COMPLEX PANCREATICoduodenal INJURIES

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THE PROBLEM

**DUODENAL / PANCREATIC INJURIES**

- Difficult to diagnose
- Not very common
- Anatomic and physiologic challenges
- 90% rate of associated injuries (abdominal and others)
- High complication rate
- WWII - series of 118 cases of duodenal injuries with 57% mortality. Largest military series.
RELATIONSHIPS TO ADJACENT STRUCTURES

ANATOMY

- duodenum digitorum - “space of 12 digits”. 30 cm
- D1 - pylorus to CBD and GDA
- D2 - CBD to ampulla of Vater
- D3 - Ampulla - SMA/SMV
- D4 - SMA/SMV - jejunum
ANATOMIC CONSIDERATIONS

ADJACENT STRUCTURES

- Over aorta and IVC; spine
- SMV joins splenic vein to form portal vein
- Anterior to right kidney
- Inferior to gallbladder and liver
- Distal pancreas intimate with spleen
- Multiple variations in vascular anatomy
PHYSIOLOGIC CONSIDERATIONS

PANCREATIC FUNCTION

- Approximately 10 L of fluid from stomach, biliary tract, and pancreas pass through duodenum each day.
- Normally, small bowel absorbs 80% of this.
- If hole, leak, fistula - significant impact on fluid and electrolyte homeostasis.
- Endocrine (insulin, glucagon, gastrin) and Exocrine (amylase, proteases and lipases)
IMAGING, LABS

DIAGNOSIS

- History - blow to epigastric area
- Labs (amylase, lipase) - can be helpful but unreliable
- Imaging - CT scan - good (80-90%) at detecting injury, but not very good at determining ductal injury
- ERCP - can be diagnostic and therapeutic (stent)
- MRCP - non-invasive. Not very helpful
INTRA-OPERATIVE STRATEGIES

DIAGNOSIS OF INJURY INTRA-OPERATIVELY

▸ Laparotomy - bile staining, retroperitoneal hematoma, fat necrosis, supra-mesocolic edema.

▸ Kocher maneuver - head of pancreas and duodenum

▸ Lesser sack/ gastrocolic ligament - body and tail of pancreas

▸ In rare cases, need to divide pancreas - smv/pv bleeding
PRINCIPLES OF TREATMENT

- Adequate debridement and drainage
- Duodenal diversion
- Nutritional support
TREATMENT

- Grade 1/2 - non-operative tx or simple drainage
- Grade 3 - Distal pancreatectomy +/- splenectomy vs wide drainage
- Grade 4 - wide drainage, ERCP/stent
- Grade 5 - Damage control laparotomy; Wide drainage and debridement, ?staged Whipple - if devitalized duodenum or pancreatic head
SEVERAL OPTIONS USUALLY MEANS NO BEST SOLUTION

TREATMENT OF DUODENAL INJURIES

- Grade 1 - observe
- Grade 2 - +/- evacuate hematoma; primary repair (single layer monofilament)
- Grade 3 - Primary repair, duodeno-duodenostomy, duodeno-jejunostomy, pyloric exclusion +/- feeding jejunostomy, triple tube therapy
- Grade 4/5 - damage control; ? delayed whipple
DUODENAL MANAGEMENT - CONTINUED

- Duodenal diverticulization (Berne et al, 1968) - antrectomy, vagotony, tube douodenostomy, and gastrojejunostomy.
  - Time consuming, resecting normal stomach, largely abandoned.

MORE DUODENAL TRICKS

- Duodenostomy - for decompression after primary repair
- Serosal patches
  - Both show no benefit (Ivatury, et al)
  - Duodenojejunostomy with Roux-en-Y reconstruction may be safest option if cannot repair primarily (Weigelt, et al)
MORBIDITY AND MORTALITY

COMPLICATIONS

- Hemorrhage - most common cause of early death; delayed

- Pancreatic fistula - low/high output. Drainage, ERCP/stent, operative tx. Somatostatin, Distal feeding. Adds avg 27 days and $191K.

- Duodenal fistula and stricture - pyloric exclusion with gastroenterostomy - decreases output of fistula and facilitates drainage of GI tract if stricture
MORBIDITY CONTINUES

COMPLICATIONS

- Abdominal abscess - Image guided drainage can usually effectively manage

- Pancreatic pseudocyst - endoscopic, percutaneous and surgical options

- Pancreatitis - usually self limiting. Pancreatic necrosis requires debridement at times.

- Pancreatic insufficiency - Usually if > 80% removed or underlying pathology. Replace endocrine/exocrine fun
“HERE’S THE DEAL”

SUMMARY

- Complex pancreaticoduodenal injuries are challenging
- In acute setting, stop bleeding, identify injuries, close holes, and drain
- Avoid Whipple (definitely the reconstruction) in initial operation, but do it soon if necessary
- Bile, gastric contents and pancreatic enzymes leaking into abdominal cavity and/or retroperitoneum worse than results of good Whipple
- Good Luck!