All Patients with Chrome-Cobalt Hip Implants are at risk for:

- Hypercobaltemia
- Pseudotumors
- Cobaltism

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A 56 mm Metal (CrCo) Ball on a Metal (CrCo) Socket
MoM Risks 2013:
Periprosthetic Metallosis

• Present in most all MoMs
• Cumulative
• Drives increased failure rate

Postmortem Study of Femoral Osteolysis Associated with Metal-on-Metal Articulation in Total Hip Replacement: An Analysis of Nine Cases
Monika Huber, Georg Reinisch, Peter Zenz, Karl Zweymüller, and Felix Lintner
Pseudo-Tumor

Tissue “Necrosis”  “Chronic” Inflammation
Incidence [Co] >20 mcg/L

- Common in painful MoMs
- Common in MoMs with steep shells
- Common in ASRs

Arthroprosthetic Cobaltism: Neurological and Cardiac Manifestations in Two Patients with Metal-on-Metal Arthroplasty: A Case Report

Stephen S. Tower

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*Editor’s Note: It should be noted that one of the patients in the present study (Case 1) is the author of the report (S.S.T.).
MoM Risks: Cobaltism

- sub-clinical [Co] 1-20 mcg/L
- clinically uncommon [Co] 10-20 mcg/L
- clinically frequent [Co] > 20 mcg/L

Arthroprosthetic Cobaltism: Neurological and Cardiac Manifestations in Two Patients with Metal-on-Metal Arthroplasty: A Case Report
Stephen S. Tower, M.D.
## Cobaltism stratification by nature and severity of Manifestations

<table>
<thead>
<tr>
<th></th>
<th>Prodromal</th>
<th>Mild</th>
<th>Moderate</th>
<th>Severe</th>
<th>Potentially Fatal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Psychological</strong></td>
<td>New anxiety, irritability, increased or depressed mood that does not result in medical consultation.</td>
<td>New mood symptoms for which medications are prescribed. New minor difficulties with memory or learning.</td>
<td>Diagnosis and treatment of new major mood or thought disorder. Notable new problems with memory or learning.</td>
<td>Dementia or hospital admission for new psychiatric diagnosis.</td>
<td>New involuntary psychiatric inpatient admission. New suicide attempt.</td>
</tr>
<tr>
<td><strong>Cardiovascular</strong></td>
<td>Elevation of resting heart rate. Relative exercise intolerance. New diagnosis of hypertension.</td>
<td>New breathlessness that results in cardiopulmonary work-up.</td>
<td>New non-CAD cardiomyopathy, pericardial effusion, or pericarditis.</td>
<td>New non-CAD cardiomyopathy, pericardial effusion, or pericarditis requiring treatment.</td>
<td>New non-CAD cardiomyopathy, pericardial effusion, or pericarditis requiring intensive care.</td>
</tr>
<tr>
<td><strong>Thyroid</strong></td>
<td>New elevations in thyroid antibodies.</td>
<td>New rising TSH, thyroid supplementation not yet indicated.</td>
<td>New symptomatic hypothyroidism, thyroid supplementation indicated.</td>
<td>New profound hypothyroidism or goiter.</td>
<td>Goiter with airway compromise.</td>
</tr>
</tbody>
</table>

CAD Coronary Artery Disease, CVA Cerebral Vascular Accident
Cobaltism: Severity relates to the degree and duration of cobaltemia.
Alaska series failed MoM about 35 revised of ? at risk
Median $[\text{BCo}] > 40$ mcg/L
about a third have cobaltism
Metal-Metal Hips Blood Cobalt mcg/L (Parts per Billion)

- 0.20 mean normal, > 1.0 excess exposure
- 1.0 mean 28 mm Metasul
- 2.0 mean resurfacing (BHR)
- >5 considered toxic
- “teens” some APC reports (long exposure)
- > 20 APC case reports
- Cost $270

Young RN
BHR “BH” late 2008
Missed 2 annual follow-ups but saw surgeon 1-2 times a week at work
BCo > 40
Neurocobaltism with 48 months of surplus morbidity
R Rejuvenate 8/2010
L V 40 CrCo head 9/2012
Summer 2012 progressive fatigue, poor sleep, nausea, weight loss 140-120 pounds, deafness, myalgia, cognitive decline, [BCo] 11 mcg/L and new A fib and EDD 4/2013
56 YO well male
3 years s/p L. V40 32 mm MoP
6 years post R. V40 32 mm MoP
Several months L. HFT [BCo] of 4
Admit CCU post ECHO
66 year-old med-mal lawyer with 4 months of HFT left hip

Bilateral Zimmer MLT 32 mm CrCo THA in 2006

[BCo] of 4 mcg/L
Systemic toxicity may proceed Hip Symptoms

Symptoms of ARMD precede manifestations of Cobaltism

Manifestations of Cobaltism precede symptoms of ARMD
Known Arthoprosthetic Cobaltism Cases are Escalating

#1 Megaterino 2001 CoM
#2 Steens 2006 CoM
#3 Oldenberg 2009 CoM
#4 Rizzetti 2009 CoM
#5 Ikeda 2010 CoM
#7 Tower 2010 MoM
#9 Mao 2011 MoM
#10 Machado 2012 MoM
# 14 Gent 2013 MoM
#15 Pechlova CoM
#15 Gilbert 2012 CoM
# 23 Tower 2013 MoM
> 40 Ghent 2013 MoM
? > 100 by 2014 MoM
? > 1000 by 2015

Three million + US Hips at risk!
AkAPC #4 BHR S&N

Implanted for 36 Months
Blood Cobalt Level 322 mcg/L
Same as NEJM case that need heart transplant
AAOS and NPS Criteria as of 1/2014 (MoM)
Any hip with Chrome-Cobalt Components!

- Annual [BCo] > 1 mcg/L are Hypercobaltemic
- Cross-sectional imaging
- Consider Revision
  - [BCo] > 10
  - Any Systemic Toxicity c/w cobaltism
  - Hip symptoms and pseudo-tumor
  - “Destructive” pseudo-tumor with or without symptoms