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RETROSPECTIVE INVESTIGATION OF FAILED METAL ON METAL TOTAL HIP REPLACEMENTS: A GUIDE TO MANAGEMENT

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DISCLOSURES

- NO DISCLOSURES

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CONTEMPORARY METAL ON METAL (MoM) HIPS

- PROMISING EARLY RESULTS
- GOOD 5-10 YR SURVIVORSHIP
- LOW RATES OF WEAR RELATED FAILURE

Metal-on-Metal Hip Arthroplasty in Patie
Thirty Years of Age or Younger

By Julien Girard, MD, MSc, Donatien Bocquet, MD, Guillaume Autissier, MD, Nicolas Fouillero
Damien Fron, MD, and Henri Migaud, MD

The Journal of Arthroplasty

Cementless metal-on-metal hip arthroplasty in patients less than 50 years of age: Comparison with a matched control group using ceramic-on-polyethylene after a minimum 5-year follow-up

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- **HIGH FAILURE RATES**
  - **8.1% AT 10 YRS**
- **METAL SENSITIVITY**
  - **1% INCIDENCE**
  - **⬆1.6 > 32 MM HEAD SIZE**

*Adelaide. Australian Orthopedic Association. National Joint Replacement Registry Report. Annual Report. 2011

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BACKGROUND

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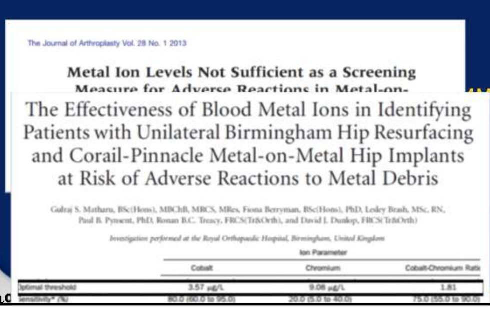
BACKGROUND



The Journal of Arthroplasty Vol. 28 No. 1 2013

Metal Ion Levels Not Sufficient as a Screening Measure for Adverse Reactions in Metal-on-

The Effectiveness of Blood Metal Ions in Identifying Patients with Unilateral Birmingham Hip Resurfacing and Corail-Pinnacle Metal-on-Metal Hip Implants at Risk of Adverse Reactions to Metal Debris

Gulraj S. Matharu, BSc(Hons), MBChB, MRCS, MRes, Fiona Berryman, BSc(Hons), PhD, Lesley Brash, MSc, RN, Paul B. Pynsent, PhD, Ronan B.C. Treacy, FRCS(Tr&Orth), and David J. Dunlop, FRCS(Tr&Orth)

Investigation performed at the Royal Orthopaedic Hospital, Birmingham, United Kingdom

	Ion Parameter		
	Cobalt	Chromium	Cobalt-Chromium Ratio
Optimal threshold	3.57 µg/L	9.08 µg/L	1.81
Sensitivity* (%)	80.0 (60.0 to 95.0)	20.0 (5.0 to 40.0)	75.0 (55.0 to 90.0)

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MoM FAILURES

- PATIENT ANXIETY
- UNCERTAINTY

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UNCERTAINTY REVOLVES AROUND

- ETIOLOGY
- ANALYSIS
- TREATMENT

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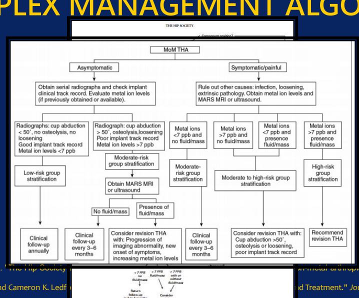
COMPLEX MANAGEMENT ALGORITHMS



Lombardi Jr, A. V., et al. "The Hip Society ... -metal arthroplasty." Journal of Bone & Joint Surgery, British

Bolognesi, Michael P., and Cameron K. Ledf... nd Treatment." Journal of the American Academy of Orthopaedic Surgeons

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Co/Cr RATIO'S & IMPLANT SPECIFIC THRESHOLDS ??

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Sensitivity* (%)	80.0 (60.0 to 95.0)	20.0 (5.0 to 40.0)	75.0 (55.0 to 90.0)
Specificity* (%)	76.2 (70.6 to 81.0)	99.6 (98.9 to 100)	71.0 (65.4 to 76.2)

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INVESTIGATION OF FAILED MoM THR

- FAILURE ETIOLOGY
- OPERATIVE INDICATION
- CLINICAL OUTCOMES

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MATERIALS & METHODS

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- RETROSPECTIVE REVIEW OF 53 CONSECUTIVE REVISED MoM THR
- DEMOGRAPHICS
  - MALES: 21
  - FEMALES: 32
  - AVERAGE AGE: 58.8 YRS (30-83)

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PRE-OP EVALUATION

- XRAYS
- ACUTE PHASE REACTANTS
- CoCr BLOOD ION LEVELS
- MARS MRI
- ASPIRATION (EFFUSION,⬆ ACUTE PHASE REACTANTS)
- OPERATIVE HISTOLOGY

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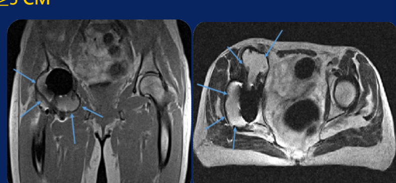
METAL ARTIFACT REDUCTION SEQUENCE (MARS) MRI ANALYSIS

PERIARTICULAR EFFUSION ≥5 CM

NORMAL POST OPERATIVE APPEARANCE



LARGE PERIARTICULAR EFFUSION

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HISTOPATHOLOGY (ALVAL SCORE)

- SYNOVIAL LINING
- INFLAMMATORY INFILTRATE
- TISSUE ORGANIZATION

Sum	ALVAL
0-4	Low
5-8	Moderate
9-10	High

* Campbell, Pat, et al. "Histological features of pseudotumor-like tissues from metal-on-metal hips." *Clinical Orthopaedics and Related Research®* 468.9 (2010): 2321-2327.

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RESULTS

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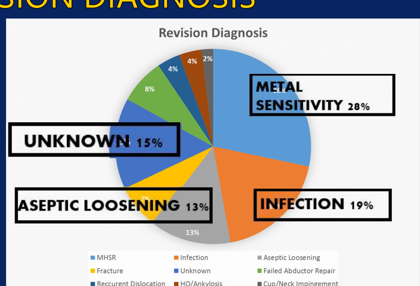
REVISION DIAGNOSIS



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REVISED COMPONENTS

* RECALLED IMPLANT

All MoM Revisions

Stem/Head	# of Implants
Summit/Pinnacle	35
Summit/ASR*	4
SROM/ASR*	1
SROM/Pinnacle	1
Replica/Pinnacle	1
Smith & Nephew*	1
Biomet-M2a Magnum	6
Zimmer/Durom*	4

Metal Sensitivity Patients

Stem/Head	# of Implants
Summit/Pinnacle	5
Summit/ASR*	2
SROM/ASR*	1
Smith & Nephew*	1
Biomet-M2a Magnum	3
Zimmer/Durom*	3

REVISED COMPONENTS

All MoM Revisions

Stem/Head	# of Implants
Summit/Pinnacle	35
Summit/ASR	4
SROM/ASR	1
SROM/Pinnacle	1
Replica/Pinnacle	1
Smith & Nephew	1
Biomet-M2a Magnum	6
Zimmer/Durom	4

ION LEVELS BY REVISION DIAGNOSIS

FAILURE MODE	Co	Cr	Co/Cr Ratio
METAL SENSITIVITY	9.6 (2.4-40)	3.9 (1.8-67.0)	2.1
INFECTION	5.1 (0.1-10.6)	1.8 (0.5-6.3)	3.53
ASEPTIC LOOSENING	13.2 (1.7-27)	6.9 (1.9-16)	4.37
UNKNOWN	6.7 (0.5-31.9)	12.5 (0.7-76.4)	0.85

PRE-OPERATIVE LABS

LAB VALUE	METAL SENSITIVITY	NON METAL SENSITIVITY	P-Value
WBC	7.1 (3.5-9.8)	7.6 (4.4-12)	0.33
ESR	19.5 (2.9-65.0)	19.1 (1-123)	0.96
Co	9.6 (2.4-40) ug/L	7.8 (0.1-31.9) ug/L	0.58
Cr	3.9 (1.8-6.4) ug/L	6.9 (0.5-76.4) ug/L	0.68
Co/Cr	2.1 (1.1-3.8)	1.9 (0.2-10.8)	0.81
LYM	43.6 (10-66) %	44.8 (2-90) %	0.93
PMN	51.7 (29-88) %	40.5 (1-94) %	0.46

UNPAIRED STUDENT T-TEST (α= <0.05)

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FLUID ON MRI

METAL SENSITIVITY PATIENTS	
# MSR + PTS W MRI	13
# MSR + PTS W +MRI	11
% OF MSR + PTS W +MRI	85

NON-METAL SENSITIVITY PATIE	
# NON-MSR PTS W MRI	22
# NON-MSR + PTS W +MRI	4
% NON-MSR PTS W +MRI	18%

P=<0.001
OR= 24.8

CONTINGENCY TABLE

MRI FINDINGS

METAL SENSITIVITY	Y	N	TOTAL
	11	2	13
	4	18	22
	15	20	35

P=<0.001
ODDS RATIO= 24.8

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ALVAL SCORE

	ALVAL SCORE
MHSR	6.8
NON-MHSR	3.3
P-VALUE	<0.001

CLINICAL OUTCOMES

MEAN FOLLOW UP: 18.7 MONTHS

	MHSR	NON-MHSR	TOTAL
1° - REVISION (Mo)	49.7	59.9	57.1
PAIN RESOLUTION	80% (12/15)	58% (22/38)	64.2% (34/53)
SUBSEQUENT REVISIONS	13.3% (2/15)	2.6% (1/38)	6% (3/53)

PAIN

MEAN FOLLOW UP: 18.7 MONTHS

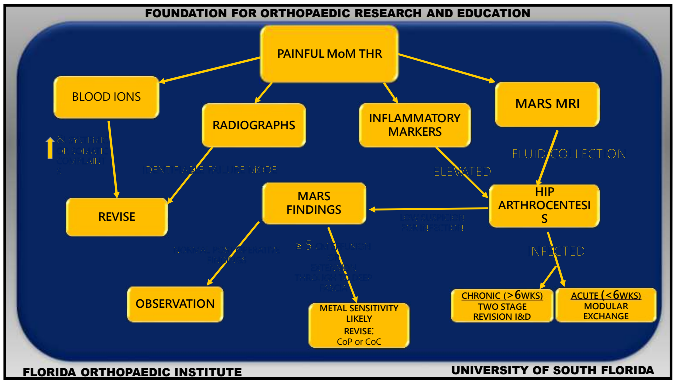
MODE OF FAILURE	PAIN RESOLUTION	SUBSEQUENT REVISION	LITIGATION
METAL SENSITIVITY	12/15(80%)	2/15 (13%)	2/15(13%)
FRACTU			/4(25%)
FAILED ABDUCTOR REPAIR	2/4(50%)	0	1/4(25%)
OTHER	4/5(80%)	0	1/5(20%)

FAILURE
75% H

PERSISTENT PAIN
OR=8.25
P=0.01

KNOWN
) PAIN

DISCUSSION



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SUMMARY

- 28% OF PATIENTS HAD METAL SENSITIVITY
- BLOOD ION LEVELS ≠ METAL SENSITIVITY
- LARGE PERIARTICULAR EFFUSIONS HIGHLY PREDICTIVE OF METAL SENSITIVITY
- ⬆ PERSISTENCE OF PAIN IN PATIENTS WITH FAILURE OF UNKNOWN ETIOLOGY

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STUDY LIMITATIONS

- RETROSPECTIVE REVIEW (LEVEL IV EVIDENCE)
- SINGLE INSTITUTION STUDY

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CONCLUSION

- REVISION
  - IDENTIFIABLE MODES OF FAILURE
    - + EFFUSION ON MARS MRI
- UNKNOWN FAILURE ETIOLOGY = PERSISTENT PAIN

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THANK YOU

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