Section 16

LECTURE

Imaging of the GI Tract
IMAGING OF THE GI TRACT

DIAGNOSTIC RADIOLOGY - THE USE OF CONTRAST

An overview of the radiologic techniques used to define intra-abdominal organs and pathology.

I. Natural contrast - the plain abdominal film

Bone, tissue, fat, air
Define obstruction, perforation, calcification
Quick & cheap

II. Barium as a contrast agent - imaging of the hollow organs

Upper GI series, small bowel follow through, barium enema
Dynamic exam when done under fluoroscopy
Selective manipulation (compression spot films)
“Double contrast” air barium interface
Advantages:
Non invasive, relatively inexpensive
Better for function than anatomy
Disadvantages:
Limited sensitivity, lack of color, lack of therapeutic potential
Does not view solid organs
Largely eclipsed by endoscopy

III. The biliary exam - absorbed contrast agent

Liver and biliary excretion
Least valuable when you need it most

IV. Other radiologic approaches

Imaging procedures - non-invasive radiology of the solid organs and gall bladder

Ultrasound - Acoustic Transmission
Procedure of choice for gall bladder, and biliary tree, pelvic organs, ? pancreas
Crude, quick technique for identification of cysts, masses, aneurysms,
internal structures and stones
Most effective in the thin patient
depth of penetration and clarity of image depend on frequency of sound

Computerized Body Tomography
Computer manipulation of Xray images
Can define precisely small differences in tissue density
I.V. and oral contrast to define vascular tree, bowel
New “spiral” scanners eliminate errors due to breathing, permit thinner sections
Uses:

Best pancreatic imaging
  Suspected pancreatic cancer - jaundice, pain
  Acute pancreatitis - abscesses, phlegmon
Suspected hepatic metastases
  Primary, benign and malignant tumors
Definition of abscess
Retroperitoneal Pathology
Guidance systems for percutaneous biopsy
  and aspiration techniques (limited size specimens)
Surprisingly low complication rates

Nuclear Medicine Scans
  Technetium$^{99}$ sulfur colloid for liver metastasis - obsolete, emptying
  HIDA for biliary excretion, gall bladder function
  Gallium, monoclonal antibodies, Indium for abscesses
  Labeled red blood cell bleeding scan

MRI - Magnetic Resonance Imaging - magnetic deformation
  $T_1$ weighted images - lesion detection
  $T_2$ weighted images - lesion characterization (fluid, blood, solid)
  Potential for separating by metabolic state as well as by
    anatomy - not yet helpful
  At present, useful for hepatic masses, hemochromatosis
    differentiating cysts from vascular structures

Contrast Agents
  Gadolinium - perfusion = iodine
  Iron oxide - RE system = $T^{99}$ sulfur colloid

MR Cholangiography and Pancreatography
  Computer reconstruction of fluid filled duct
  Detects change in character, intraluminal filling defects

PET scans – positron emission
  Defines metabolic activity in lesions via glucose uptake
  Differentiate malignant from benign lesions.

THE INTERVENTIONAL RADIOLOGIST

A variety of diagnostic and therapeutic approaches with unavoidable
level of risk; often preferable to riskier and more debilitating
surgical alternatives.
I. Direct cholangiography
   ERCP - see endoscopy
   PTC - skinny needle cholangiography
      direct puncture of bile duct through liver under fluoroscopic guidance
      differentiates mechanical biliary obstruction from hepatocellular disease.
      99% success rate if ducts dilated
      much less, 50-70% if non-dilated

Transhepatic biliary drainage
   A means of relieving obstructive jaundice in the poor operative risk
External drainage vs. internal endoprosthesis
Ability to change catheters
   expandable metal stents for long-term patency
Definitive therapy for the pre-terminal patient
Disadvantage - leakage around drainage catheter
   biliary ascites
   patient discomfort, dislodgment

Intra-abdominal abscess
   Aspiration for diagnosis, especially pancreatic phlegmon
Catheter placement for drainage
   Diverticulitis - simplifies surgery
   Postoperative abscesses
   probably not appropriate in pancreatic lesions

II. Injection therapy of hepatic metastases
   Injection of alcohol to ablate lesion
   Use of cryosurgery for same

VASCULAR RADIOLOGY - DIAGNOSIS AND THERAPY

I. Non invasive visualization of the vascular tree
   Doppler ultrasound - patency of vessels
   MR angiography - patency of vessels
   CT angiography - defines vascular
      Increasing use of 3-D reconstruction of MR and CT images replacing
      direct diagnostic angiography. Rapidimage accrual combined with timed
      IV contrast vastly improves the identification of lesions and defines their
      Respectability

II. Invasive angiography
   Technique
      Femoral artery puncture - Seldinger needles, guidewires
      Catheters with memory
      Continuous recording of passage of a bolus of contrast from artery to vein

Complications - cholesterol emboli, vascular injury, renal failure

15.3
Uses

Gastrointestinal bleeding
Identification of site of active bleeding
Infusion of vasoconstrictor material to decrease rate of bleeding
Embolization of bleeding vessel
clots, instant glue
Recurrent bleeding - obscure lesions
angiodysplasia, small bowel tumor

Defining gastrointestinal anatomy
Mesenteric ischemia - a difficult diagnosis; occlusion of 2 or 3 vascular trunks
Portal hypertension - site of block and suitability for surgery

Pancreatic tumors - defining operability

Hepatic tumors - suitability for embolization
Intra-arterial chemotherapy via infusion pump
Chemo-embolization

Techniques for variceal obliteration - quick-setting glues

Angiographic portosystemic shunts - TIPS
Used in variceal bleeders unsuitable for operation
Poor risk for awaiting transplant
False passage created hepatic vein to portal vein
Insert guidewire
Expandable metal stent creates shun
May help intractable ascites

III. Lithotripsy and gallstone dissolution

Shock wave lithotripsy
Fragmentation of stones in gall bladder, occasionally bile duct, may still require dissolution therapy, eclipsed by laparoscopic cholecystectomy
Gallstone dissolution by direct catheter placement
methylterbutyl ether
Laser and electrohydraulic lithotripsy
Basketing of retained stones