Cobalt cardiotoxicity in a patient with bilateral Metal-on-Metal (MoM) arthroplasty

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Objective: Cobalt-chromium alloy MoM hip replacement can result in excessively high blood cobalt levels. Cobalt systemic toxicity is well known for thyroid (goitre, hypothyroidism) and heart (myocardiopathy, pericardial effusion). Sensineural hearing loss, ocular toxicity, peripheral neuropathy and cognitive decline are also reported among the long-term systemic effects of metal release from hip replacement prosthesis. Only single case reports of cobalt systemic toxicity following metal arthroplasty are available. This concern is still underrecognized and long term epidemiological studies are required. Appropriate time-dependence and cut-off levels for cobalt systemic toxicity are needed. We report one more case of severe acute cardiac dysfunction following MoM hip replacement.

Case report
A healthy 38-year-old man underwent staged bilateral MoM total hip replacement 10 and 9 years ago (Artek® brand in 2002 and Press-fit Cedior®/Metasil® 54 insert in 2003) because of bilateral osteonecrosis. Within a year following the first hip replacement, he experienced symptoms (squeaking and pain from the hip joint) suggesting a no longer properly functioning device.

- On April 2013, he was referred to a cardiac intensive care unit for cardiogenic shock.
- A non ischemic dilated myocardiopathy from an unspecified origin was diagnosed. He only admitted an excessive alcohol intake due to a joyful and festive lifestyle. Thyroid function was unaffected and the renal function was normal. He was placed on beta-blocker, ACE and diuretic treatments.
- Eight months later, cardiac function dramatically improved (LVEF about 50%) but its cardiovascular treatment was still ongoing and alcohol consumption discontinued.
- Cobalt and chromium blood levels were respectively at 267.2 µg/L (normal range from 0.2 to 7 µg/L in patients with cobalt-containing hip implants) and 136.8 µg/L (N < 0.90 µg/L).
- A Ct-scan showed massive osteolysis and granulomatous tissue reaction, notably at the right hip replacement.
- On June 2014, a right hip revision arthroplasty was performed.
- On September 2014, blood cobalt level decreased to 54.21 µg/L.
- Whereas, patient resumed normal physical activities, he complained of painful contralateral hip prosthesis. Blood cobalt level increased again to 120 µg/L.
- On February 2015, a contralateral hip revision was performed.
- A controlled blood cobalt level is still pending but the patient is currently fine.

Discussion
Cobalt cardiomyopathy was first reported in the 1960s among heavy beer drinkers following the adjunction of cobalt as a beer foam stabilizer (now forbidden); since cobalt intake was mild, malnutrition and alcoholism have been highlighted as major co-factors. A recent review of published case reports of systemic toxicity related to metal hip prosthesis (1) evidenced dyspnoea or accurate cardiotoxicity in 11 patients; blood cobalt exceeded 350 µg/L for most of them (the lowest value was 14 µg/L but the patient had multiple cardiovascular risk factors).

Conclusion
We report the case of a young and previously healthy man who experienced an acute cardiogenic shock related to a non ischemic dilated myocardiopathy considered to be from an unspecified origin. However, he had no longer properly functioning MoM arthroplasty for at least 9 years and cobalt blood concentration peaked over 250 µg/L. Alcohol intake could have played a role but cardiac improvement required ongoing cardiac medications despite alcohol withdrawal.