ERCP:

Indications
Contraindications
Equipment
Cases

Emori Bizer, M.D.
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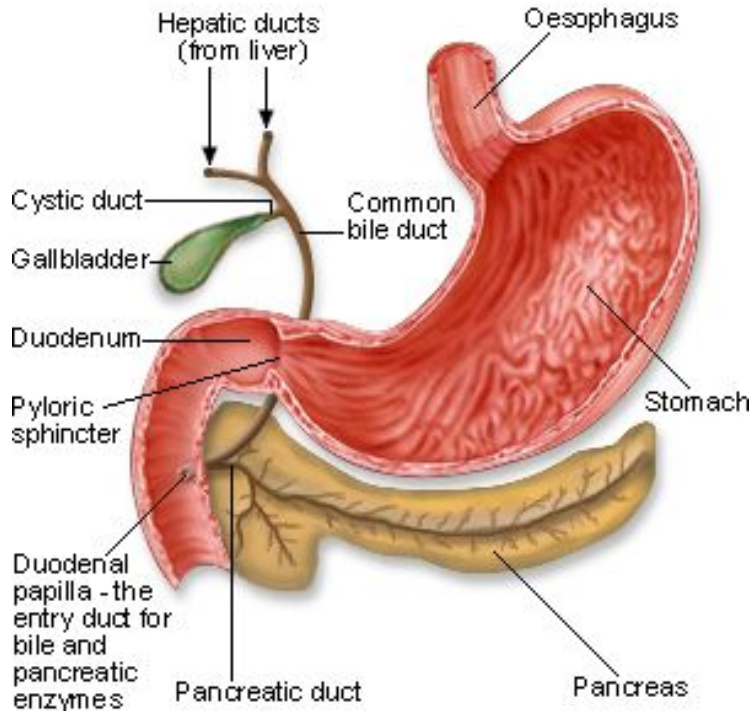
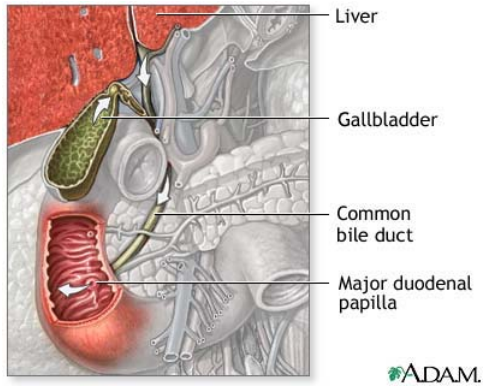

Hepatic ducts
(from liver)
Oesophagus
Cystic duct
Common
bile duct
Gallbladder
Duodenum
Pyloric
sphincter
Stomach
Duodenal
papilla - the
entry duct for
bile and
pancreatic
enzymes
Pancreatic duct
Pancreas

Disclosure

- Cases: Endoscopic management was based on expert clinical recommendations
  - There are not guidelines for every clinical scenario encountered
- I am not an expert
- This is to serve as an introduction to ERCP and as a brief overview of commonly encountered medical problems requiring ERCP. It is not comprehensive. An extensive literature search was not performed.

ERCP Indications



- Biliary Obstruction – suspected or known
- Pancreatic Obstruction – suspected or known
- Evaluation of signs/symptoms suggesting pancreatic malignancy
- Evaluation of idiopathic pancreatitis
- Evaluation of sphincter of oddi by manometry

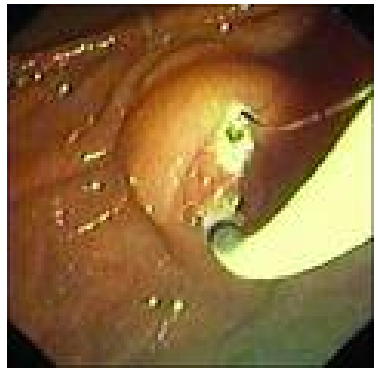
ERCP Indications

- Stent placement
  - Strictures (benign or malignant)
  - Fistulae
  - Post-op bile leak
  - High risk pts with large, unremovable common duct stones
- Balloon dilatation of ductal strictures
  - Biliary or pancreatic

ERCP Indications

- Pancreatic pseudocyst drainage
- Nasobiliary drain placement
  - Cholangitis
  - Post-op bile leak
- Tissue sampling from biliary or pancreatic ducts
- Therapy of disorders of the PD

ERCP Indications



- Sphincterotomy
  - Choledocholithiasis
  - To facilitate placement of biliary stent or balloon dilatation of biliary stricture
  - Sphincter of Oddi dysfunction
  - Sump Syndrome
  - Choledochocele involving the major papilla
  - Ampullary carcinoma (non-surgical candidates)
  - Facilitate access to the pancreatic duct

ERCP Contraindications

- Evaluation of abdominal pain of obscure origin in the absence of objective findings which suggest biliary or pancreatic disease
- Evaluation of suspected gallbladder disease without evidence of bile duct disease
- As further evaluation of proven pancreatic malignancy unless management will be altered

ERCP: Contraindications to Sphincterotomy

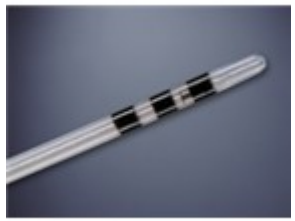
- Coagulopathy

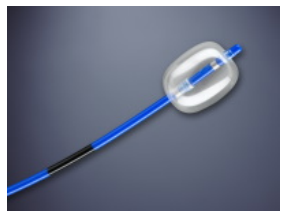
- Highest risk of post-sphincterotomy bleeding:
  - Coagulopathy
  - Anticoagulation within 3 days (after)
  - Precut sphincterotomy
  - Cholangitis prior to ERCP
  - Bleeding during the ES
  - Lower ERCP case volume

ERCP: Exchange systems

- Standard exchange = Long system
  - 450cm guidewire
- Rapid Exchange Biliary System (Boston Scientific)
  - 260cm guidewire
  - Locking device secures guidewire
  - ?shorter procedure time
  - ?less radiation exposure
  - ?improved maintenance of ductal access

ERCP:
The Tools of the Trade (Toys!)

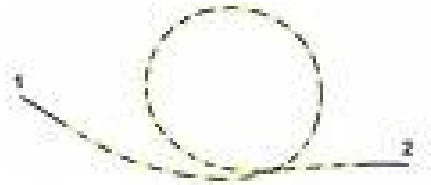


- Cannulation Catheters
  - Plain
  - ‘tomes = cut
  - Balloon = dilate, sweep
- Dilator Catheter (Sohendra)
- Manometry Catheter
- Nasobiliary drainage catheter
  - 5Fr-7Fr, sideports. Use in suspected cholangitis but no stones on cholangiogram.
- Nasopancreatic drainage catheter
  - 5Fr. Used after sphincterotomy or to irrigate and drain a pancreatic pseudocyst

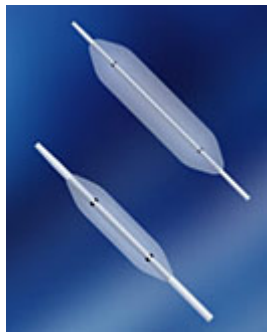
Top Left: Glo-Tip Catheter, Top Right: D.A.S.H. sphincterotome, Bottom Right: Escort Balloon Catheter, Bottom Left: Sohendra dilator catheter

ERCP: Wires = Lifeline



- Jag
  - Standard wire
  - Has one hydrophilic end
- Hydra
  - Soft tip
  - Used for cannulation
- Glidewire (Boston Sci)
  - Super slick
  - Used to get past strictures
- Metro (Cook)
  - coated, good for strictures, angled or straight tip.
  - .025 or .035 diameter
- RoadRunner (Cook)
  - .018 wire. good for strictures

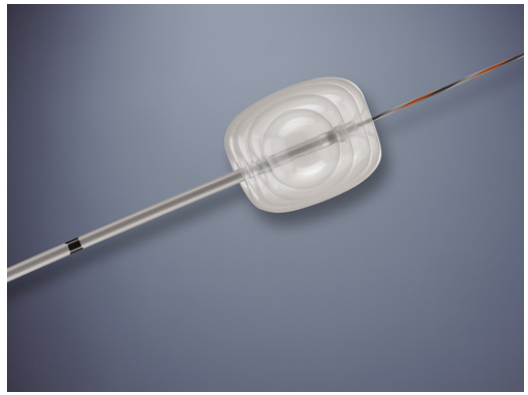
ERCP Tools



- Dilators
  - Balloon
  - Sohendra dilator catheter, stent retriever
- Brush cytology catheters
  - Long nose – biliary
  - Short nose – pancreatic, intrahepatic biliary strictures
- Biopsy forceps

ERCP Tools

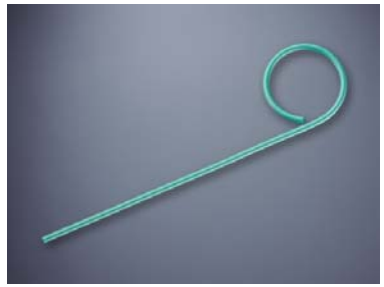
- Stone extraction
  - Balloon – sweep
  - Stone retrieval baskets
  - Mechanical lithotriptor



Top: Fusion Quattro Extraction Balloon

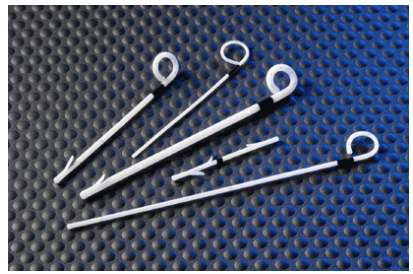
Middle: Olympus Stone Extraction Basket

ERCP Tools



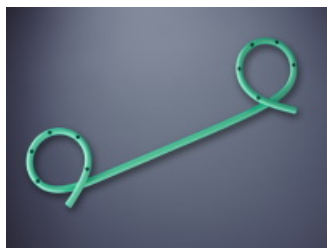
L: SPSOS

B: Hobbs



- Plastic Stents
  - **Pancreatic**:
    - SPSOS – small diameter, soft, single pigtail, prophylaxis only
    - Hobbs – small to medium diameter, soft, single pigtail
    - GPSO – straight, no pigtail, larger diameter
  - **Biliary**
    - CLSO - largest diameter, not soft, straight
    - ZSO – double pigtail

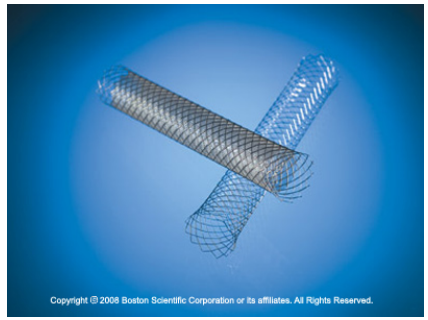
ZSO

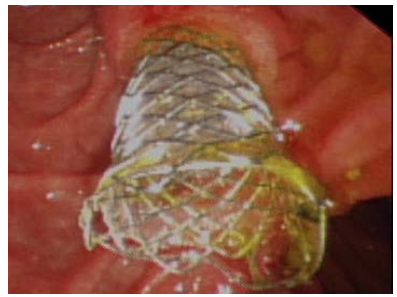


T: GPSO

L: CLSO

ERCP Tools





- Metal Stents
  - Metal, Uncovered (SEMS)
    - Microvasive (Boston Scientific) – narrower mesh
    - Zilver (Cook) – wider mesh
  - Metal, Covered
    - Wallstent – used to prevent tumor ingrowth
- (Enteral stents not discussed)

Top Left: Boston Scientific Covered and Uncovered WallStents.
Top Right: Cook Zilver Biliary Stent,

ERCP Tools

- A Few Words Regarding Plastic Stents
  - Poiseuille's Law: patency related to stent diameter
  - Plastic stents occlude 2/2 bacterial biofilm
  - Straight configuration improves patency
  - Single pigtail – prevents inward migration
    - Used in PD
  - Double pigtail – prevents upward or downward migration
    - Difficult CBD stones, hilar strictures
  - Smaller diameter stents better in normal PD
    - Larger diameter stents indicated in PD in setting of dilated PD, PD strictures, stones
  - Insertion of 10F CBD stent does not require sphincterotomy

CASES

Plug for Farrah: She details cars!

N.R.

- 78 y/o WM underwent a CT chest to follow up a lung nodule. CT showed an abnormal finding which prompted ERCP.

N.R. Learning Points: CBD Stones (The Basics)

- Stone Extraction Procedure:
  - Biliary access and Cholangiogram
  - Biliary sphincterotomy
    - *Must be ***large enough*** to extract stone
  - Extract with balloon or basket
    - Basket for medium to large stones
  - Final occlusion cholangiogram
- Biliary stenting
  - Large unremovable stones

D.R.

- 50 y/o white female with a history of common bile duct stones, s/p aborted procedure at an outlying facility after a CBD stent placement.

D.R. Learning Points: CBD stones

- FYI: Stones <1cm will pass through following sphincterotomy. Stones >2cm generally require fragmentation
- Complications of Biliary Stone Extraction
  - Stone impaction – what to do:
    - Try pushing stone up with forceps
    - Extend sphincterotomy or needle knife
    - Inflate balloon below stone to push it up
    - PLACE A STENT OR NASOBILIARY DRAIN!
  - Migration of stone to intrahepatic ducts
    - Wire-guided: balloon > basket. Pull into CBD.
  - Impaction of basket
    - Can occur if wires get embedded into stone
    - Mechanical Lithotripsy emergently

D.R. Learning Points

- When to refer to tertiary center
  - Mucking around at the papilla for more than ?30-45 minutes increases risk of post-ERCP pancreatitis
  - In the setting of biliary obstruction, the most important thing is to RELIEVE the obstruction. Stenting and asking for help is an option.
- CBD stone extraction can get complicated, quickly

C.E.

- 80 y/o white female
- Originally presented as an EUS referral for h/o abdominal pain and wt loss with abnormal CT showing possible distal CBD stricture. EUS showed tortuous distal CBD and dilated proximal CBD. No pancreatic mass. ERCP was recommended.
- ERCP to evaluate distal CBD stricture vs. malignancy.

C.E. Learning Points: CBD Stricture

- Pre-procedure Evaluation of CBD Stricture
  - History
    - Benign: acute/chronic pancreatitis, prior RUQ surgery, h/o U.C., difficult biliary stone disease, stable weight, wax/wane sx's, fluctuating labs
    - Worrisome: progressive sx's, weight loss, decompensation of known PSC, no h/o abdominal illness

C.E. Learning Points: CBD Stricture

- Labs: assess severity, chronicity, etiology
  - Mild-mod ↑Alk Phos (NL amino's/TB): modest impairment to bile flow
  - Mild-Mod ↑Alk Phos + abnl amino's: hepatic process or acute onset obstruction
  - TB: not directly linked to degree of obstruction
  - Elevated PT: chronic obstruction with malabsorption of fat soluble vitamins
  - ↑Amylase/Lipase: PD obstruction 2/2 biliary stone, mass, or chronic pancreatitis
  - CA 19-9: pancreatic or biliary carcinoma, cholangitis
    - >100: cancer (in absence of known pancreatitis, cholangitis)
    - >1000: cancer or florid cholangitis

C.E. Learning Points
CBD Strictures

- Imaging: USN, CT, MRCP
  - Biliary dilatation
  - Mass
- Endoscopic Options
  - EUS +/- FNA: complementary
  - ERCP
- PTC Indications
  - Complete biliary obstruction
  - Undefined proximal end of stricture
  - Altered upper gut anatomy (R-x-Y, Whipple)
  - Failed endoscopic access

C.E. Learning Points
CBD Stricture

- Cholangiographic Findings to Suggest Malignancy (66% sensitivity)
  - Progressive focal stricturing over time
  - Abrupt shelf-like borders
  - Length >14mm
  - Intrahepatic ductal dilatation
  - Intraductal polypoid or nodularity
- In setting of PSC, ↑suspicion malignancy:
  - >10mm length
  - Hilar/bifurcation
  - Irregular margins

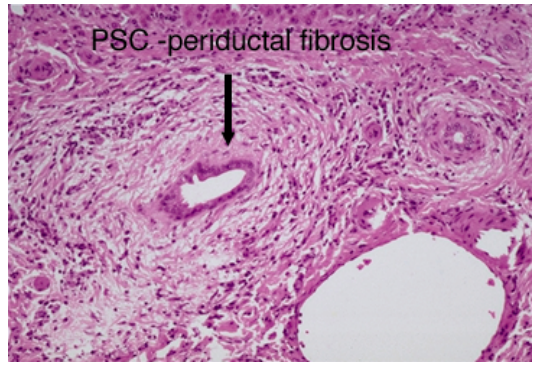
C.E. Learning Points: CBD Stricture

- Endoscopic Management: ERCP
  - Peri-procedural antibiotics
  - Full strength contrast
  - Multiple early films
  - For hilar strictures, minimize intrahepatic contrast until wire access established (DRAIN)
  - Dilate: balloon selection size based on non-obstructed duct distal to stricture
  - Tissue: brush (at least 5 passes), biopsy
  - Stent
  - Cholangioscopy

E.P.

- 68 y/o WF with history of primary sclerosing cholangitis who had abnormal LFTs and an MRCP which showed possible intrahepatic ductal stricturing and possible common bile duct stricturing.

E.P. Learning Points PSC



- PSC
  - Spectrum of Presentation: asymptomatic, abnl lft's (alk phos), pruritis, fatigue, RUQ pain, jaundice, cirrhosis
  - Up to 30% develop cholangiocarcinoma
- Diagnosis
  - MRCP – sens 88%, spec 99%
    - Disadvantage: 75% PSC pts with abnl labs/cholestasis require therapeutic intervention
    - Use if no cholestasis
  - ERCP – Gold Standard.
    - Therapeutic intervention
    - Perform in setting of cholestasis or high clinical suspicion of intervention
  - Liver biopsy – limited role
    - Disease may not be evenly spread throughout the liver
    - Portal inflammation, concentric "onion skin" periductal fibrosis, periportal fibrosis, then septal and bridging fibrosis

E.P. Learning Points PSC

- DDx/Secondary sclerosing cholangitis
  - H/o biliary surgery
  - Calculi
  - Neoplasms
  - Hepatic artery injury/ischemic cholangiopathy
  - Hepatic artery chemotherapy
  - AIDS
- Cholangiographic PSC mimickers
  - Hepatic malignancies
  - Polycystic Liver Disease
  - Infiltrative liver disease
  - Inflammatory pseudotumors
  - Retroperitoneal fibrosis (?)

E.P. Learning Points
PSC: ERCP

- Perform ERCP in pts with cholestasis (jaundice, abnl LFT's) or abnormal imaging
  - Does NOT change natural history of dz. RISKS!
  - Prognosis: controversial predictors
    - Bilirubin included which decreases after endo mgt
- Peri-operative antibiotics (pre then post x 3d)
- Do NOT inject contrast into obstructed intrahepatics unless you have wire access to enable drainage
  - Soft (hydra) tip wires

E.P. Learning Points
PSC: ERCP interventions

- Dominant Stricture Management
  - Definition (no consensus)
    - Stenosis < 1.5mm extrahepatic bile duct
    - Stenosis < 1.0mm R/L main intrahepatic duct
  - Brush and/or biopsy any dominant stricture
  - Balloon dilate then short-term (10-14d) stent (plastic) across a dominant stricture
  - Biliary sphincterotomy not necessary
    - Increases complications
- Add Ursodeoxycholic Acid 20-25mg/kg/d

J.R.

- 62 y/o WM Veteran with new onset jaundice.

J.R. Learning Points
Malignant Biliary Obstruction due to Pancreatic Head Mass

- 5th most lethal CA in USA
- Sx: painless jaundice, anorexia, wt loss, cholestastic sx's (pruritis, dark urine, acholic stools), impaired glucose tolerance
- Staging
  - CT shows Pancreatic Head Mass
    - if suggests resectable panc CA and pt operative candidate, refer for surgery
    - If unresectable, refer for ERCP for palliation
    - If need tissue for chemo/XRT, EUS for FNA
  - Suspected Pancreatic Head Mass (CT inconclusive)
    - EUS for diagnosis, FNA, staging (vasc invasion, LN's)

J.R. Learning Points
Malignant Biliary Obstruction due to Pancreatic Head Mass

- ERCP
  - Findings: Distal CBD/PD strictures with proximal ductal dilatation ("Double Duct Sign")
  - Management:
    - Biliary decompression if: cholangitis, pruritis, palliation (?improved Q.O.L?)
    - Conflicting evidence regarding any survival benefit from metal vs plastic stent in this setting
    - Plastic: patency 2-5mos
    - SEMS: allow 10mm diameter, longer patency (4-10mos)
      - Indicated for unresectable malignant disease
      - Choose UNCOVERED if Gallbladder intact
    - Type of stent should be individualized

G.W.

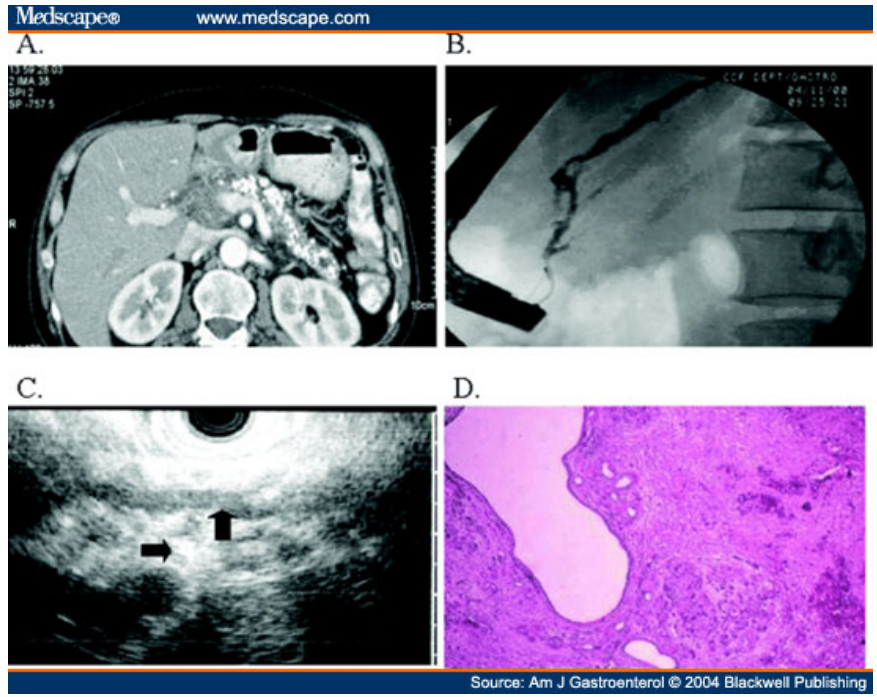
- Chronic calcific pancreatitis with abdominal pain and abnormal CT scan with pancreatic duct stricture

Cambridge Classification: Chronic Pancreatitis on ERCP

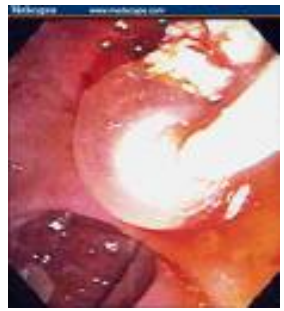
Class	Grade	Main PD	Side Branches
1	Normal	Normal	Normal
2	Equivocal	Normal	<3 Abnormal
3	Mild	Normal	≥3 Abnormal
4	Moderate	Abnormal	≥3 Abnormal
5	Severe	Abnormal with at least 1: Dilated Duct >10mm Obstruction Filling Defects Severe irregularity	≥3 Abnormal

G.W. Learning Points Chronic Pancreatitis

- DDx **PAIN** in Chronic Pancreatitis
  - Increased interstitial/intraductal pressures
    - Stones or strictures
  - Closed compartment syndrome
  - Neural infiltration
  - Ongoing acute pancreatitis
  - Pseudocyst
  - Biliary obstruction



G.W. Learning Points: Chronic Pancreatitis

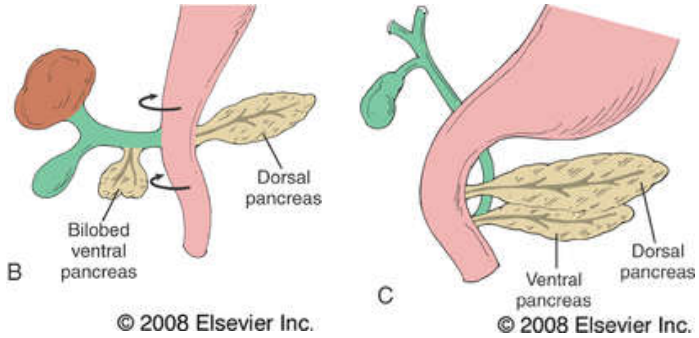


- Endoscopic Management
  - Major papilla pancreatic sphincterotomy
  - Stricture dilatation
    - Balloon
    - Sohendra dilator or stent retriever (8.5F)
  - Stone extraction
    - ESWL
    - Intraductal lithotripsy: less successful than biliary
  - Can place Nasopancreatic Catheter if multiple sessions planned
  - Stent: larger diameter: 8.5-10F single, multiple
    - Serial stenting every 3-4 months for 2 yrs
    - Trial off stenting
    - Consider surgical referral

E.F.

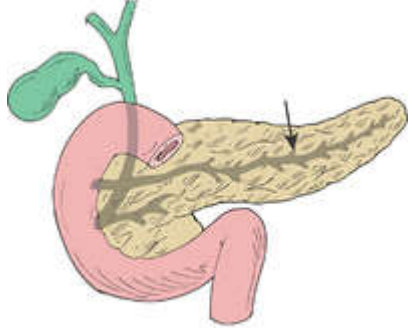
- 27 y/o WF with h/o chronic intermittent abdominal pain and nausea since January 2009. +wt loss. Epigastric/LUQ. Worse post-prandially.
- Extensive w/u thus far negative: KUB's, Abdominal USN, HIDA, SBFT, GET, CT a/p.
- MRCP: biliary and pancreatic ducts too small of caliber to be visualized.

E.F. Learning Points Pancreas Divisum



- Pancreatic Embryology
  - Dorsal and Ventral Pancreatic buds form 5th wk
  - Dorsal pancreatic bud (Duct of Santorini) – forms pancreatic tail, body, neck, portions of head
  - Ventral pancreatic bud (Duct of Wirsung) – forms uncinate process, periampullary portion of pancreatic head. Arises with bile duct.
  - Rotation of the duodenum posteriorly 7th wk
    - Buds and ducts fuse
- P. Divisum: failure of fusion (or incomplete fusion) of dorsal and ventral pancreatic buds
  - Dorsal duct of Santorini drains the pancreatic secretions via the minor papilla

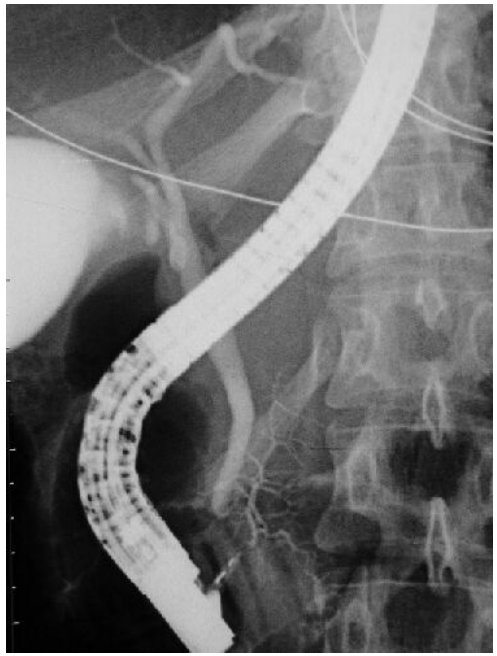
E.F. Learning Points
Pancreas Divisum



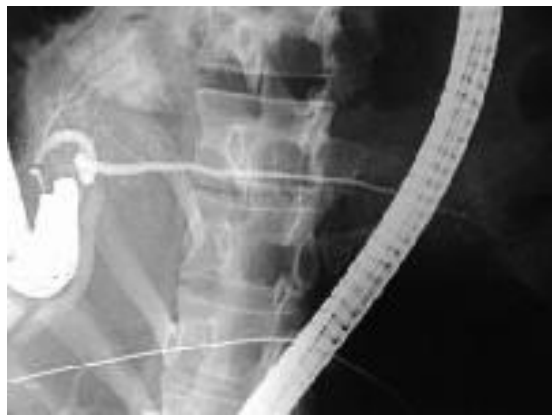
- Pancreas Divisum should be in the DDx chronic intermittent abdominal pain, particularly if post-prandially.
- Estimated 7% of the population have this embryologic failure of the dorsal and ventral pancreatic fusion
- Most are asymptomatic
- Clinical significance controversial. Most believe that need ampullary stenosis of minor papilla to cause clinical syndrome.
  - Potential cause of idiopathic pancreatitis (?25%)

E.F. Learning Points Pancreas Divisum

- Endoscopic Management: Diagnose
  - EUS as high as 97% sens. ERCP gold standard.
  - Ventral duct pancreatogram: arborizing PD that does not cross midline. No uncinate (arises dorsal)
  - Minor papilla dorsal duct pancreatogram: main PD with no communication to the ventral pancreas



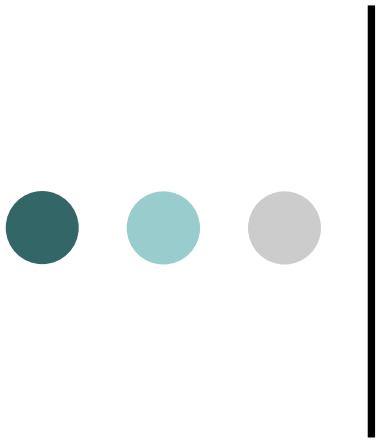
Major Papilla Cholangiogram and Ventral Pancreatogram



Dorsal Duct Pancreatogram

E.F. Learning Points Pancreas Divisum

- Endoscopic Management: Treat (Controversial)
  - Based on theory of obstruction
  - Minor papilla stenting, sphincterotomy, or sphincteroplasty
    - Most evidence among pts with recurrent acute pancreatitis. Some is favorable. Not all randomized
    - Less response with chronic pancreatitis
    - Minimal benefit if abdominal pain alone
- Future: Secretin-MRI (USN less reliable, high FP)
  - Ductal dilatation >1mm persisting for >15min indicative of obstruction.
    - Might help select pts who would benefit from endoscopic therapy



Show and Tell Cases

Cool Stuff You Might Never See

Or

Just Really Complicated Stuff

C.J.

- 30 y/o WF who underwent orthotopic liver transplant in 03/2009 for acetaminophen ingestion who has had worsening LFTs, alkaline phosphatase, AST, and ALT over the last couple of months

Post OLT Biliary Complications

Timing	Type	Etiology
EARLY	Bile Leaks	Anastomotic Cystic Duct Accessory bile ducts Incidental intrahepatic injury Cut surface of liver T-tube
	Early Stricture	Mismatch duct-duct Technical error
	Late Stricture	Anastomotic vs. Nonanastomotic
LATE	Cholangitis	
	Filling Defects	Choledocholithiasis Sludge Biliary Cast Syndrome
	Ampullary Obstruction	SOD, stenosis
	Recurrent Biliary Dz	Sclerosing cholangitis Malignancy

E.B. (not me!)

- 42 y/o WF with h/o “liver problem” as a child with some sort of surgery at that time. H/o complicated CBD stones with stenting.

A.M.

- 95-year-old white female who has had a several month history of nausea, decreased appetite, and weight loss who had a CT scan done in Paducah, Kentucky which showed intrahepatic biliary ductal dilatation.

Common Indications for Antibiotics in ERCP

- Biliary Obstruction
  - All known obstruction
  - PSC pts
- Pancreatic Cystic Lesions and Fluid Collections
- Drugs:
  - Cipro penetrates bile ducts well
  - Levaquin 500mg IV
  - Flagyl 500mg IV
  - Gentamycin 80mg in contrast

ASGE Guidelines, 2005

RISK of proced.	Procedure performed	Warfarin	ASA/ Plavix	Heparin/ LMWH
HIGH	Sphincterotomy	Hold x 5d	Hold x 7-10d	Hold x 8hr
LOW	ERCP w/o sphincterotomy, Biliary/Panc stents w/o sphincterotomy	No change	No change	No change

References

- Baron, T. ERCP. Elsevier, 2008.
- Sleisenger and Fortran, 8th ed
- ASGE.org