Fatal Cobalt Toxicity after Total Hip Arthroplasty
Revision for Fractured Ceramic Components

Kimberly A Fox MD, Todd M Phillips MD, Michael G Abesamis MD
University of Pittsburgh Medical Center, Pittsburgh PA USA

Introduction

- Post-arthroplasty metallosis is an uncommon complication of arthroplasty
- Systemic cobalt toxicity post-arthroplasty is extremely rare
- Systemic symptoms of cobalt toxicity may include fatigue, weakness, visual and hearing impairments, cardiomyopathy, polycythemia, cognitive dysfunction, and neuropathy
- To date, only one prior death is known to be attributed to this complication

Case Report

- Single patient chart review
- 60 year old female with a history of ceramic-on-ceramic right total hip arthroplasty in 2004
- Developed metallosis of the joint and underwent synovectomy to a metal-on-polyethylene articulation
- Ten months after, presented to the ED with right hip pain, dyspnea, hearing loss, a metallic dysgeusia, and weight loss
- CTA chest revealed pulmonary emboli, and had echocardiogram on admission (Table 1).
- Serum cobalt was elevated at 424.3mcg/L (plasma ref. range 0.1-0.4mcg/L) and 24-hour urine cobalt was 4820.5 mcg/L (normal< 2.0 mcg/L).
- Plan was for removal of the hip prosthesis and treatment with N-acetylcysteine and succimer.

Case Discussion

- This is a case of fatal cobalt-induced cardiomyopathy in a patient whose ceramic components of a total hip arthroplasty fractured causing metallosis.
- Likely a result of persistent wear of the new cobalt-chromium femoral head by residual ceramic particles.
- Providers should be aware of signs and symptoms of cobalt toxicity and potential dangers of ceramic prosthesis revision to cobalt-chromium components.
- In the correct clinical setting with elevated serum and urine levels, discussions should occur with toxicology and orthopedics about possible chelation and removal of the prosthesis.

Figure 1. Patient’s right hip x-rays in 2013. Multiple densities around the right hip representing fractured ceramic prosthetic components.

<table>
<thead>
<tr>
<th>Echocardiogram on Admission</th>
<th>Repeat Echocardiogram</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ejection Fraction</td>
<td>35-40%</td>
</tr>
<tr>
<td>LV systolic function</td>
<td>Mild to moderate global dysfunction</td>
</tr>
<tr>
<td>LV diastolic function</td>
<td>Stage I diastolic dysfunction</td>
</tr>
<tr>
<td>RV systolic function</td>
<td>Mildly reduced</td>
</tr>
<tr>
<td>Mitral Regurgitation</td>
<td>Moderate to severe</td>
</tr>
<tr>
<td>Tricuspid Regurgitation</td>
<td>Mild</td>
</tr>
<tr>
<td>PA pressure</td>
<td>Normal</td>
</tr>
</tbody>
</table>

Table 1. Comparison of transthoracic echocardiogram results on admission and on repeat after patient demonstrated signs of decompensated cardiogenic shock.

Conclusion

Patients with cobalt-chromium prosthesis are at risk for systemic cobalt toxicity, which can cause fatal cardiomyopathy.