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)
- Suprisingly 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

- Gadalinium - 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 itheir 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

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 laparascopic cholecystectomy
Gallstone dissolution by direct catheter placement
methyltertbutyl ether
Laser and electrohydraulic lithotripsy
Basketing of retained stones