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SEEKING A CURE

5th Annual Conference for PSC Patients and Caregivers

The Wyndham Chicago Hotel

Chicago, Illinois • May 1-3, 2009

Primary

Sclerosing

Cholangitis

New Frontiers

In Imaging Techniques and Tissue Acquisition in PSC

John A. Martin, MD
Associate Professor of Medicine and Surgery
Director of Endoscopy
Feinberg School of Medicine • Northwestern University
Northwestern Memorial Hospital • Chicago, Illinois

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Imaging
Tissue acquisition

Why are they important in PSC?

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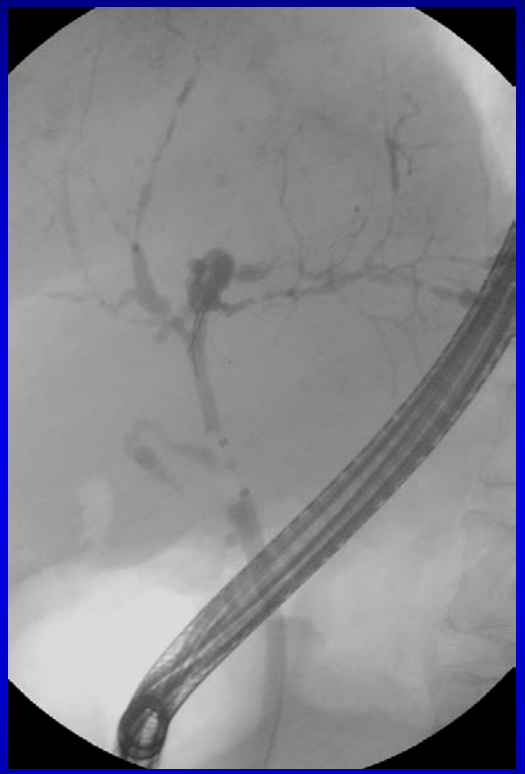
Why imaging studies are important in PSC



- For diagnosis of PSC
  - Tissue alone (liver biopsy) is usually not enough
- To determine anatomy of bile duct involvement
  - Initially
  - If laboratory values change
- To survey for possible development of cholangiocarcinoma (bile duct cancer)

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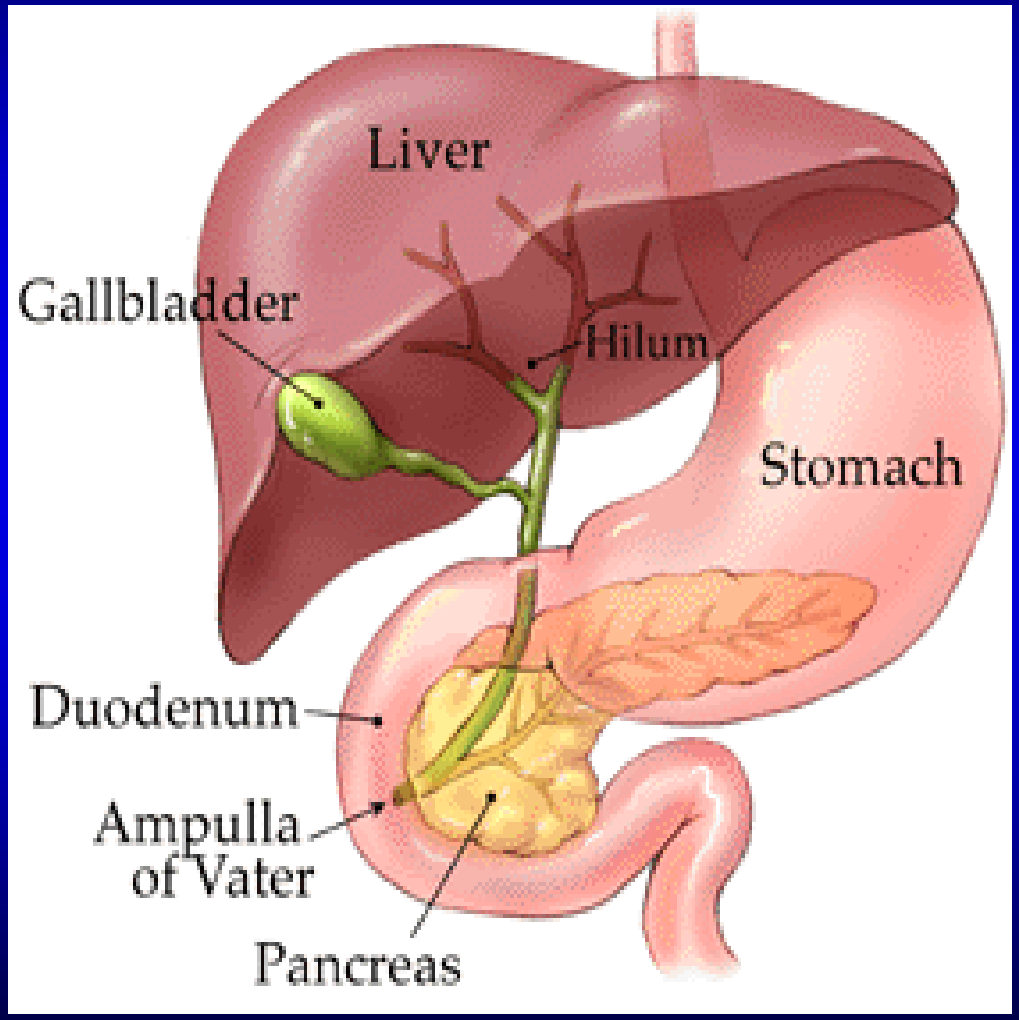
Biliary anatomy



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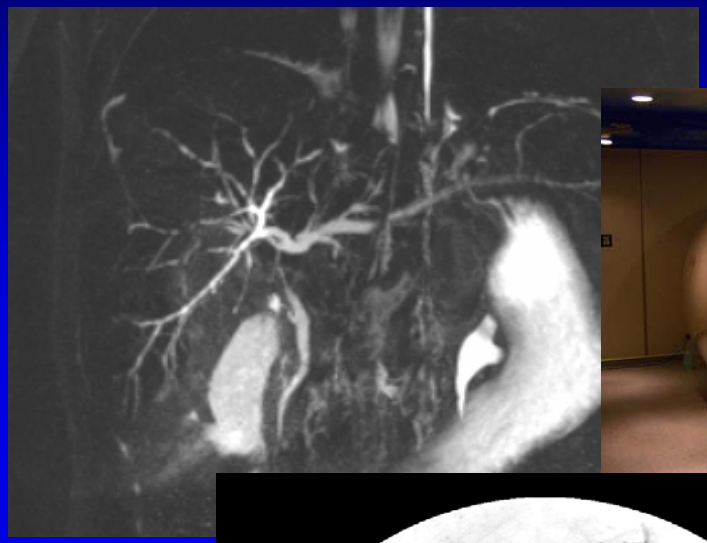
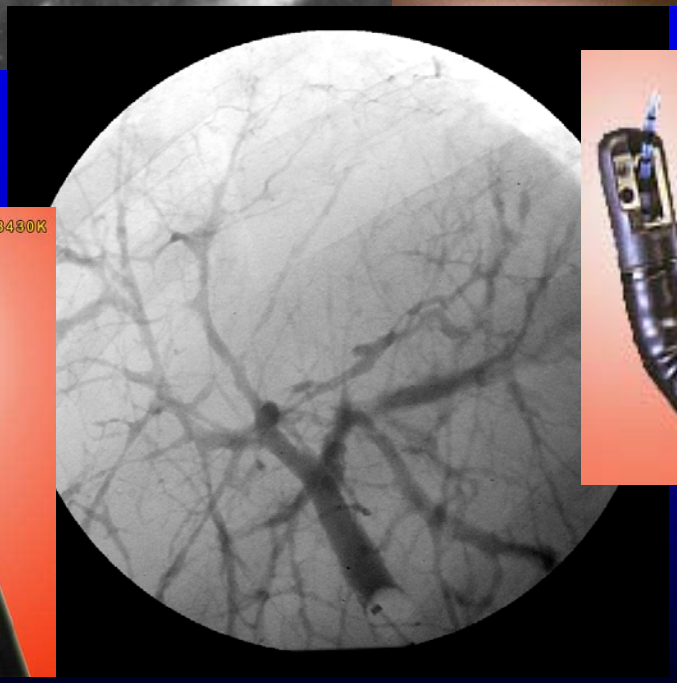
Core imaging studies in PSC

- **MRI (MRCP)**
- **ERCP**
- **Ultrasound**
- **Endoscopic Ultrasound (EUS)**
- **CT scan**
- **PTC**





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Why tissue acquisition important in PSC

- To determine if certain areas of bile duct narrowing contain bile duct cancer (cholangiocarcinoma)
  - No imaging study *alone* can confirm the presence of bile duct cancer
  - Treatment frequently requires a *definitive diagnosis* which can only be made from viewing cells (cytology) or tissue (histology) under the microscope

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How is tissue acquired in PSC?

- ERCP
  - Brushing for cells (cytology)
  - Needle aspiration
  - Forceps biopsy
- Percutaneous needle aspiration
- EUS
  - Needle aspiration
  - Tru-cut biopsy

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“You can’t do today’s job with yesterday’s methods and be in business tomorrow.” Anonymous

Technology

Technique

Perspective

What’s new in MRI?

Synergy & Complementarity

What's old?

- Purely diagnostic ERCP…except where
  - Endoscopic therapy may be needed
  - MRCP may not be diagnostic
  - High quality MRCP may not be available
  - Patient can't or won't undergo MRCP
    - Metal, pacer, AICD
    - Claustrophobia
    - Weight
    - ‡ Contrast intolerance, *renal failure
- The idea that ERCP and MRCP are inherently competitive technologies

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What's new?

- ERCP-MRCP complementarity
  - MRCP as initial diagnostic pancreaticobiliary imaging study of choice: MRCP can make ERCP better
  - MRCP as pre-ERCP planning or "staging" in selected cases to enhance therapeutic capabilities
- High-resolution MRCP protocols
- Novel "functional MRCP protocols"

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This has happened quickly: How long has MRCP been around?

About ¼ as long as ERCP

ERCP	1968
ERCP + Sphincterotomy	1974
MRCP first described	1992
High-quality MRCP	1996
High-quality MRCP widely available	2000 (sort of…)

MRCP performance

- What does high-quality MRCP require?
  - Operator expertise (technique)
  - Properly specified protocols (technique)
  - Optimal hardware/software packages (technology)
    - Newer hardware: surface phased-array multicoils
    - High field-strength, high-performance gradients
    - Ultrafast, single-breath-hold sequences
    - Thin-slice images
    - Multiple projections (axial, coronal, MIP)
  - Short image-acquisition times

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Primary Sclerosing Cholangitis (PSC)

- Diagnostic accuracy of MRCP in PSC: (sens ~80-95%, spec ~65-100%, acc ~85-90%)
  - Talwalkar, et al., 2004
  - Vitellas, et al., 2002
  - Textor, et al., 2002
- Still operator- and institution-dependent
- Cost effective as initial diagnostic imaging modality
  - Talwalkar, et al., 2004

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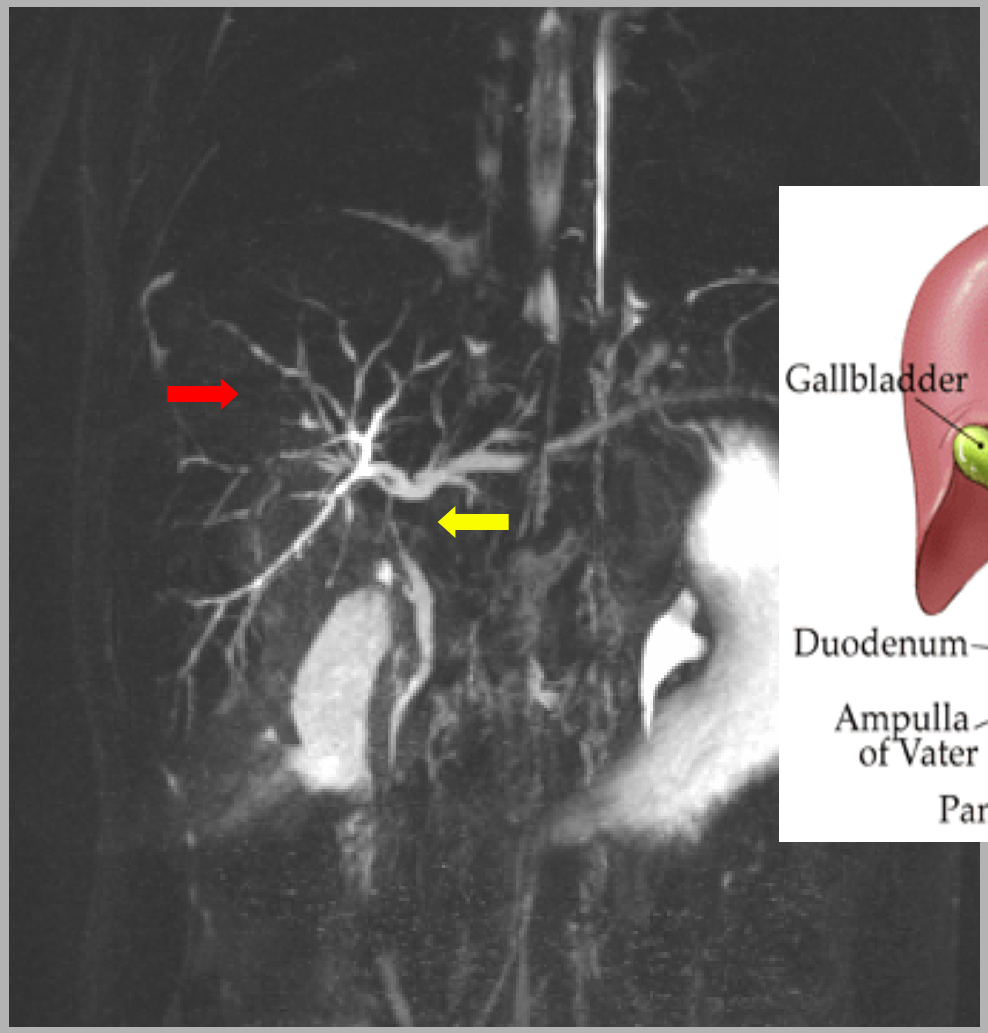
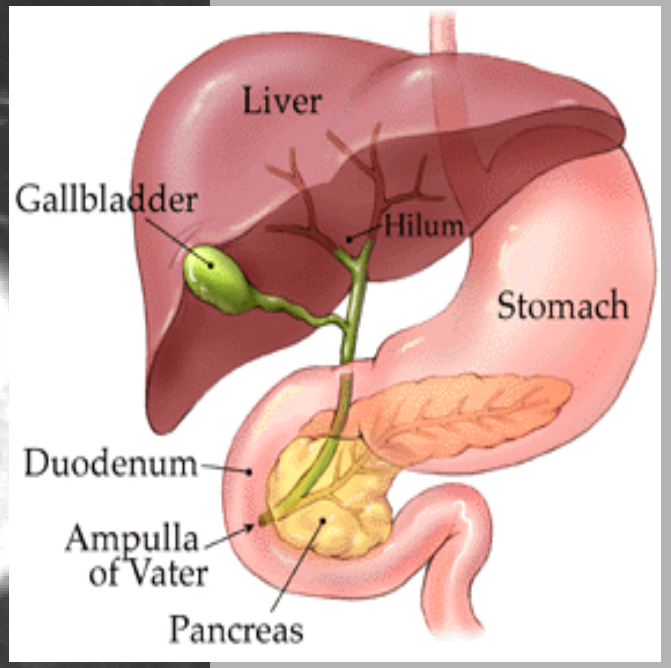
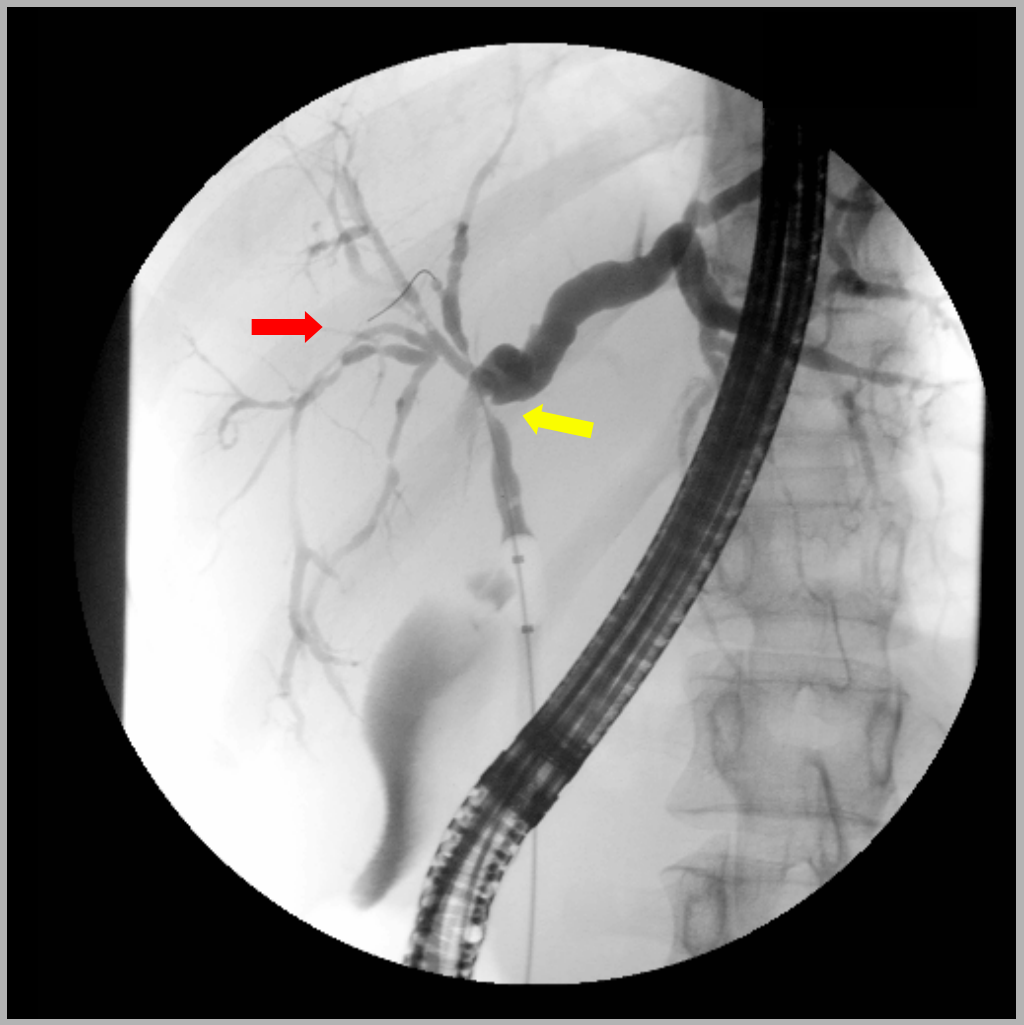
MRCP in PSC: RIHD Beading & Stricturing, Hilar Dominant Stricture

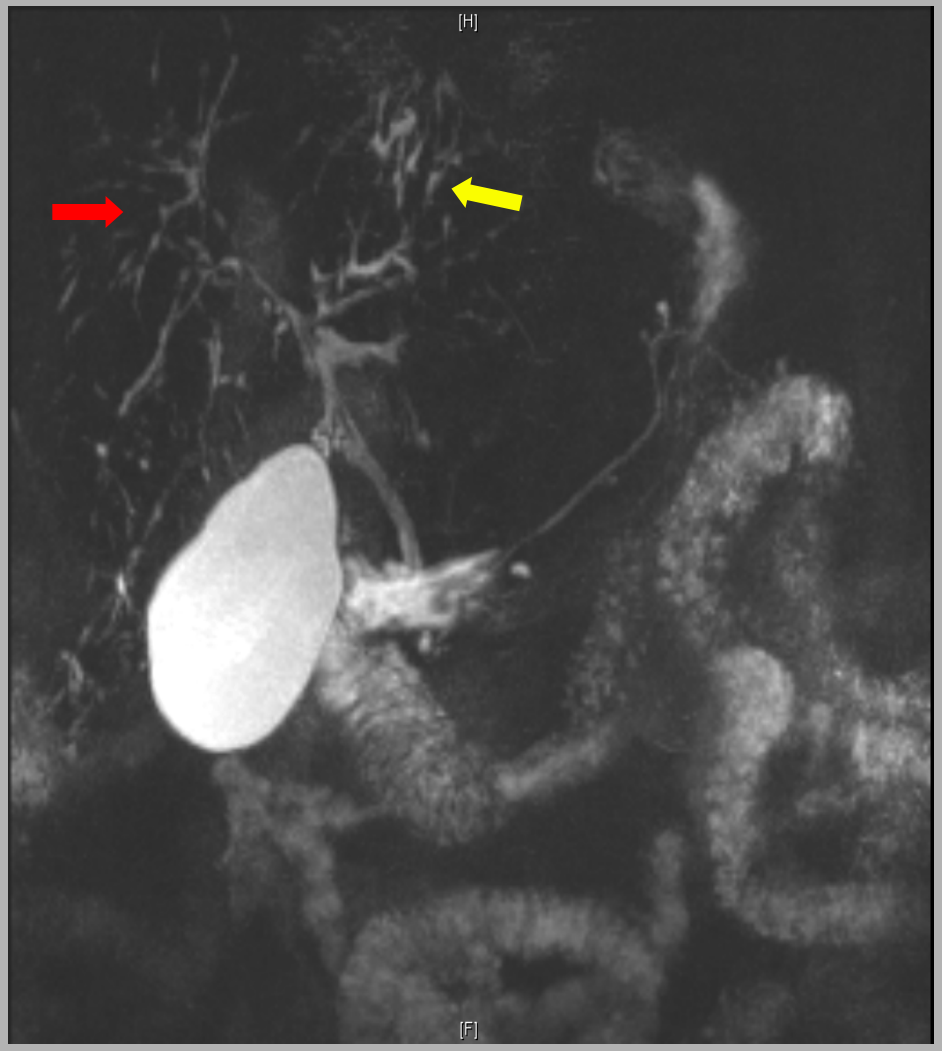




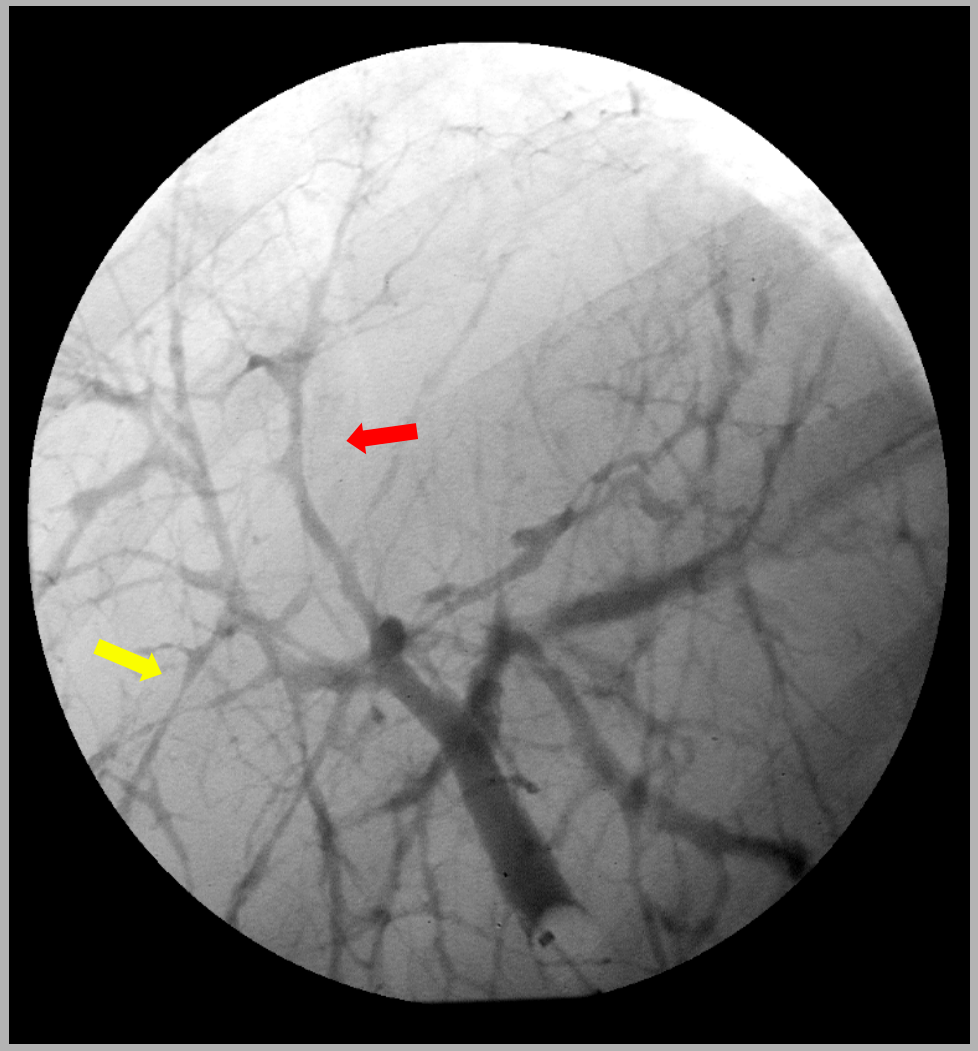
ERCP in PSC: RIHD Beading & Stricturing, Hilar Dominant Stricture



MRCP in PSC: Obvious IHD Beading & Stricturing



ERCP in PSC: IHD Beading & Stricturing, Worse in RIHD



Detecting biliary malignancy in PSC

- Upshot: MRCP adds tremendous value
  - Especially when combined with liver MRI
- MRCP excels with malignant hilar strictures
  - Accurately demonstrates level of obstruction
    - > 90% Schwartz LH, Am J Roentgenol 1998;170:1491.
  - Depiction of stricture complexity, radicular involvement
    - Critical for strategizing drainage via ERCP or PTC
    - Avoidance of ERCP-induced cholangitis
  - Can identify ducts that can't be "filled" (seen) at ERCP
- Special protocols increase ability to detect cancer

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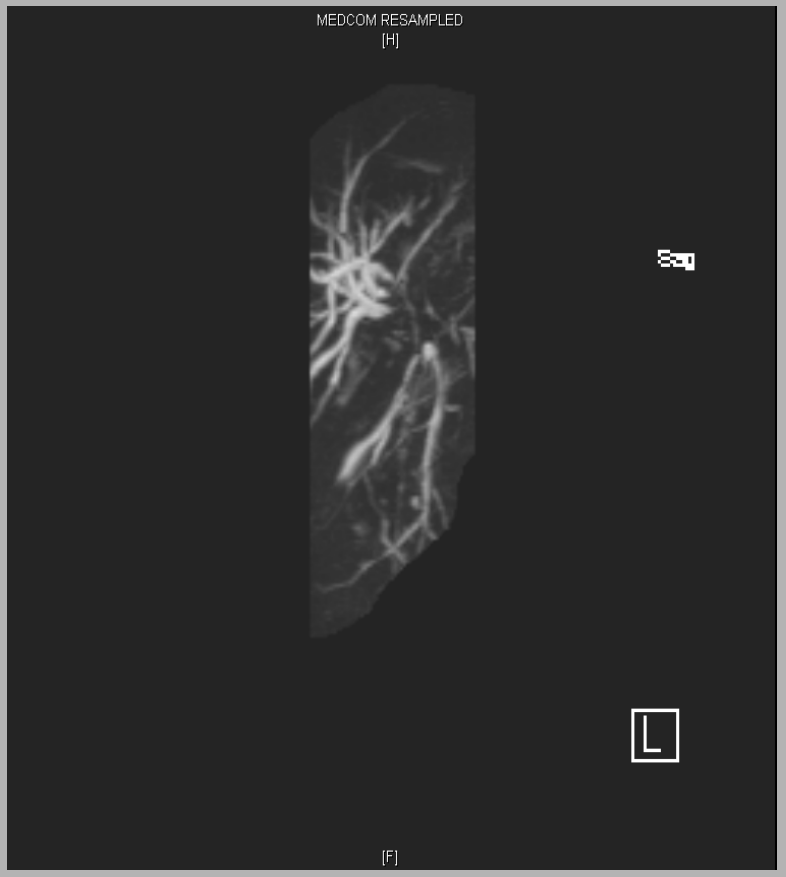
T2 MRCP: Malignant hilar stricture



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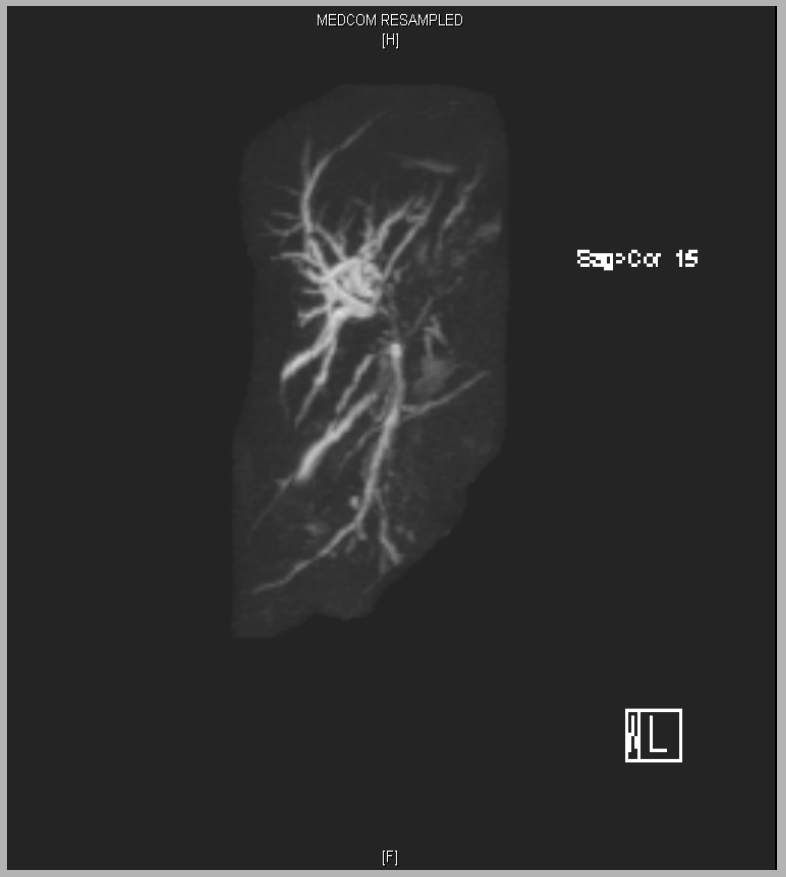

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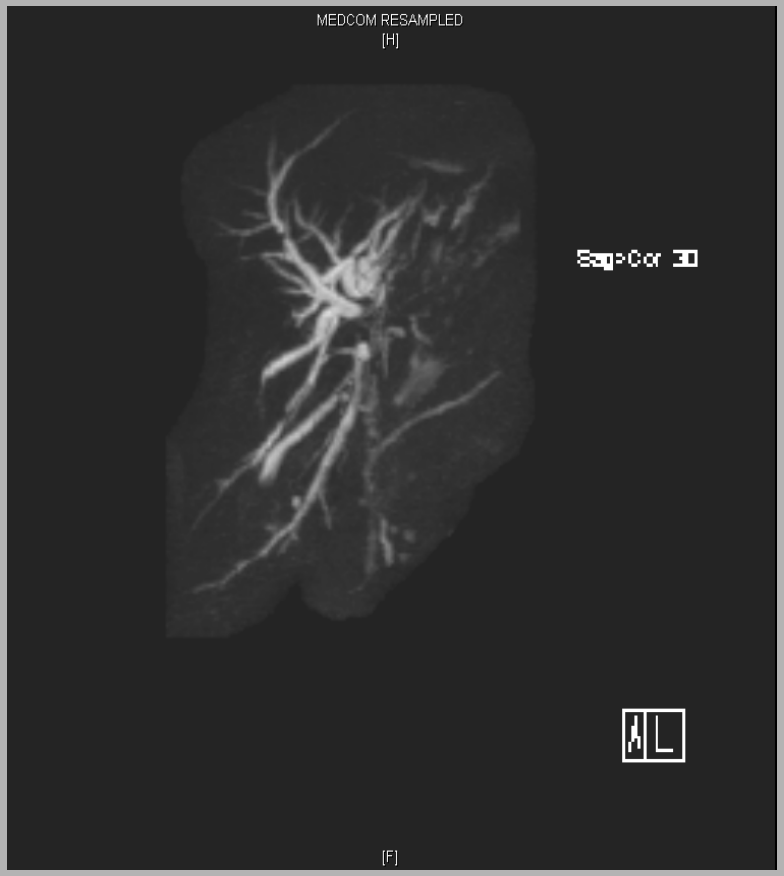

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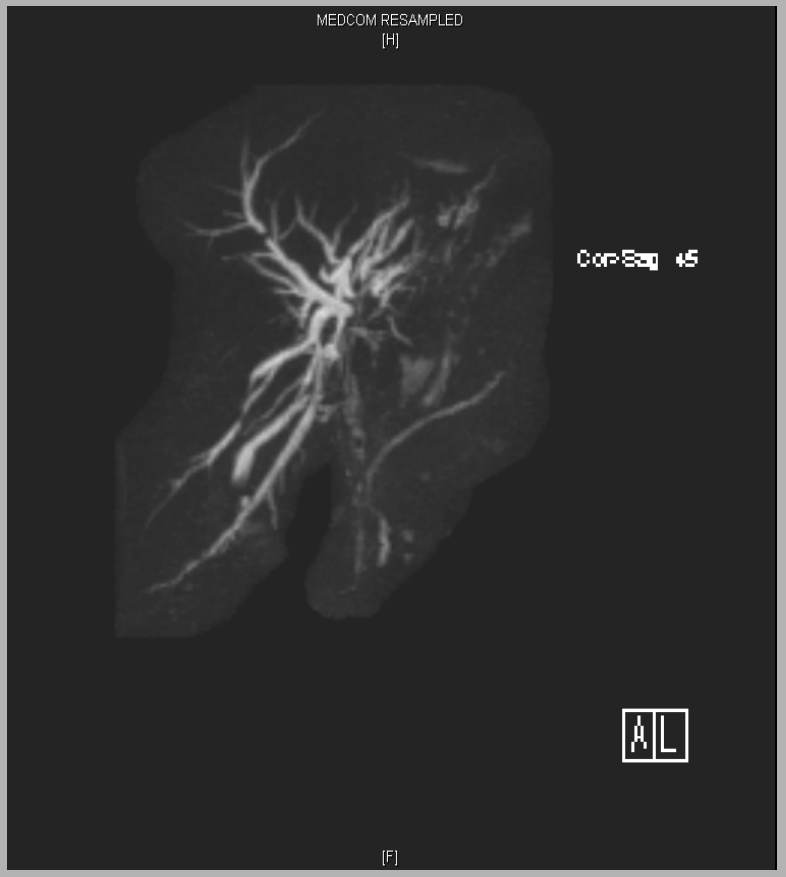

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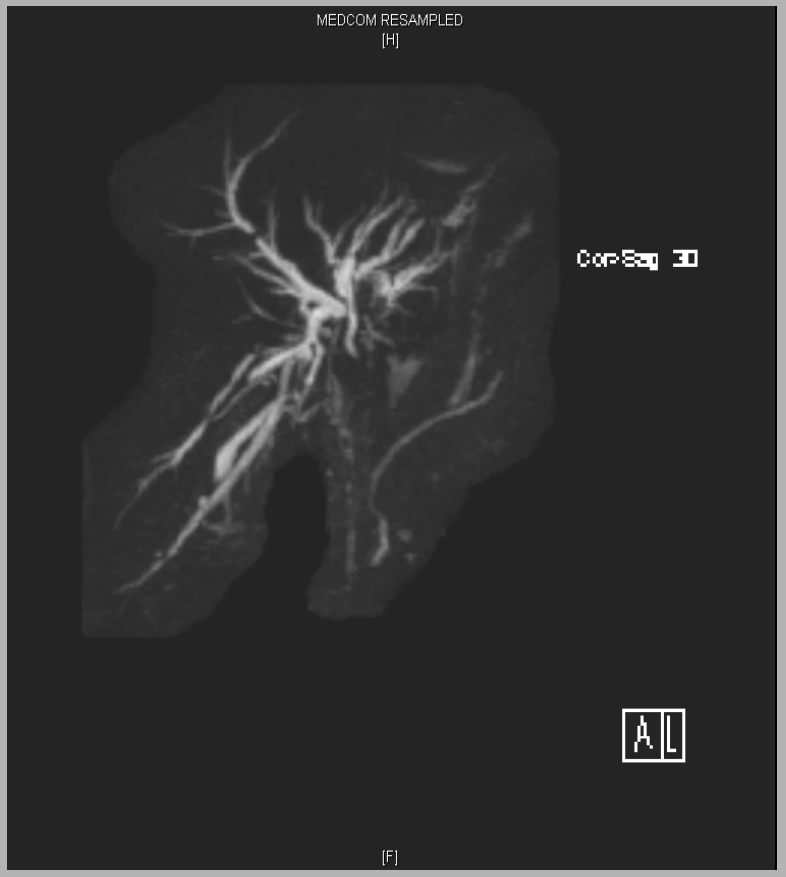

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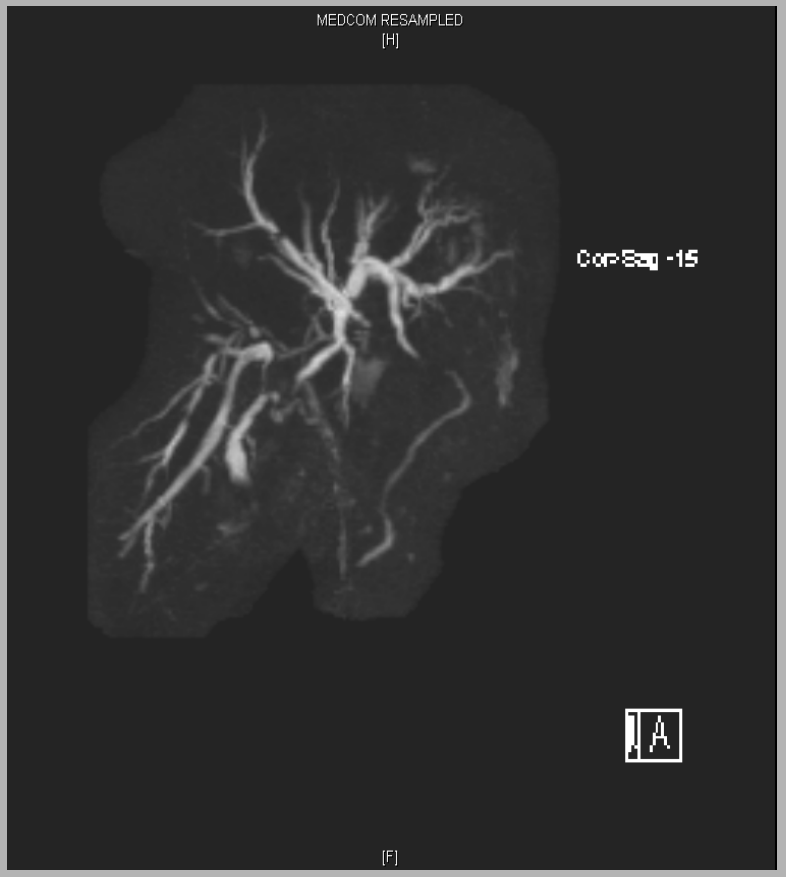

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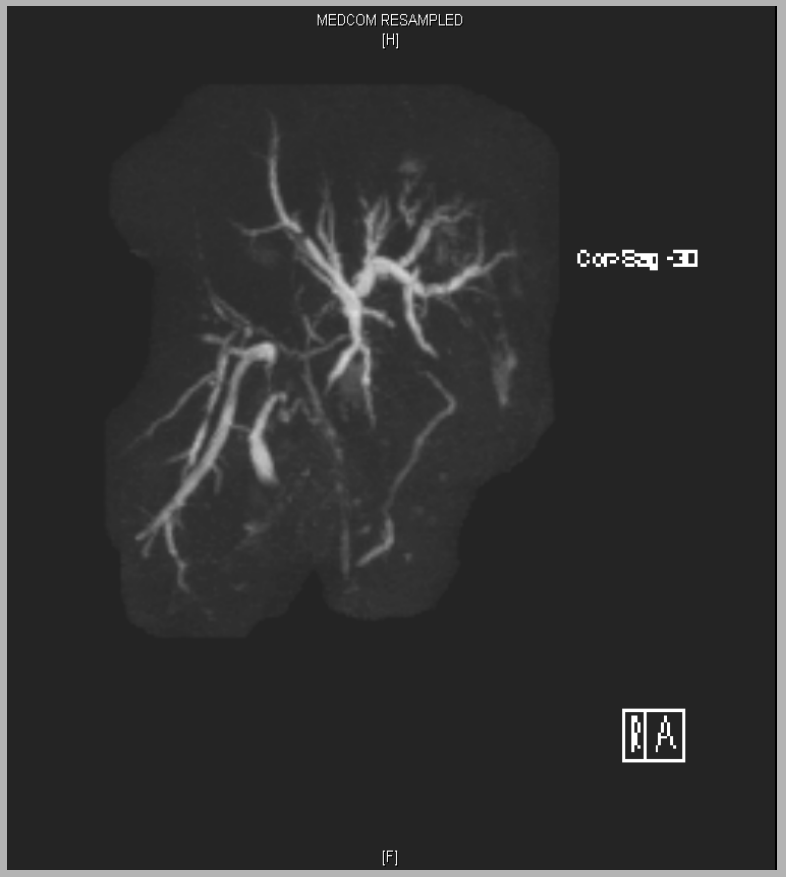

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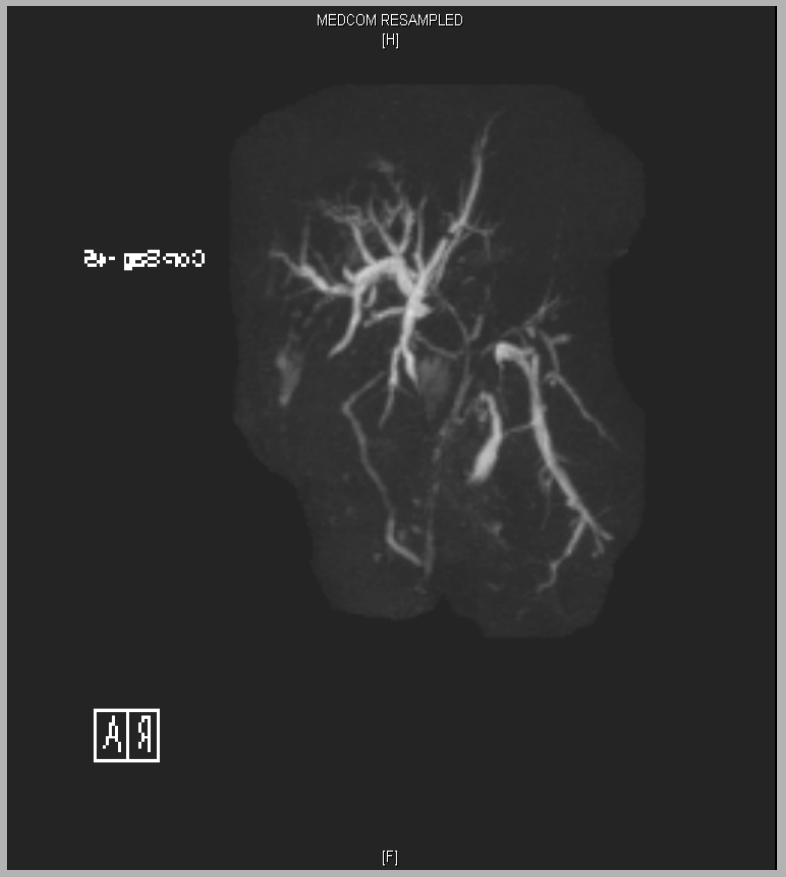

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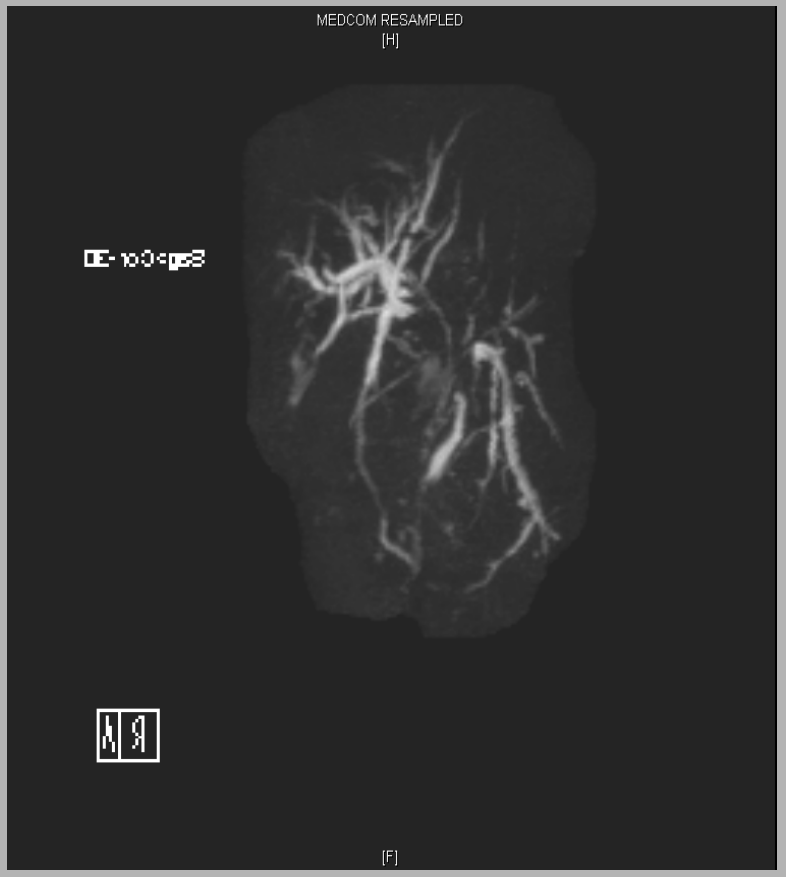

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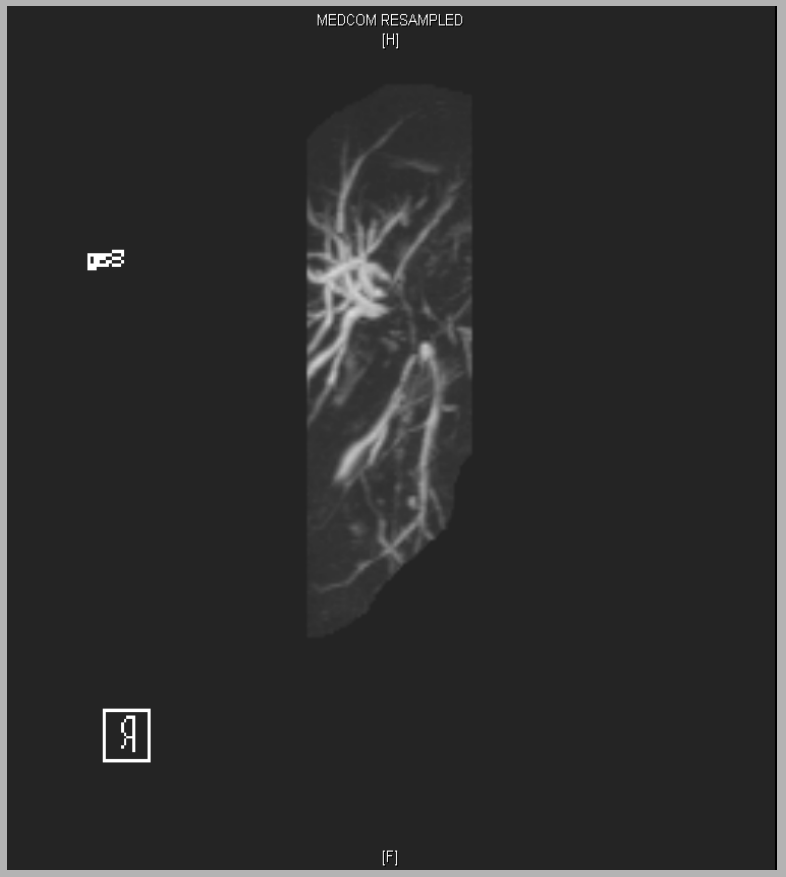

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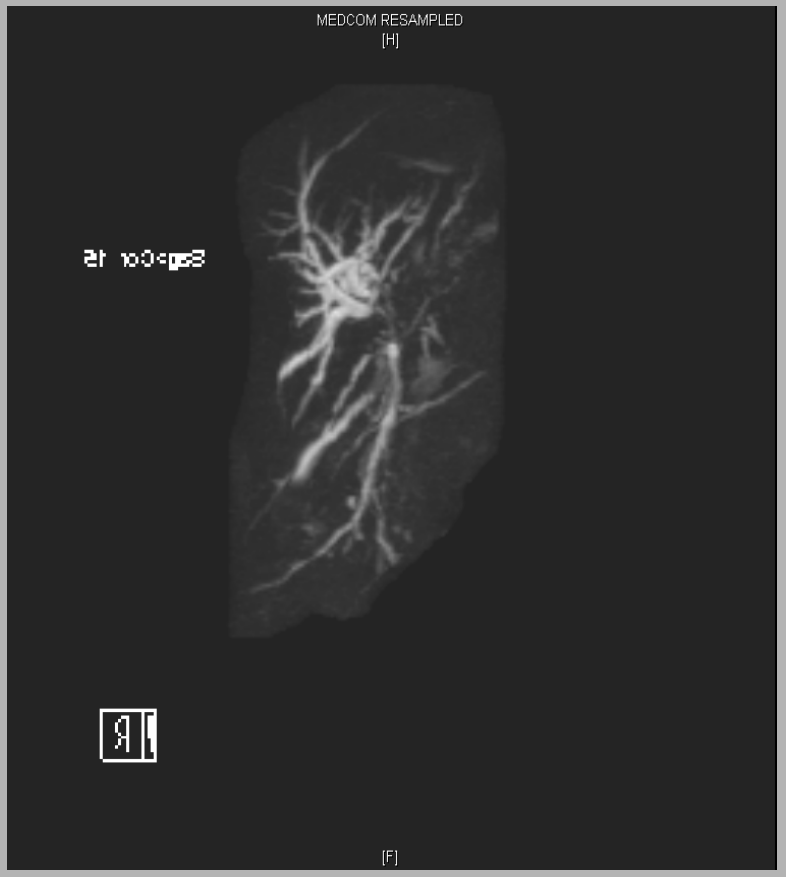

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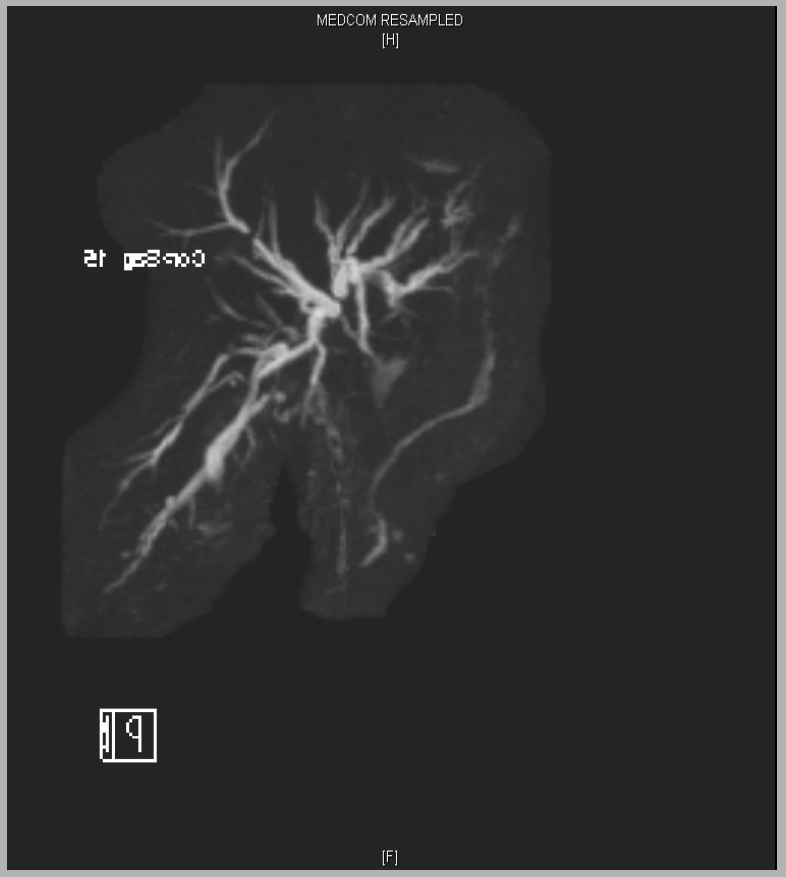

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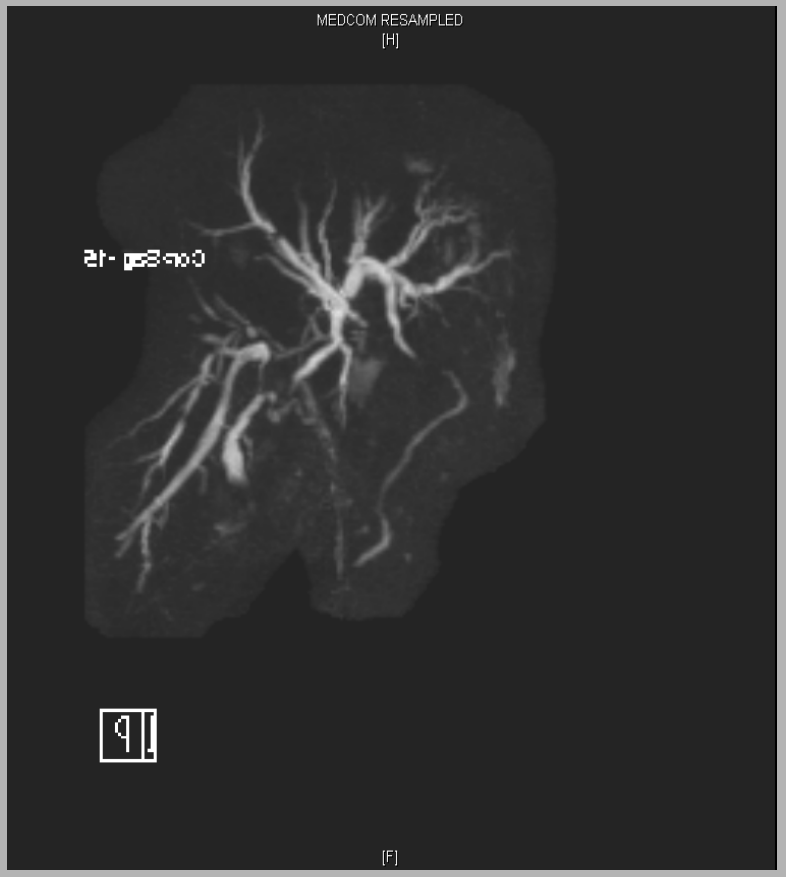

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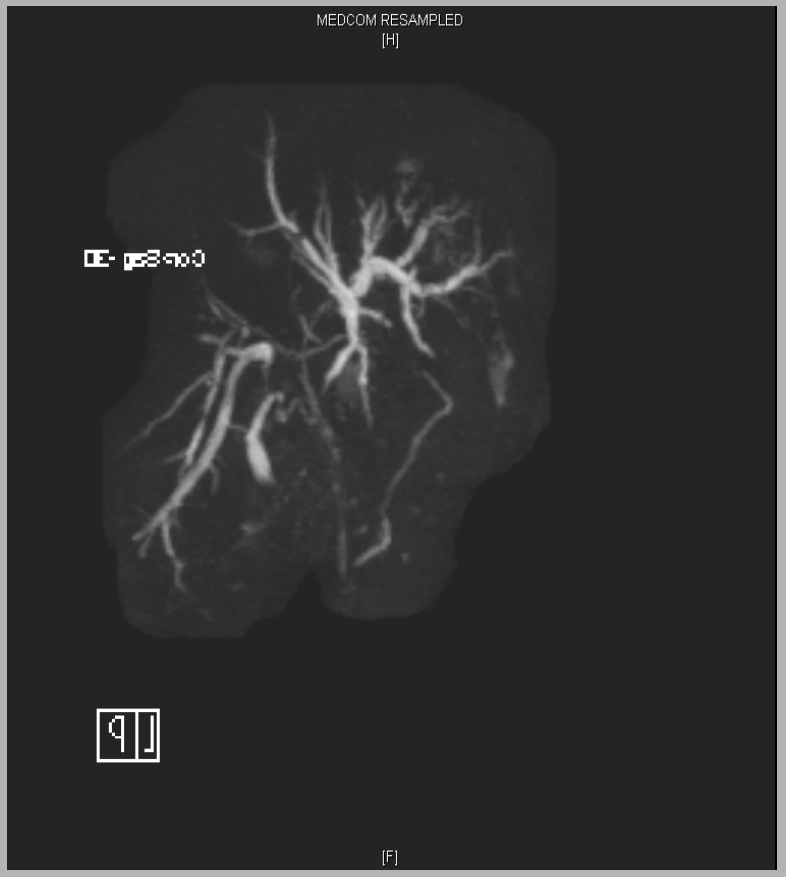

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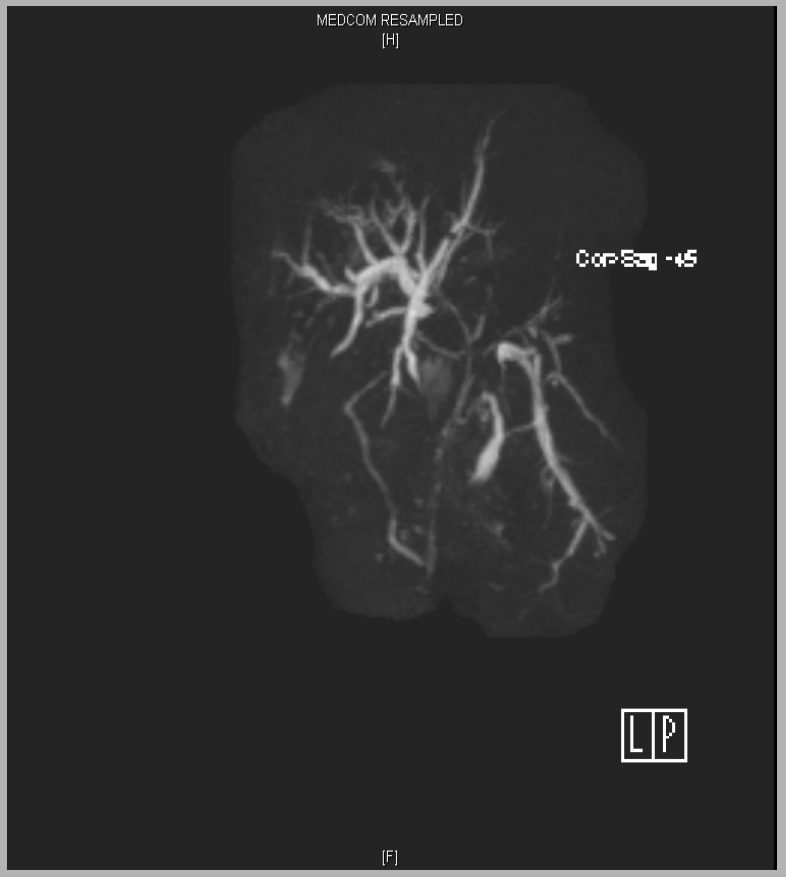

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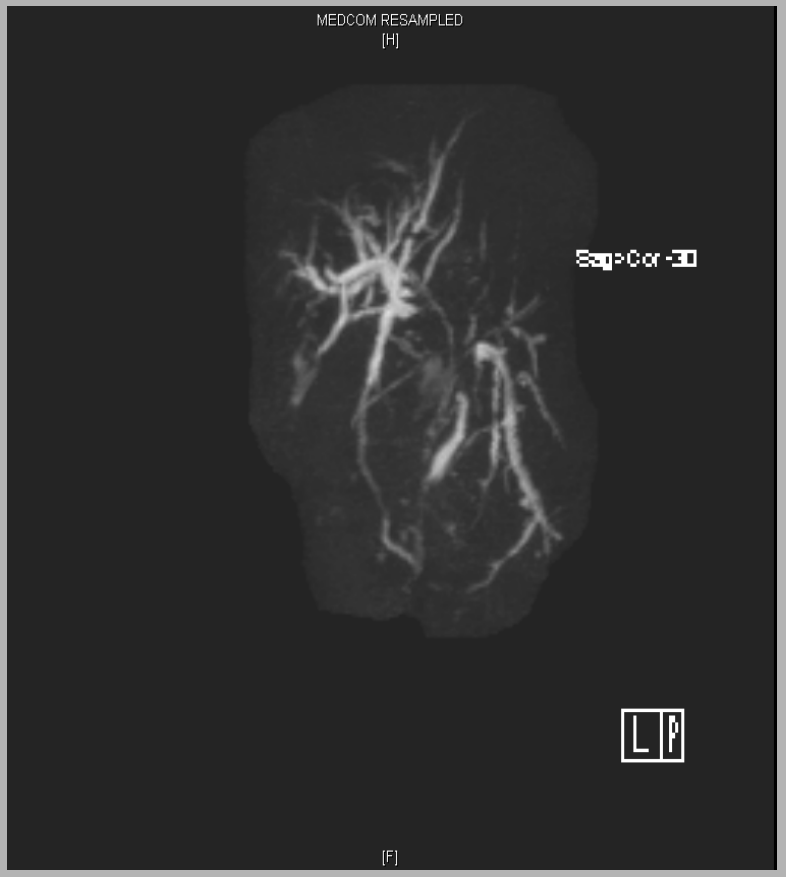

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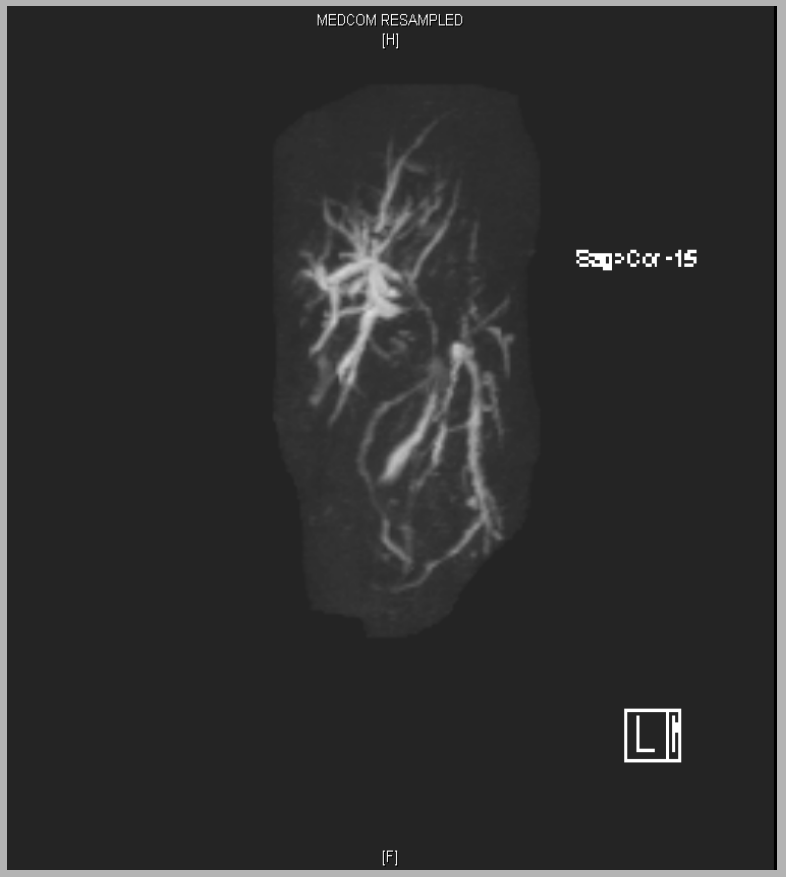

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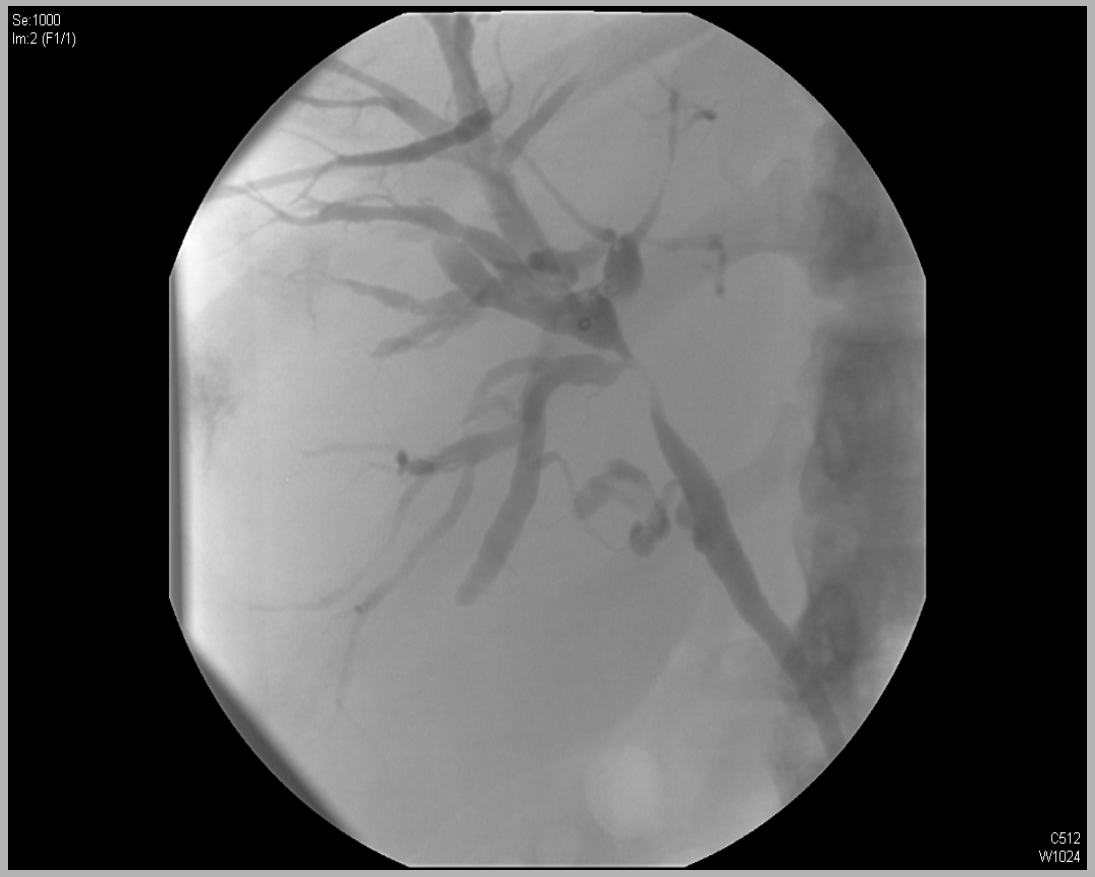

What’s new in ERCP and tissue acquisition?

New technology / techniques in peroral cholangiopancreatoscopy

- New ways to get to the bile duct itself
- New ways to see directly into the bile duct once you get to the bile duct
- New ways to see the tissue of the bile duct once you get in there

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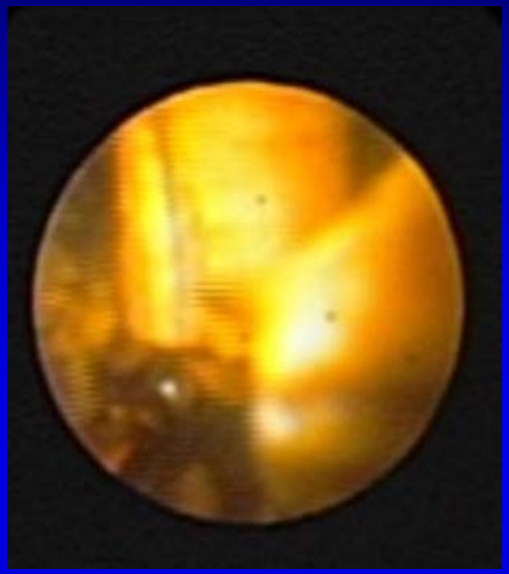
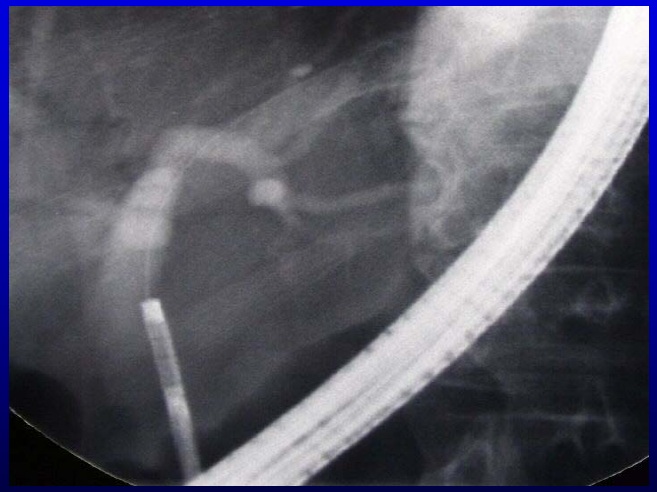
Single-operator cholangiopancreatoscopy





Courtesy B. Peterson, M. Topazi

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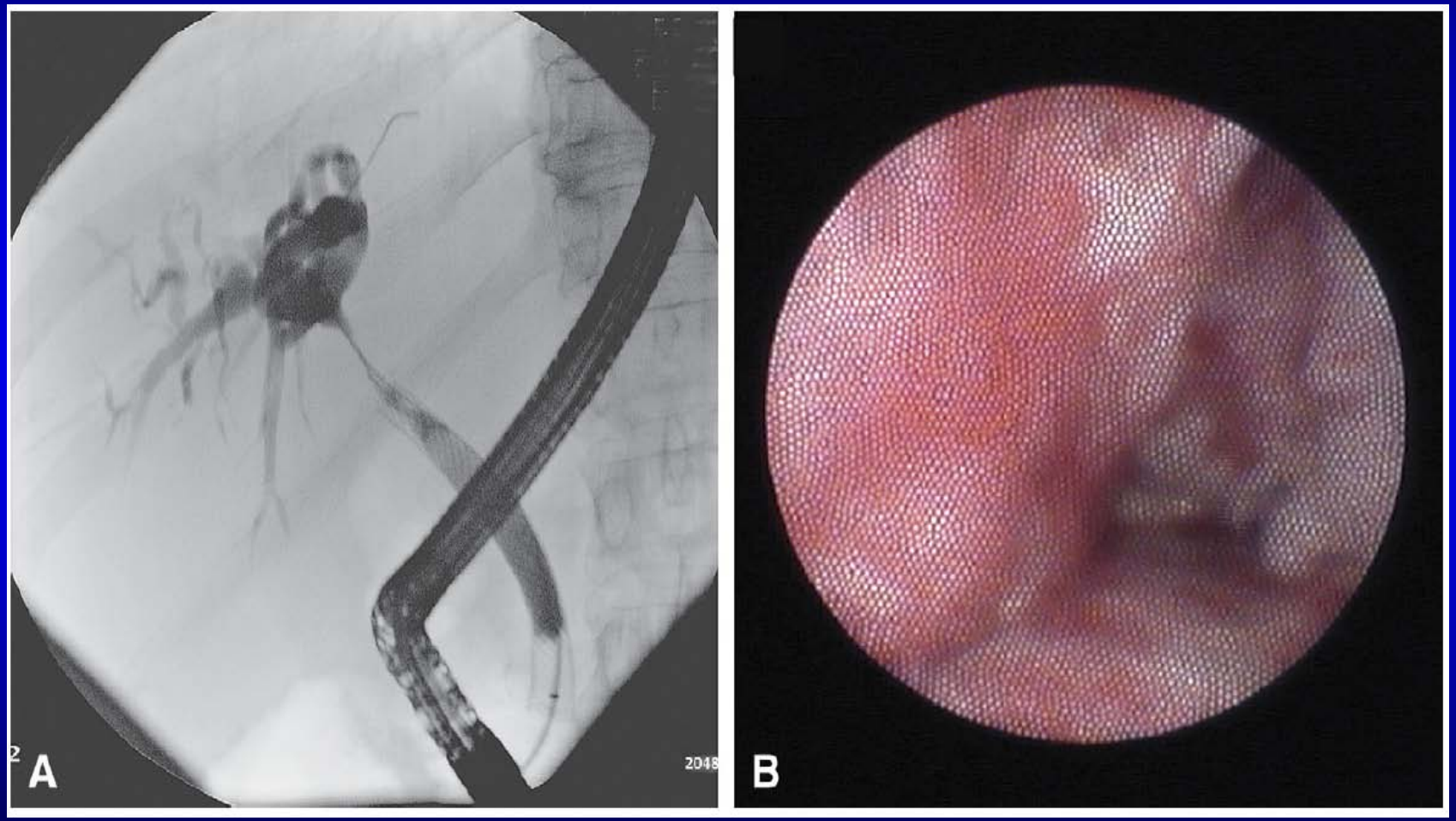
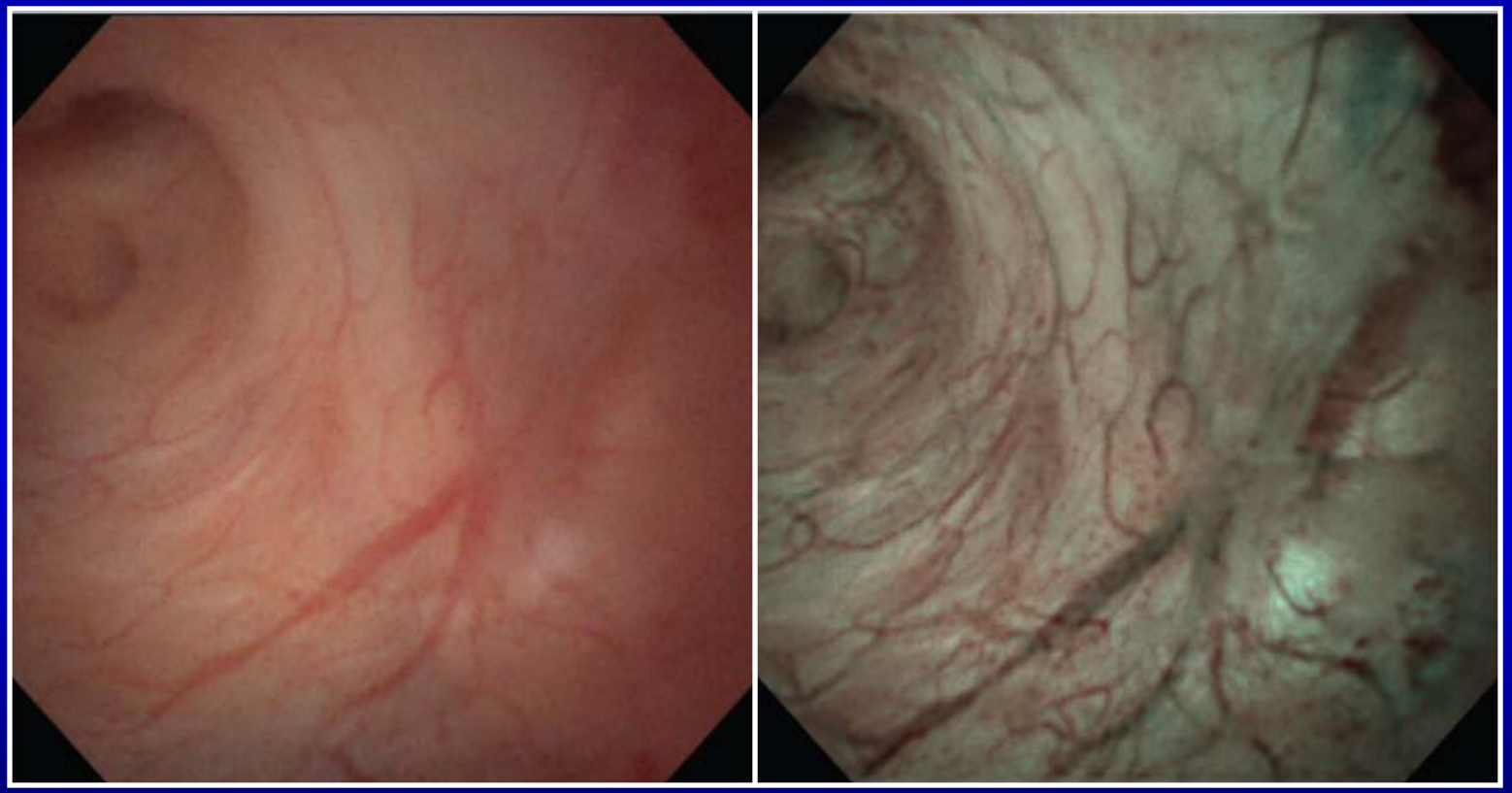
Single-operator cholangiopancreatoscopy



Chen Y, Pleskow D. GIE 2007;65:832.

CCD video-choledochoscopy

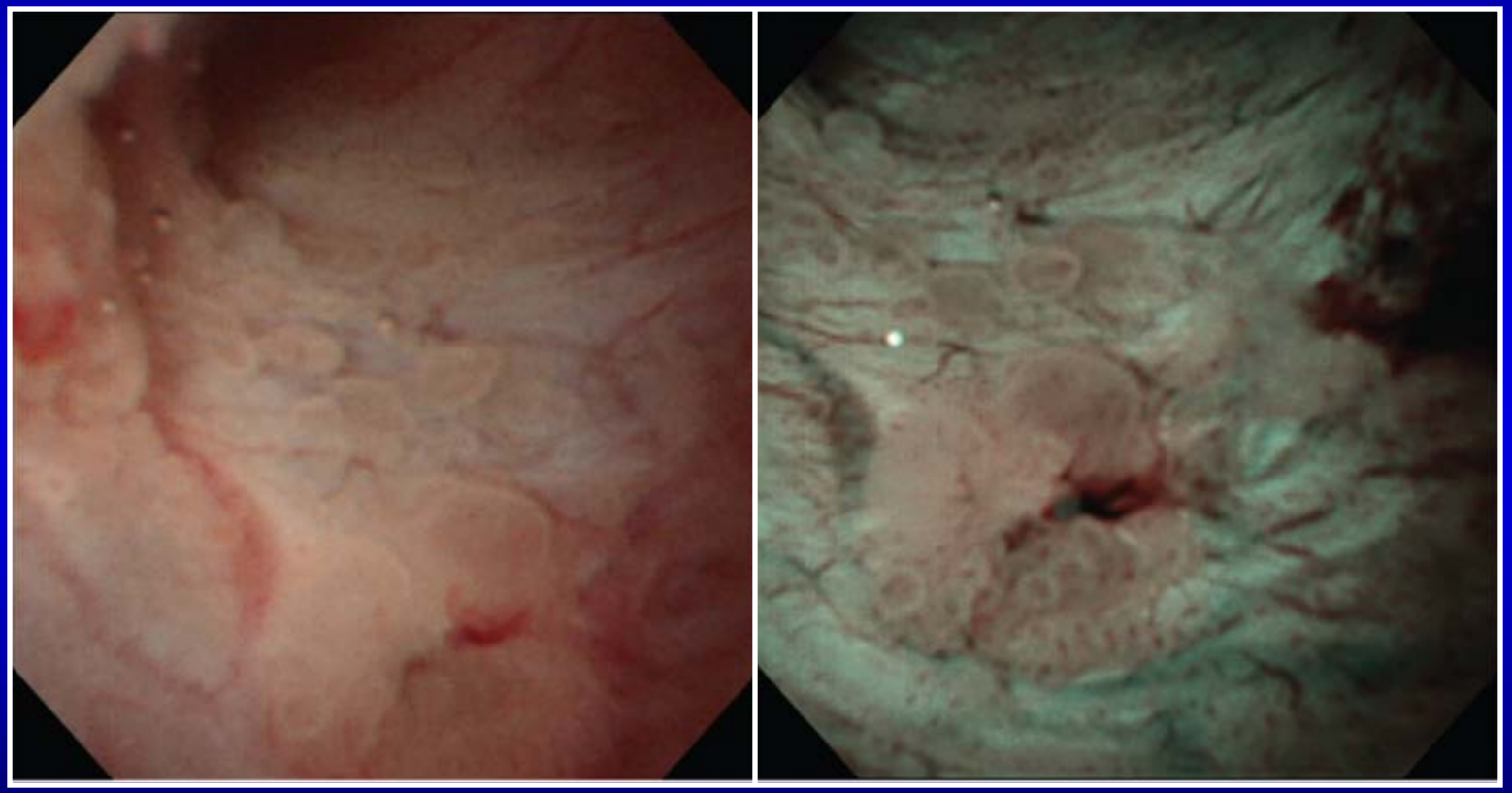
CCD **CCD with NBI**



*Igarashi, et al., Digest Endosc 2007;**19**:S105-S108.*

NBI video-choledochoscopy

CCD | **CCD with NBI**



*Igarashi, et al., Digest Endosc 2007;**19**:S105-S108.*

CCD-NBI video-choledochoscopy

Courtesy Professor Takao Itoi, MD, Tokyo Medical University

CCD-NBI video-choledochoscopy

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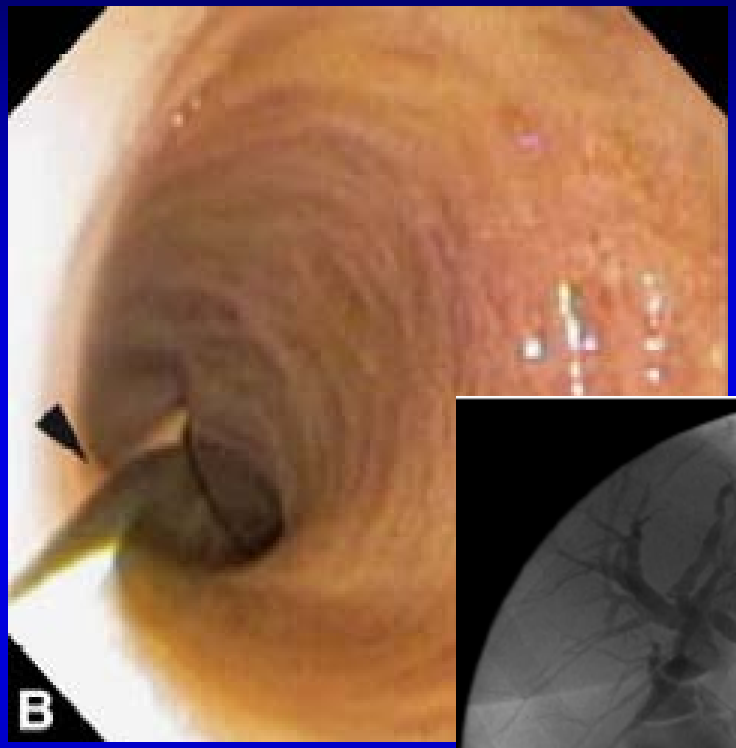
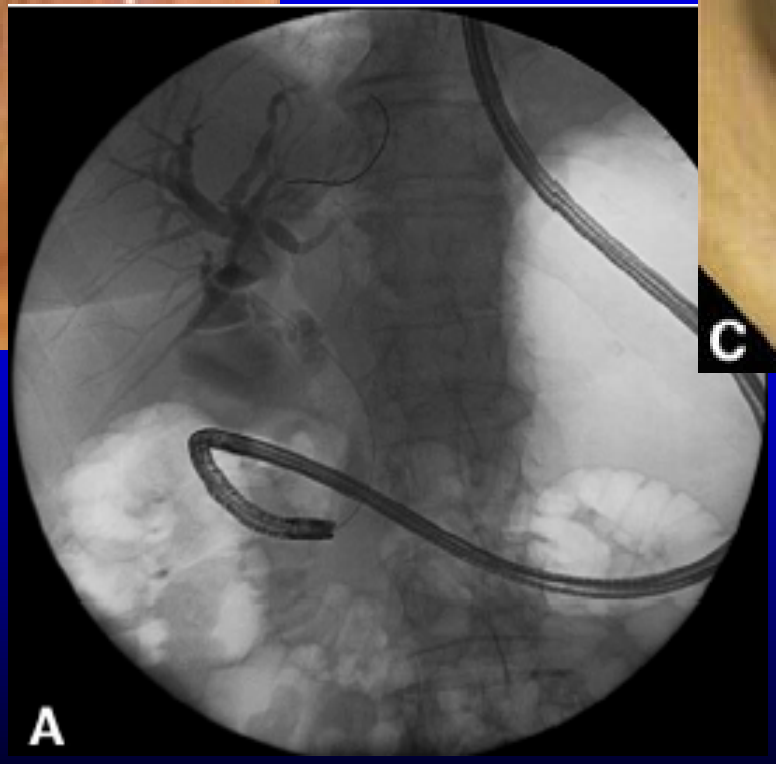
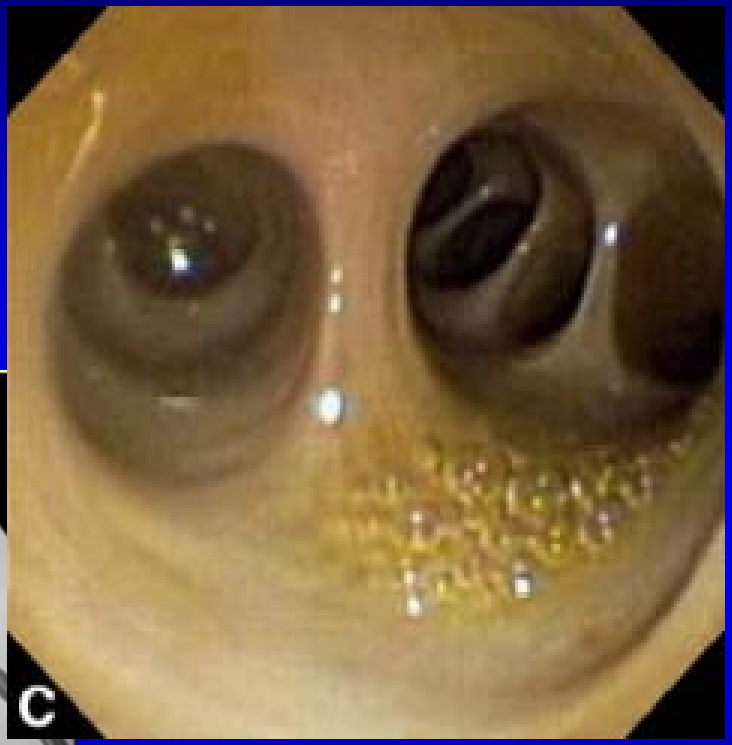
Direct video cholangioscopy

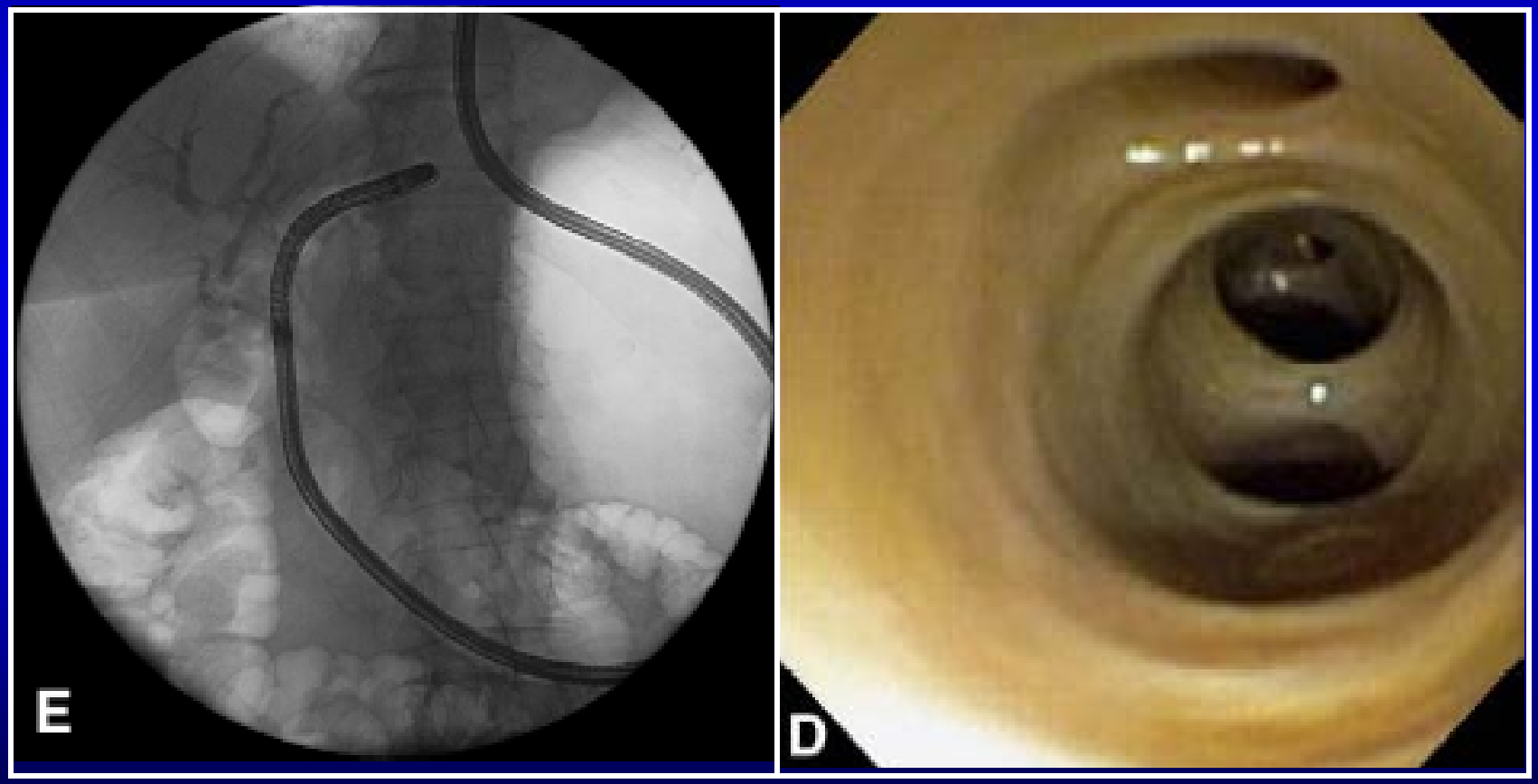






*Larghi & Waxman, GIE 2006;**63**:853-857.*

Direct video cholangioscopy



*Larghi & Waxman, GIE 2006;**63**:853-857.*

Direct video cholangioscopy

Courtesy I. Waxman, MD, University of Chicago

Endoscopic access: Balloon enteroscopy-assisted ERC

Endoscopic access

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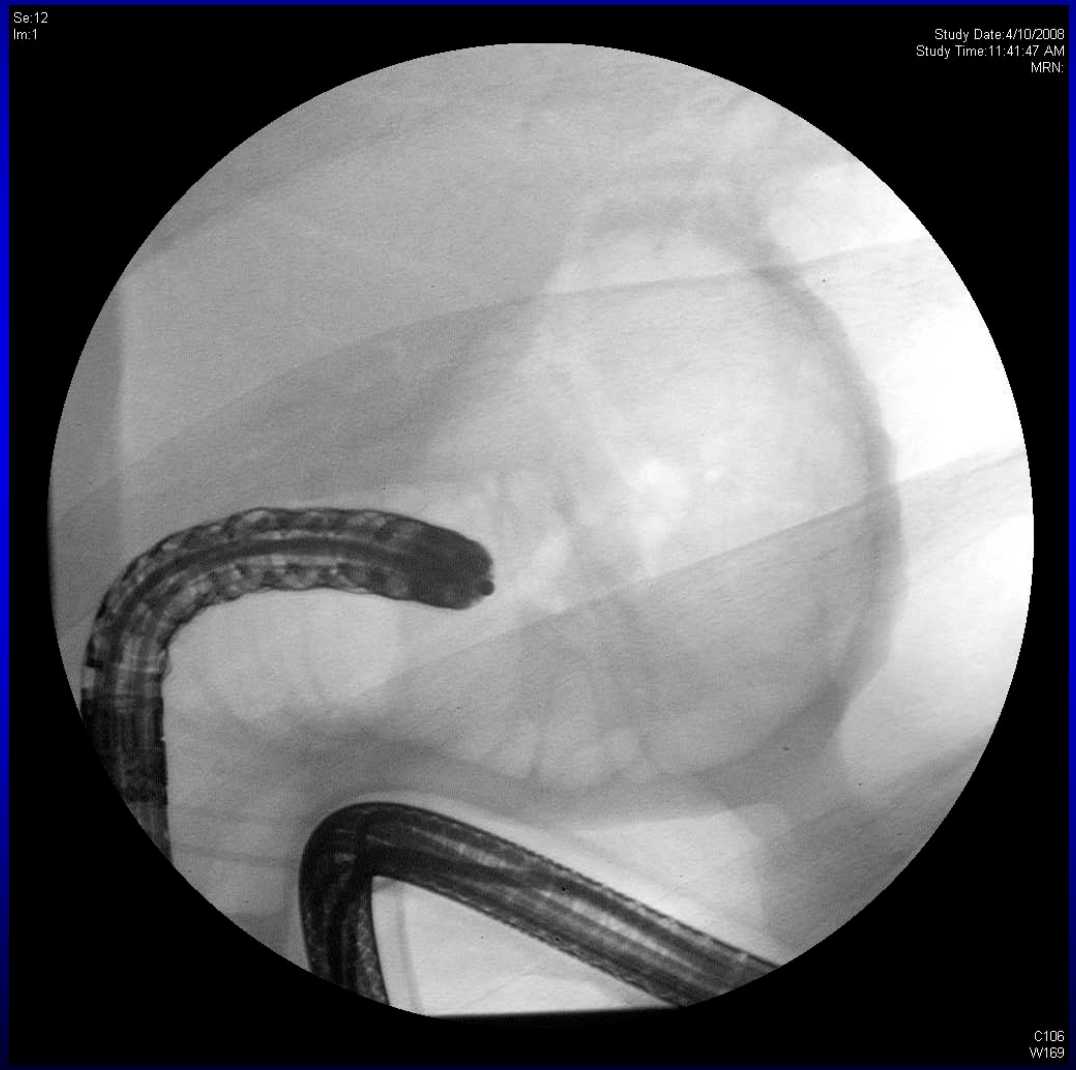
Endoscopic access



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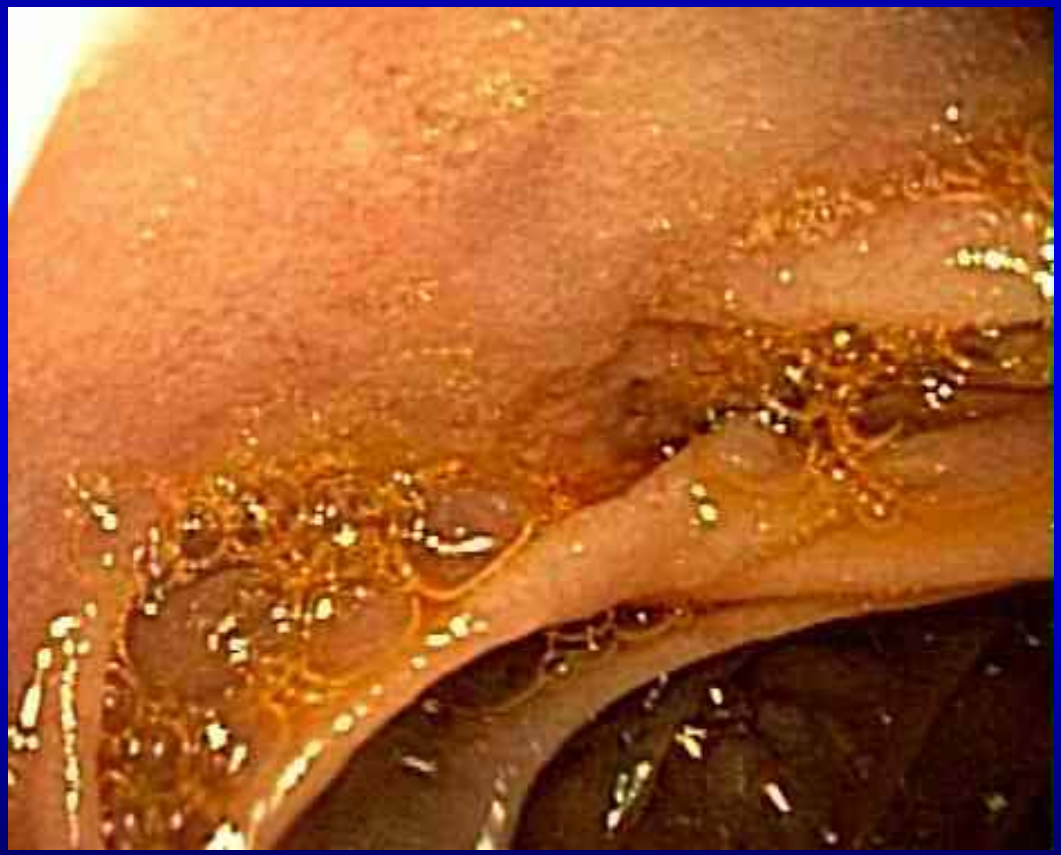
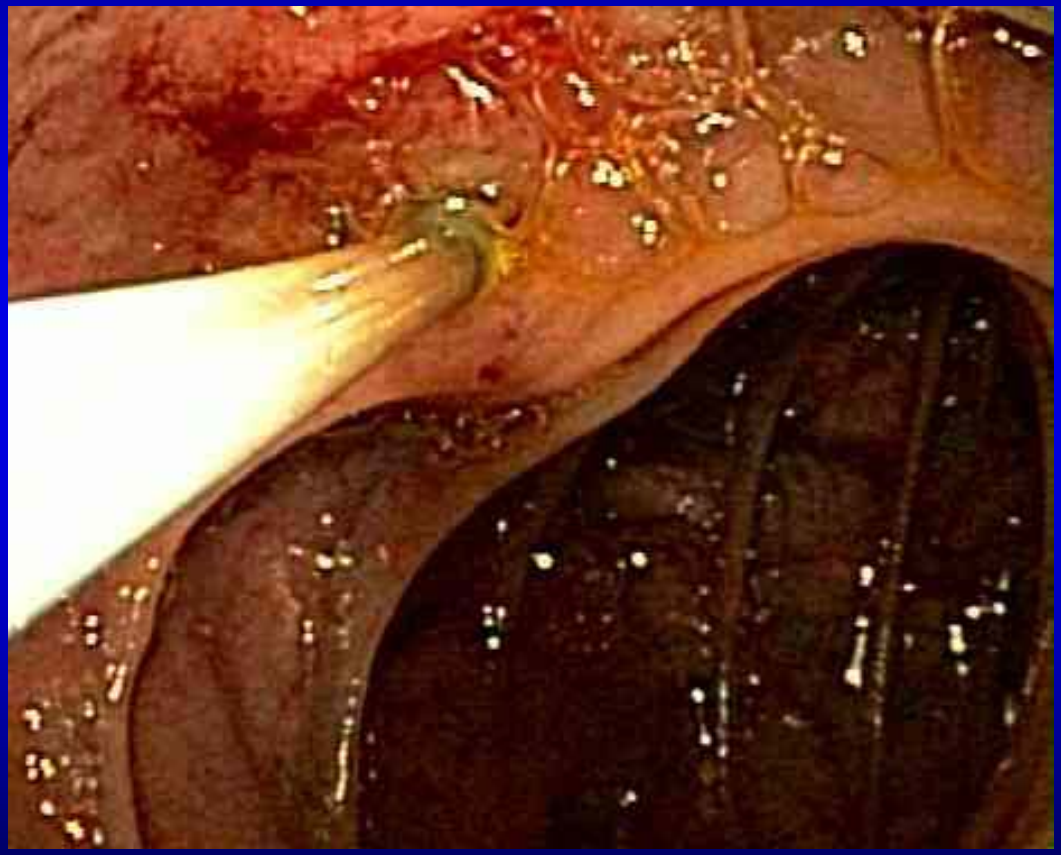
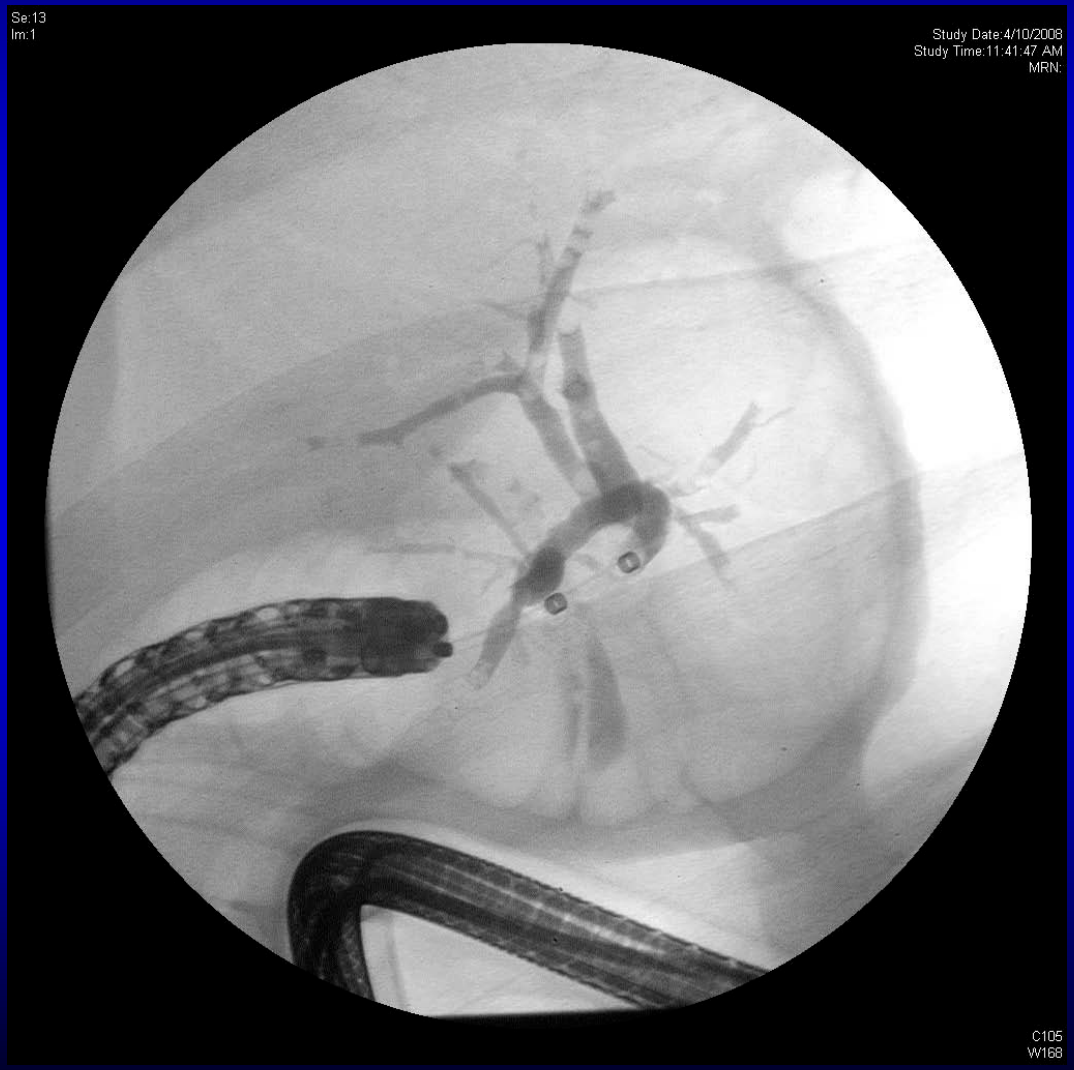
Endoscopic access



Endoscopic access



Endoscopic access



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Endoscopic access

The future

- Novel endoscopic visualization technologies
  - Virtual cholangioscopy
  - Intraductal OCT
  - Autofluorescence*
  - Magnification endoscopy*
  - Flourescence molecular probe endoscopy*

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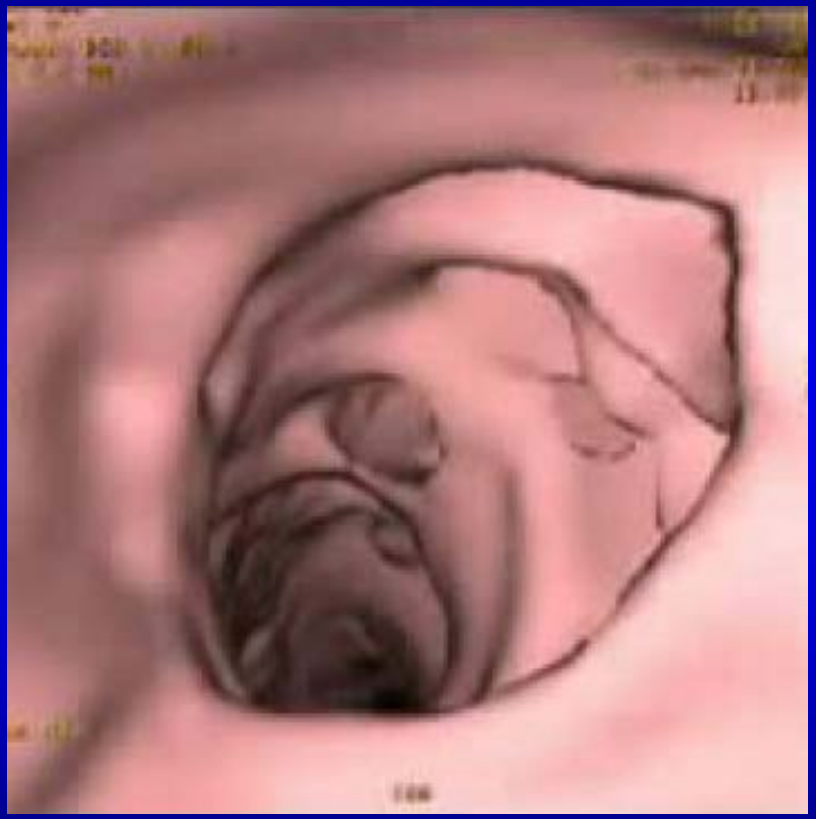
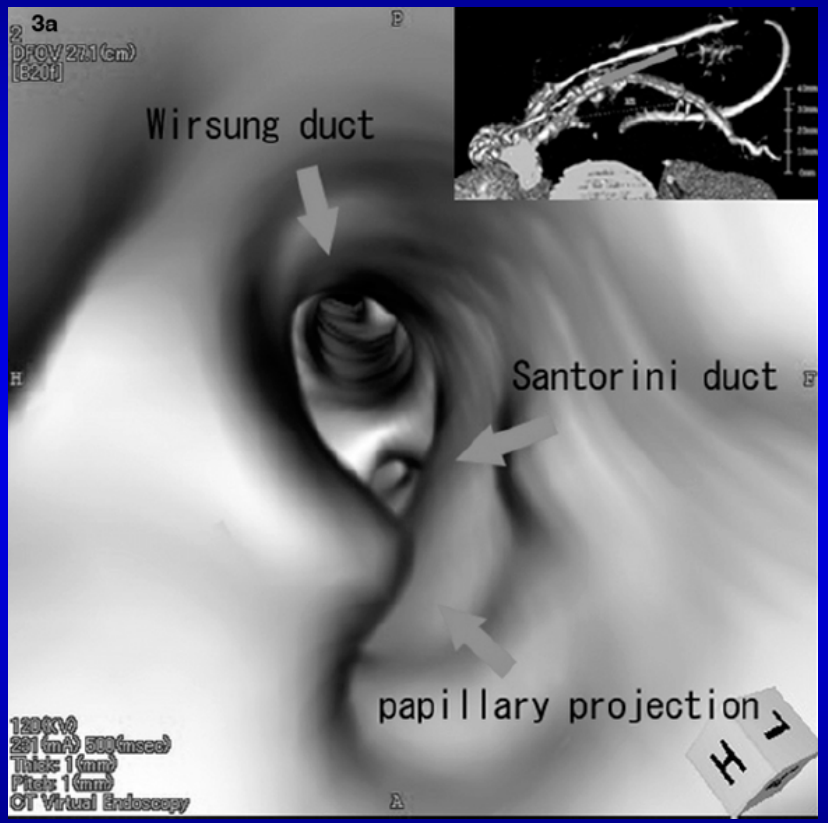
Virtual ERCP



MR Cholangiopancreatoscopy

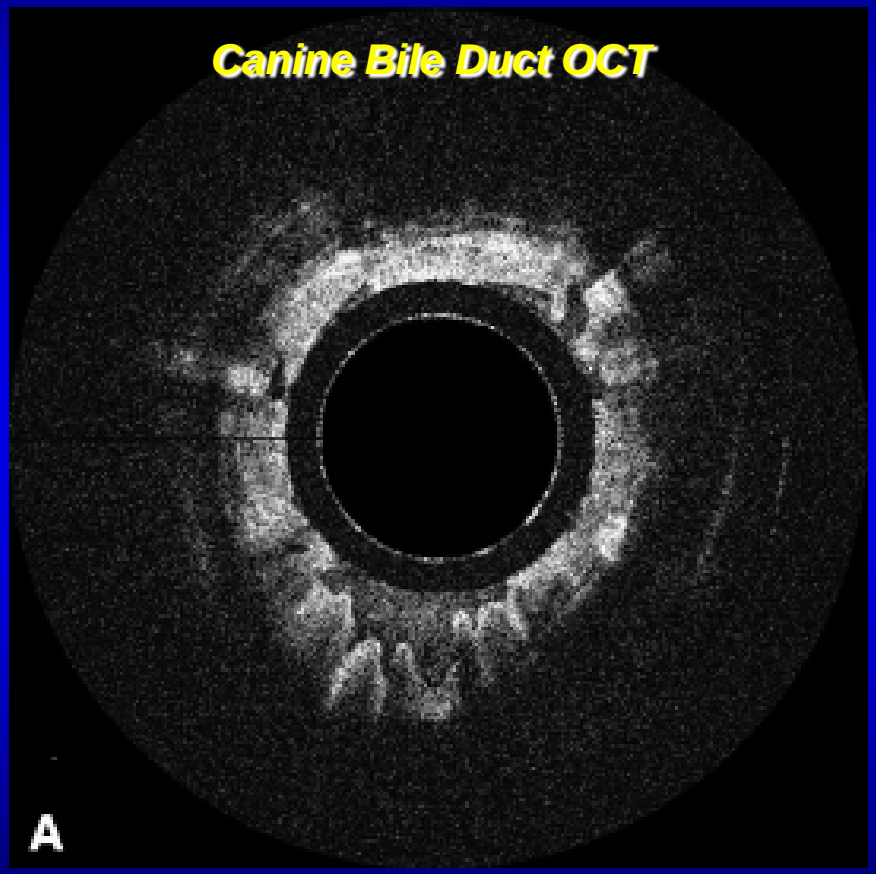
Kalapala, et al, J Pancreas 2008;9:220-225.



CT Cholangiopancreatoscopy

Sata, et al, Abdom Imaging 2006;31:326-331.

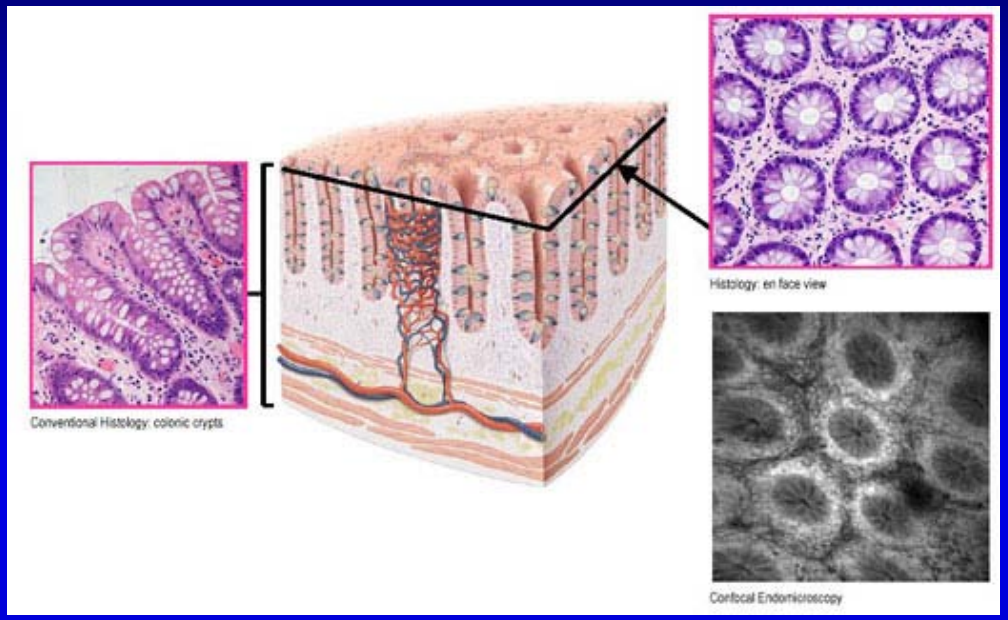
OCT: IR light reflectance



Singh, et al, GIE 2005;62:970-974.

Isenberg, et al, GIE 2008;67:AB107-AB108.

Confocal Endoscopy



Courtesy L.M. Wong Kee Song, MD

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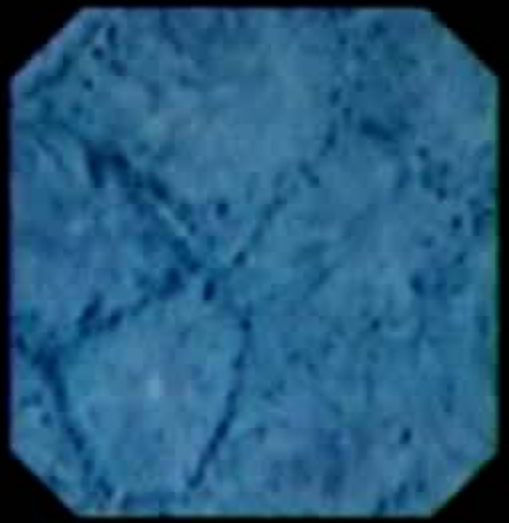
Endocytoscopy

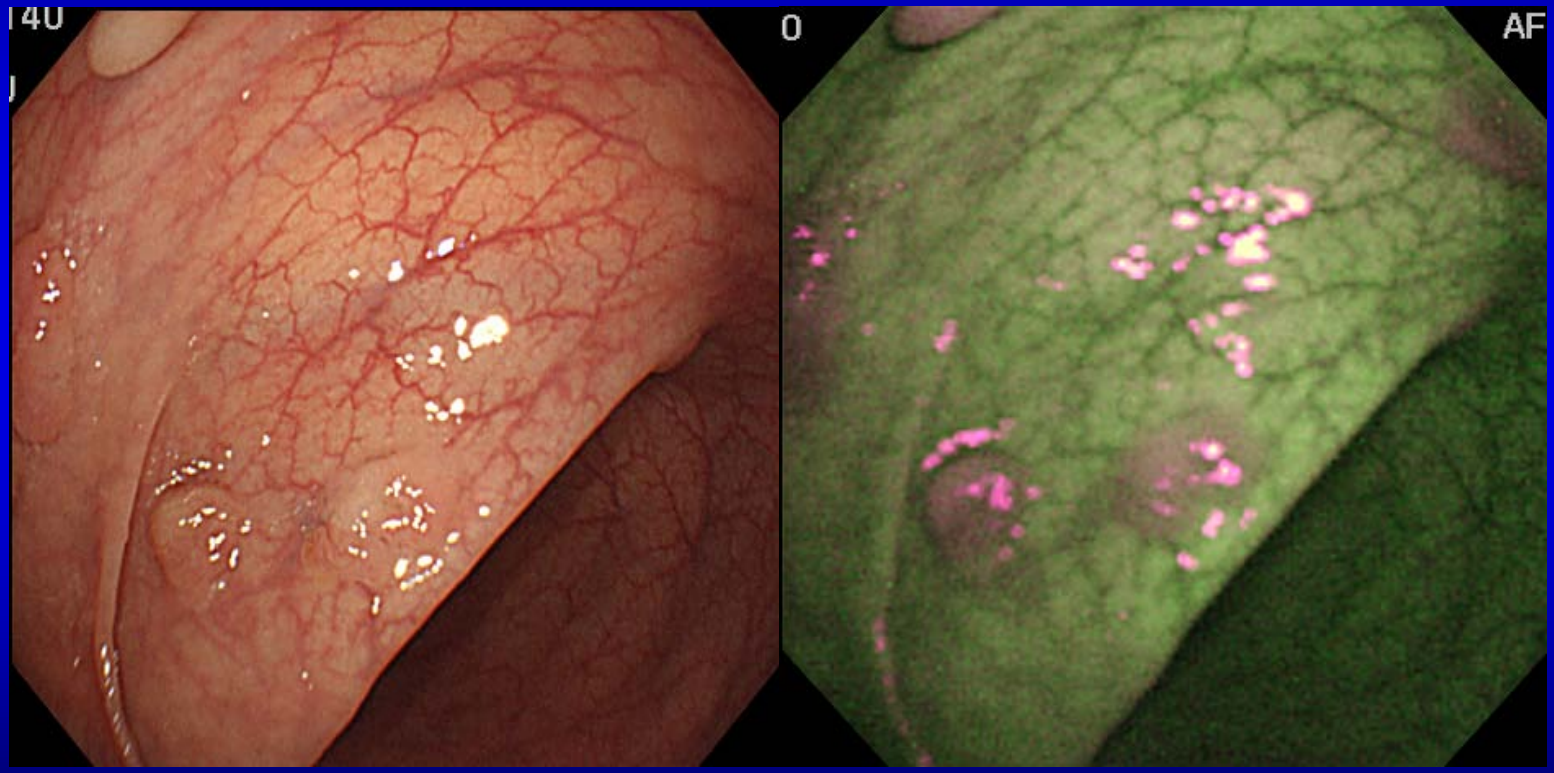
- Real-time imaging of surface cell layer under methylene blue assisted-super high magnification (450x or 1100x)



Colonic Mucosa 450x

Courtesy Drs. Wong Kee Song and Eber

Auto-fluorescence Imaging (AFI)



Courtesy Dr. Uedo

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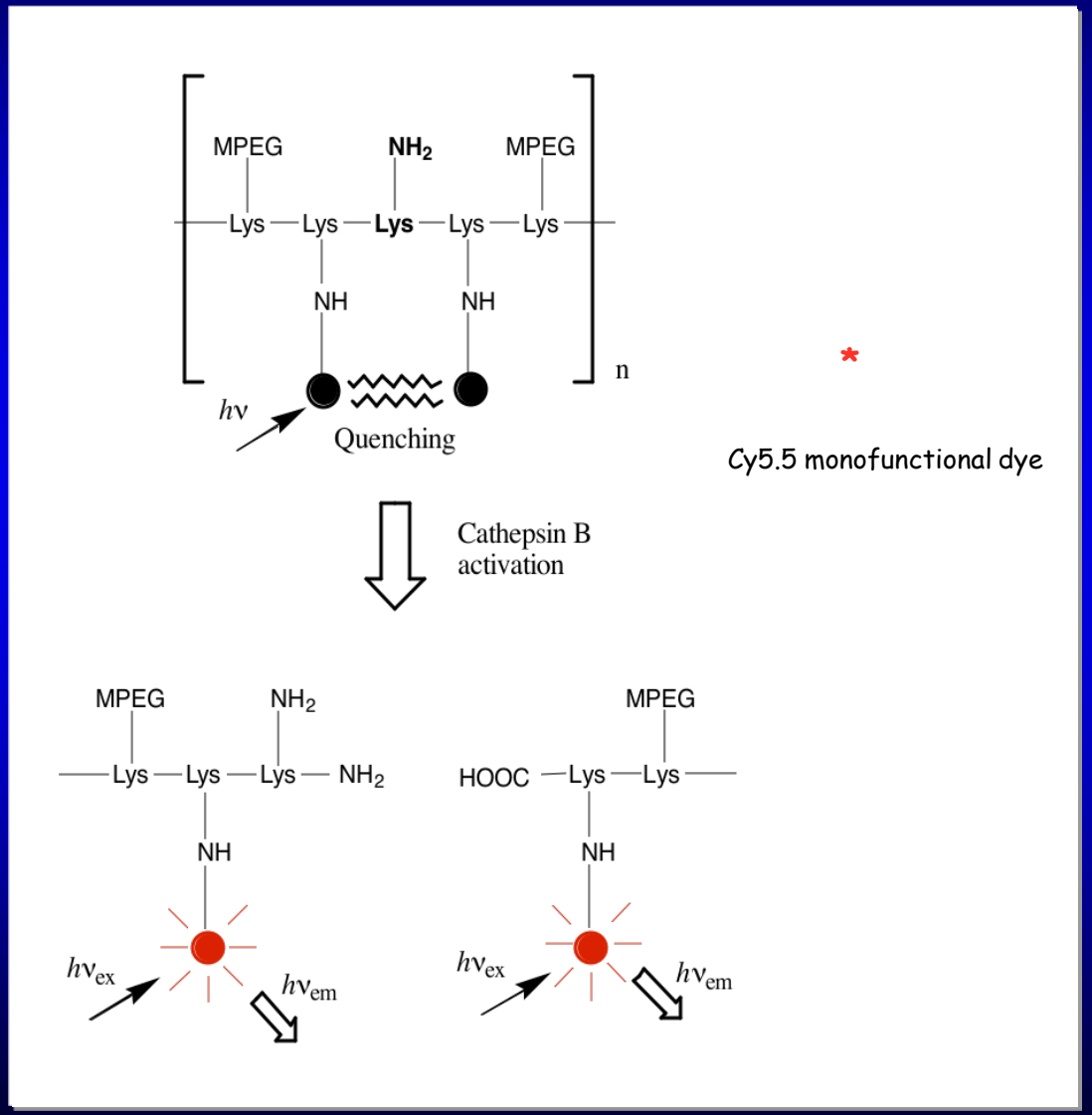
Fluorescence Probe Endoscopy

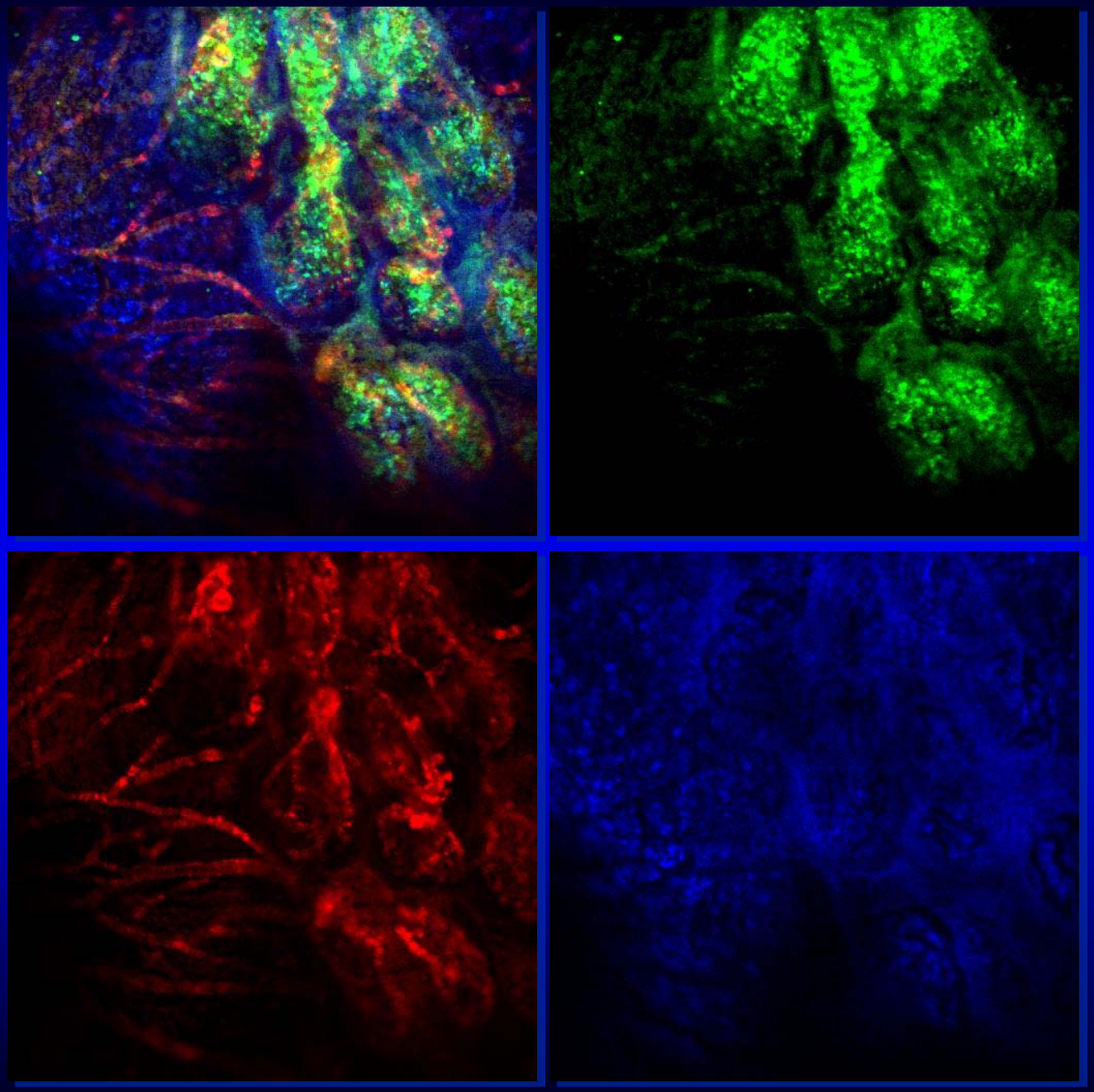
The cathepsin probe: are molecular probes the future of diagnostic endoscopy?

Gounaris and Khazaie, PLoS ONE 2008; 3: e2916.



Molecular imaging in endoscopy:

Cathepsin probe endoscopy in a mouse model



Gounaris and Khazaie

Summary

Imaging and tissue acquisition in PSC

- We’re seeing more
- We’re seeing better
- We’re seeing more clearly
- We’re seeing what we couldn’t see before
- We’re going where we couldn’t go before

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Summary

The future is bright…and it looks bright too!

we're Stampin' out disease in Chicago...

THANK YOU FOR YOUR INTEREST!

NORTHWESTERN UNIVERSITY INTERDISCIPLINARY LIVER DISORDERS PROGRAM

HEPATOLOGY

GASTROENTEROLOGY

TRANPLANT SURGERY

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5th Annual Conference for PSC Patients and Caregivers

The Wyndham Chicago Hotel

Chicago, Illinois • May 1-3, 2009