A Case of Obstructive Jaundice: Imaging and Intervention

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Request for Radiologic Study

• Mr. K.T.
  – 76 y/o male w/ hx of colon ca, presents w/ jaundice, nausea and weight loss.

• Labs:
  – ALT 65, AST 55, Total Bili 20.7 (Direct 15.7), Alk Phos 375, Lipase 432, PT/PTT 14.3/27

• Please assess for obstructive mass vs. choledocholithiasis vs. cholangitis
Approach to Cholestasis

Hyperbilirubinemia

Unconjugated (Indirect)
- Overproduction
- Defect in conjugation

Conjugated (Direct)
- Defect in secretion

Hepatocellular dysfunction
- Hepatitis
- Cirrhosis
- Drug-induced
- Sepsis
- Post-op
- 1° Biliary Cirrhosis

Obstruction
- Choledocholithiasis
- Cholangiocarcinoma
- Pancreatic carcinoma
- Pancreatitis
- Sclerosing cholangitis
Obstructive Jaundice: Menu of Radiologic Tests

• Ultrasound
  – > 95% Se for cholelithiasis
  – Choledocholithiasis: 75% Se w/ dilated bile ducts, 50% Se w/ non-dilated bile ducts
  – Perihilar, extrahepatic and periampullary cancers may not be detected
  – Indirect signs: intrahepatic ductal dilatation, abrupt changes in ductal diameter
  – Color Doppler: detect compression, encasement or thrombosis or portal vein or hepatic artery by tumor
  – Reported 50% detection rate for gallbladder ca, 86% for cholangio ca.
Ultrasound

Dilated intrahepatic bile ducts

Mass

From gu.vghtc.gov.tw/meeting/GSXCases

From BIMDC PACS
Menu of Radiologic Tests (2)

• CT
  – 75% Se for detecting choledocholithiasis
  – Offers more comprehensive analysis than u/s
  – Less dependent on operator’s skills
  – Intrahepatic mass lesions and dilated intrahepatic ducts are easily detected
    • Criteria for bile duct dilatation:
      – Normal CBD = 4-6 mm; >8 mm - dilated; >10 mm - unequivocally dilated
      – Visualization of intrahepatic ducts = bile duct dilatation
  – Visualization of perihilar tumors or tumors involving vasculature, and lymph node involvement
  – To visualize cholangiocarcinoma, must do delayed imaging (~10 min) w/ contrast (i.e. not a standard procedure = must request if high suspicion)
CT

Mass

Dilated intrahepatic bile ducts

Note: Vessel abruptly ends with no sign of peripheral flow.
Menu of Radiologic Tests (3)

- MRI
  - Noninvasive; don’t need contrast!
  - Demonstrates ductal dilatation and strictures with 95% sensitivity
  - Sensitivity for stone visualization of 75-95%, better than CT or US
  - MRCP uses T2-weighted imaging
  - Fat suppression further contributes to visualization of biliary tract
  - Rapidly becoming the imaging modality of choice for the biliary system
MRCP

- Dilated intrahepatic bile ducts
- Mass

From BIDMC PACS
Menu of Radiologic Tests (4)

• ERCP
  – Procedure of choice for abnormalities of the distal biliary and pancreatic ducts
    • Offers the option of intervention
      – Stone extraction
      – Sphincterotomy
      – Placement of biliary stent
    – Unsuccessful in 3-10% of cases; 1-5% incidence of pancreatitis and other complications
ERCP

Dilated Left and Right hepatic bile ducts

Obstruction/stricture

From BIDMC PACS
Menu of Radiologic Tests (4)

• PET Scan
  – In-vivo assessment of metabolism of bile-duct epithelial cells
  – Cholangiocarcinoma cells have high glucose uptake (“hot spots”)
  – Hepatocytes have high glucose-6-phosphatase activity, thus turnover glucose rapidly, increasing signal-to-background ratio
  – Small studies have documented detection of 1 cm lesions w/ PET
  – Has potentional, but needs more investigation
Percutaneous Transhepatic Cholangiography (PTC)

- Close to 100% Se and Sp for identifying the cause and site of biliary tract obstruction
- Preferred over ERCP for more proximal lesions
- Indicated after failed ERCP
- Provides opportunity for intervention
  - Bile sample: cancerous cells seen in 30-40% of cases of cholangioca
  - Brush biopsy: 40-70% w/ cytologic examination
  - Placement of drain or stents to relieve sxs, improve hepatic function, and allows palpation of ductal structures at time of exploration

From www.lib.csmv.edu.tw
Mr. KT’s PTC (DSA)

Note: No filling of left biliary tree!

- R biliary system
- Chiba needle
- Drain in CBD placed via ERCP

From BIDMC PACS
Percutaneous Transhepatic Biliary Drainage (PTBD)

• Goal = Palliation (decrease pruritus, cholangitis, and improve hepatic failure)
• Indications
  – Malignant biliary obstruction
    • Pancreatic cancer (#1 cause)
    • 1º biliary cancer
    • Mets to porta hepatis
  – Benign biliary obstruction
    • Strictures
    • Biliary calculi
    • Leak of bile, fistulas, sepsis
• External vs. Internal drainage
  – External – does not cross obstruction, drains percutaneously to bag
  – Internal-external – bile in obstructed segment enters through the side holes of the catheter and emerges beyond the obstruction; the external segment can be capped to make it internal
  – Internal – drains only into enteric system
  – Internal- external drain provides ready access for later procedures
  – External drain requires pain management, bile salt replacement, and maintenance on antibiotics (not physiologic)
PTBD (2)

- **Patient preparation**
  - Plt > 50,000
  - PT < 17 secs
  - Allergies! (especially contrast)
  - Administer broad spec antibx 1-2 hr pre-procedure (shown to decrease incidence of sepsis)
  - Continue abx 1-2 d post-procedure
    - Gram negs: E. coli, Klebsiella
    - Anaerobes
    - Gram pos: Streptococci, Enterococci
  - Single or combinations of Flagyl, gent, cipro, amp commonly used
  - Anesthesia: Conscious sedation w/ midazolam (Versed) and fentanyl is commonly used, along w/ local anesthesia for percutaneous procedure
Mr. KT’s PTBD (DSA)

R Biliary System

.035 glidewire (R)

L Biliary System

.035 glidewire (L)

From BIDMC PACS
Balloon Dilatation of Stricture

Note: Is this Mr. KT?

From BIDMC PACS
Biliary Stent

• **Indications**
  – Unresectable malignant strictures of extrahepatic, or proximal left or right ducts
  – ? For benign disease b/c durability has not been assessed

• **Contraindications**
  – Requiring periodic access to biliary tree
  – Curable disease
  – Future surgical procedure of biliary tree
  – Biliary leaks or fistulas

• **Advantages**
  – No external catheter
  – No external contamination
  – More freedom for patient

• **Disadvantages**
  – Lack of easy accessibility to biliary system
  – Stenosis
  – Recurrent interventions
Biliary Stent and Drain Placement

Stents

Drains

Pigtails in duodenum

From BIDMC PACS
Follow up after PTC

• Flush catheter w/ saline 2-3x/day
• For internal-external drains:
  – External drainage for 2-3 days
  – Follow bilirubin levels q1-2d
  – Tube cholangiogram at 2-3 drains to assess patency
  – Convert to internal by capping
  – Repeat tube cholangiogram ± drain change q3mos
Mr. KT’s “Tube Check”

From BIDMC PACS
PTBD Observed Results

- Successful palliation 90-95% of cases
- Procedure failure 5% of cases
- 30-day Mortality in 4 Major Series ~27-33% (same as surgery in pts. w/ advanced malignancy)
- Pre-op PTBD – Effect on Mortality has been reported to decrease from 25% to 10%
- Balloon dilatation
  - Excellent (1-2 yrs) = 24%
  - Recurrence = 1%
- Endoprosthesis of malignant biliary obstructions
  - Successful deployment = 80-93%
  - Frequency of stent occlusion ~ 6-23% (reported in literature)
    - Tumor overgrowth
    - Debris
    - Re-epithelialization
  - Migration has been seen reported in up to 5% of cases
Complications from PTC

- Cholangitis/bile leakage/catheter dislodgment ~ 40-50%
- Hemorrhage/hemobilia ~ 2.5%
- Sepsis ~ 2.5% (decreased w/ administration of pre- and post-procedure abx)
- Liver abscess < 1%
- Bile pleural effusion/ptx ~ 0.5%
- Pancreatitis ~ 10-15%
- Mortality ~ 1.7%
  - Hemorrhage
  - Septic shock
Mr. KT’s Brush Biopsy Results

• Diagnosis:
  – Atypical, degenerated ductal epithelial cells, histiocytes and inflammatory cells
  – Likely cholangiocarcinoma
Biliary Tract Cancers

- 20,000 new cases/yr of liver and biliary tract cancer in the U.S.
- Biliary tract cancer ~ 7,500/yr
  - 5,000 are gallbladder cancer
  - 2,500 are bile-duct cancers (extrahepatic, ampulla of Vater)
  - Intrahepatic bile-duct cancers classified traditionally as 1º liver cancer
- “Cholangiocarcinoma” includes intrahepatic, perihilar, and distal extrahepatic tumors of the bile ducts.
- Risk factors
  - Gallbladder cancer: gallstones, females, sex, obesity, high CHO intake, chronic infection w/ S. typhi, porcelain gallbladder.
  - Cholangioncarcinoma: 1º sclerosing cholangitis (10-30% lifetime risk), UC, bile-duct adenoma, biliary papillomatosis, choledochal cysts, Caroli’s disease, exposure to Thorotrast, O. viverrini and C. sinensis infestation (25-50x)

From NEJM 2003, 341(18)
Biliary Tract Cancers (2)

- Klatskin’s tumor
  - Originally described by Klatskin in 1965
  - Perihilar tumors involving the bifurcation of the hepatic duct

- Classification of perihilar bile-duct tumors (by Bismuth et al.)
  - Type I: below the confluence
  - Type II: reaching the confluence
  - Type IIIa: occluding the CHD
  - Type IIIb: Type IIIa and occluding either the R or L hepatic ducts
  - Type IV: Multicentric or involving the confluence and both R & L hepatic ducts

- 2/3 of all cases are perihilar tumors; ¼ are distal extrahepatic tumors; remainder are intrahepatic

From NEJM 2003, 341(18)
Biliary Tract Cancers (3)

• Histologic types
  – Adeno, papillary, mucinous (most common)
  – Sq cell, small cell, mesenchymal (<5%)

• Other tumors that can obstruct the biliary tree by
  – Direct extension: pancreas, duodenum, stomach, colon
  – Metastasis: ovary, breast, colon
  – Lymph node involvement: lymphoma

• TNM Staging
  – Stage 0: carcinoma in situ
  – Stage I: limited to mucosa, muscle layer or ampulla
  – Stage II: local invasion
  – Stage III: mets into regional and hepatoduodenal LN or invasion to adjacent tissues
  – Stage IV: extensive invasion of liver, adjacent structures or organs, mets to peripancreatic, periduodenal, periportal, celiac or mesenteric LN, distant mets.
Biliary Tract Cancers (4)

- Multiple mutations in oncongenes and tumor-suppressor genes have been described
- Many cholangiocarcinomas show staining with Ab to MUC-1
- However, little or nothing is know about how these factors cause biliary tract cancer

From NEJM 2003, 341(18)
Treatment

• Surgery – only tx proven to improve 5-yr survival
  – Common procedures are:
    • Roux-en-Y hepaticojejunostomy for type I and II tumors
    • Roux-en-Y + hepatic lobectomy for type III
    • Whipple procedure for distal extrahepatic tumors
    • Orthotopic liver transplantation for unresectable intrahepatic or perihilar tumor in the absence of extrahepatic disease

• Radiation
• ChemoTx
• Percutaneous biliary drainage
Conclusions

- Pt w/ jaundice
  - Start w/ ultrasound
  - If clinical suspicion is high for biliary tract malignancy, get MRCP!
- PTC can be used to dx etiology of obstructive jaundice via tissue biopsy
- PTC/PTBD provides palliative treatment w/ great efficacy
- Definitive tx is surgical
- Future imaging modalities such as PET, endoscopic ultrasonography, and radiolabeled antibody or ligand imaging have potential to provide early detection and novel treatments to populations at risk for biliary tract malignancies
References

- BIDMC PACS System
- www.lib.csmv.edu.tw
- www.uptodate.com
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