

Review Article

Cobalt Syndrome Following
Total Knee Arthroplasty:
A Case-Based Review and
Clinical Implications

Vaidya Bala*

Medical Co-Director, Public and Population Health, The Wollongong Hospital,
Australia

Abstract

Background: Cobalt syndrome, or arthroprosthetic cobaltism, is a rare but serious complication of joint arthroplasty caused by systemic cobalt ion exposure. Traditionally linked to metal-on-metal hip implants, recent evidence implicates polyethylene liner degradation in total knee arthroplasty (TKA) as a source of metal ion release.

Objective: To present a case of unilateral cobalt syndrome following bilateral TKA and integrate current literature to highlight diagnostic and therapeutic considerations.

Methods: A comprehensive independent medical examination and literature review were conducted. Clinical findings were correlated with imaging, implant analysis, and manufacturer recall data.

Results: The patient developed chronic synovitis and systemic symptoms due to polyethylene liner degradation and metal-on-metal contact. Diagnostic workup supported cobaltism. Management included multidisciplinary pain care, cobalt assays, and recommendations for implant revision.

Conclusion: Cobalt syndrome should be considered in patients with unexplained symptoms post-TKA, especially when involving recalled implants. Early recognition and intervention are critical to prevent long-term morbidity.

Keywords: Adverse Local Tissue Reaction; Cobalt Syndrome; Exactech Recall; Metallosis; Polyethylene Liner Degradation; Rehabilitation; Total knee arthroplasty

*Corresponding author: Vaidya Bala, Medical Co-Director, Public and Population Health, The Wollongong Hospital, Australia. Email: Vaidya.balasubramanian@health.nsw.gov.au

Citation: Bala V (2025) Cobalt Syndrome Following Total Knee Arthroplasty: A Case-Based Review and Clinical Implications. J Orthop Res Physiother 11: 064.

Received: October 24, 2025; **Accepted:** November 04, 2025; **Published:** November 10, 2025

Copyright: © 2025 Vaidya Bala, This open-access article is distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Introduction

Cobalt syndrome, also known as metallosis or adverse local tissue reaction (ALTR), is characterised by local inflammation and systemic toxicity due to cobalt ion release from orthopaedic implants [1]. While primarily associated with metal-on-metal hip arthroplasty, polyethylene liner degradation in TKA has emerged as a potential source of cobalt exposure [2]. The Exactech Optetrak Logic system was globally recalled in 2022 due to packaging faults that accelerated polyethylene oxidation [3]. This degradation can lead to micromotion, edge loading, and unintended metal-on-metal contact, triggering cobalt and chromium ion release [4].

Methods

This report synthesises findings from a detailed independent medical examination conducted in September 2025 of a 58-year-old male patient who underwent bilateral TKA in June 2021. Data were extracted from surgical records, imaging, pathology reports, and manufacturer documentation. A literature review was conducted using PubMed, MDPI, and JAMA Network Open to identify relevant studies on cobaltism in arthroplasty.

Results

Clinical Presentation

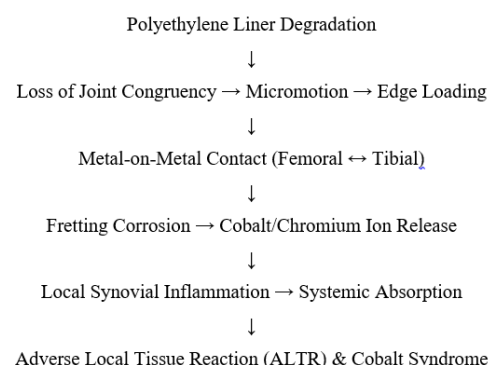
The patient developed persistent left knee pain, swelling, and synovitis 18 months post-TKA. Imaging revealed synovial inflammation without loosening. Aspiration ruled out infection. Systemic symptoms included fatigue, anxiety, impaired mobility, and suspected thyroid dysfunction (Table 1).

Implant Composition

Component	Material	Clinical Relevance
Femoral Component	Cobalt-Chromium-Molybdenum Alloy	Source of cobalt and chromium ions
Tibial Baseplate	Titanium Alloy	Generally inert, low ion release
Tibial Insert	Ultra-High Molecular Weight Polyethylene	Subject to oxidative degradation and wear

Table 1: Degradation of polyethylene may lead to metal-on-metal contact between femoral and tibial components.

Pathophysiological Cascade



Investigations and Management

Physical examination revealed a warm, swollen left knee with limited flexion and instability. Imaging confirmed synovitis without loosening. Cobalt assays and thyroid function tests were performed. Revision surgery was planned, and interim management included multidisciplinary rehabilitation and pain care.

Discussion

This case underscores the diagnostic complexity of cobalt syndrome in TKA. Although knee implants are not typically associated with metal-on-metal articulation, polyethylene degradation can result in unintended metal contact and ion release [5]. Studies show that 57% of patients with cobalt-chrome implants test cobalt-positive, with systemic symptoms such as fatigue and thyroid dysfunction [6]. The European Union's classification of cobalt as a carcinogen highlights the need for long-term surveillance [7].

Hypoallergenic revision strategies have been described for metal allergy in knee arthroplasty [8]. Vigilant surveillance following device recalls, including metal ion quantification and targeted imaging, is crucial for early intervention [9].

Conclusion

Cobalt syndrome is a clinically significant but underrecognized complication of TKA. This case demonstrates the importance of early diagnosis and intervention, particularly in the context of recalled implants. Multidisciplinary care and surgical revision are essential for symptom resolution and functional recovery.

Acknowledgement

I want to acknowledge the law firm Commins Hendriks, located at 23 Gurwood Street, Wagga Wagga, NSW, Australia 2650, and the client who attended for an assessment for a medical negligence claim, who made it possible to further research and investigate this clinical disorder.

Funding Statement

This research received no external funding.

Conflict of Interest

The author declares no conflict of interest related to this manuscript.

Ethical Approval

This case report was prepared in accordance with ethical standards. Patient consent was obtained for publication.

References

1. Jacobs JJ, Hallab NJ, Urban RM, Wimmer MA (2006) Wear particles. J Bone Joint Surg Am 2: 99-102
2. Kwon YM, Lombardi AV, Jacobs JJ, Fehring TK, Lewis CG, et al. (2014) Risk stratification algorithm for management of patients with dual modular taper total hip arthroplasty. consensus statement of the American Association of Hip and Knee Surgeons, the American Academy of Orthopaedic Surgeons and the Hip Society. J Arthroplasty 29: 2060-4.
3. Willert HG, Buchhorn GH, Fayyazi A, Flury R, Windler M, et al. (2005) Metal-on-metal bearings and hypersensitivity in patients with artificial hip joints. A clinical and histomorphological study. J Bone Joint Surg Am 87: 28-36.
4. Thomas P, von der Helm C, Schopf C (2021) Metal allergy in total knee arthroplasty: Revision surgery using a hypoallergenic implant in 11 patients. Journal of Orthopaedic Surgery and Research 16: 1-9.
5. Exactech Inc (2022) Urgent Medical Device Correction - Optetrak Logic Polyethylene Inserts.
6. Tower SS, Cho CS, Bridges LR, Gessner BD (2021) Prevalence of Cobalturia Among Adults With Joint Replacements. JAMA Network Open. 4: 2121758.
7. Tower SS, Gessner BD, Cho CS, Bridges L (2023) The association of cobalturia with cobaltism symptoms a prospective blinded study of 229 post-arthroplasty patients. PLoS One 18: 0295203
8. Brüggemann A, Hailer NP (2024) Concentrations of Cobalt, Chromium and Titanium and Immunological Changes after Primary Total Knee Arthroplasty—A Cohort Study with an 18-Year Follow-Up. J. Clin. Med 13: 951
9. American Academy of Orthopaedic Surgeons (2024) Updated clinical practice guideline for the prevention of total hip and knee arthroplasty periprosthetic joint infection in Patients Undergoing Dental Procedures. AAOS Newsroom.



Advances In Industrial Biotechnology | ISSN: 2639-5665

Advances In Microbiology Research | ISSN: 2689-694X

Archives Of Surgery And Surgical Education | ISSN: 2689-3126

Archives Of Urology

Archives Of Zoological Studies | ISSN: 2640-7779

Current Trends Medical And Biological Engineering

International Journal Of Case Reports And Therapeutic Studies | ISSN: 2689-310X

Journal Of Addiction & Addictive Disorders | ISSN: 2578-7276

Journal Of Agronomy & Agricultural Science | ISSN: 2689-8292

Journal Of AIDS Clinical Research & STDs | ISSN: 2572-7370

Journal Of Alcoholism Drug Abuse & Substance Dependence | ISSN: 2572-9594

Journal Of Allergy Disorders & Therapy | ISSN: 2470-749X

Journal Of Alternative Complementary & Integrative Medicine | ISSN: 2470-7562

Journal Of Alzheimers & Neurodegenerative Diseases | ISSN: 2572-9608

Journal Of Anesthesia & Clinical Care | ISSN: 2378-8879

Journal Of Angiology & Vascular Surgery | ISSN: 2572-7397

Journal Of Animal Research & Veterinary Science | ISSN: 2639-3751

Journal Of Aquaculture & Fisheries | ISSN: 2576-5523

Journal Of Atmospheric & Earth Sciences | ISSN: 2689-8780

Journal Of Biotech Research & Biochemistry

Journal Of Brain & Neuroscience Research

Journal Of Cancer Biology & Treatment | ISSN: 2470-7546

Journal Of Cardiology Study & Research | ISSN: 2640-768X

Journal Of Cell Biology & Cell Metabolism | ISSN: 2381-1943

Journal Of Clinical Dermatology & Therapy | ISSN: 2378-8771

Journal Of Clinical Immunology & Immunotherapy | ISSN: 2378-8844

Journal Of Clinical Studies & Medical Case Reports | ISSN: 2378-8801

Journal Of Community Medicine & Public Health Care | ISSN: 2381-1978

Journal Of Cytology & Tissue Biology | ISSN: 2378-9107

Journal Of Dairy Research & Technology | ISSN: 2688-9315

Journal Of Dentistry Oral Health & Cosmesis | ISSN: 2473-6783

Journal Of Diabetes & Metabolic Disorders | ISSN: 2381-201X

Journal Of Emergency Medicine Trauma & Surgical Care | ISSN: 2378-8798

Journal Of Environmental Science Current Research | ISSN: 2643-5020

Journal Of Food Science & Nutrition | ISSN: 2470-1076

Journal Of Forensic Legal & Investigative Sciences | ISSN: 2473-733X

Journal Of Gastroenterology & Hepatology Research | ISSN: 2574-2566

Journal Of Genetics & Genomic Sciences | ISSN: 2574-2485

Journal Of Gerontology & Geriatric Medicine | ISSN: 2381-8662

Journal Of Hematology Blood Transfusion & Disorders | ISSN: 2572-2999

Journal Of Hospice & Palliative Medical Care

Journal Of Human Endocrinology | ISSN: 2572-9640

Journal Of Infectious & Non Infectious Diseases | ISSN: 2381-8654

Journal Of Internal Medicine & Primary Healthcare | ISSN: 2574-2493

Journal Of Light & Laser Current Trends

Journal Of Medicine Study & Research | ISSN: 2639-5657

Journal Of Modern Chemical Sciences

Journal Of Nanotechnology Nanomedicine & Nanobiotechnology | ISSN: 2381-2044

Journal Of Neonatology & Clinical Pediatrics | ISSN: 2378-878X

Journal Of Nephrology & Renal Therapy | ISSN: 2473-7313

Journal Of Non Invasive Vascular Investigation | ISSN: 2572-7400

Journal Of Nuclear Medicine Radiology & Radiation Therapy | ISSN: 2572-7419

Journal Of Obesity & Weight Loss | ISSN: 2473-7372

Journal Of Ophthalmology & Clinical Research | ISSN: 2378-8887

Journal Of Orthopedic Research & Physiotherapy | ISSN: 2381-2052

Journal Of Otolaryngology Head & Neck Surgery | ISSN: 2573-010X

Journal Of Pathology Clinical & Medical Research

Journal Of Pharmacology Pharmaceutics & Pharmacovigilance | ISSN: 2639-5649

Journal Of Physical Medicine Rehabilitation & Disabilities | ISSN: 2381-8670

Journal Of Plant Science Current Research | ISSN: 2639-3743

Journal Of Practical & Professional Nursing | ISSN: 2639-5681

Journal Of Protein Research & Bioinformatics

Journal Of Psychiatry Depression & Anxiety | ISSN: 2573-0150

Journal Of Pulmonary Medicine & Respiratory Research | ISSN: 2573-0177

Journal Of Reproductive Medicine Gynaecology & Obstetrics | ISSN: 2574-2574

Journal Of Stem Cells Research Development & Therapy | ISSN: 2381-2060

Journal Of Surgery Current Trends & Innovations | ISSN: 2578-7284

Journal Of Toxicology Current Research | ISSN: 2639-3735

Journal Of Translational Science And Research

Journal Of Vaccines Research & Vaccination | ISSN: 2573-0193

Journal Of Virology & Antivirals

Sports Medicine And Injury Care Journal | ISSN: 2689-8829

Trends In Anatomy & Physiology | ISSN: 2640-7752

Submit Your Manuscript: <https://www.heraldopenaccess.us/submit-manuscript>

Herald Scholarly Open Access, 2561 Cornelia Rd, #205, Herndon, VA 20171, USA.

Tel: +1 202-499-9679; E-mail: info@heraldopenaccess.us

<http://www.heraldopenaccess.us/>