

# Workup of the Painful Total Hip Arthroplasty: *“Looks Good But Feels Bad”*

**R. Michael Meneghini MD**

*CEO, Indiana Joint Replacement Institute  
Professor of Clinical Orthopedic Surgery  
Indiana University School of Medicine*

# COI Disclosures

## Consulting Payments / Royalties

- **Enovis (DJO Global)**
- OsteoRemedies
- Innomed
- Kinamed

## Consulting Payments

- 3M / KCI

## Scientific Advisory Board Options

- Emovi
- PeekMed

## Investment / Ownership Shares

- Surgery Center of Fort Wayne
- M2 Orthopedics

## Research Support

- Enovis (DJO Global)

## Fellowship Funding

- OMEGA

## Editorial Boards

- Journal of Arthroplasty
- Orthopedics Today

# Painful Total Hip Arthroplasty

- Frustrating for the patient and doctor.
- Long list of possible causes
- Approach systematically
- **Do not revise without knowing etiology**



# Painful THR: Differential Diagnosis

## Intrinsic Etiology:

- Loosening
- Infection
- Instability
- Impingement
- Particulate Synovitis
- Poly Wear
- Metal Hypersensitivity
- Modulus mismatch

## Extrinsic (local):

- Bursitis
- Tendonitis
- Heterotopic Ossification
- Abductor Avulsion
- Stress Fracture

# Painful THR: Differential Diagnosis

## Extrinsic: Remote

- Spinal Pathology
- Nerve Palsy / Neuropathy
- Nerve Entrapment



## Vascular Disease

- Claudication
- Osteitis Pubis / pubic symphysis
- Hernia
- Intra-abdominal pathology
- Tumor

# Painful THR: Workup

- History
- Physical
- Plain Radiographs
- Advanced Imaging
- Laboratory analysis
  - PJI
  - ALTR / MACC



# Painful THR: Radiographs

**Serial radiographs are  
the most effective  
method of detecting  
component loosening**

**Attempt to obtain preoperative and initial  
postoperative radiographs**



# Cementless Acetabular Loosening

- **Radiographic Loosening Criteria**

- Radiolucent lines >1mm that initially appeared after two years
- Progression of radiolucent lines after two years
- Radiolucent lines in all three zones
- Radiolucent lines 2 mm or wider in any zone
- Migration

**94% Sensitivity, 100% Specificity**

- **Highly porous metal may vary from above!**

Udomkiat P, Wan Z, Dorr LD . J Bone Joint Surg Am Dec 2001



# Cemented Stem Loosening

- **Definite Loosening**
  - Subsidence
  - Fracture of Stem
  - Cement Mantle Fracture
  - Continuous RLL cement/stem

Harris WH, McGann WA. JBSJ 1986;68A:1064-1066



# Uncemented Stem Loosening

- **Uncemented Stems**
  - Complete RLL over the **porous coated** part of stem
  - Subsidence
  - Position change
  - Abnormal bone remodeling



# Painful Total Hip Replacement

- **Now what???**
  - Well-Fixed implants on plain radiographs
  - Pain
  - Infection excluded



# Laboratory Analysis - PJI

- Laboratory Analysis
  - ESR
  - C-reactive Protein
- Aspiration if elevated
  - Include differential



# 2014 MSIS Definition of PJI

**Table III. Musculoskeletal Infection Society 2014 Consensus definition of PJI**

PJI is present when one of the major criteria exists or three of five minor criteria exist

<b>Major criteria</b>	<b>Two positive <u>periprosthetic</u> cultures with phenotypically identical organisms, OR A sinus tract communicating with the joint, OR</b>
<b>Minor criteria</b>	<b>1. Serum erythrocyte sedimentation rate <math>\geq 30</math> mm/hr AND C-reactive protein <math>\geq 1</math>mg/dL 2. Synovial fluid white blood cell count <math>\geq 3000</math> OR ++ change on leukocyte esterase test strip 3. Synovial fluid <u>polymorphonuclear neutrophil</u> percentage <math>\geq 80\%</math> 4. Positive histologic analysis of <u>periprosthetic tissue</u> (<math>&gt;5</math> neutrophils per high-power field in 5 high-power fields (x400)) 5. A single positive culture</b>

# PJI Lab Diagnosis Chart

	ESR	CRP	Synovial WBC	Synovial Diff
<b>Acute Postop</b>	NA	100 mg/L	10,000	90%
<b>Acute Hematogenous</b>	NA	100 mg/L	10,000	90%
<b>Chronic</b>	30	10	1500	65%
<b>Safe for Reimplantation</b>	Decreasing	Decreasing	3000	90%

# Painful Total Hip Replacement

- **Bone Scan - Tc-MDP**
  - **Sensitive**
  - **Not specific – false positives**
  - **Stress Fracture, Sacroiliitis, loosening etc.**



# Painful Total Hip Replacement



**Well Fixed**



**Aseptic Loosening**



# Intra-Articular Marcaine Injection

- **Extrinsic vs. intrinsic pain**
- Valuable if pain relief obtained
  - Location
  - Quantification
- **Absence of pain relief does not rule out loosening**



# Painful THA – Modulus Mismatch

- **End of Stem Pain**
  - **Activity Related**
  - **Generally within first 12 months**
  - **Large stem sizes**
  - **Typically uncemented stems**
- **Modulus of Elasticity Mismatch**
  - **297 patients**
  - **trend of thigh pain with larger implant sizes**
  - **Usually diminishes**
  - **Vresilovic, 1992**



# Painful THA - iliopsoas Tendinitis

- Poorly understood and frequently undiagnosed
- **Increasingly common with anterior-based THA approaches & highly porous cups**
- Groin pain s/p THA with well fixed implants
- Pain with hip flexion-based activities
- Physical Exam:
  - Groin pain with resisted hip extension from a flexed position

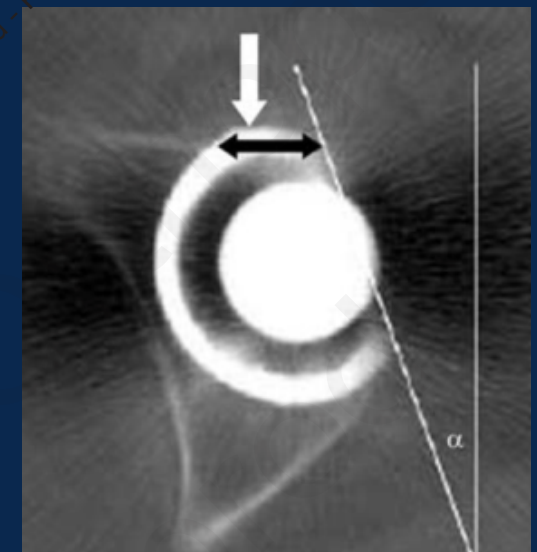
# Painful THA - iliopsoas Tendinitis

- Higher risk in acetabular components positioned:
  - Horizontal
  - Relatively retroverted
  - Lateralized or oversized
  - Dysplastic native acetabulae



# Iliopsoas Tendinitis – Radiograph Evaluation

- Cross-table radiograph
- CT scan
- MRI
- Diagnostic Injection
  - CT Scan
  - Ultrasound



# Iliopsoas Tendinitis – Operative Treatment

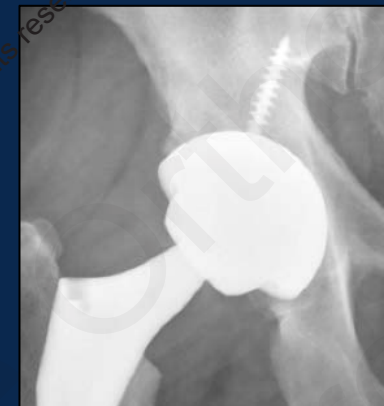
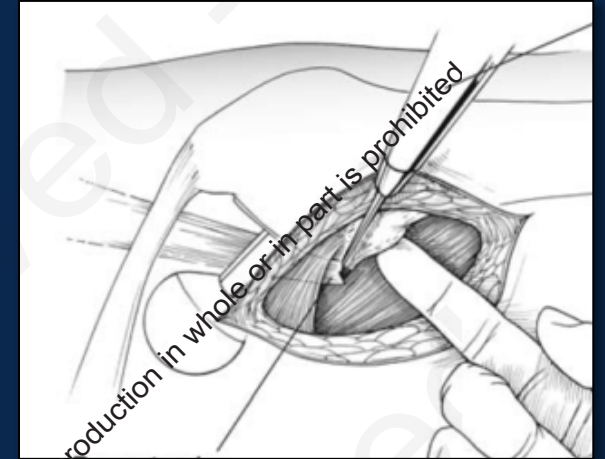
## Iliopsoas Impingement After Primary Total Hip Arthroplasty: Operative and Nonoperative Treatment Outcomes

Brian P. Chalmer, MD, Peter K. Sculco, MD, Rafael J. Sierra, MD, Robert T. Trousdale, MD, and Daniel J. Berry, MD

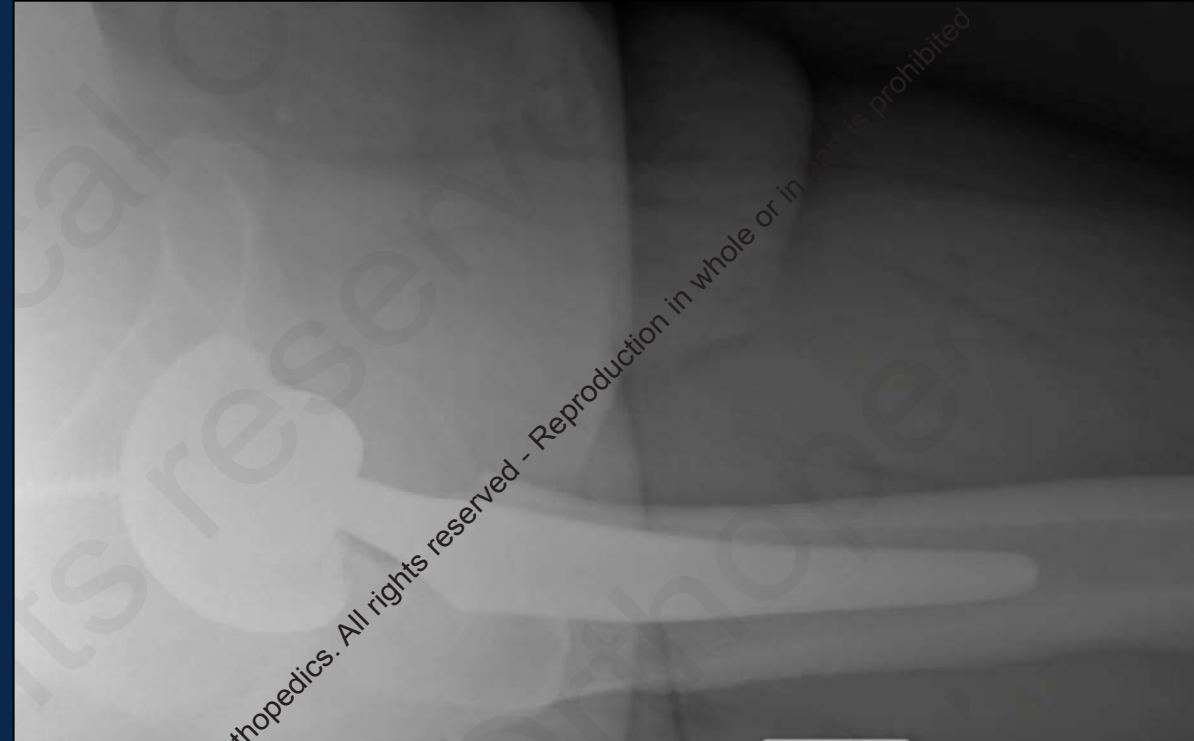
- 49 patients, latest follow-up range 2-8 years
- Symptom resolution in 50% in non-operative group vs 76% in operative group (p=0.06)
- **≥8mm of component prominence, acetabular revision led to groin pain resolution in 92% (12/13) compared to 33% (1/3) treated with tenotomy (p=0.07)**

# Iliopsoas Tendinitis – Surgical Technique

- Arthroscopic Release
- Open Tenotomy & Cup Revision
  - Release tendon at lesser trochanter
  - Medialize cup
  - Optimize anteversion
  - More “Vertical”

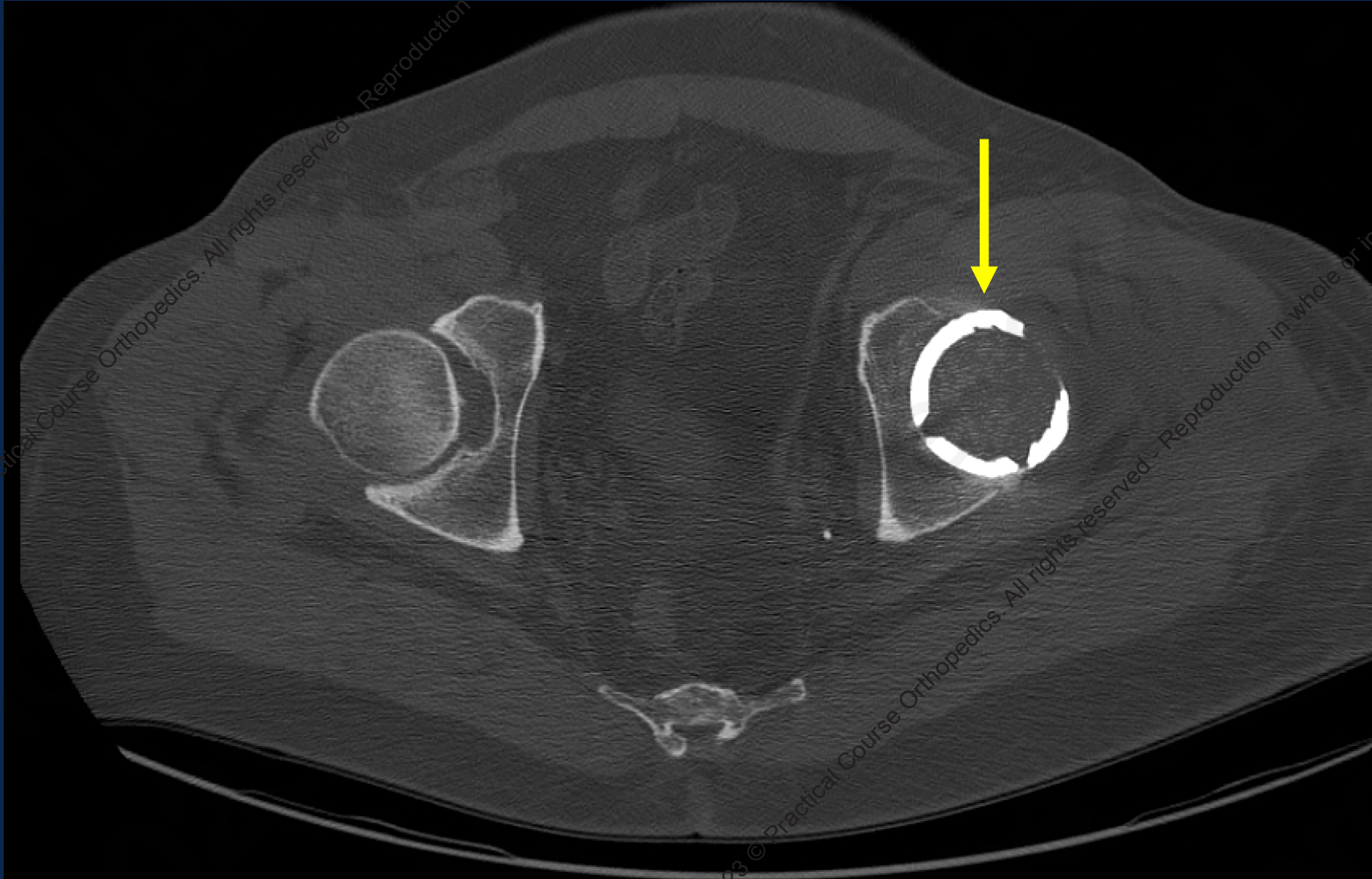


# Case Example





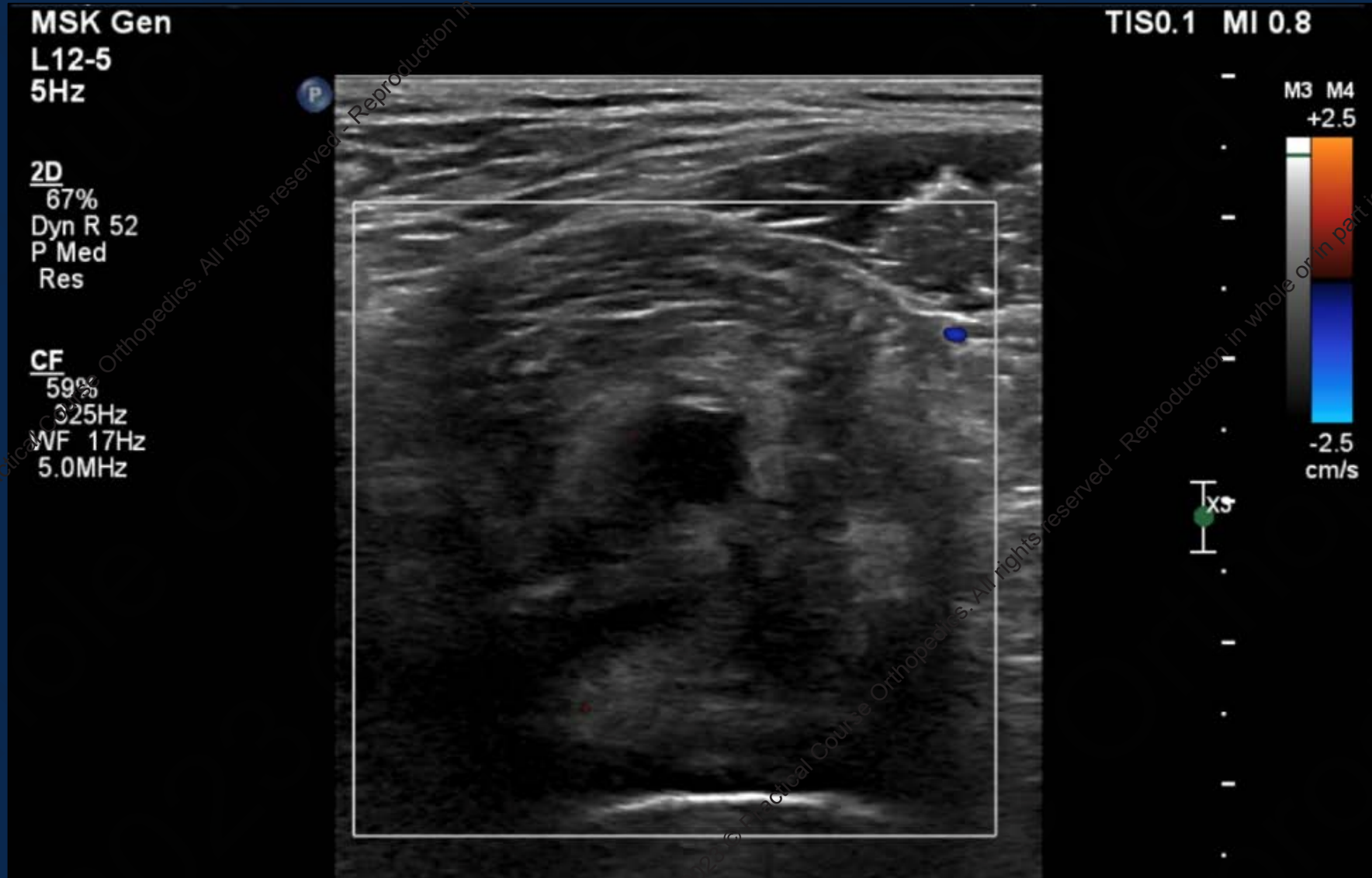
# Case Example



2023 © Practical Course Orthopedics. All rights reserved. Reproduction in whole or in part is prohibited.

2023 © Practical Course Orthopedics. All rights reserved. Reproduction in whole or in part is prohibited.

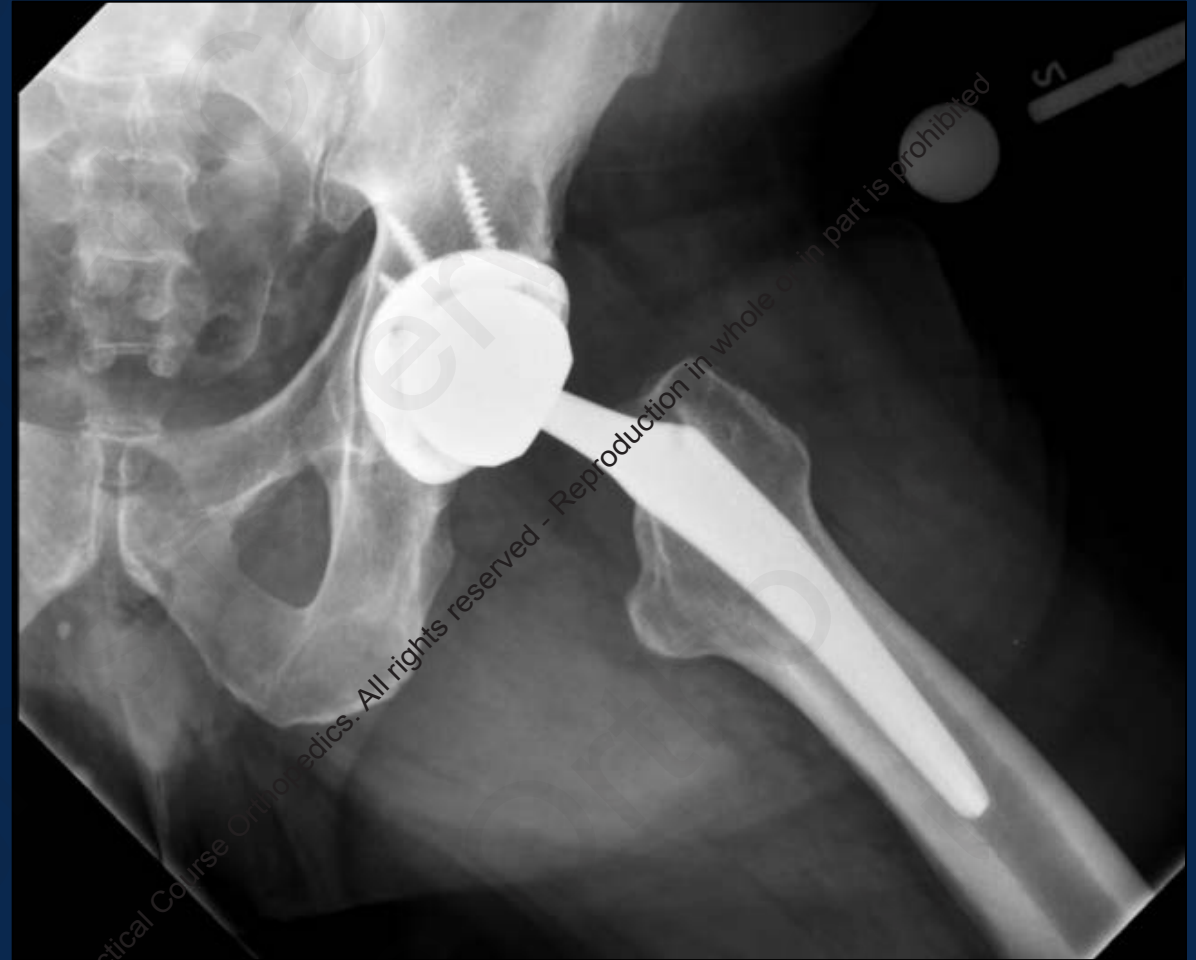
# Case Example



2023 © Practical Course Orthopedics. All rights reserved - Reproduction in whole or in part is prohibited

2023 © Practical Course Orthopedics. All rights reserved - Reproduction in whole or in part is prohibited

# Postoperative Radiographs



# Metal Hypersensitivity THA

## Red Flags:

- New onset pain or weakness
- Late dislocations

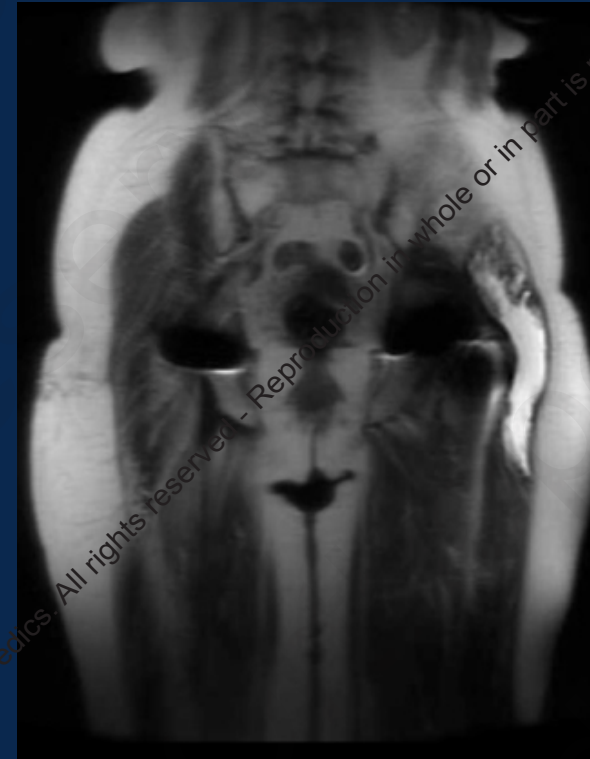
## “At Risk” Implants

- MOM total Hips
- Modular Necks
- Cobalt Chrome Heads
  - Can be ANY size metal head
- “I can’t find anything wrong”



# Metal Hypersensitivity Workup

- Serum Metal Ions
  - Cobalt / Chromium
  - May be equally elevated in MoM bearings
  - Trunionosis - Cobalt preferentially elevated
- Metal Artifact Reduction “MARS” MRI
- **Decision to Revise Multi-Factorial**
- **Rule out PJI with synovial fluid aspiration**



# Manual Cell Count and Differential



- ESR, CRP less predictive
- WBC Fluid less predictive
- PMN's > 85% predictive

Must be counted  
**MANUALLY** in the lab

- ESR, CRP less predictive
- WBC fluid > 4350 predictive
- PMN's > 85% predictive

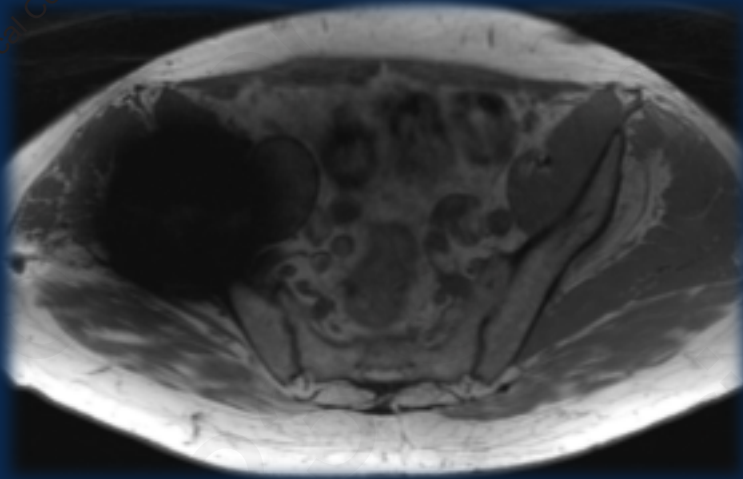
## Do Serologic and Synovial Tests Help Diagnose Infection in Revision Hip Arthroplasty With Metal-on-metal Bearings or Corrosion?

Paul H. Yi BA, Michael B. Cross MD, Mario Moric MS, Brett R. Levine MD, MS, Scott M. Sporer MD, Wayne C. Paprosky MD, Joshua J. Jacobs MD, Craig J. Della Valle MD

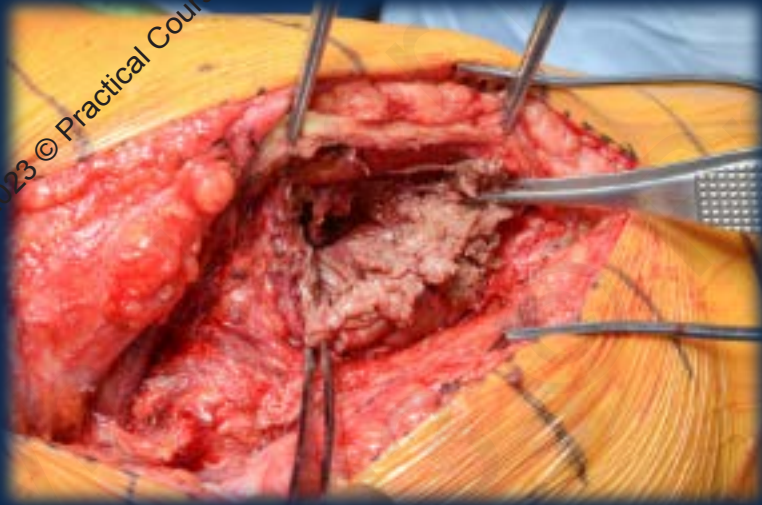
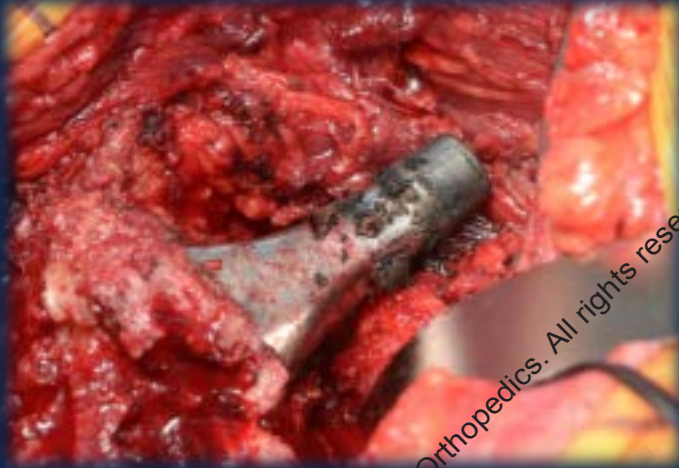
Clinical Orthopaedics  
and Related Research®  
A Publication of The Association of Bone and Joint Surgeons®

# Cross-Sectional Imaging

- MRI
  - Metal-on-metal articulations
  - Dual-modular necks
  - Taper corrosion



# Serum Metal Ion Levels



- Cobalt
- Chromium
- Interpret with caution
- Understand units in your lab and published data
  - ng/mL
  - ppb



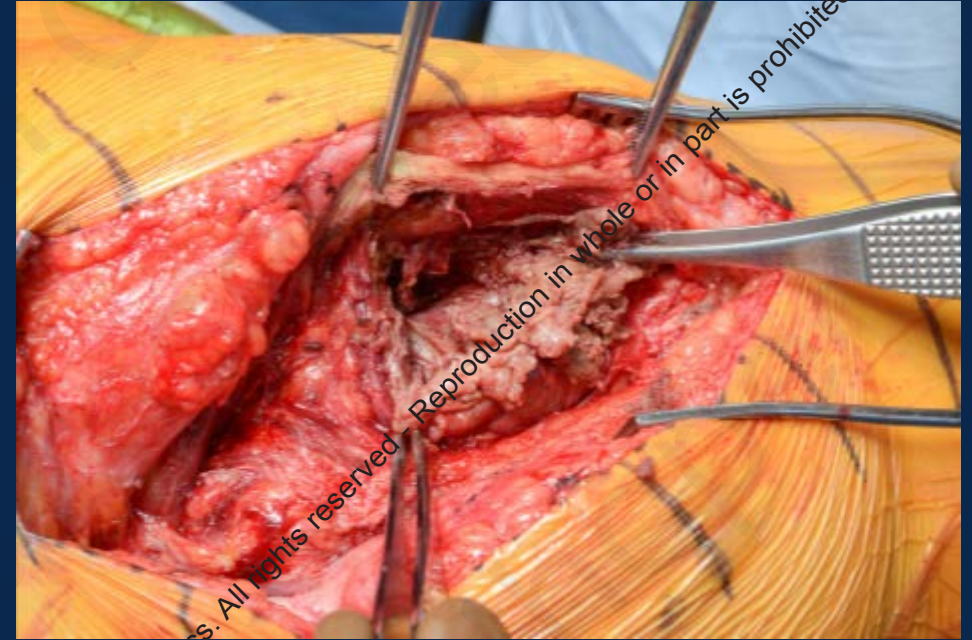
# Serum Metal Ion Levels

## Metal-on-Metal

- 7 ppb?
- 5 ppb?
- 2 ppb?

## Trunnionosis

- Ratio Co:Cr ?
- Cobalt Threshold ?



- \* MacDonald et al. *JOA*. 2004.
- \* Lombardi et al. *JBJS Br*. 2012.
- \* Kwon et al. *JBJS Am*. 2014.

# Trunnionosis: Ion Levels

Cobalt  $\geq$  1 ng/mL

- 100% sensitivity
- 90% specificity
- 96% PPV
- 100% NPV

Co  $\gg$  Cr

The Journal of Arthroplasty 32 (2017) S272–S277

Contents lists available at [ScienceDirect](#)

 **The Journal of Arthroplasty**

journal homepage: [www.arthroplastyjournal.org](http://www.arthroplastyjournal.org)

Basic Science

Serum Metal Levels for Diagnosis of Adverse Local Tissue Reactions Secondary to Corrosion in Metal-on-Polyethylene Total Hip Arthroplasty

Yale A. Fillingham, MD\*, Craig J. Della Valle, MD, Daniel D. Bohl, MD, Mick P. Kelly, MD, Deborah J. Hall, BS, Robin Pourzal, PhD, Joshua J. Jacobs, MD

Department of Orthopaedic Surgery, Rush University Medical Center, Chicago, Illinois

 CrossMark

# Painful THA Summary

- Invoke a Systematic Approach
  - Thorough History and Physical
  - Radiographic Evaluation
  - Laboratory and other studies
- Keep Differential in Mind
- Establish Etiology
- Do not be afraid to:
  - **Say No to Surgery and Observe**
  - **Seek a colleagues 2<sup>nd</sup> Opinion**
- Develop a clear surgical plan targeting etiology

# Thank you!



2023 © Practical Course Orthopedics. All rights reserved - Reproduction in whole or in part is prohibited.



INDIANA JOINT REPLACEMENT INSTITUTE

