Interventional Radiology

A Medley of Interventions in the Digestive System

Ricardo Paz-Fumagalli, MD
Radiology Department
Mayo Clinic, Jacksonville, FL

Purpose:
- To present an overview of common abdominal procedures in Interventional Radiology
- Oncologic interventions excluded
- Presented in separate lecture last year

Percutaneous GI Access

Gastrostomy, Gastrojejunostomy and Direct-Stick Jejunostomy

Academic centers
- Endoscopic 65%
- Radiologic 35%

Community hospitals
- Endoscopic 82%
- Radiologic 18%

Levin, Radiology 1990

Gastrostomy:
Enteral Nutrition

- Neurologic impairment
  - Altered swallowing mechanism
  - Mental status changes
- Tumors of pharynx, larynx and esophagus
- Facial trauma
Gastrostomy:
Gastric Decompression

- Obstruction
  - Peritoneal carcinomatosis, pancreatic carcinoma
  - Severe chronic inflammation—pancreatitis
- Gastroparesis
  - Diabetes, scleroderma

Percutaneous Gastrostomy:
Procedure

- Nasogastric catheter for air insufflation
- Glucagon IV for temporary stomach paralysis
- Gastropexy optional
- Tract directed towards pylorus
  - Facilitates G-J conversion
- Tract dilatation
  - Peel-away sheath if tube ≥16F
- Place tube over guidewire

Gastropexy
“To hold the stomach in place”

- Facilitates tract dilatation
- Optimizes the tract healing
- Prevention of leaks
  - When manipulating the tube
  - At time of initial placement—controversial
- Complications of the T-fasteners
  - Local infection
  - Gastric erosion
  - Skin erosion
Gastrojejunostomy

American Society of Gastrointestinal Endoscopy

Indications:
- Severe GE reflux
- Aspiration of tube feedings
- Gastroparesis
  - diabetes
  - scleroderma

Gastrointestinal Endoscopy 1998

Gastrojejunostomy: Procedure

- Access similar to G-tube
- Tract directed towards pylorus
- Transpyloric catheterization of jejunum
- Single or double lumen
  - Enteral nutrition
  - Gastric decompression
Direct-Stick Jejunostomy

Indications
- Gastrostomy not possible
- Gastric resection
- Gastric pathology
- Interposition of organs

Direct-Stick Jejunostomy: Procedure
- Prep similar to G-tube
- Visualize colon
- Barium PO the night before
- Nasojejunal catheter; glucagon
- Selective jejunal air distention
- Jejunopexy and percutaneous catheterization
- Avoid balloon catheter
- Intestinal obstruction

Radiologic GI Access
Advantages
- Possible in poor candidates for other types of gastrostomy
- Rescues failed PEG
- Minimizes sedation and eliminates general anesthesia
- Offers the benefits of gastropexy
  - Short and stable tract, prevents tract disruption
  - Allows free and safe tract manipulation
- Simultaneous gastric decompression and jejunal feeding
- Easy use of jejunum
- Routine use of G-J
- Management of patient at risk for aspiration pneumonia
- Direct-stick jejunostomy can rescue failed or impossible G tube
- Morbi-mortality comparable or better than other methods
Percutaneous Biliary Drainage and Biliary Stents

Biliary Drainage
Indications
- Eliminate jaundice and pruritus
- Treat cholangitis and sepsis
- Management of bile leaks
- Biliary stone management
- Failed ERCP
- Access for brachytherapy
- Before biliary surgery

Biliary Drainage
Procedure Steps
- Transhepatic cholangiogram
- Secure catheter access distal to abnormality
  - 8-12 F
  - Internal/external drainage
  - Retention loop (pigtail)
- Gravity drainage to collection bag

- Pancreatic cancer
- Duodenal mass precluded endoscopic management

- Extensive intrahepatic biliary stones
- Percutaneous stone removal
- Several sessions
- Bilateral biliary access
- Final result
Biliary Stents

Implants in the lumen of bile ducts to support the duct open

- Plastic
  - Temporary
  - Internal (usually endoscopic)
  - Internal/external (percutaneous)
- Metallic
  - Permanent internal implant. Cannot be removed.

Percutaneous Biliary Stent

Procedure

- Transhepatic access
- Over-the-wire technique
- Self-expandable

Pancreatic cancer

Endoprotesis metálica percutánea

Benign stricture of hepatojejunostomy anastomosis

- Balloon dilatation
- Internal/external drain
Papillary cholangiocarcinoma
Metallic stent

Acute Gastrointestinal Hemorrhage: Angiographic Therapy

Gastrointestinal Hemorrhage

Team management
- Internal Medicine
- Gastroenterology
- Critical care
- Radiology
- Diagnostic
- Interventional
- Surgery

Acute Gastrointestinal Hemorrhage
Endoscopy

Initial diagnosis and treatment
- Endoscopy is diagnostic in:
  90% upper GI bleeding
  60% lower GI bleeding
- Blood flow from small bowel creates confusion
- Endoscopic hemostasis in 80%

Anatomy

Upper GI tract
- Extensive vascular redundancy
- Abundant collateralization of blood flow
Anatomy

Lower GI tract
- Less redundancy and collateralization compared to upper tract

Acute Gastrointestinal Hemorrhage

Radiology

- Localization
  - CT scan
  - Nuclear Medicine
  - Angiography
- Guide therapy
  - Surgical versus angiographic

*Retzlaff. JAMA, 1961

Acute Gastrointestinal Hemorrhage

Imaging

- CT scan
  - Fast multidetector scanner
  - Can show bleeding site
  - Limitations:
    - Intermittent bleeding, need for IV contrast, often oral contrast given.

Tew K. AJR 2004;182:427-430

Acute GI Hemorrhage

Visceral angiography
- Selective catheterization
- Celiac trunk
  - Gastroduodenal, hepatic, left gastric, splenic arteries
- Superior mesenteric
  - Pancreatoduodenal, ileal, jejunal, colic arteries
- Inferior mesenteric

Acute GI Hemorrhage

Angiographic treatment

- Indications
  - Sick or debilitated patient, poor surgical candidate
  - Recently embolization used more liberally
- Vasopressin infusion
- Embolization

Objective
- Vascular occlusion
  - Upper GI tract
    - Extensive collaterals
    - Tolerates less vascular selectivity
  - Lower GI tract
    - Less collaterals
    - More susceptible to ischemia if not very selective
Acute GI Hemorrhage

Emboliization

- Technique
  - Catheterization as selective as possible
  - SF y 2.2-3F catheters
  - Embolization agents
    - Gelfoam
    - PVA >250µ
    - n-BCA
    - Coils
    - Avoid liquid agents

Embolization Agents

- Coils
- N-Butyl Cyanoacrilate
- PVA (polivynil alcohol)

Acute GI Hemorrhage

- Upper GI tract
  - Causes
    - Peptic ulcer disease
    - Esophageal varices
    - Hemorrhagic gastritis
    - Esphagitis
    - Mallory-Weiss tear
    - Marginal ulcer
    - Sphincterotomy
    - Neoplasia
    - Hemobilia
    - Aortoenteric fistula
    - Pseudoaneurysm
    - Dieulafoy lesion
    - Vascular malformations

- Lower GI tract
  - Causes
    - Diverticulosis
    - Angiodysplasia
    - Neoplasia
    - Inflammatory disease
    - Ischemia
    - Polyps
    - Meckel’s diverticulum
    - Aortoenteric fistula
    - Endoscopic procedures

Gastric hemorrhage

- 88 year old male
- Abdominal surgery for mesenteric hemorrhage
  - Originating rom middle colic artery
  - Surgical ligation
- Postoperative gastric hemorrhage
  - Angiogram negative
  - Prophylactic embolization of left gastric artery
  - Gastric bleeding that failed endoscopic treatment
  - Angiographic treatment even if bleeding site not found

Lang EV. AJR, 1992
Hemobilia

- 41 year old female with liver transplant
- Multiple liver biopsies
- Upper GI bleeding
  - Non-diagnostic endoscopy
  - Angiography for diagnosis

Angiodysplasia

- Submucosal vascular ectasia
- Vascular conglomerate in arterial phase of angiogram
- Early and prominent venous drainage

Angiodysplasia

- 92 year old female
- Lower GI bleeding
  - Blood in colon interfered with endoscopy
  - Diagnostic angiogram needed

Diverticular hemorrhage

- 77 year old male
- No medical history
- Rectal bleeding
Chronic Mesenteric Ischemia: Percutaneous Intervention

Chronic Mesenteric Ischemia

- Chronic occlusive vascular disease
  - Celiac, Superior and Inferior Mesenteric arteries
    - Asymptomatic
      - Abundant collateralization
    - Intestinal Angina
      - Insufficient collateralization after meals
    - Intestinal Infarction
      - Insufficient collateralization at rest

Chronic Mesenteric Ischemia

- Intestinal Angina
  - Cause
    - Arterial occlusion
    - 2 or 3 arteries with narrowing or occlusion
      - Single severe superior mesenteric artery narrowing can be symptomatic

Chronic Mesenteric Ischemia

- Treatment
  - Surgery
  - Percutaneous Intervention
    - Angioplasty/Stenting
Symptomatic Single Vessel Disease
- M.R. 59 year old female
- Non-specific abdominal pain
- Nausea, weight loss

M.R. 59 year old female
Normal celiac/IMA
SMA FMD
PTA Post PTA
Complete resolution of abdominal symptoms

Asymptomatic Multiple Vessel Disease
- J.A. 57 year old male
- LUQ pain, 100 lb. weight loss

Abdominal Collections:
Percutaneous Management
- 50% celiac stenosis
- 79% SMA stenosis, IMA occlusion
- 3-20-02 SMA stent

Abdominal Collections
- Postoperative abscess
- Enteric abscess
  - Diverticular, Appendiceal
  - Crohn’s disease
- Liver abscess
- Biliomas
- Pancreatic collections

Percutaneous Drainage Objectives
- Complete resolution (without surgery)
- Adjuvant to surgery
  - Stabilize the critically ill
  - Simplify complex collections
  - Improve/control high flow fistulas
Percutaneous Drainage Benefits

- Avoids laparotomy and general anesthesia
- Minimizes morbidity:
  - Minimal transgression of peritoneum
  - Organs are not mobilized
  - Less pain and respiratory interference
  - The patient can mobilize immediately
- Stabilizes the critically ill

Percutaneous Drainage Technical aspects

- Find the collection: CT/US
- Antibiotic if needed
- Choose a safe drainage route
- Place 8-14 F caliber drainage catheter

Percutaneous Drainage Post op Abscess

Diverticular Abscess

- Diverticulum
- Diverticulitis

68 year old male

Diverticular abscess drainage

Appendiceal Abscess

- Sigmoid resection

Sigmoid resection
Bilioma

Liver mass
Liver resection
Infected post op collection

Fistulogram after drainage
Isolated leaking bile duct.
Alcohol injection for duct sclerotherapy. Another operation avoided.

Pancreatic Pseudocyst

Definition

Collection of pancreatic juice without infection, surrounded by a fibrous wall or granulation tissue

Natural History

<5 cm resolve or stay asymptomatic
<6 weeks: 40% resolve, 20% complicated
>6 weeks: 4% resolve, 60% complicated
Acute pancreatitis, majority resolve
Chronic pancreatitis, majority do not resolve

Conservative Management

If <5 cm, symptomatic and without complications

Indications for Intervention

Symptoms
Increase in size or if recurrent
Complications:
- Rupture, hemorrhage, infection, intestinal or biliary obstruction
Pancreatic Pseudocyst
Percutaneous Drainage

Resolution of fluid collection
Communication with pancreatic duct closed in 4 weeks

Pancreatic Necrosis

- 20% of pancreatitis
  - 40-70% get infected
  - Responsible for 80% of mortality

Infected Pancreatic Necrosis

- Surgery is treatment of choice
  - Necrosectomy
- Percutaneous drainage
  - Catheter “necrosectomy”
  - Traditionally 20-30% successful
  - Can improve results with aggressive intervention

Infected Pancreatic Necrosis

Percutaneous drainage
- Remove fluid
- Remove necrotic tissue
  - Labor intensive and difficult
  - Repeated washings of the cavity

Infected Pancreatic Necrosis

- 41 year old male
- Had surgical necrosectomy
- Surgical drainage tubes in place
Infected Pancreatic Necrosis

- Exchange of surgical for radiologic tubes
- Placement of an additional percutaneous drain
- Fluoroscopy showed necrotic semi-solid material

3 weeks later

4 weeks later

Infected Pancreatic Necrosis

- Repeated percutaneous removal of necrotic tissue
- Resolution without surgery

8 weeks later

9 months later