CASE REPORT

Psychiatric Symptoms due to Cobalt Toxicity: A Case Report

Pallavi[1], Mohd Kamil[2], Vipin Singh[3], Muktesh Singh[4]

Received on: 22 May 2024; *Accepted on:* 15 June 2024; *Published on:* 20 July 2024

Abstract

Cobalt is thought to cause a variety of symptoms in patients whose toxic amounts accumulate in the blood. Cobalt poisoning may be due to metal implants. A 50-year-old female had a fracture of the neck of the femur and underwent total hip arthroplasty under spinal anesthesia. On postoperative day 8, she became restless and hyperactive, persistently repeating words and actions and having visual hallucinations. Psychiatry opinion was taken, and intensive care units (ICUs)-induced psychosis could be ruled out. Meanwhile, her serum cobalt levels were sent, keeping in mind the differential diagnosis of cobalt-induced neuropsychiatric toxicity, and the levels were S. Cobalt – 10.88 μg/L. After discontinuing cobalt-containing medications, the patient gradually improved symptomatically over 2–4 days and was eventually discharged from the ICU.

Keywords: Alloys, Case report, Chromium, Cobalt, Hallucinations, Intensive care units, Metal-on-metal joint prostheses.

Journal of Trauma Intensive Care STIC (2024): 10.5005/jtric-11018-0007

Introduction

Over the past few years, the number of joint replacement surgeries in India has increased rapidly. The number of joint replacements in India is set to grow at the highest rate in the world from 2020 to 2026.

Cobalt-chrome (Co-Cr) is an alloy of cobalt and chromium. Commonly used in dental and orthopedic implants, it has high strength, wear resistance and temperature endurance. Orthopedic implants usually contain cobalt with traces of chromium, molybdenum, and other elements. Adverse physiological effects include metal allergy and toxicity due to the release of metal ions that occurs due to metal corrosion surrounded by biological systems.[1] Implant failure patients requiring revision surgery, psychiatric disorders following metal-on-metal implant surgery, have been reported. The three mechanisms related to psychiatric problems are either psychological mechanisms such as static brain damage caused by cobalt/chromium toxicity, fear of the possibility of further continuing problems and surgical procedures with pain and mobility, or an early-onset dementia aggravated by metallosis.[2] The findings of a high level of oxidative DNA damage in the brain, accompanied by morphological, functional alterations and the relationship between many psychiatric diseases, shows that damaged genomic DNA contributes to the pathophysiology of mental disorders.

Abdel Hamid OI et al., reported that hip prostheses made from cobalt and chromium can destroy DNA, reduce cellular viability and lead to chromosomal aberration. Chromosomal translocations and aneuploidy appeared predominantly in the peripheral blood lymphocytes of patients undergoing metal-on-plastic revision arthroplasty.[3]

Case History

A 50-year-old female presented to our institution with pain in her right hip and the inability to use her right lower limb for the last 2–3 months. There was a history of trauma to the right lower limb due to slipping on the floor. She was evaluated for the same and was found to have a fractured neck femur on the right side. She underwent total hip arthroplasty under spinal anesthesia. On postoperative day 6, she had sudden hypotension (BP – 88/50 mm Hg). She was initially resuscitated with IV fluids and subsequently started on vasopressor support. The patient was transferred to the intensive care units (ICUs) for evaluation and management.

In the ICU, on postoperative day 8, she became restless and hyperactive, persistently repeating words and actions and having visual hallucinations. A Psychiatric opinion was taken, and ICU-induced psychosis could not be ruled out. Meanwhile, her serum cobalt levels were sent considering the differential diagnosis of cobalt-induced neuropsychiatric toxicity, and the levels were 10.88 μg/L (normal range – 0.50–3.50 μg/L). Subsequently, all medications containing cobalt (Injection Optineuron, Tablet Pregaba-M) were stopped, and other alternative medications were started. The patient gradually improved symptomatically over 2–4 days and was eventually discharged from the ICU.

Discussion

The health effects of excessive cobalt exposure are distinguished by a complex clinical syndrome, a varying set of endocrine deficits, cardiovascular and neurological, directly related to the uptake of

[1–3]Department of Anaesthesiology and Critical Care, King George's Medical University, Lucknow, Uttar Pradesh, India

[4]Department of Anaesthesiology, Motilal Nehru Medical College, Prayagraj, Uttar Pradesh, India

Corresponding Author: Mohd Kamil, Department of Anaesthesiology and Critical Care, King George's Medical University, Lucknow, Uttar Pradesh, India, Phone: +91 9198686781, e-mail: kamil27989@gmail.com

How to cite this article: Pallavi, Kamil M, Singh V, *et al*. Psychiatric Symptoms due to Cobalt Toxicity: A Case Report. J. Trauma Intensive Care STIC 2024;1(1):10–11.

Source of support: Nil

Conflict of interest: None

Patient consent statement: The author(s) have obtained written informed consent from the patient for publication of the case report details and related images.

cobalt ions in the tissues and blood circulation.[1–3] Neurological conditions thought to be caused by high levels of cobalt ions in blood have been demonstrated in several clinical reports in relation to patients with metal implants.[3–5] These entail a diversity of symptoms, such as mood disturbances, memory loss, cognitive decline, visual and auditory issues and peripheral neuropathy.

In our case, the patient became restless, hyperactive, persistently repeating words and actions and had visual hallucinations, which improved significantly as cobalt-containing medications were stopped.

Conclusion

This case report highlights the potential neuropsychiatric complications associated with elevated serum cobalt levels in patients with orthopedic implants. The presented patient exhibited significant neuropsychiatric symptoms, including restlessness, hyperactivity, and visual hallucinations. These symptoms coincided with elevated serum cobalt levels, which improved upon discontinuation of cobalt-containing medications. Prompt identification and management of cobalt-induced toxicity can prevent further complications and improve patient outcomes. As joint replacement surgeries continue to rise, awareness and vigilance regarding the adverse effects of metal ion release are crucial for optimizing patient care.

References

1. Green B, Griffiths E, Almond S. Neuropsychiatric symptoms following metal-on-metal implant failure with cobalt and chromium toxicity. BMC Psychiatry 2017;17(1):33. DOI: 10.1186/s12888-016-1174-1.
2. Lainiala OS, Moilanen TPS, Hart AJ, et al. Higher blood cobalt and chromium levels in patients with unilateral metal-on-metal total hip arthroplasties compared to hip resurfacings. J Arthroplasty 2016;31(6):1261–1266. DOI: 10.1016/j.arth.2015.11.045.
3. Abdel Hamid OI, Attia ME, Hirshon JM, et al. Psychiatric disorders and genotoxicity following primary metal on polyethylene total hip arthroplasty and their correlation to cobalt/chromium levels. Drug Healthc Patient Saf 2022;14:97–111. DOI: 10.2147/DHPS.S360643.
4. Catalani S, Rizzetti MC, Padovani A, et al. Neurotoxicity of cobalt. Hum Exp Toxicol 2012;31(5):421–437. DOI: 10.1177/0960327111414280.
5. Mavrogenis AF, Papagelopoulos PJ, Babis GC. Osseointegration of cobalt-chrome alloy implants. J Long Term Eff Med Implants 2011;21(4):349–358. DOI: 10.1615/jlongtermeffmedimplants.v21.i4.80.