- Sphincterotomy, or
- Stent over sphincter of Oddi, or
- Internal / external drainage, or
- Surgery



The benefits of ERCP have to be balanced with its numerous complications, such as bleeding, pancreatitis and perforation.

Ker-Kan Tan, Diana Xinhui Chan, Appasamy Vijayan, Ming-Terk Chiu *JOP. J Pancreas (Online) 2009 Nov 5; 10(6):657-663.*



Western Trauma Association Management Algorithm for acute pancreatic injury.
Bifl et al 2013 J Trauma Acute Care Surg Vol 75, Nr 6

Complications, late diagnosis

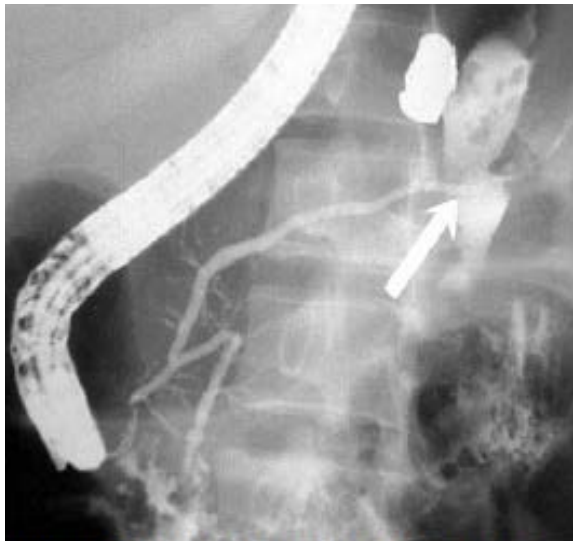
Persistent leak: ERCP

- Duct continuity preserved - stent / spincterotomy

Pseudocysts:

- Transgastric or transduodenal endo drainage

Pancreatectomy better for distal duct injuries:
prevents future stent exchanges and duct strictures



Lewis, Krige, Bornman, et al. *Br J Surg* 1993; **80**
Funnell, Bornman, Krige, Beningfield *Br J Surg* 1994; **81**
Degiannis, et al. *Injury* 2008; 39

Pancreatic injury Outcomes

SAJS
General Surgery

Pancreatic injuries after blunt abdominal trauma: An analysis of 110 patients treated at a level 1 trauma centre

J. E. J. KRIGE, M.B. CH.B., M.SC., F.R.C.S. (ED.), F.A.C.S., F.C.S. (S.A.)
U. K. KOTZE, R.N., R.M., CHN., B.A. CUR.
Department of Surgery, University of Cape Town, and Surgical Gastroenterology Unit, Groote Schuur Hospital, Cape Town

M. HAMEED, M.B. CH.B., F.C.S. (S.A.)
Department of Surgery, University of Cape Town

A. J. NICOL, M.B. CH.B., F.C.S. (S.A.)
P. H. NAVSARIA, M.B. CH.B., F.C.S. (S.A.)
Department of Surgery, University of Cape Town, and Trauma Centre, Groote Schuur Hospital

Overall complication rate was 74.5% and 16.4% mortality.

5 Whipple procedures all survived

Only 2 of the 18 deaths were attributable to the pancreatic injury.

Shock on presentation was highly predictive of death

Mortality increased exponentially with number of associated injuries

AAST Duodenal Injury Grading

Grade	Injury	Description
I	Hematoma, laceration	Involvement of a single portion of the duodenum
II	Hematoma, laceration	Involvement of more than 1 portion, disruption of <50% of the circumference
III	Laceration	Disruption of 50%–75% of the circumference of D2; disruption of 50%–100% of the circumference of D1, D3, and D4
IV	Laceration	Disruption of >75% of the circumference of D2 or involvement of the ampulla or distal common bile duct
V	Laceration, vascular injury	Massive disruption of the duodenopancreatic complex or devascularization of the duodenum

lote: The duodenum is divided into duodenal bulb (D1), descending part (D2), transverse part (D3), and ascending part D4).

Adapted from Moore EE, Cogbill TH, Malangoni MA, et al. Organ injury scaling, II: pancreas, duodenum, small bowel, olon, and rectum. J Trauma 1990;30(11):1428.

Duodenal injury

Grade I, II, III

- Repair (75-85%), debride and drain
- Consider patch, feeding tube

Grade IV, V

Tissue loss with intact ampulla and bile duct

- Debride, close, drain, decompress
- Consider pyloric exclusion?

In addition, consider disrupted ampulla or bile duct?

- Anatomical variations
- Intra-op cholangiogram / pancreaticogram, or
- Close, drain, investigate: CT / ERCP / MRCP
- Delayed definitive surgery: pancreatico-duodenectomy?

Melamud et al., Radiol Clin N Am 53 (2015)

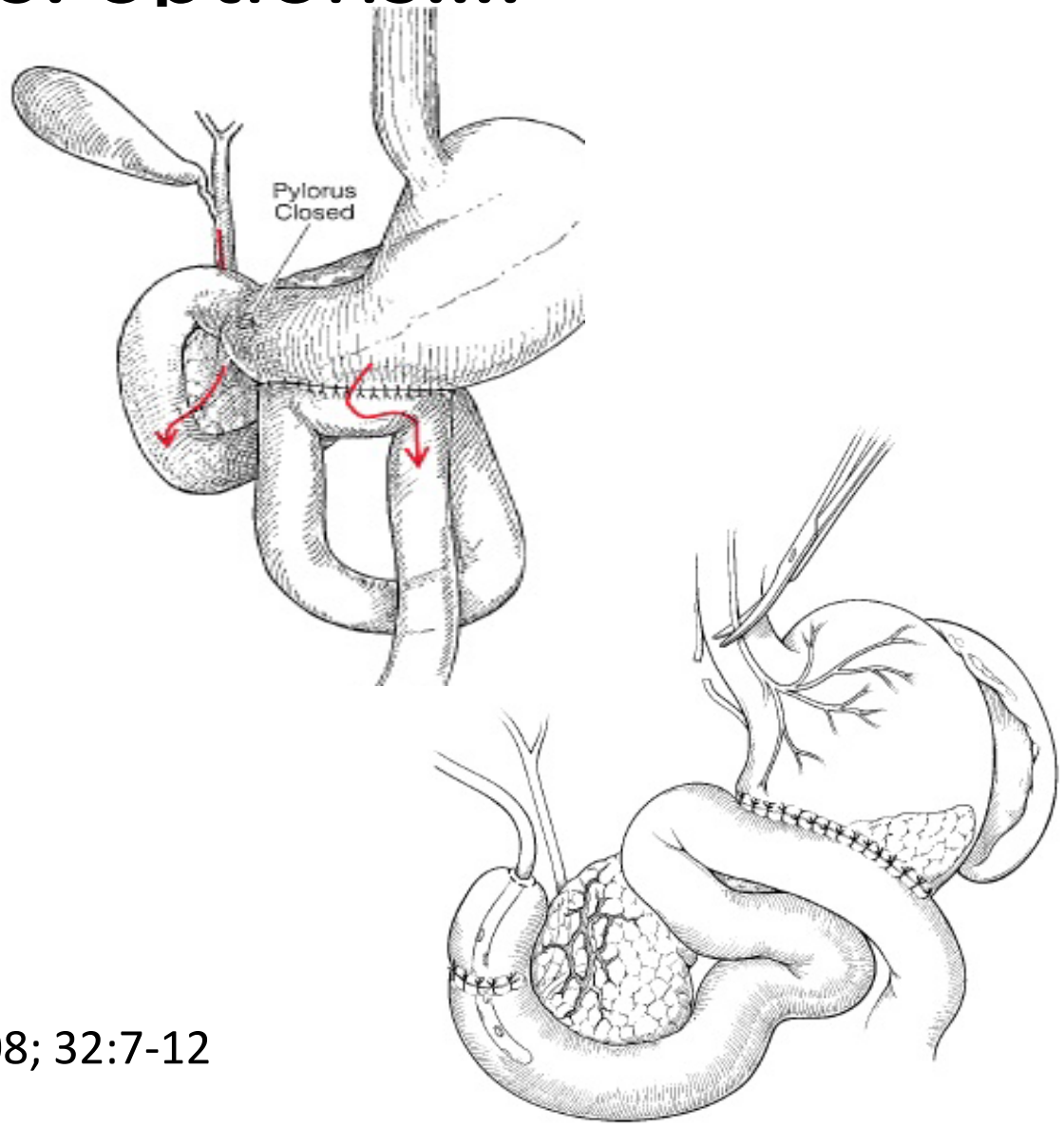
Extreme duodenal injuries: options….

Duodenorrhaphy with

- Pyloric exclusion
- Triple ostomy (gastrostomy, antegrade and retrograde jejunostomies)
- Jejunal serosal patch
- Pedicled grafts (ileum, jejunum, stomach)

Segmental resection with

- Duodeno-duodenostomy
- Duodeno-jejunostomy R-Y
- Duodenal diverticulization



Velmahos et al. World J Surg 2008; 32:7-12

Pyloric exclusion debate: always controversial

Against

- Longer hospital stay (32.2 vs 22.2 days, P = 0.003)
- Confers no survival or outcome benefit
- greater overall complication rate, greater pancreatic fistula rate
- Simple repair without pyloric exclusion is both adequate and safe for most penetrating duodenal injuries

- Pyloric Exclusion in the Treatment of Severe Duodenal Injuries: Results from the National Trauma Data Bank. Dubose et al. The American Surgeon, Volume 74, Number 10, October 2008, pp. *925-929(5)*
- A ten-year retrospective review: pyloric exclusion for penetrating duodenal and combined pancreaticoduodenal injuries. Seamon et al. J Trauma. 2007 Apr;62(4):829-33

For:

Pyloric exclusion decreases fistula rate

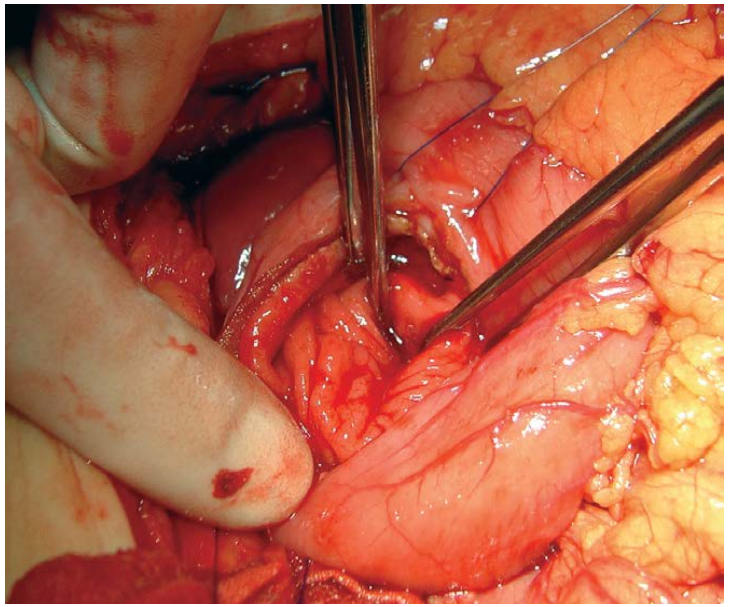
Good for “high risk” cases

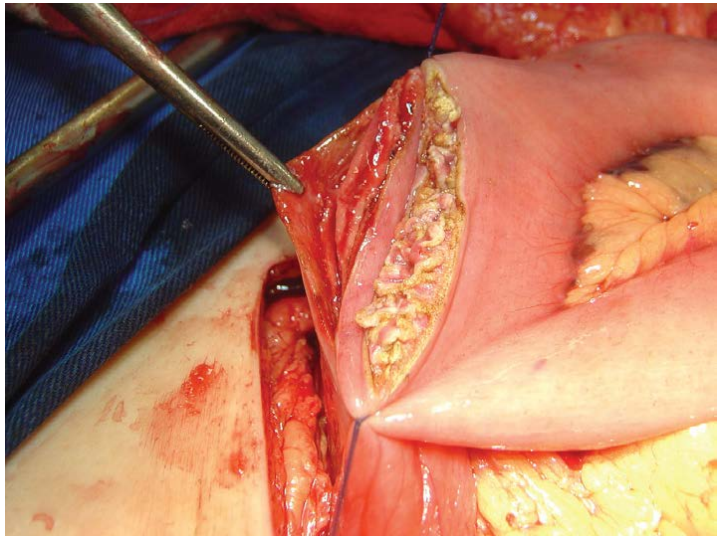
- Combined pancreas + duodenal injuries
- High grade duodenal injuries
- Gr IV pancreas head injuries

Post op fistula rate:

- 43% in primary repair and
- 12% in repair + pyloric exclusion

Degiannis et al. World J Surg. 1993;17(6):751-4.



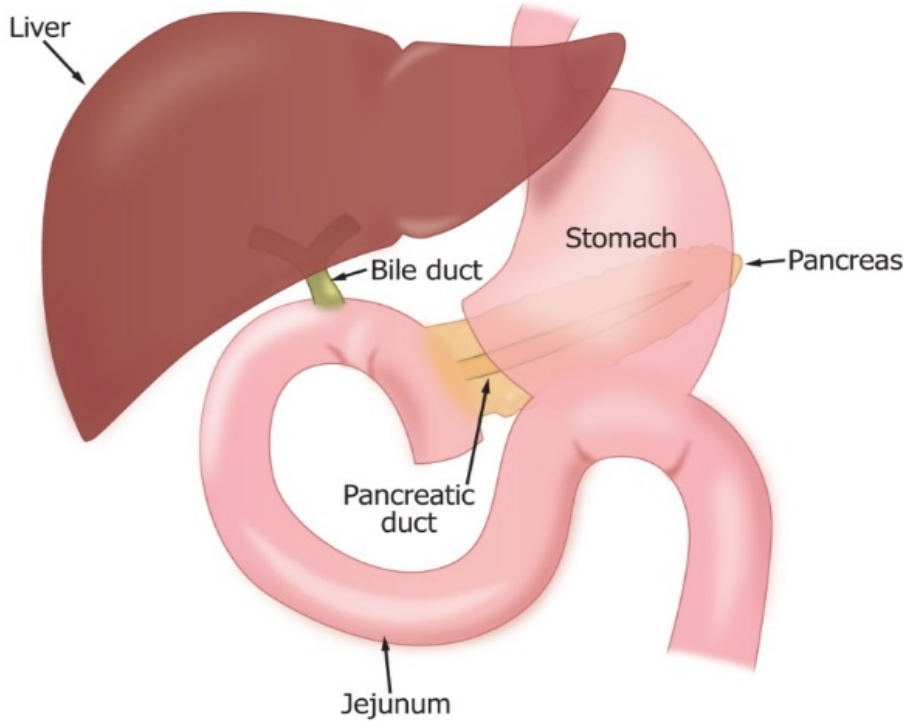


Gustavo Pereira Fraga Sao Paulo Med J. 2008;126(6):337-41.

Combined injuries requiring definitive surgery: Pancreatico-duodenectomy

High morbidity and mortality in trauma patients

- Small duct
- Associated injuries
- Oedema of pancreas and jejenum



Indicated for severe combined injuries

- Destruction of Ampulla of Vater
- Isolated grade 5 pancreatic injury
- Isolated gr 5 duodenal injury

Consider risks and benefits:

Damage control, deferral to “more favourable conditions” , or

Immediate definitive surgery

Pancreaticoduodenectomy: Outcomes

Thompson et al. J Trauma Acute Care Surgery 2013 August: 75(2): 225-228

- 15 patients over 14 years
- Whipple for penetrating and blunt trauma
- Most required damage control surgery
- 13% mortality

Van der Wilden, World J Surg 2014 38:335-340

- Data Base review over 3 yrs, 39 pts had Whipple
- Mean ISS: 27+- 13, mortality 33%
- Non Whipple patients had similar outcome
- ISS was the only independent predictor of mortality

Asensio, Demetriades et al. J Am Coll Surg. 2003 Dec;197(6):937-42

- 67% overall survival

Management of complex pancreaticoduodenal injuries: Conclusions

Optimal results require

Multidisciplinary treatment approach

- Trauma surgeons and pancreatic / hepato-biliary surgeons / endoscopic options
- Interventional radiologists and Intensivists

Choose simple solutions

- Decisive surgery for the tail of the pancreas
- Conservative approach to the head, unless imaging is conclusive of duct injury
- Simple repair & decompression for severe duodenal injuries
- Early diagnosis and repair for bile ducts

Extensive resections rarely required, if so, do “electively”

Always provide wide drainage

Mortality mostly related to concomitant injuries