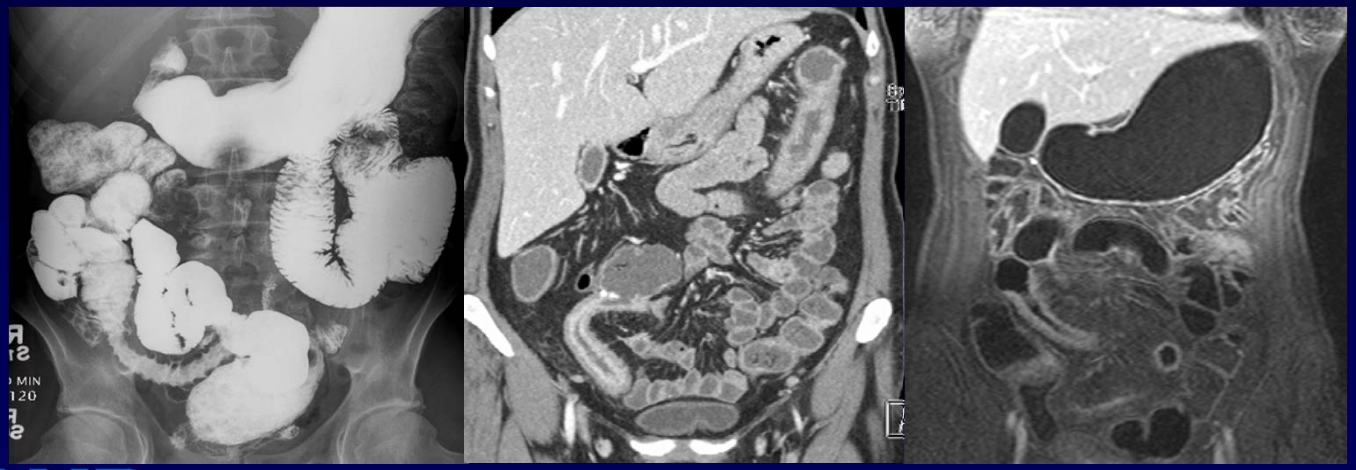
Crohn's Disease on CT/MR Enterography: SAR/AGA/ASCRS/SSAT Consensus Statement on Nomenclature for Reporting

Sept 20, 2016, 8:30-8:45 AM

Mark E. Baker, MD, FACR, FSAR, FSCBT/MR
Professor of Radiology
Cleveland Clinic Lerner College of Medicine of CWRU
Staff Radiologist, Abdominal Imaging,
Imaging & Digestive Disease Institutes, Cleveland Clinic



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CONFLICT OF INTEREST DISCLOSURE:

BRACCO:
Informal Consultations

SIEMENS HEALTHCARE:
Research Agreement
Radiation Dose Assessment & Reduction in MDCT including Iterative Reconstruction
(Salary Support, Hardware & Software)
(Not Applicable to the Presentation)

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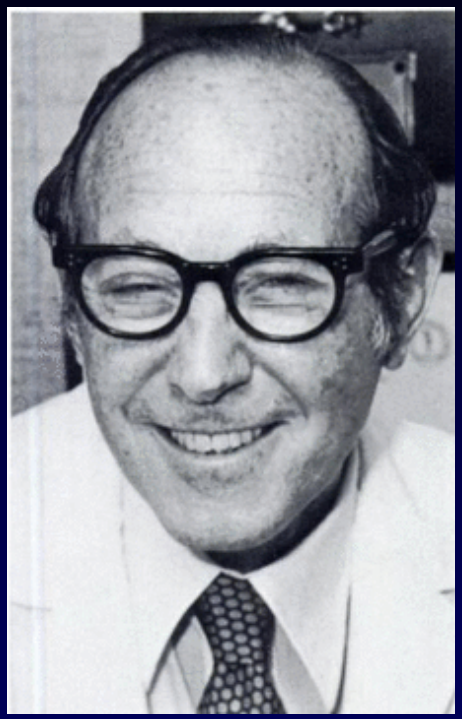
Reed P Rice, M.D.



Richard H Marshak, M.D.

Alec J Megibow, M.D.

SAR Crohn's Disease Focused Panel

- **Mahmoud Al-Hawary**
- Sudha Anupindi
- **Mark E. Baker**
- **David Bruining (Gastro)**
- Jonathan Dillman
- **Jeff Fidler**
- **JG Fletcher**
- Michael Gee
- David Grand
- "Buddy" Guglielmo
- Amy Hara
- Tracy Jaffe
- Jim Huprich
- Dean Maglinte
- Alec Megibow
- Seong Ho Park
- Joel Platt
- Daniel Podberesky
- Jordi Romola
- Dushant Sahani
- Jorge Soto
- Stuart Taylor

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Objectives

- Purpose of a Common/Standardized Nomenclature
- CTE/MRE Impressions of Crohn's
  - Image Based Morphologic Phenotypes
    - Terms to Use in Dictation
    - Meaning of Terms
    - Examples
- CTE/MRE Findings of & Report Template for Crohn's Disease
  - Insufficient Time for Presentation
  - CT enterography for Crohn's disease: optimal technique & imaging issues. Baker ME, Hara AK, Platt JF, Maglinte DDT, Fletcher JG
    - Abdominal Imaging 2015; 40: 938-952.

Purpose of Standardized Nomenclature

- Imaging is Increasingly Used to “Stage” Degree of Inflammation & Intestinal Damage
  - Lémann Score
- Outcome Measures
  - If We are to Determine Whether CTE/MRE Findings Appropriately Direct &/or Alter Rx & Predict Outcomes, the Nomenclature Must be Standardized

Vienna/Montreal Classification/Phenotypes

- Nonstricturing/Nonpenetrating (B1)
  - Active Inflammatory
- Stricturing (B2)
  - Fibrostenotic
- Penetrating (B3)
  - Sinus Tracts
  - Fistulae
  - Abscess
- Perianal (p)

Active Inflammation & “Fibro”-Stenosis

- Compelling Evidence that Active Inflammation & “Fibro”Stenosis Commonly Coexist
  - Rieder F, Zimmerman EM, Remzi FH, Sandborn WJ. Crohn’s disease complicated by strictures: a systematic review. Gut 2013; 62(7):1072-1084
- Crohn’s Disease is a Dynamic, Often Progressive Process, Which Waxes & Wanes
  - Imaging Identifies This Dynamic Process

Relationship Between Fistulae & Strictures

Vircows Arch 2000; 437: 293

- 42 Patients
  - Strictures in 38
  - Fistulae in 27
    - **Stricture Present 96%**
    - Fistulae Within (41%) or at Proximal End (56%) of Stricture

J Clin Gastro 1989; 11: 193

- 236 Specimens
  - Fistulae in 60
    - **Strictures Present in 93%**
    - Fistulae in Proximal End of Stricture- 62%
    - Fistulae Within Stricture- 31%
  - No Stricture in 7%

Ian Lavery- "Penetrating Disease without Strictures is Rare"

Reed Rice Rule- "No Stricture-No Fistula"

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Montreal/Vienna vs. Clinical, Pathologic & Imaging Findings

- Montreal/Vienna Phenotypes Cannot Be Reconciled with:
  - Clinical Findings
  - Pathologic Findings
  - Imaging Findings
- Does Not Account for Dynamic Disease Process

Nomenclature

Findings

- Wall
  - Wall Thickness & Enhancement
  - Mural Edema (T2-MRI)
    - Mural Fat (Fat Sat T2 & T1)
  - Restricted Diffusion
  - Luminal Diameter (Disease Site & Upstream)
- Mesenteric
  - Engorged Vasa Recta, Fibrofatty Proliferation, Perienteric Edema, Adenopathy, Inflammatory Mass & Abscess, Mesenteric Vein Thr/Occlus
  - Ulcer, Sinus Tract & Fistulae
- Ancillary
  - Perianal Fistulae, PSC, Stones, Venous Thrombi, Sacroiliitis, Hip AVN

Impressions (Morphologic Phenotypes)

- Active Inflammatory CD without Luminal Narrowing
- Active Inflammatory CD with Luminal Narrowing
- CD without Active Inflammation
- Stricture with Active Inflammation
- Penetrating (Added to Above)
- Stricture without Active Inflammation
- No Active Inflammatory Crohn's
- Non-Specific Inflammation

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Imaging Based Morphologic Phenotypes

To Reflect What We Identify with Imaging, Pathology & Clinically

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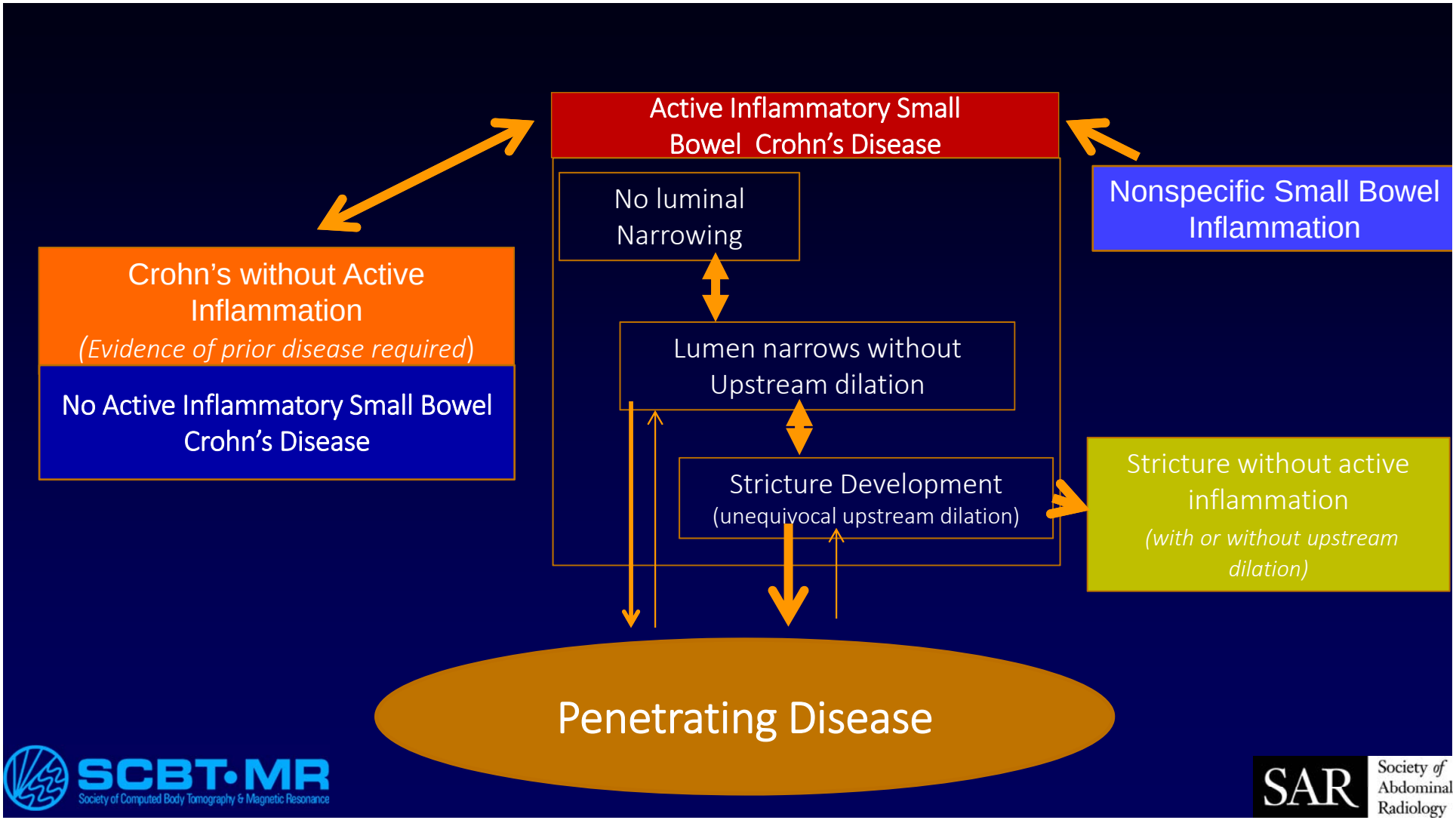
Active Inflammatory Small Bowel Crohn's Disease
No luminal Narrowing
Lumen narrows without Upstream dilation
Stricture Development
(unequivocal upstream dilation)
Crohn's without Active Inflammation
(Evidence of prior disease required)
No Active Inflammatory Small Bowel Crohn's Disease
Nonspecific Small Bowel Inflammation
Stricture without active inflammation
(with or without upstream dilation)
Penetrating Disease
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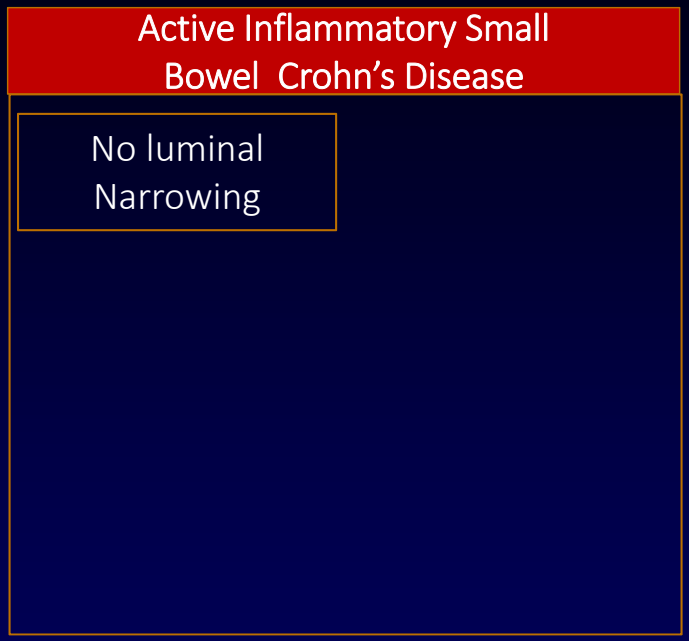

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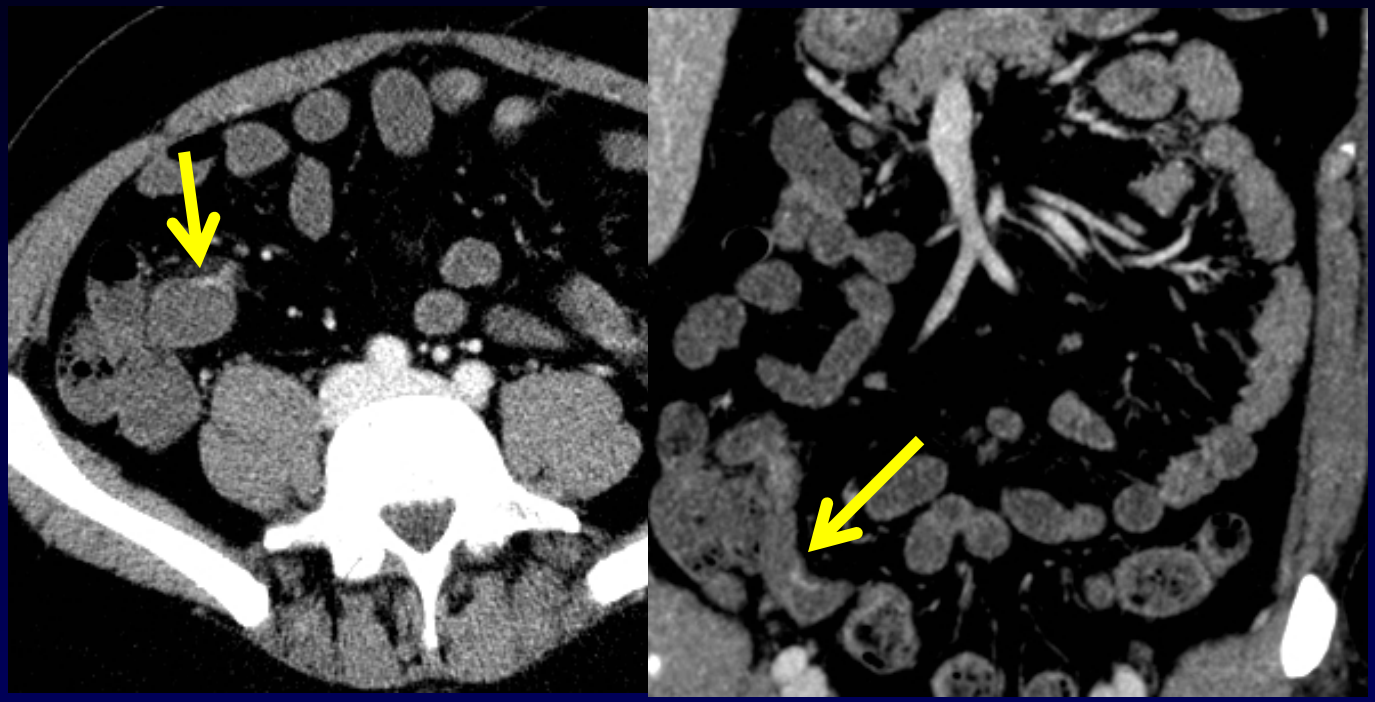
Impressions

- Active Inflammatory Small Bowel C.D.
  - **No Luminal Narrowing**
  - **No Upstream Dilation**
  - Wall Hyperenhancement
    - Generally Stratified **(NOT NECESSARILY MUCOSAL!)**
  - T2 Bright/Restricted Diffusion on MRE
  - Wall Thickening
  - Mesenteric Changes Variably Present
- **Active**
  - **Not Acute or Chronic**



ACTIVE INFLAMMATORY
SMALL BOWEL CROHN'S DISEASE
WITHOUT LUMINAL NARROWING

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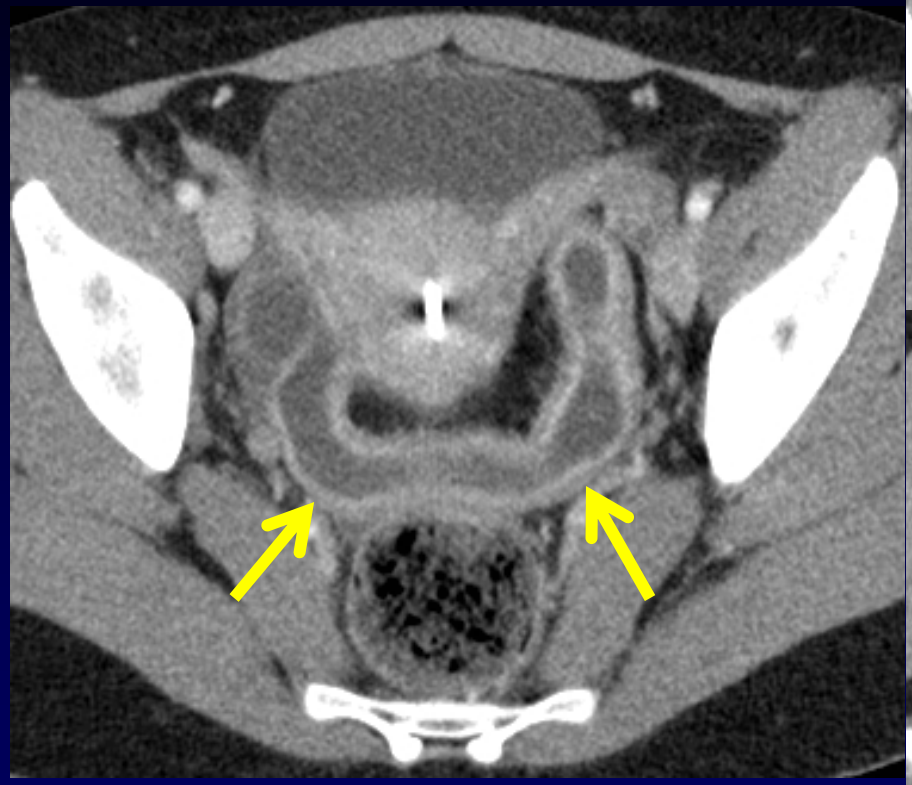

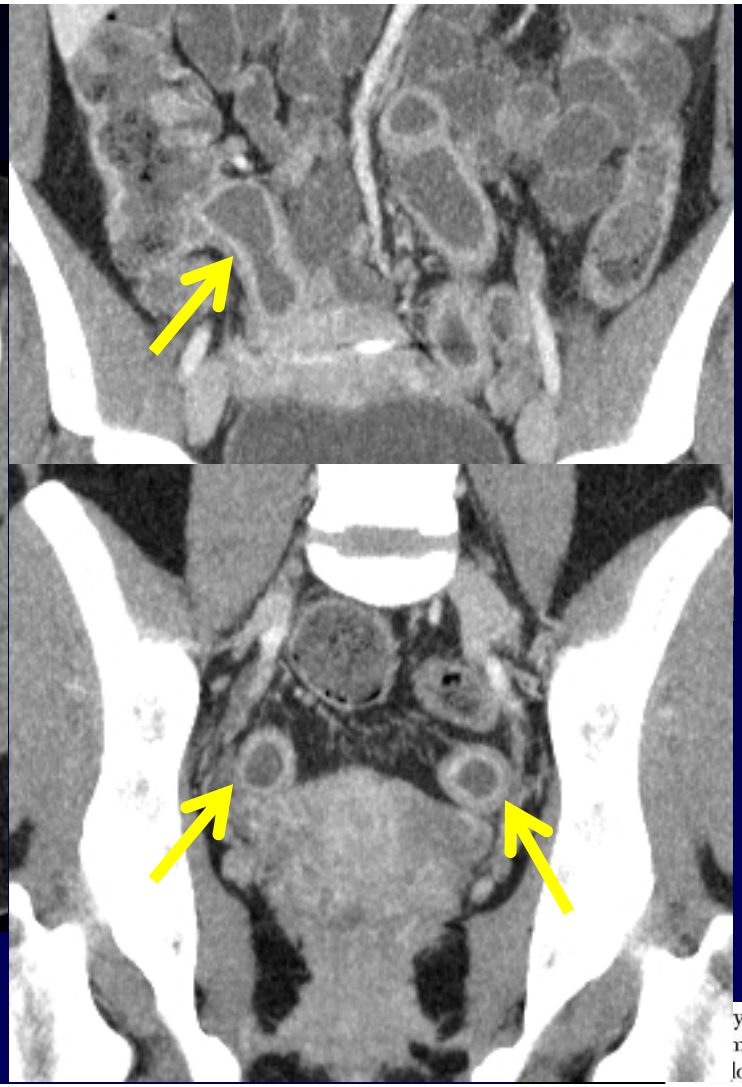

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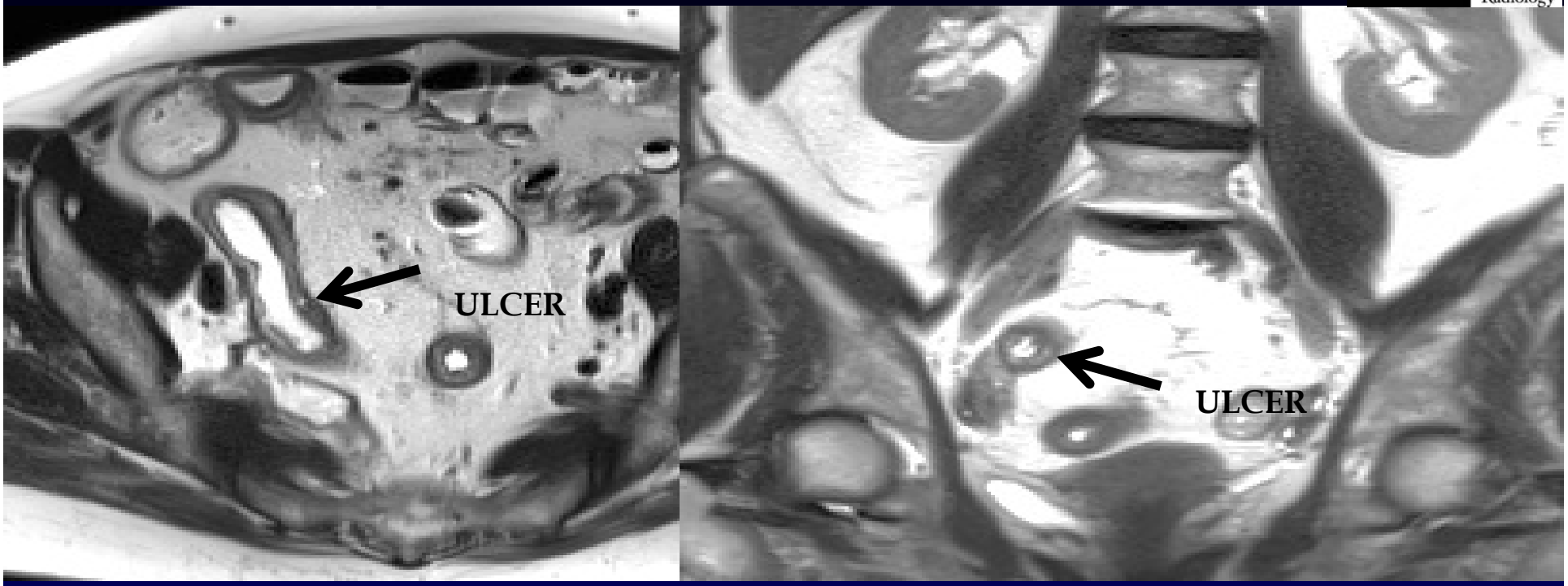

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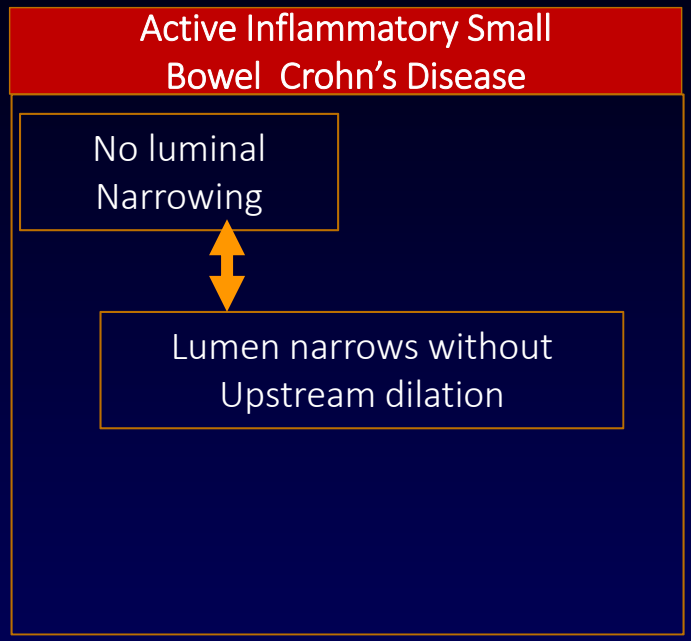
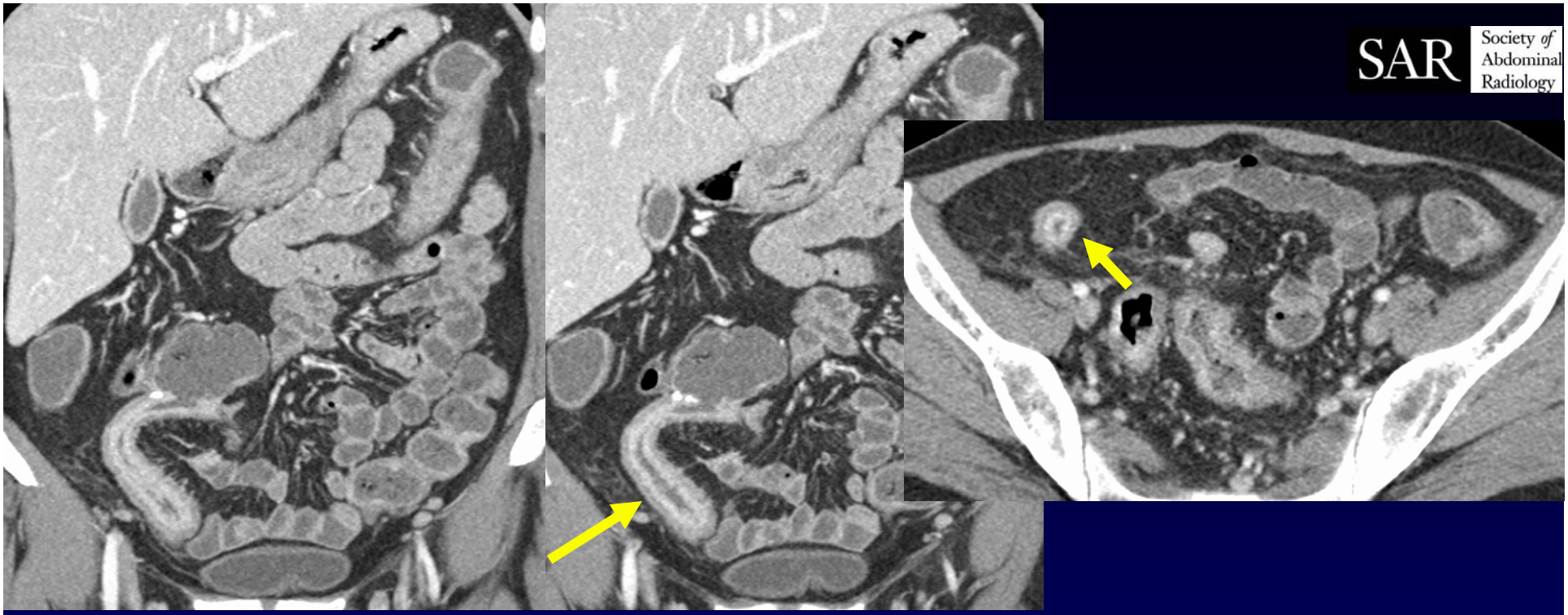
SMALL BOWEL CROHN'S DISEASE
WITHOUT LUMINAL NARROWING

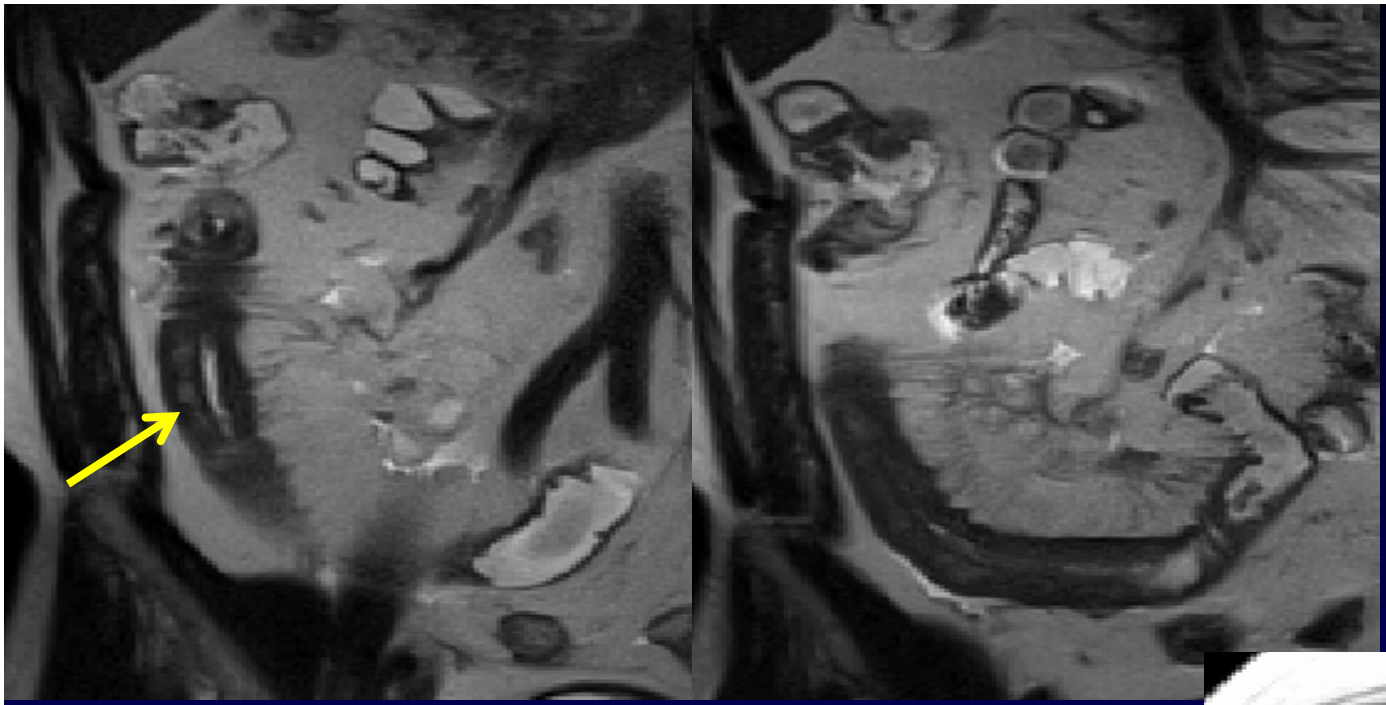

Active Inflammatory Small Bowel Crohn's Disease
No luminal Narrowing
Lumen narrows without Upstream dilation

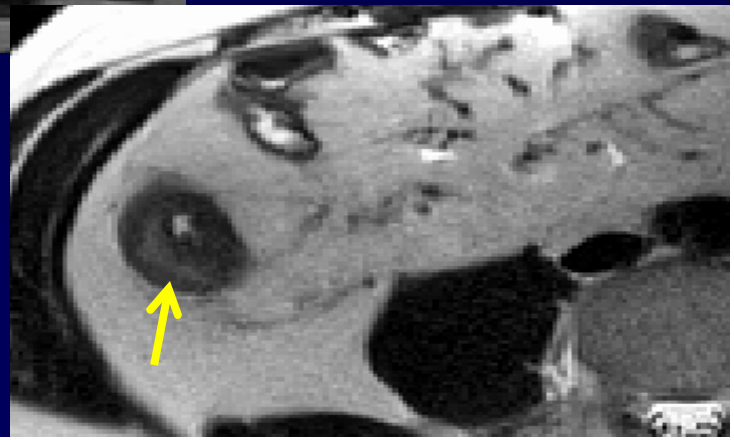
Impressions

- Active Inflammatory Crohn's Disease
  - **With Luminal Narrowing**
  - **Without Upstream Dilation**
  - Wall Hyperenhancement
  - T2 Bright/Restricted Diffusion on MRE
  - Wall Thickening
  - Mesenteric Changes Present



ACTIVE INFLAMMATORY
SMALL BOWEL CROHN'S DISEASE
WITH LUMINAL NARROWING
WITHOUT UPSTREAM DILATION
NEO-TI





ACTIVE INFLAMMATORY
SMALL BOWEL CROHN'S DISEASE
WITH LUMINAL NARROWING
WITHOUT UPSTREAM DILATION
NEO-TI

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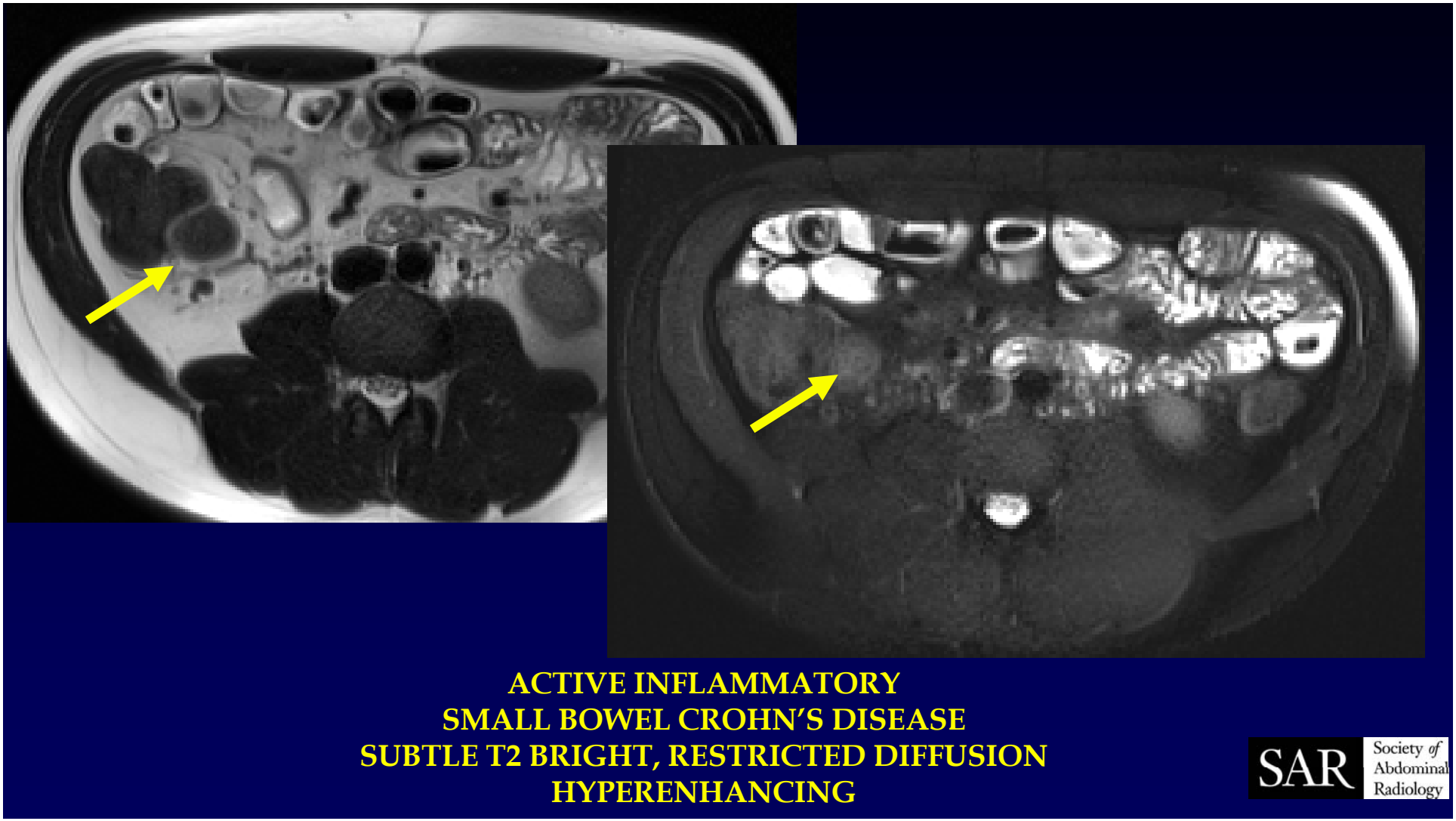

ACTIVE INFLAMMATORY
SMALL BOWEL CROHN'S DISEASE
SUBTLE T2 BRIGHT, RESTRICTED DIFFUSION
HYPERENHANCING

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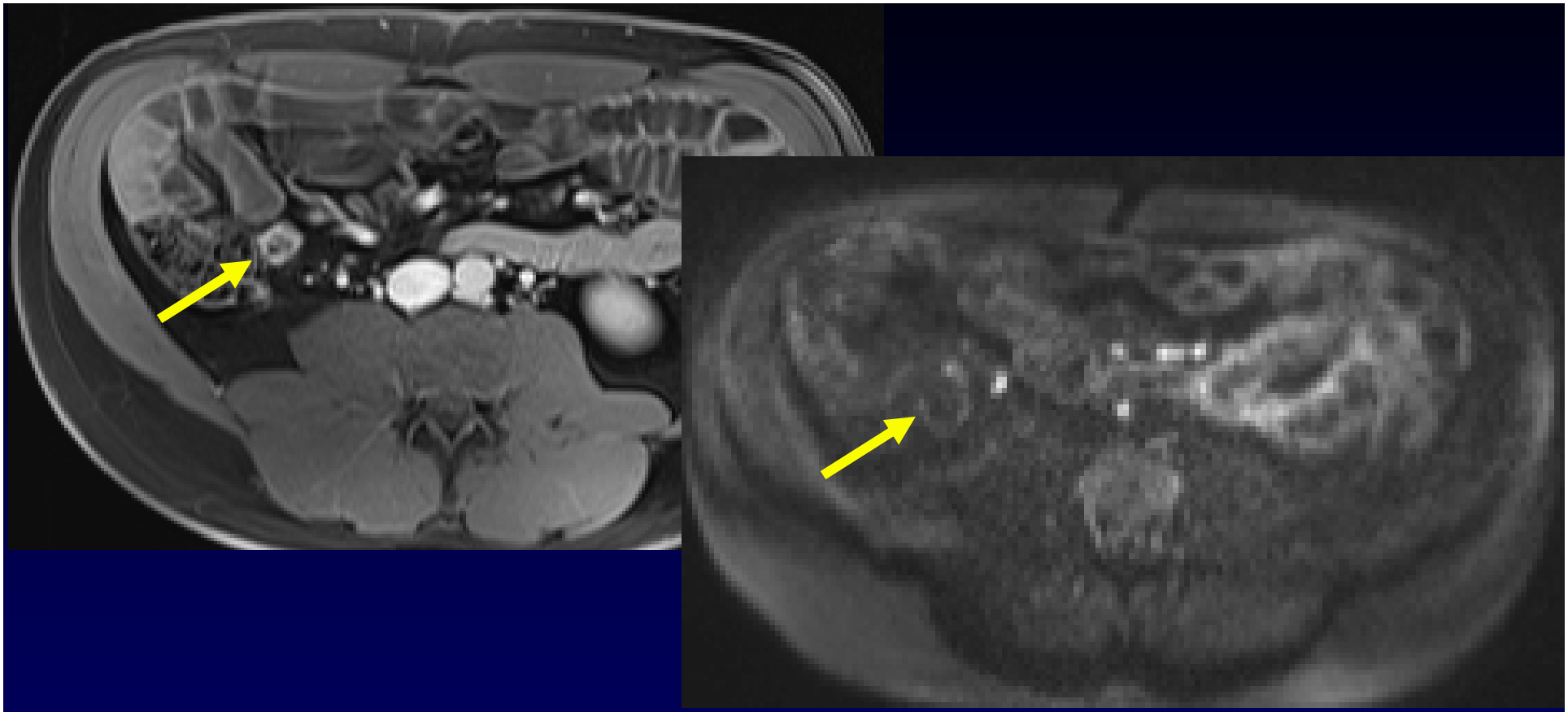

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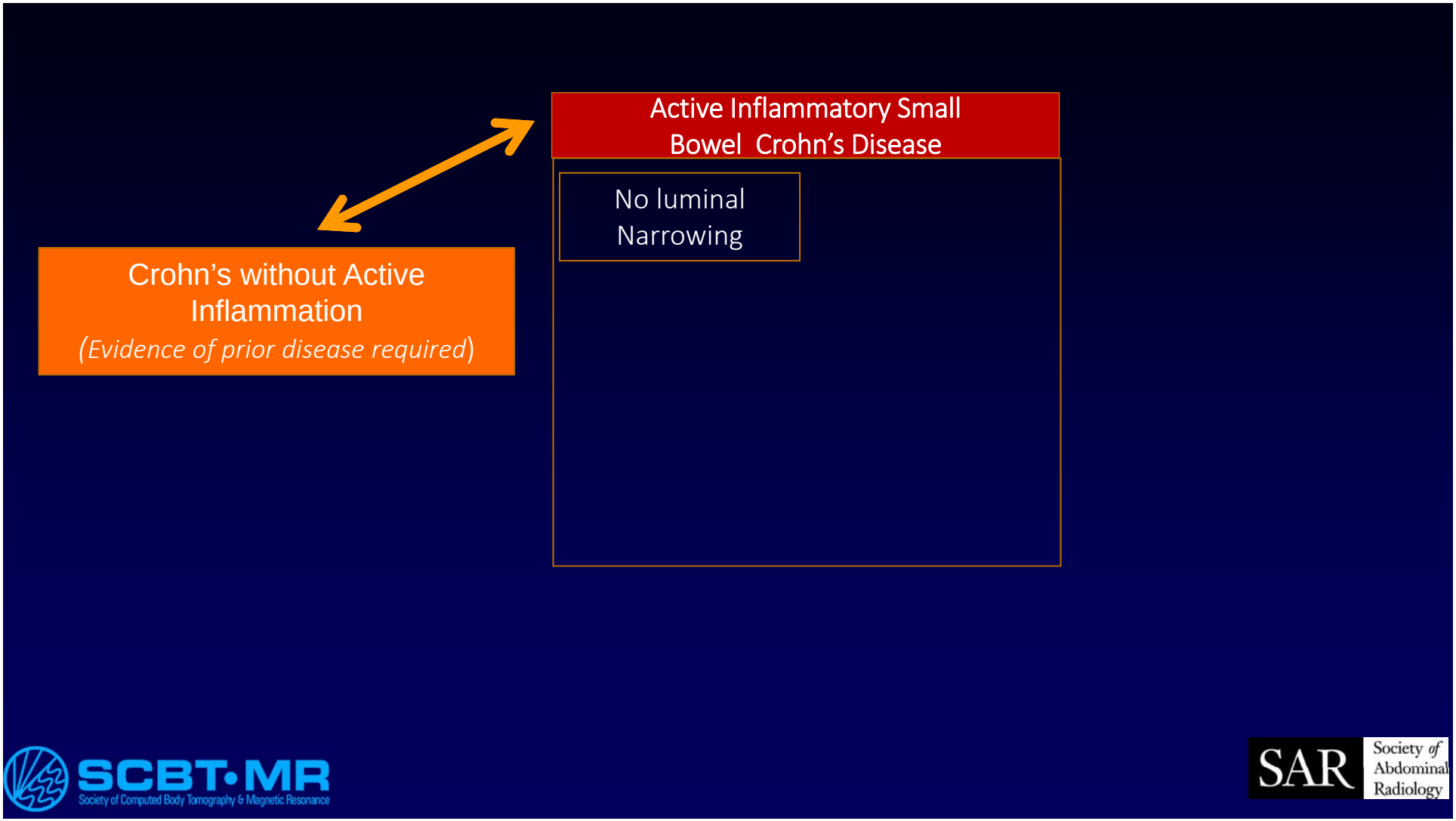
Active Inflammatory Small Bowel Crohn's Disease
No luminal Narrowing
Crohn's without Active Inflammation
(Evidence of prior disease required)
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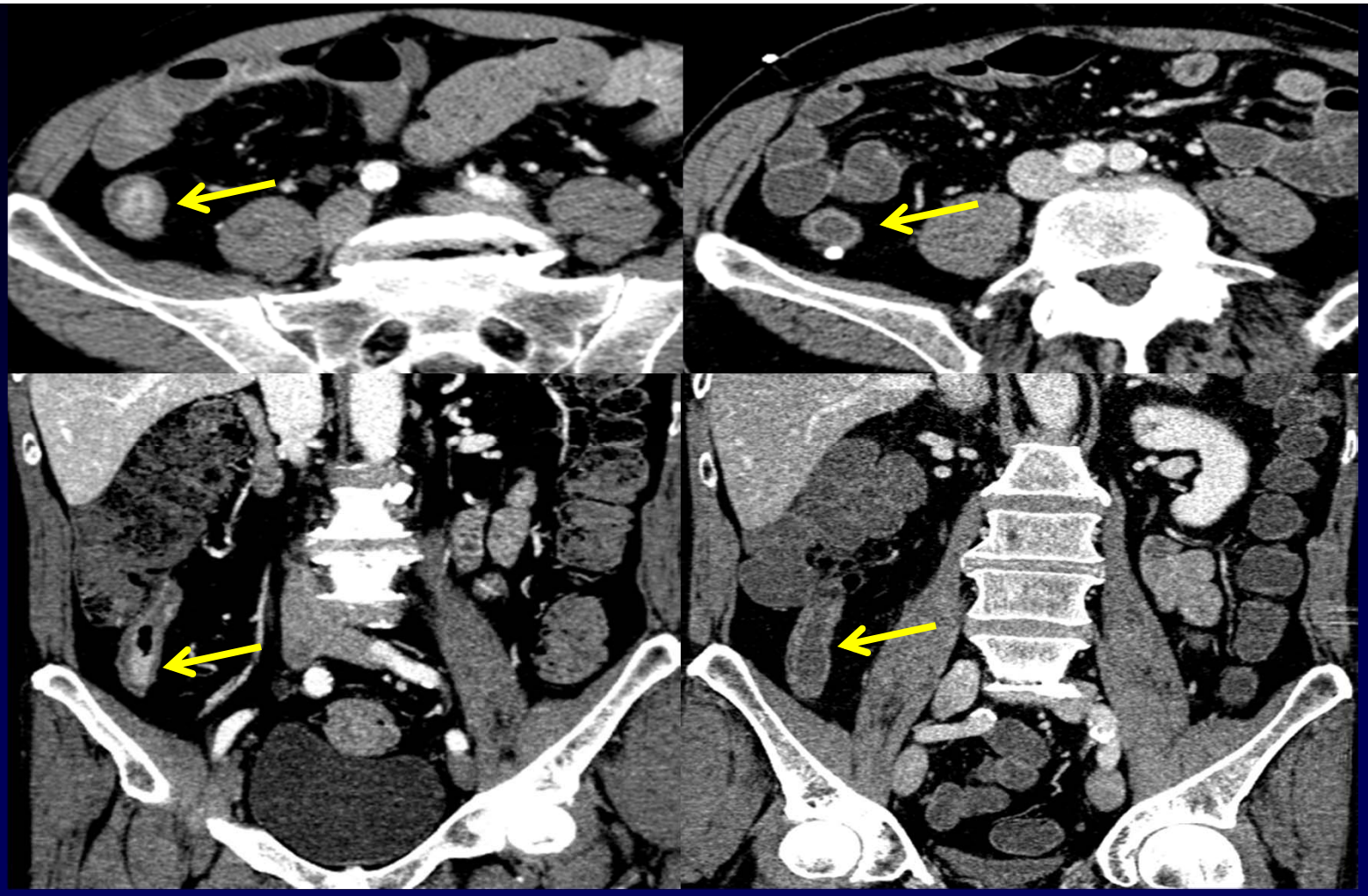
Impressions

- Small Bowel C.D. without Active Inflammation
  - No Active Inflammation
    - **Requires Prior Findings of Active Disease**
  - No or Minimal Wall Enhancement
  - Not T2 Bright/No Restricted Diffusion on MRE
  - Wall Thickening Variably Present
  - Normal Lumen
  - No Mesenteric Changes Except Fatty Proliferation



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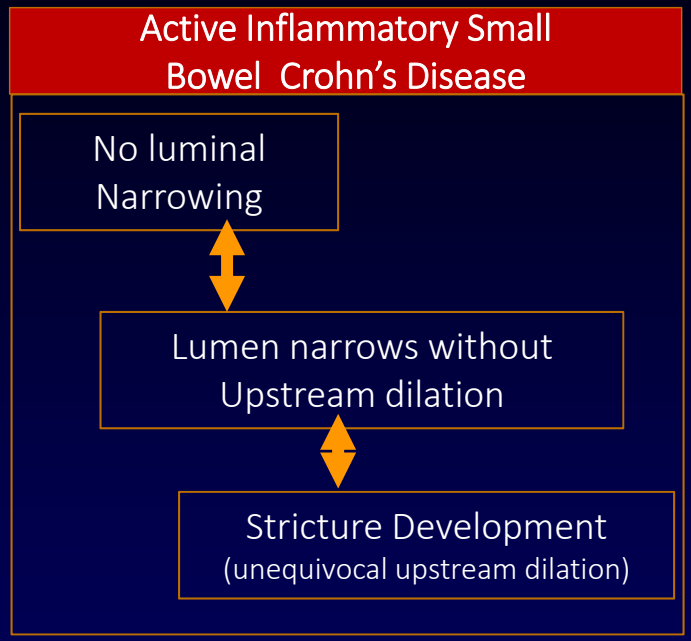

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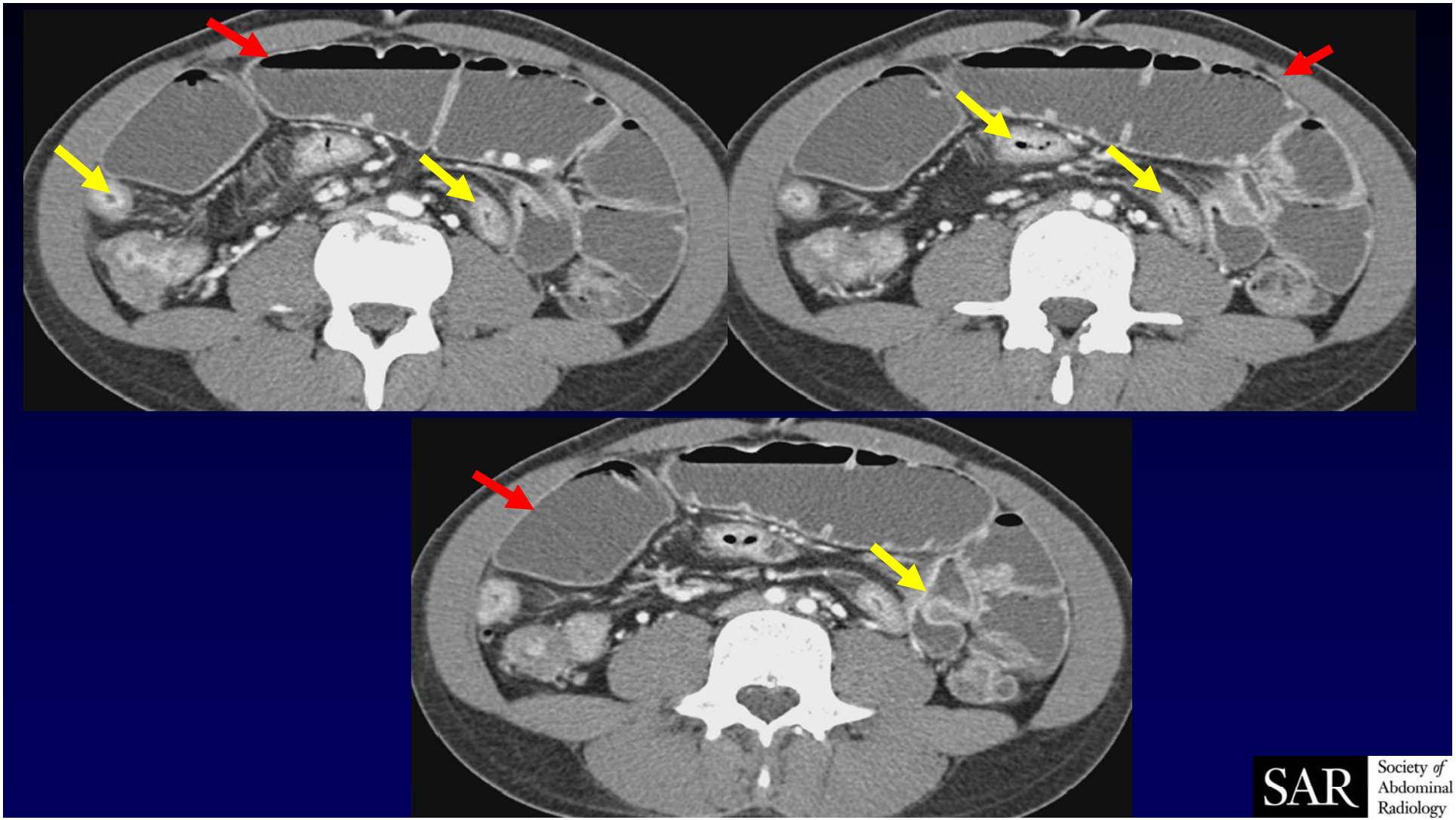
Impressions

- Stricture Development; Crohn's Disease with Stricture and Active Inflammation
  - **Luminal Narrowing**
  - **Upstream Dilation (> 3 cm)**
    - Stricture Formation
  - Wall Thickening
  - Wall Hyperenhancement
  - T2 Bright/Restricted Diffusion on MRE
  - Mesenteric Changes Present
- Mixed Fibrostenotic Changed to Stenotic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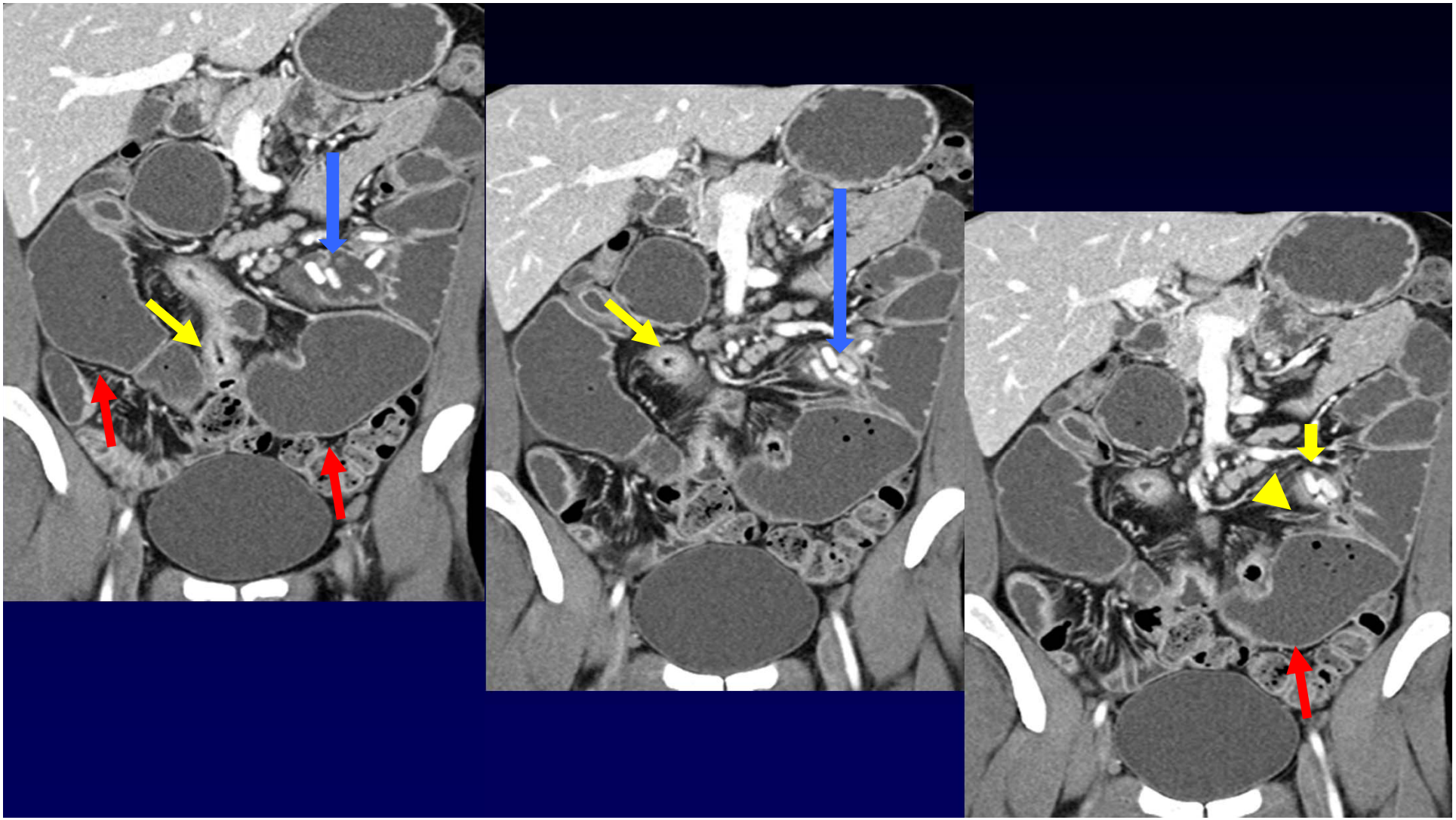

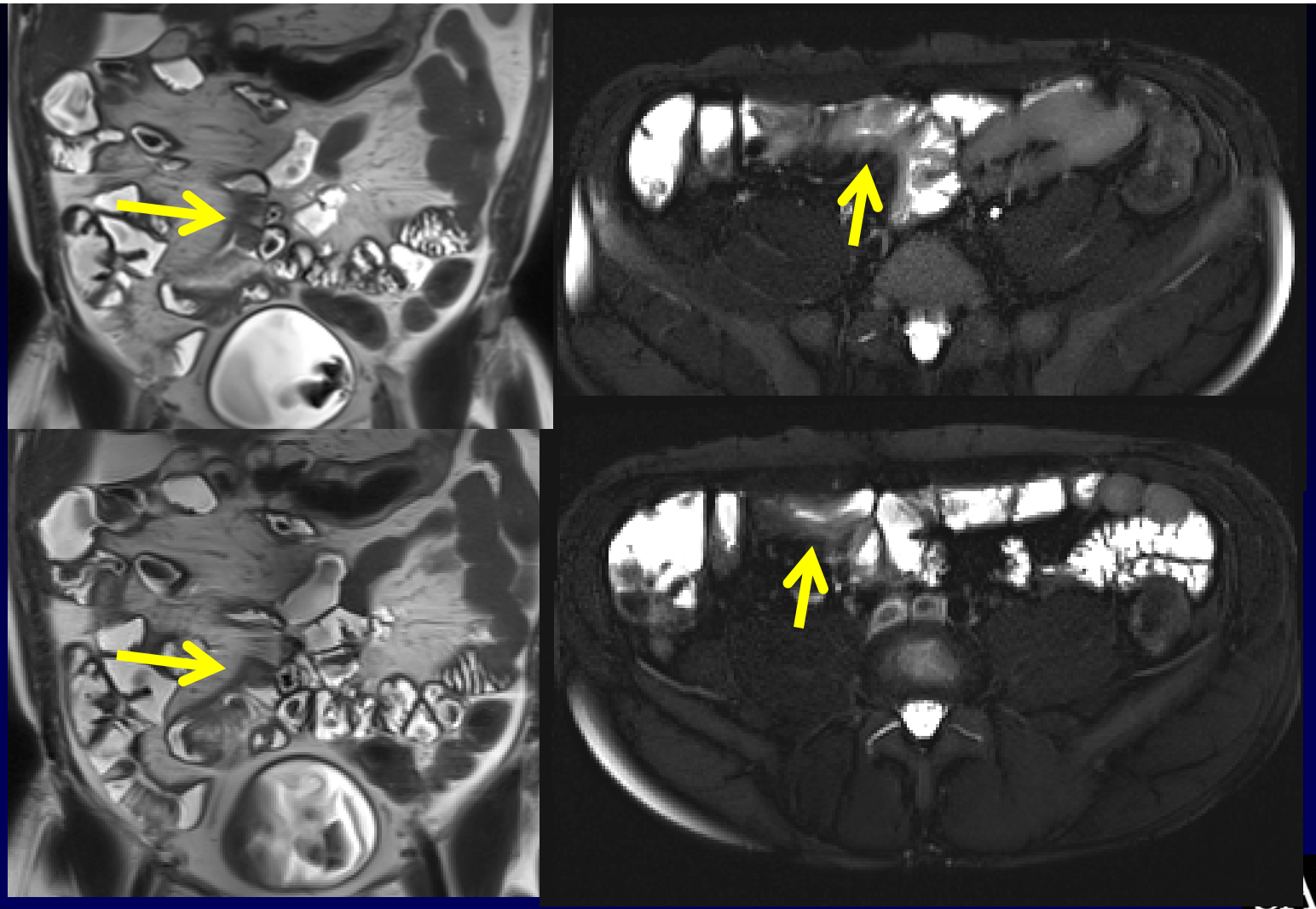

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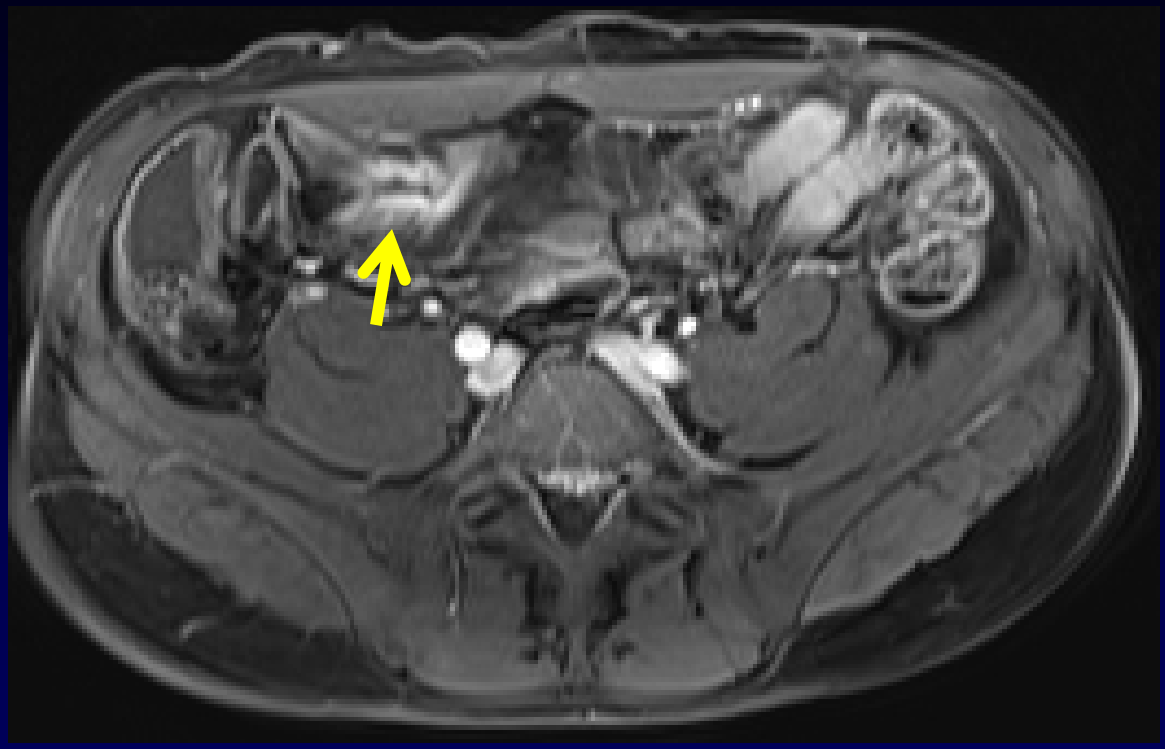

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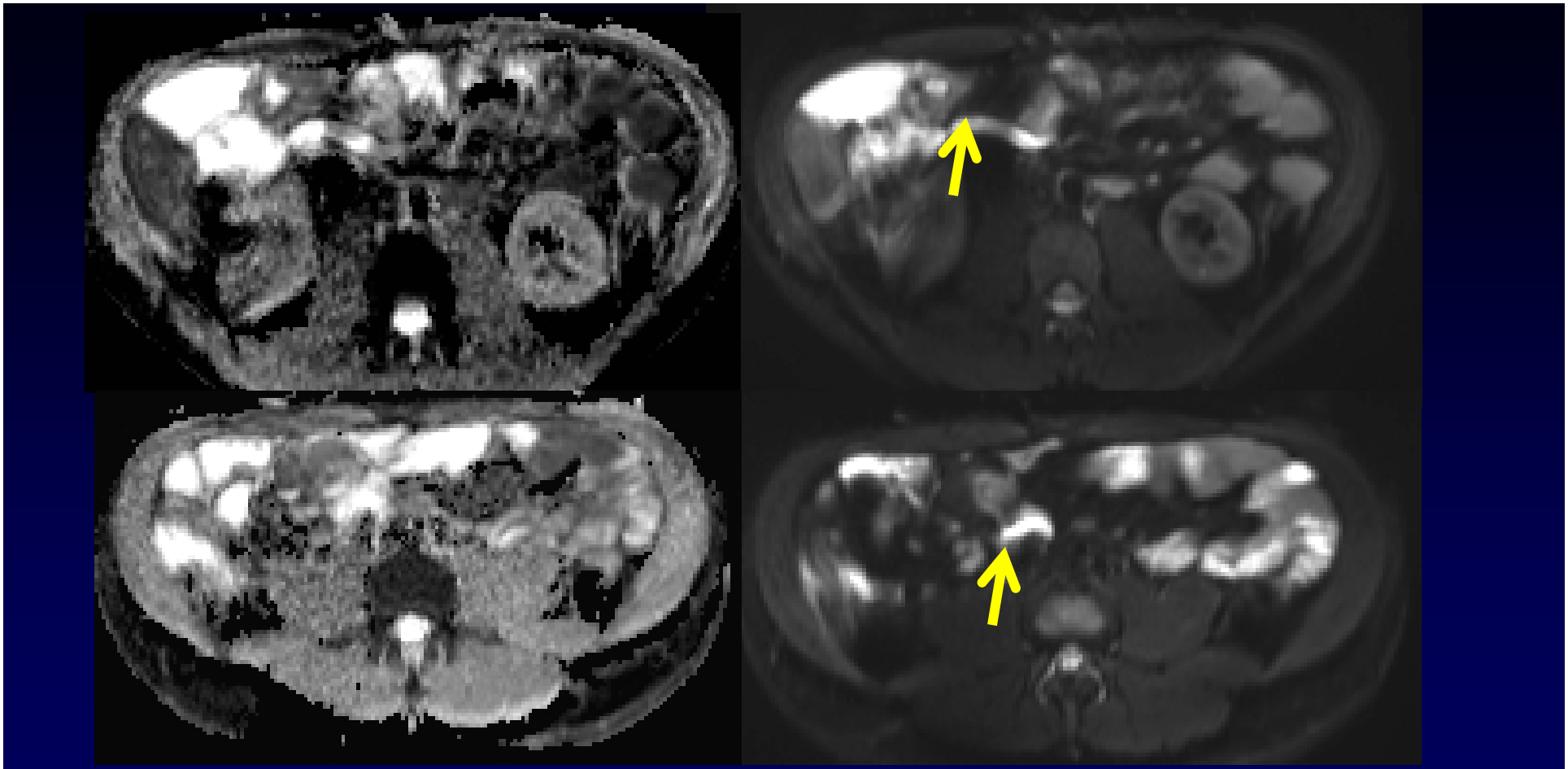

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**RESTRICTED DIFFUSION-
ACTIVE INFLAMMATION**

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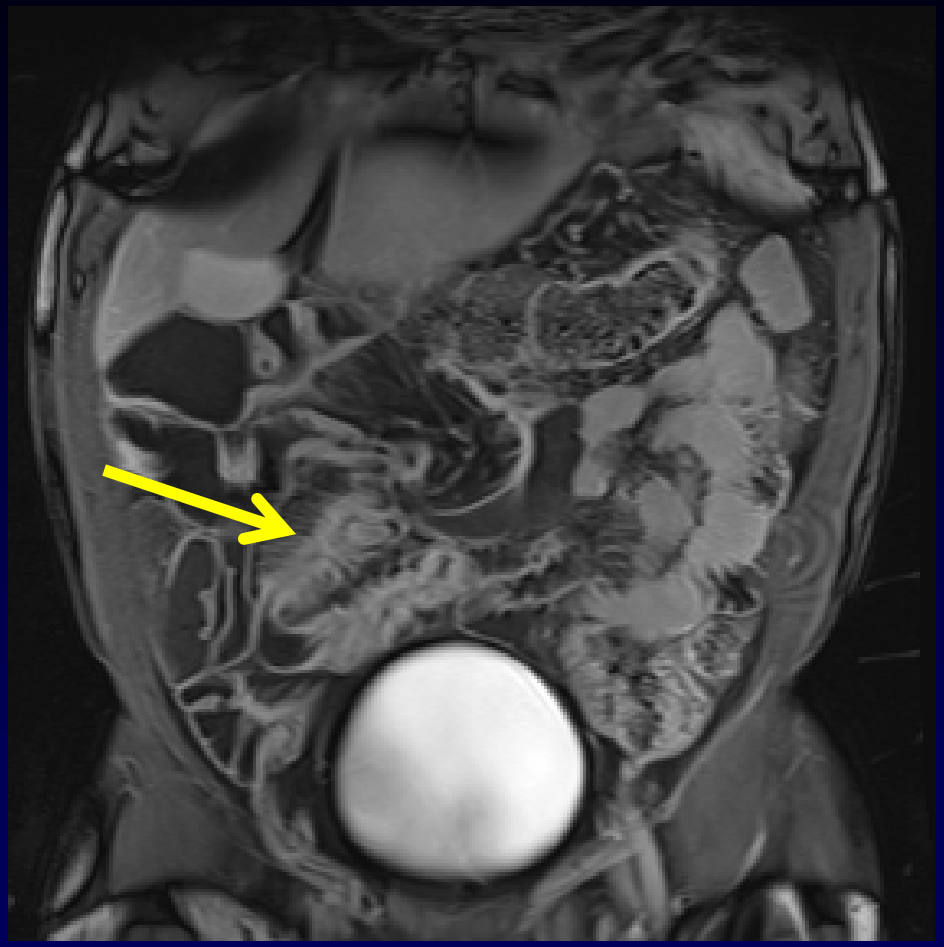

DELAYED ENHANCEMENT-
PROBABLE FIBROSIS

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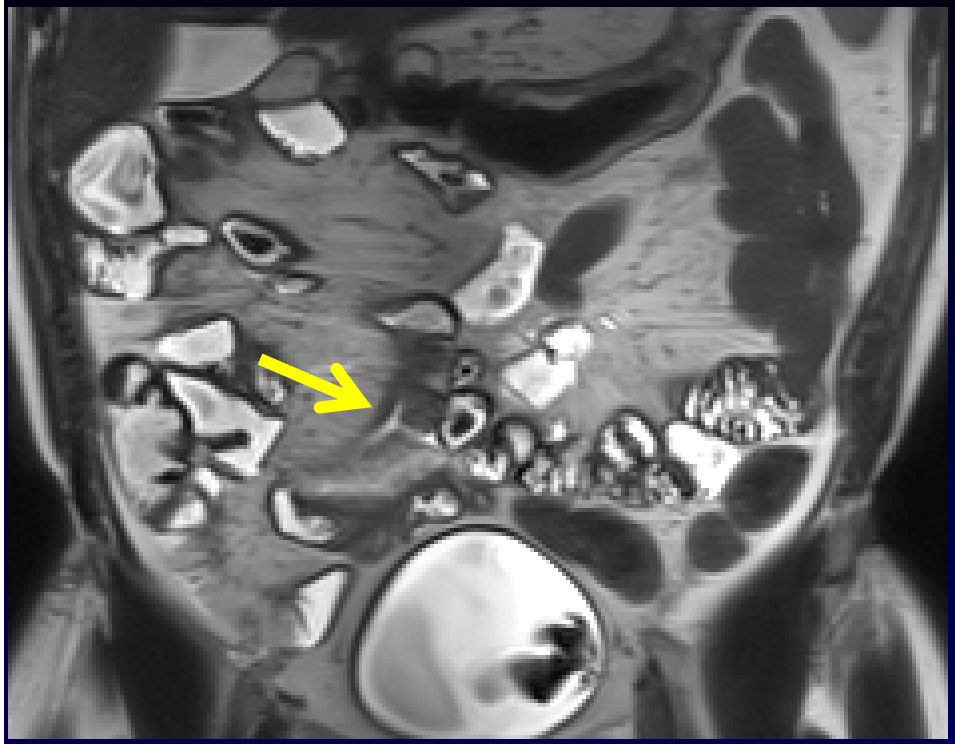

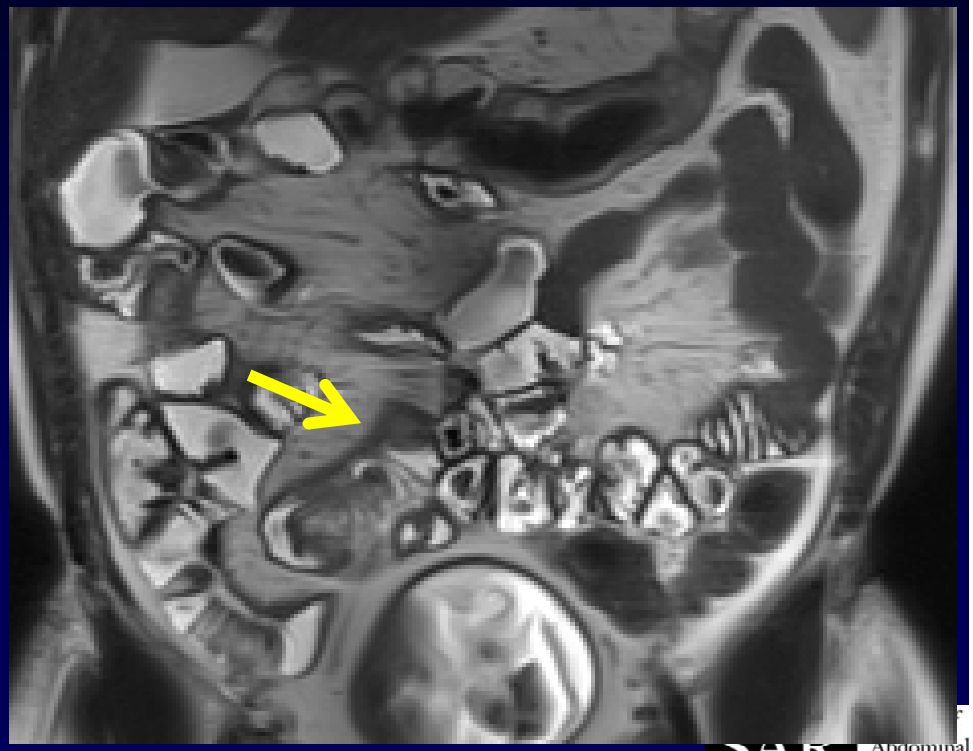

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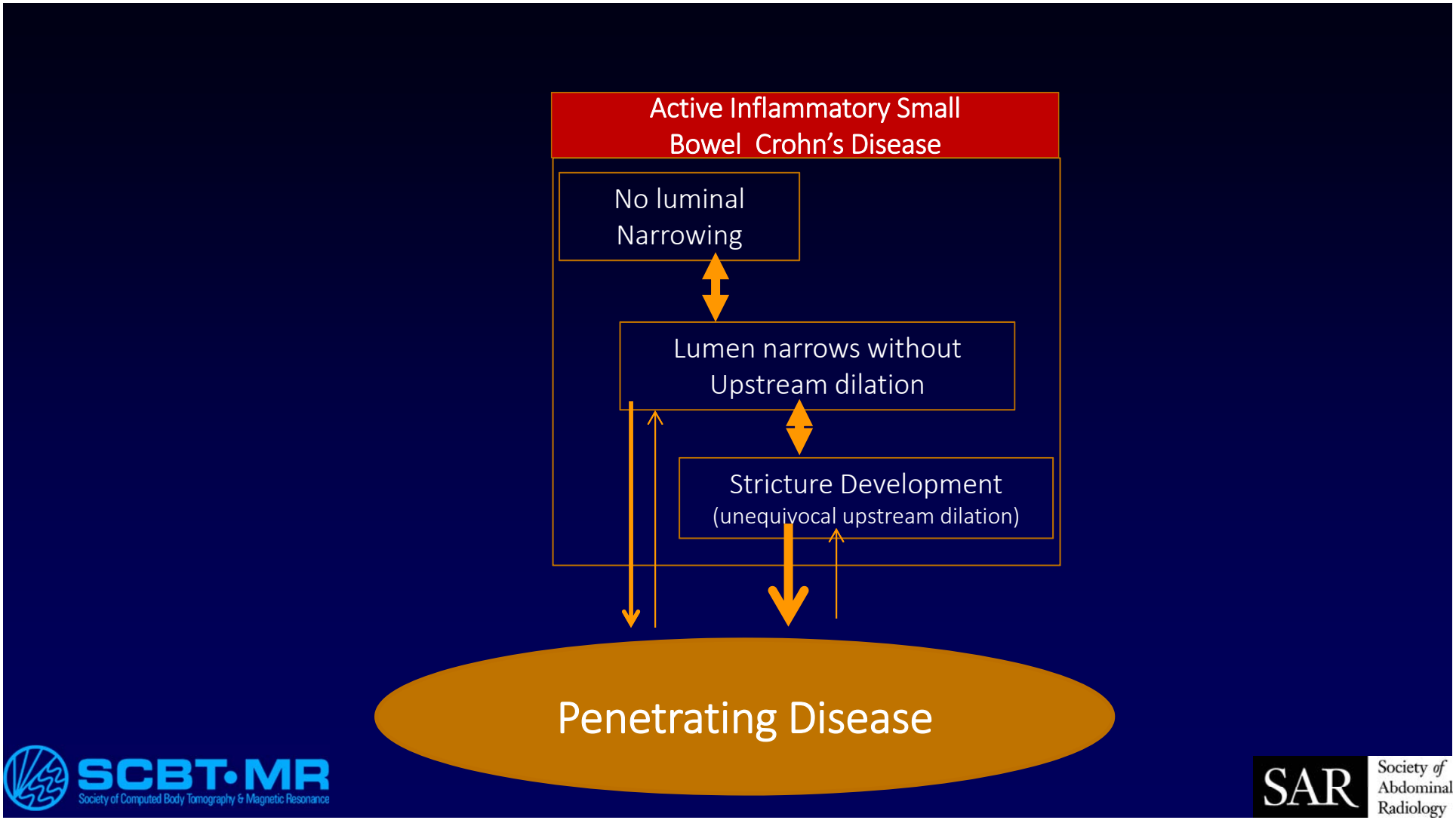
Active Inflammatory Small Bowel Crohn's Disease
No luminal Narrowing
Lumen narrows without Upstream dilation
Stricture Development
(unequivocal upstream dilation)
Penetrating Disease
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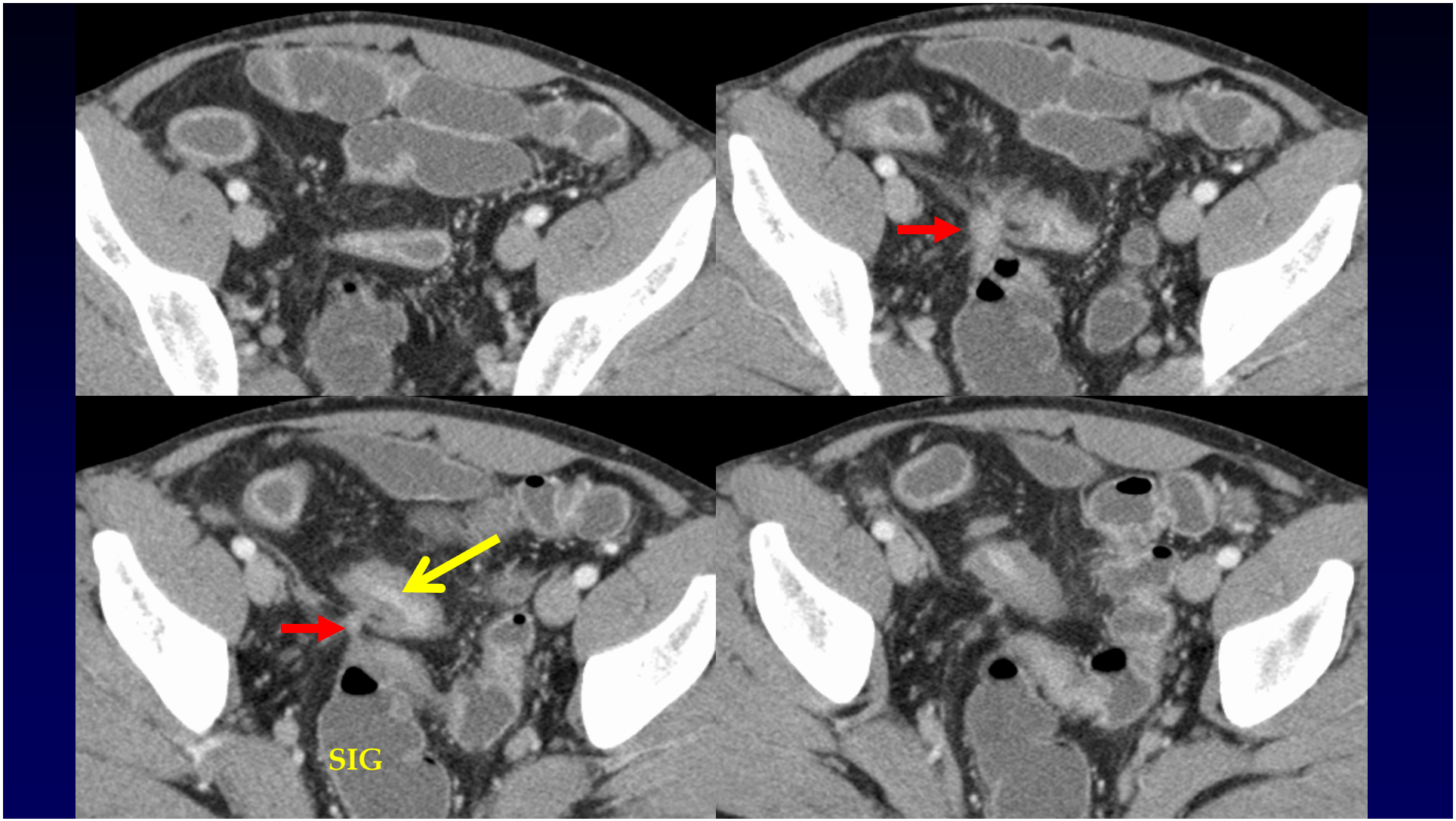
Impressions

- Penetrating Crohn's Disease
  - Can Be Added to Active or Mixed CD
    - Mixed Disease Overwhelmingly the Most Likely Phenotype
    - ? As to Whether Penetrating Disease Exists with Fibrostenotic Disease When There is No Active Inflammatory Disease
      - I Have Never Seen This
  - Sinus Tract &/or Fistulae
  - Inflammatory Mass
  - Abscess
  - Free Perforation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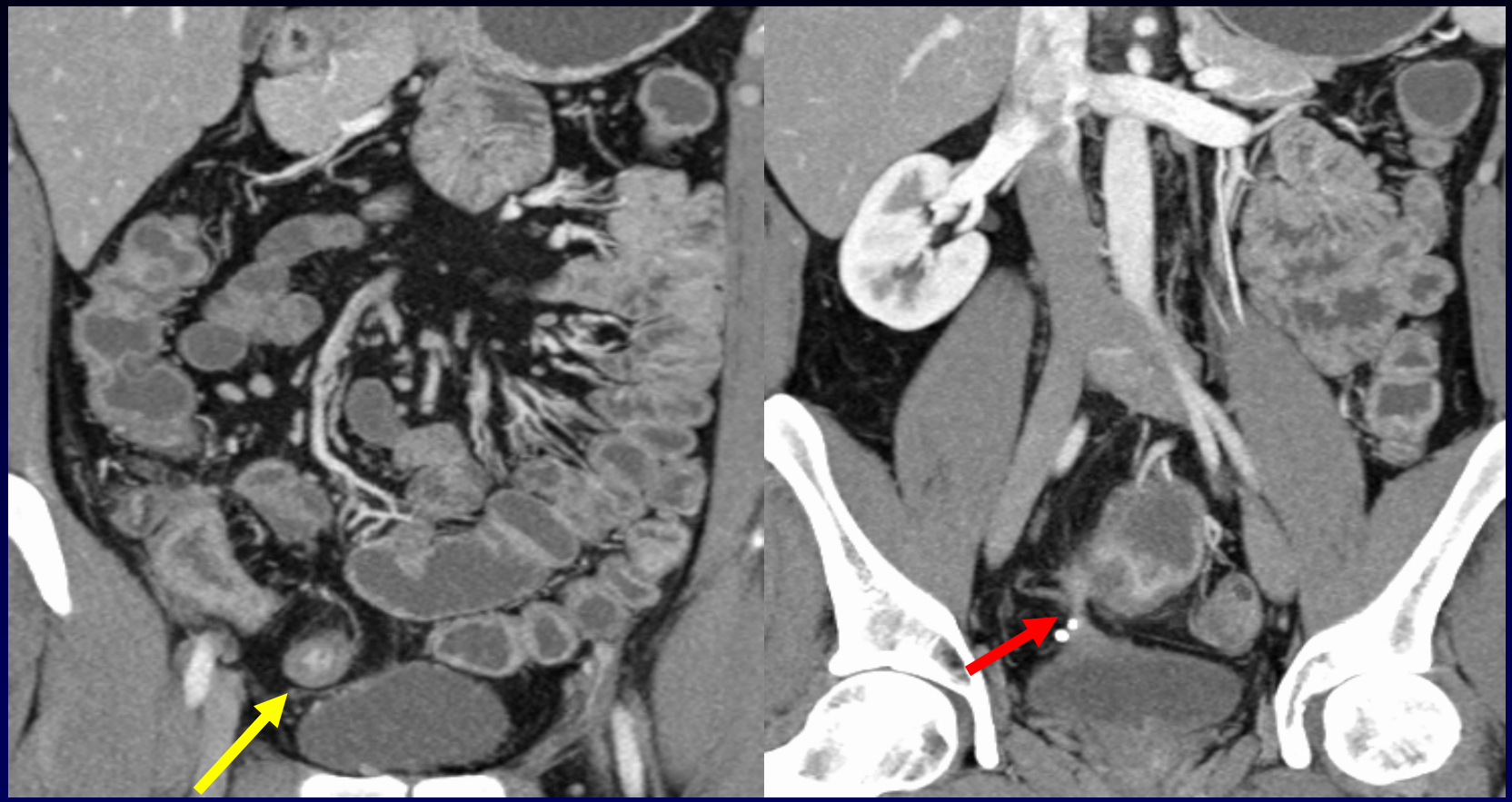

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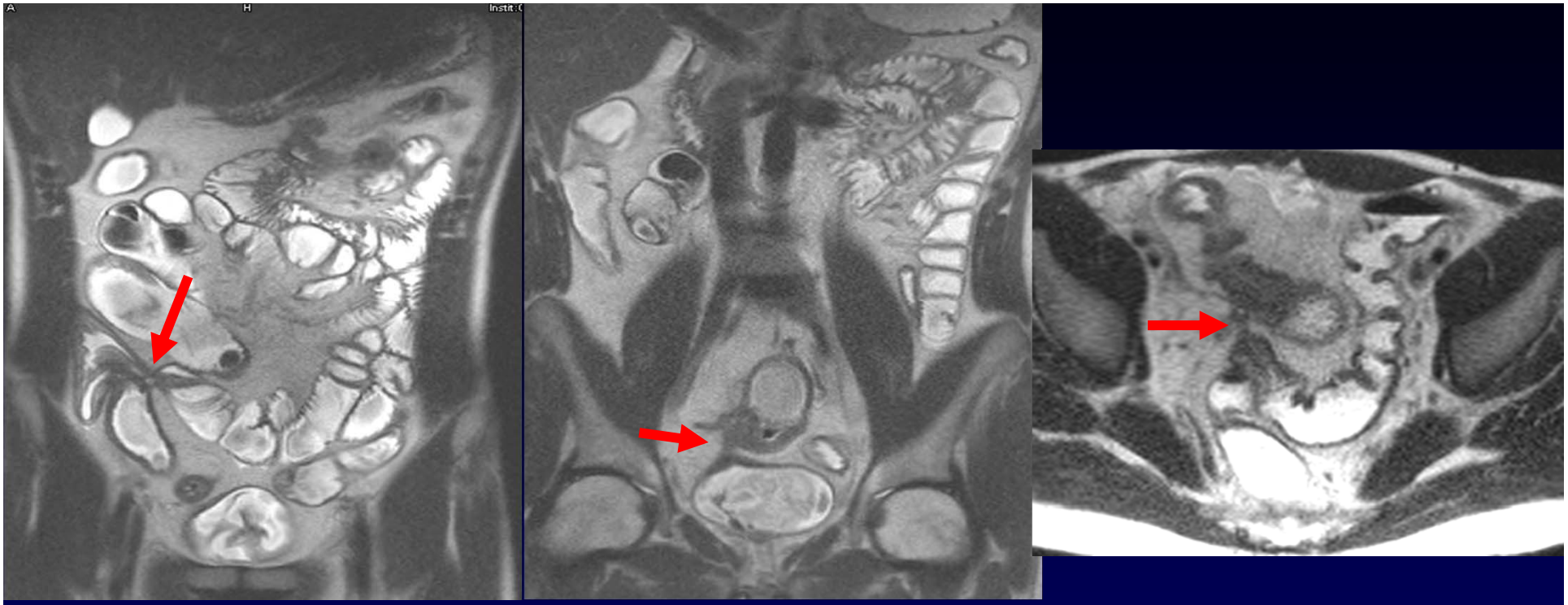

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ENTGERO-VESICULAR

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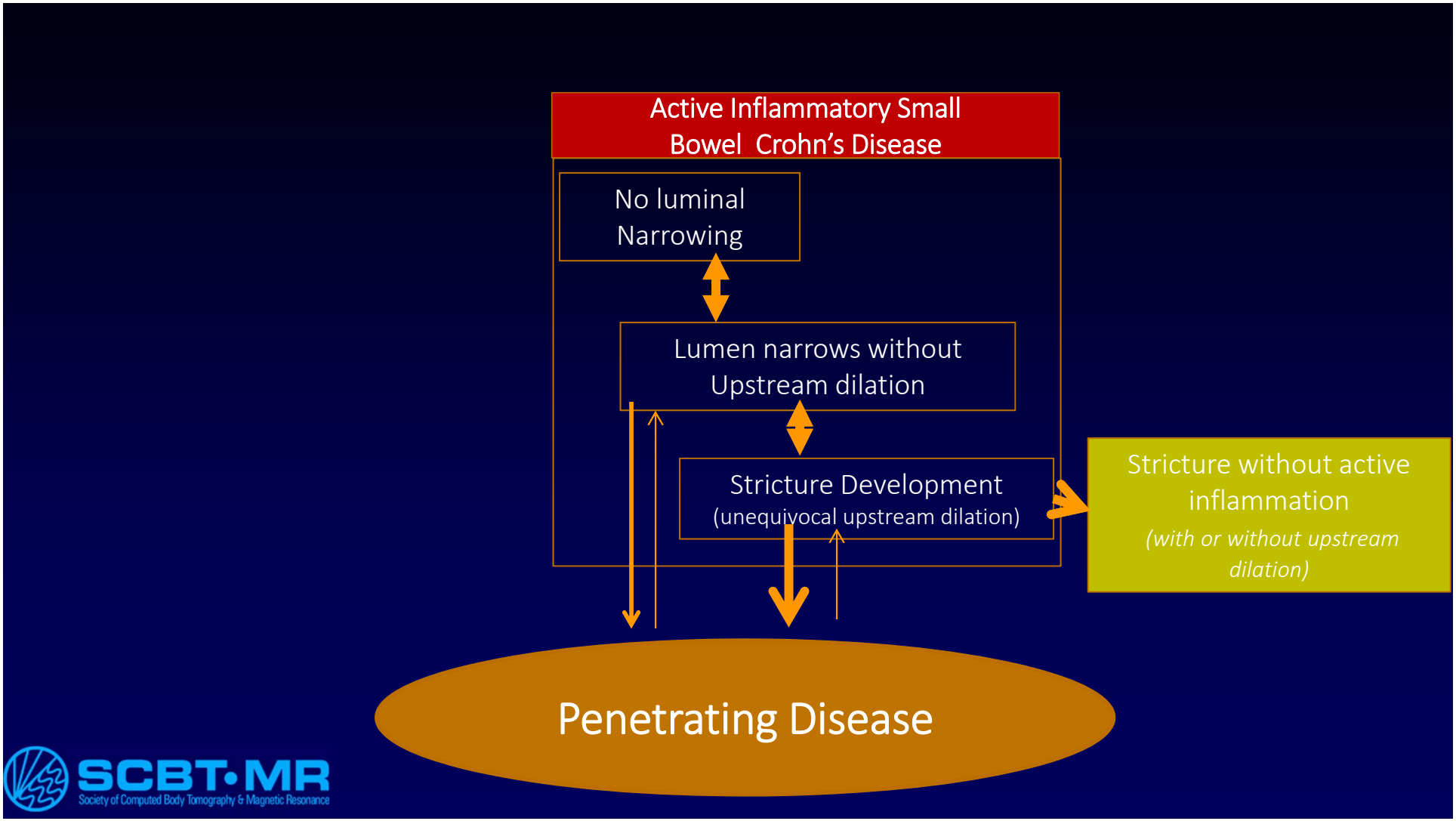
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Stricture without active inflammation
(with or without upstream dilation)
Penetrating Disease
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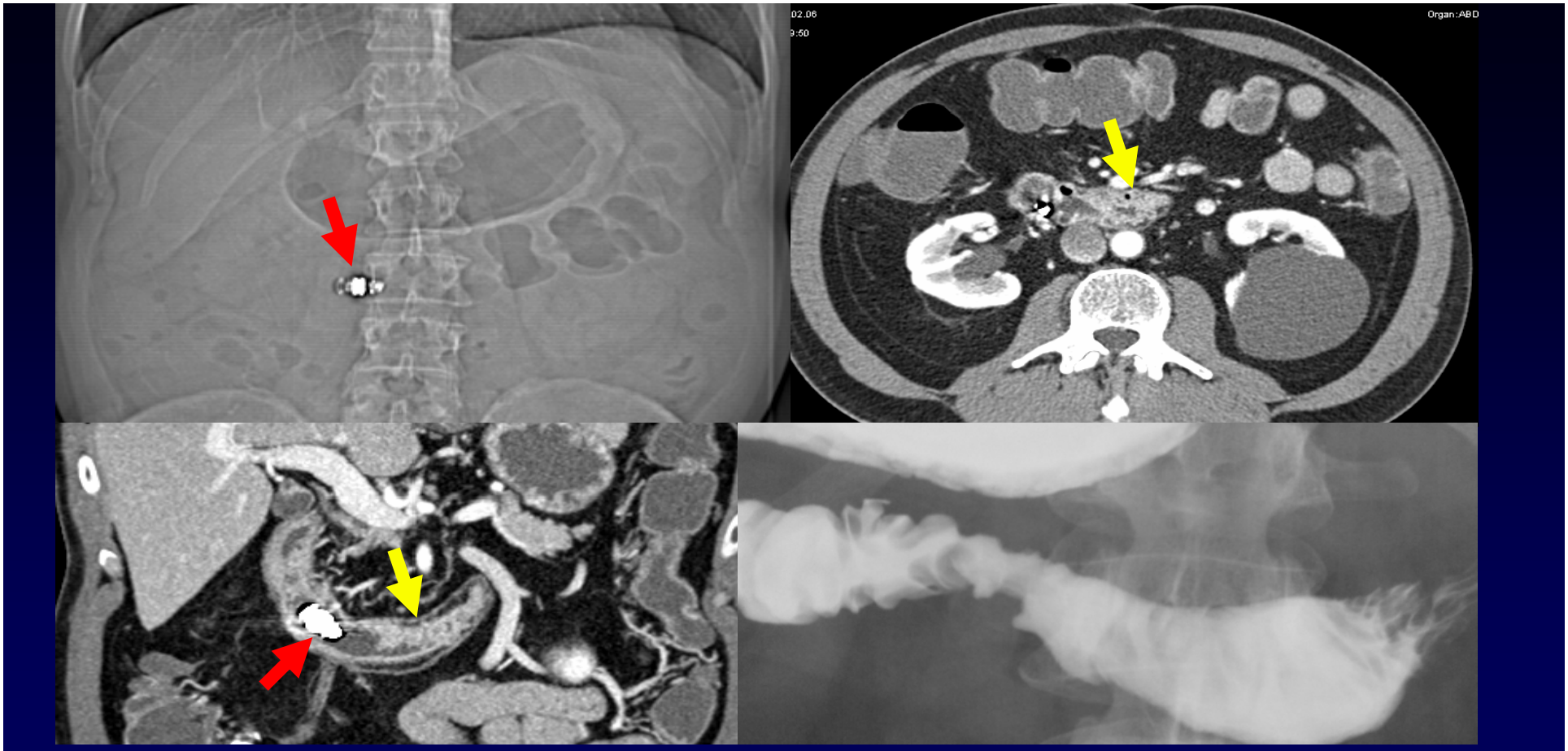
Impressions

- Stricture Development without Active Inflammation
  - "Burned Out Crohn's"
  - No Wall Thickening
  - Luminal Narrowing
  - Without or With Upstream Dilation
  - No or Minimal Wall Hyperenhancement
  - Not T2 Bright/Restricted Diffusion on MRE
  - No Mesenteric Changes
  - May Need to Eliminate "Fibro" & Just Call It Stenotic
    - "F" Word Anathema to Gastroenterologists



STRICTURED, D3 CHRON'S

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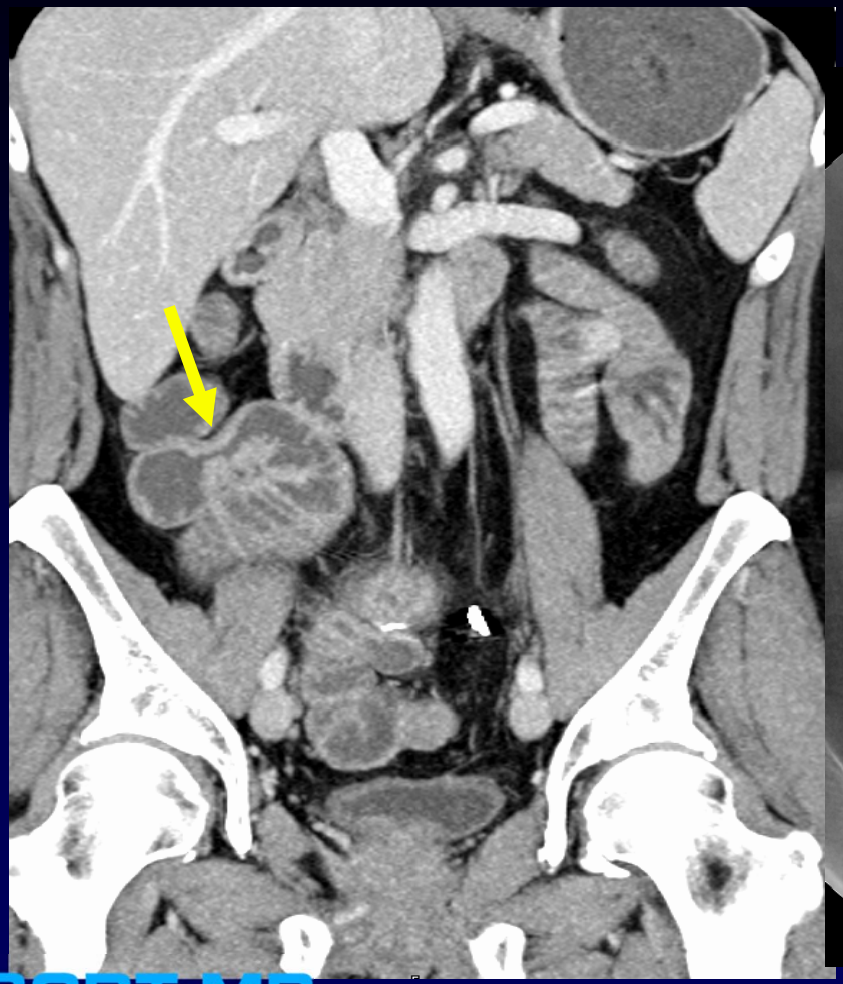

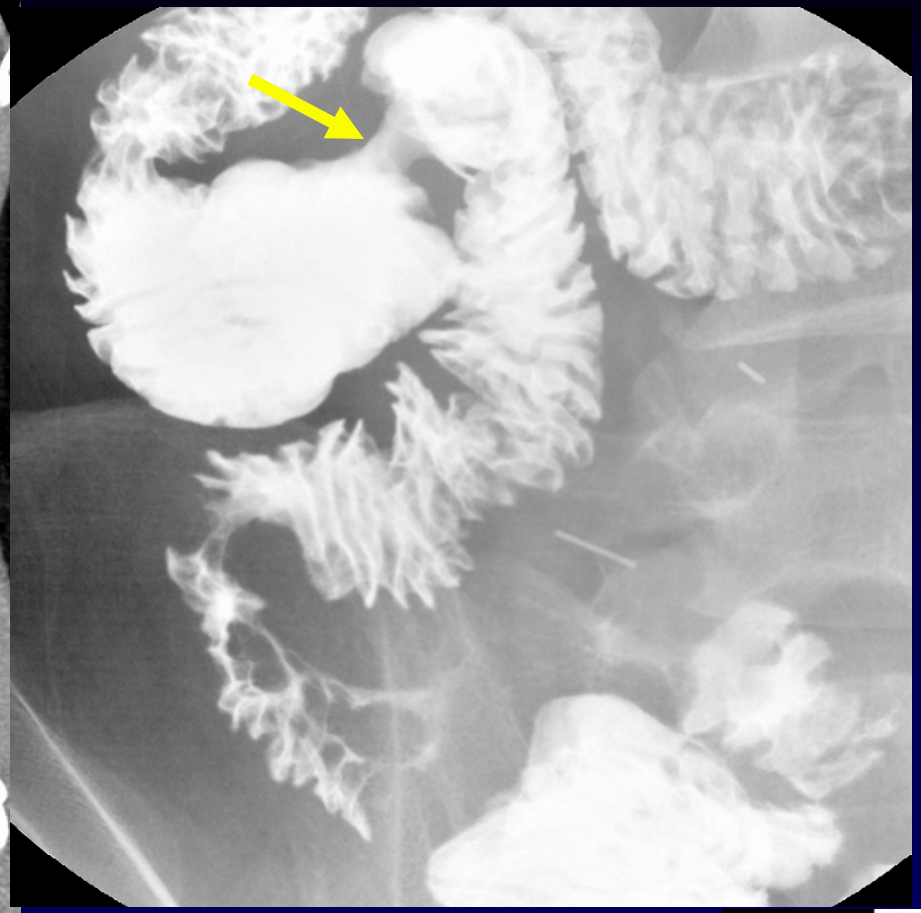

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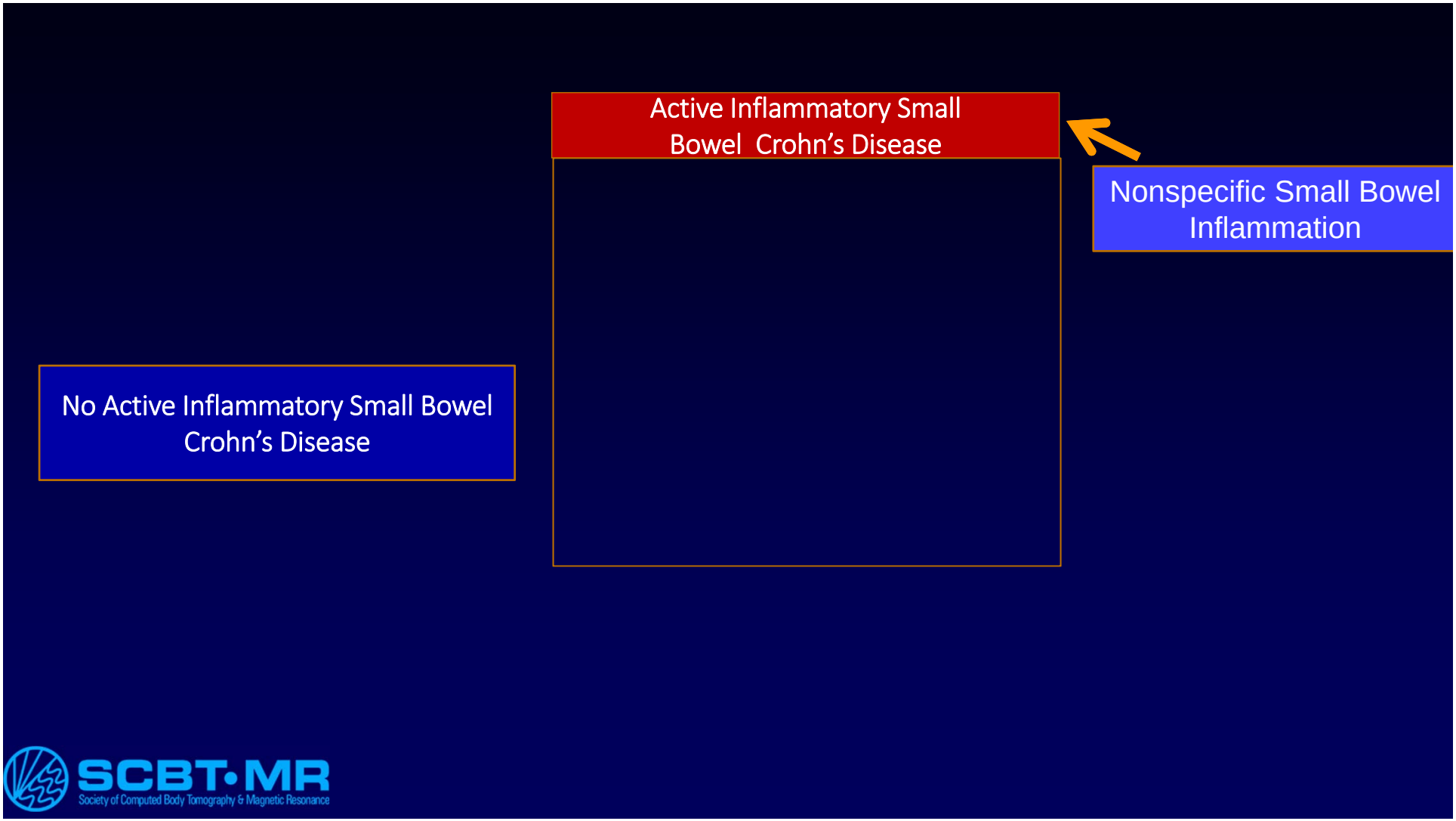
Active Inflammatory Small Bowel Crohn's Disease
Nonspecific Small Bowel Inflammation
No Active Inflammatory Small Bowel Crohn's Disease
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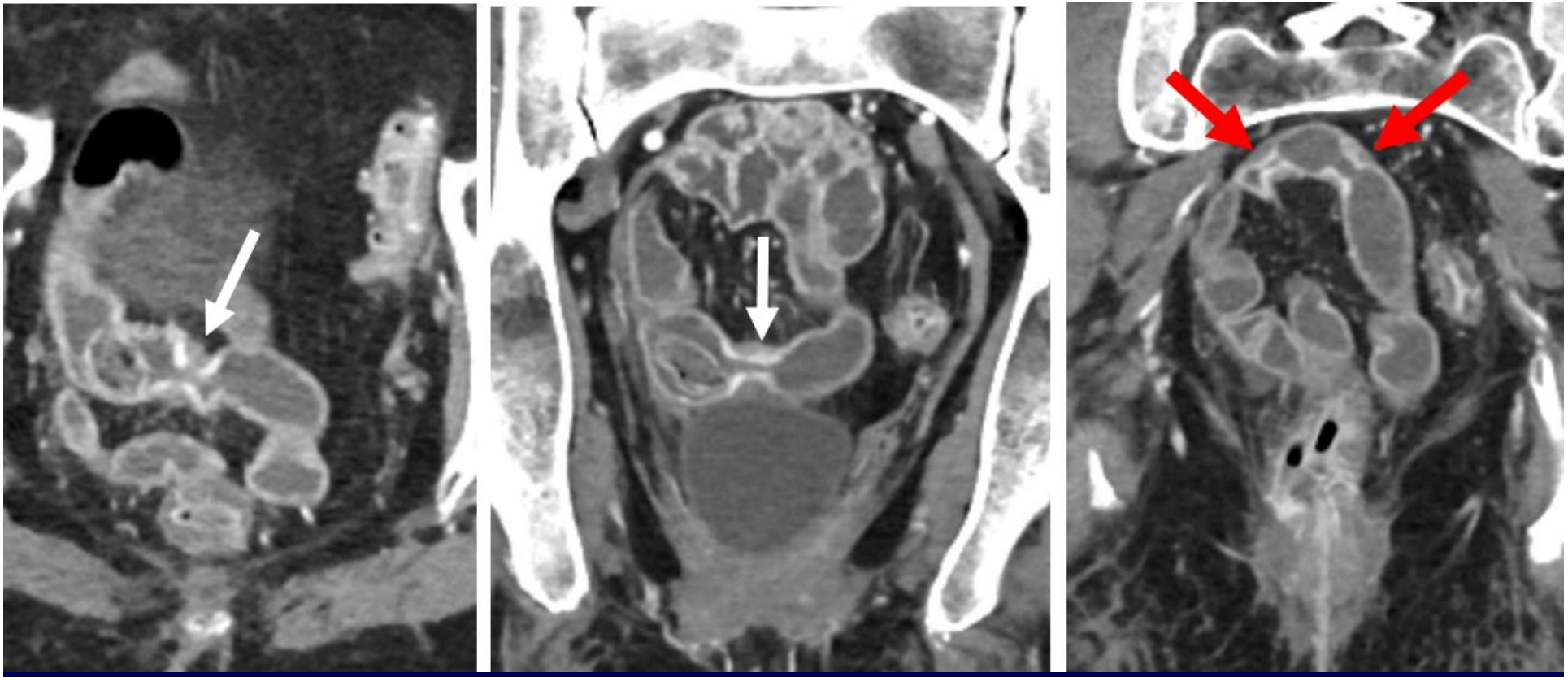
Impressions

- No Active Inflammatory Small Bowel CD
  - No Mural Findings of Active Inflammation
  - Normal Study overall
  - Often Used for Patients with a Colitis
- Nonspecific Inflammation



RADIATION STRICTURE

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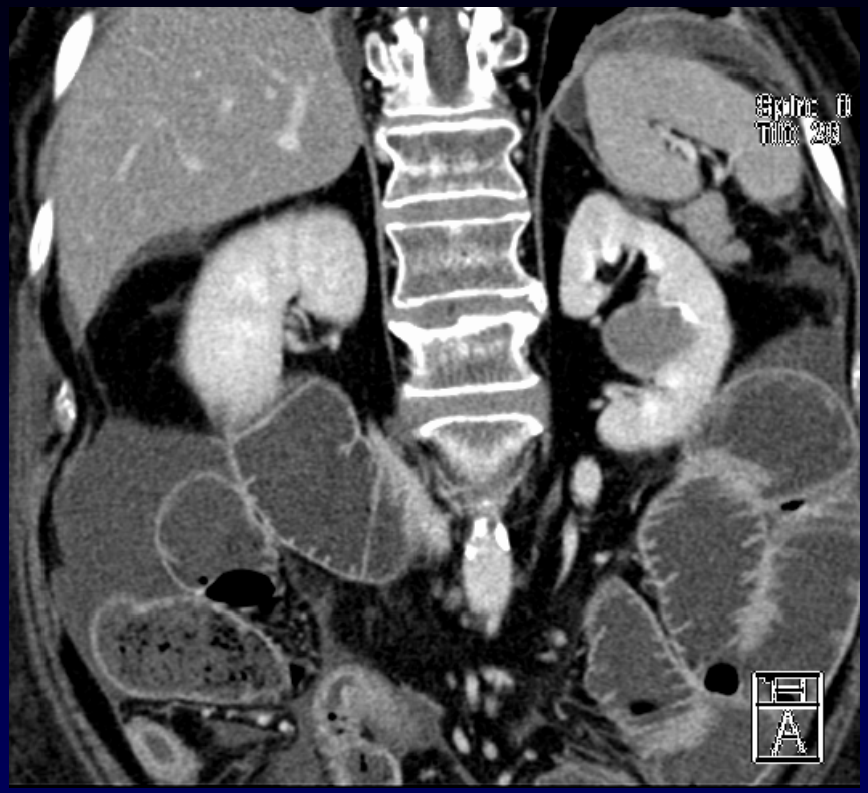

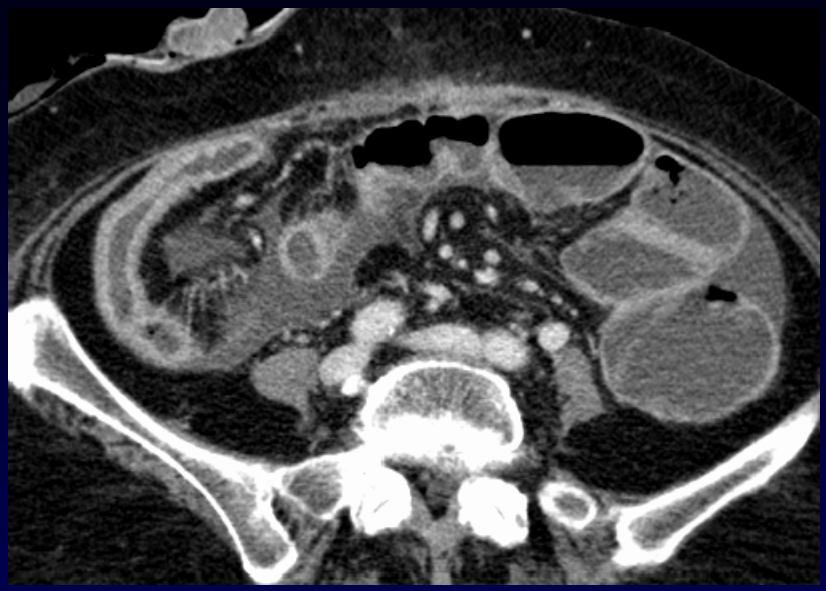

BACKWASH ILEITIS
POST PROCTOCOLECTOMY FOR
U.C.

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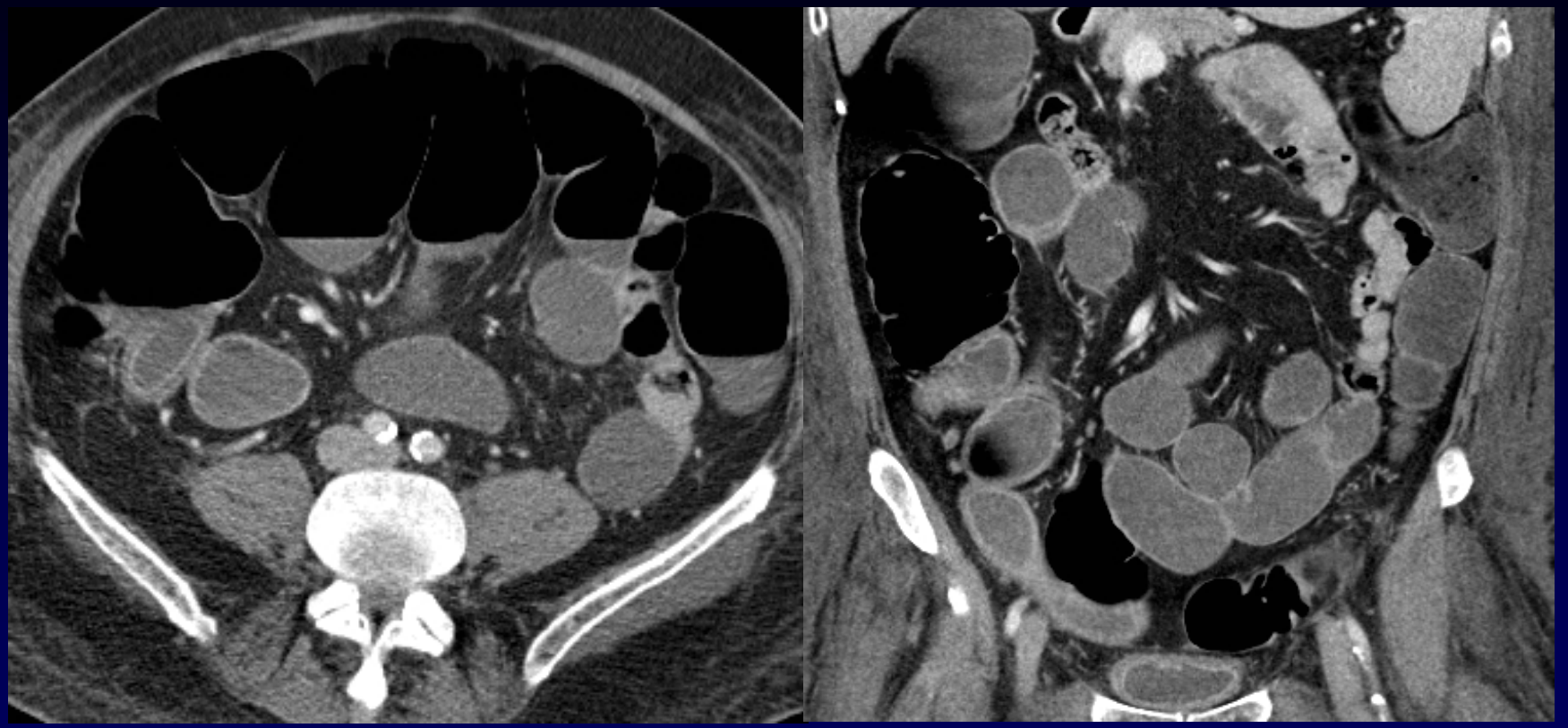

GVHD

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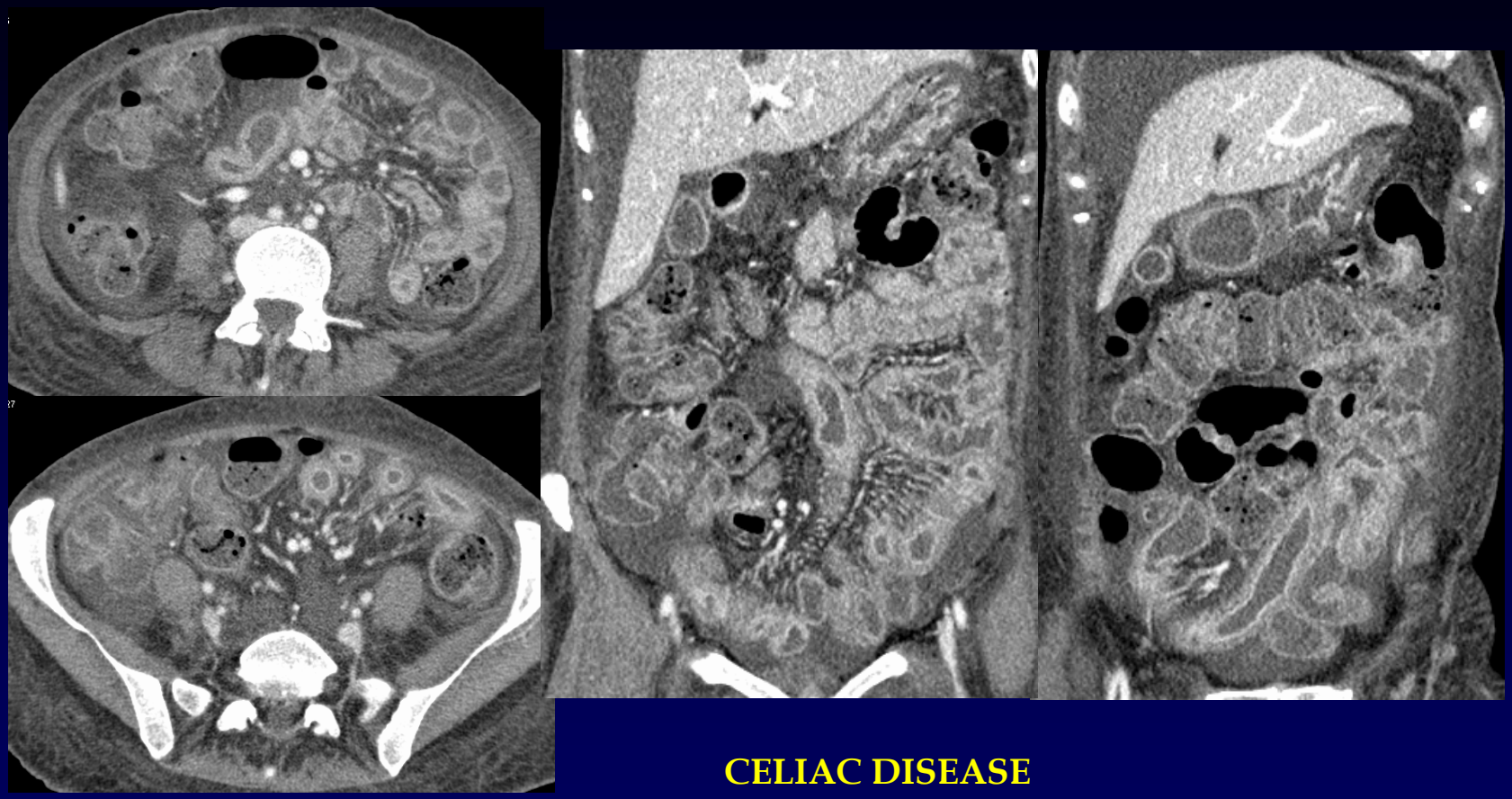

CELIAC DISEASE
ULCERATIVE JEJUNOLIEITIS

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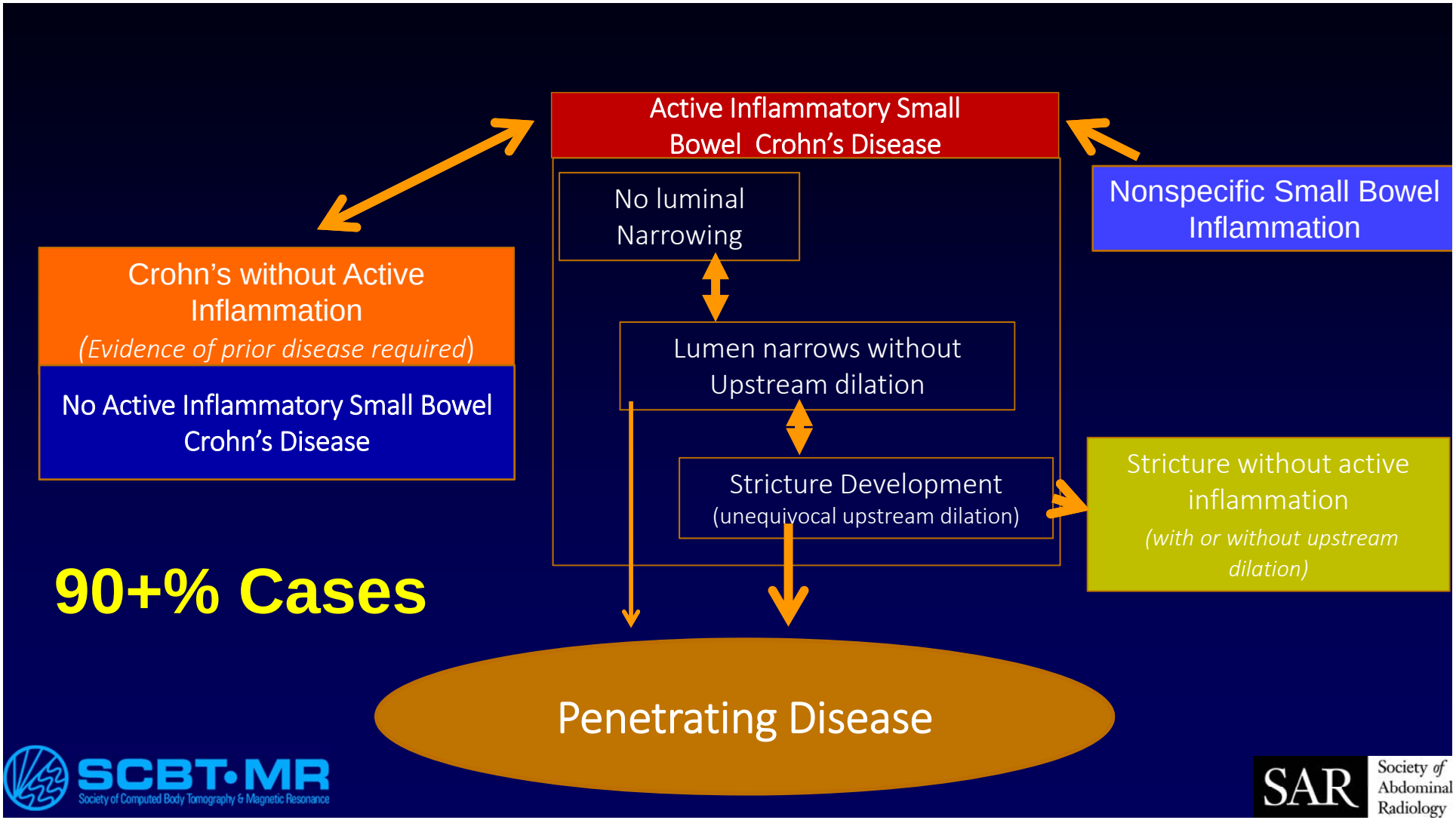
Active Inflammatory Small Bowel Crohn's Disease
No luminal Narrowing
Lumen narrows without Upstream dilation
Stricture Development (unequivocal upstream dilation)
Nonspecific Small Bowel Inflammation
Crohn's without Active Inflammation
(Evidence of prior disease required)
No Active Inflammatory Small Bowel Crohn's Disease
Stricture without active inflammation
(with or without upstream dilation)
90+% Cases
Penetrating Disease
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Imaging Approach to Small Bowel Findings

- Montreal/Vienna Phenotype Classification
  - Current Gastroenterology/Colorectal Surgery Morphologic Construct
- SAR/AGA/ASCRS/SSAT Image Based Morphologic Phenotypes
  - CTE & MRE Imaging Findings & Impressions
    - Based on Imaging Morphology
    - **Easily Applied to Lémann Score**

Proposed Imaging Based Morphologic Phenotypes & Lémann Score

SAR Impressions	Lehmann Stricturing Lesion Grade	Penetrating Lesion Grade
Crohn's without Active Inflammation	0	
Active Inflammatory without Luminal Narrowing	1	
Active Inflammatory with Luminal Narrowing	2	
Stricture with Active Inflammation (Upstream Dilation)	3	
Penetrating		3

Inflamm Bowel Dis 2011; 17: 1415

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SAR Nomenclature

- Final ACG Approval
  - Input from:
    - David Bruining, MD
    - Ellen Zimmermann, MD
    - Edward Loftus, MD
    - William Sandborn, MD
    - Cary Sauer, MD
    - Scott Strong, MD
  - Joint Publication

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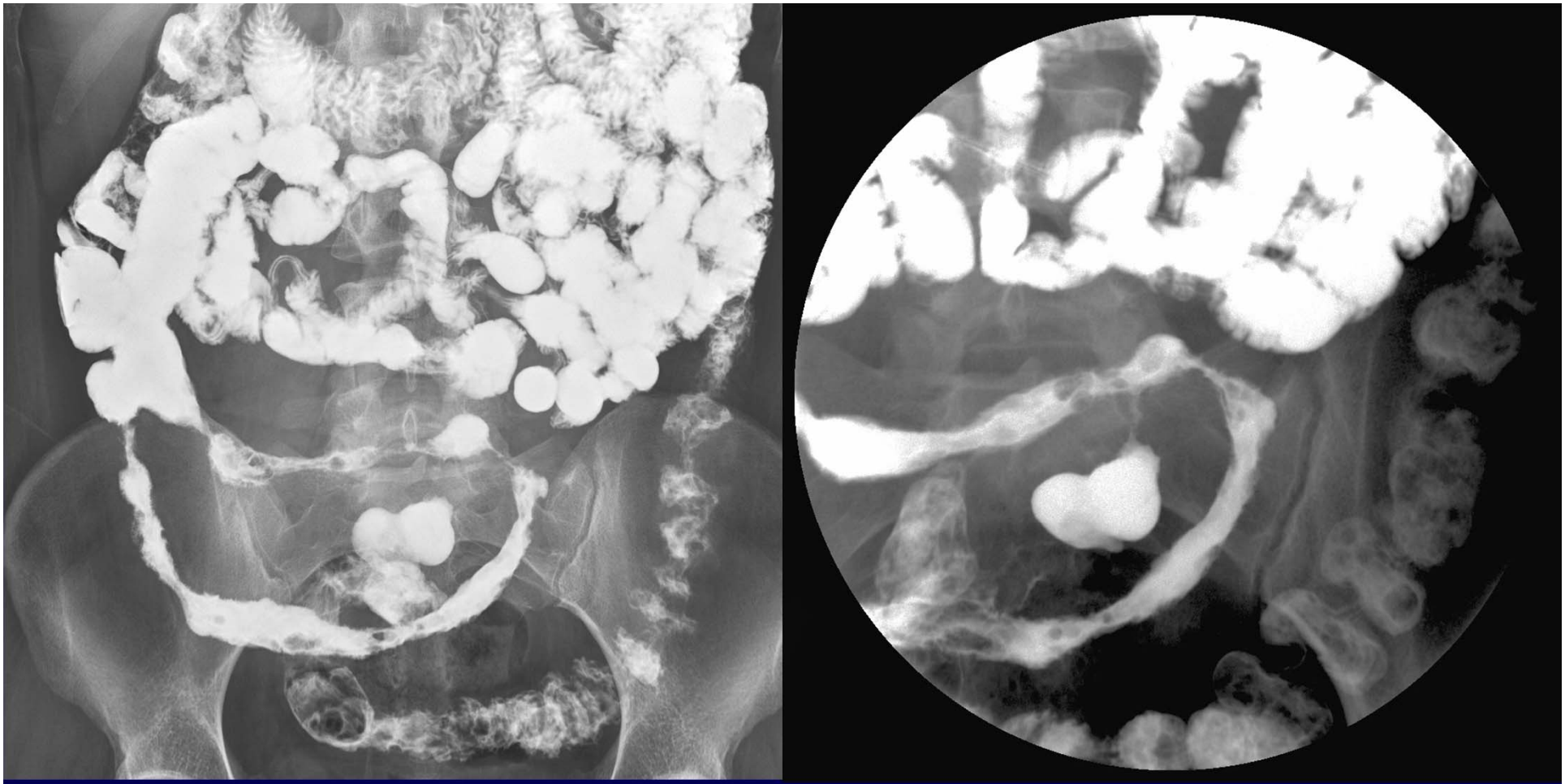

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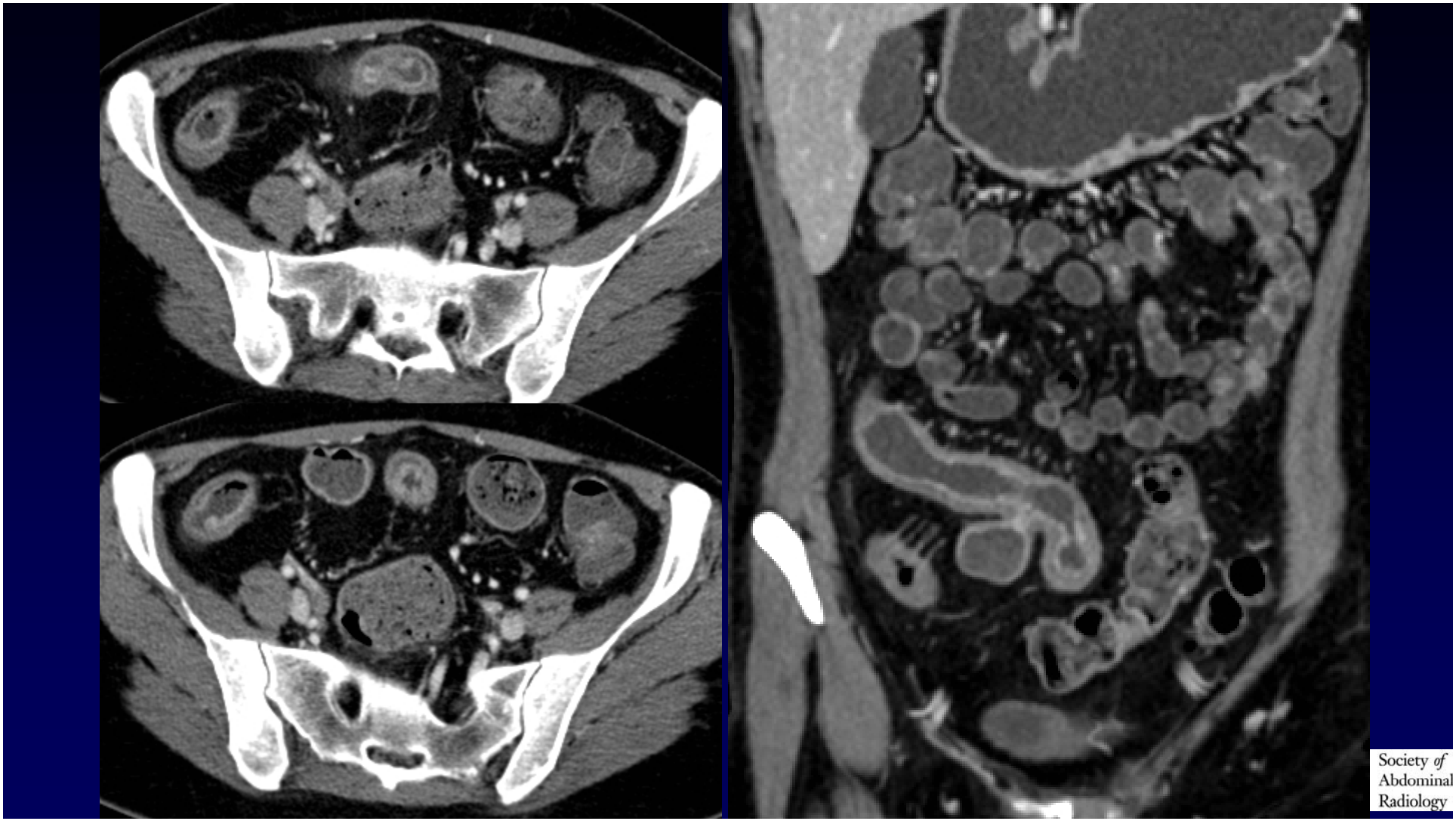
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