

Metallosis In Revision Knee Arthroplasty

M den Bakker, R Brouwer

Citation

M den Bakker, R Brouwer. *Metallosis In Revision Knee Arthroplasty*. The Internet Journal of Pathology. 2004 Volume 4 Number 2.

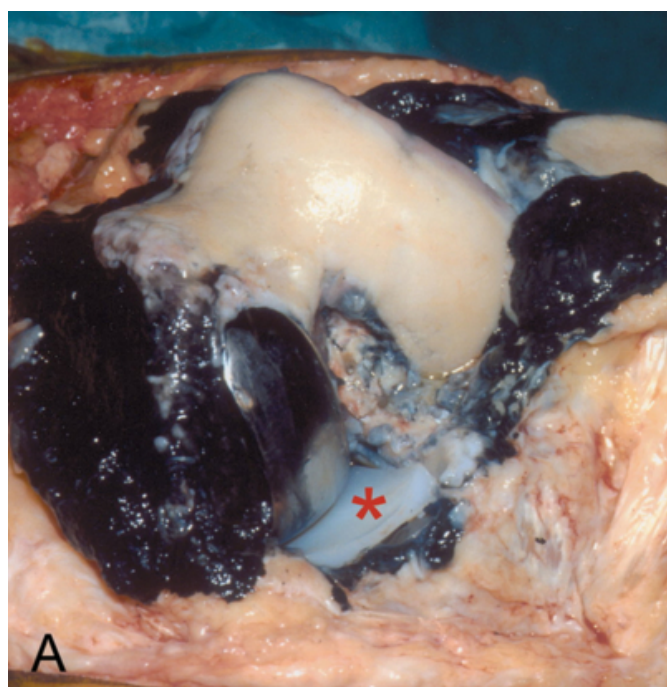
Abstract

We describe a case of extensive metallosis in the knee of a 67-year old male, resulting from failure of a unicompartimental knee prosthesis. The macroscopic, microscopic and ultrastructural findings are demonstrated.

CASE REPORT

A 67-year-old male underwent revision of a unicompartimental knee prosthesis, which had been implanted in the medial femoral condyl and tibial joint surface five years previously. The prosthesis had loosened and caused discomfort and was replaced by a total knee prosthesis. During the operation the synovial lining was found to be grossly hypertrophied and showed extensive black discoloration (A). The abnormal tissue was excised and submitted for histology.

Figure 1



The synovial aspect of the joint capsule showed a marked villous surface with a grey-black colour, which extended to the superficial parts of the tissue. The underlying connective

tissue of the joint capsule appeared normal (B). Histology (C, hematoxylin & Eosin stain, x40, unde partially crossed polarizing filters) shows accumulation of particulate black pigmented metallic fragments in histiocytes and in synoviocytes. Irregular birefringent polyethylene fragments derived from the insert (A*) are scattered throughout the tissue. Scanning electron microscopy and energy dispersive X-ray diffraction (EDX) analysis of gold-coated tissue (D) shows a distinct titanium peak (arrow) in addition to normal tissue elements (left-upper panel x17, right-upper panel x2900, EDX target in white square). The tibial component of the prosthesis had been composed of titanium.

Figure 2

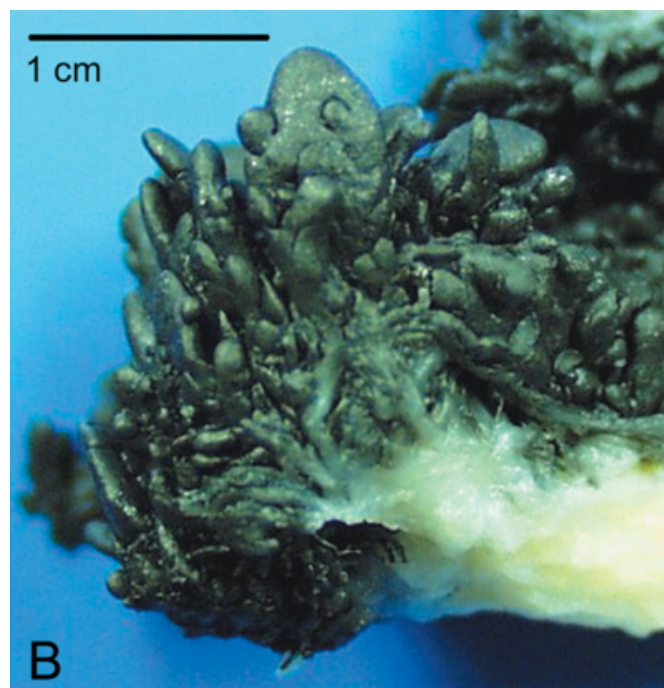


Figure 3

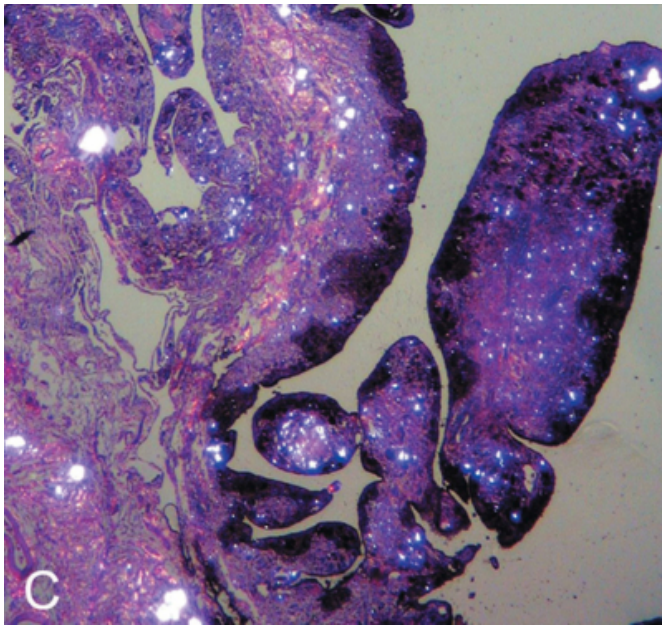
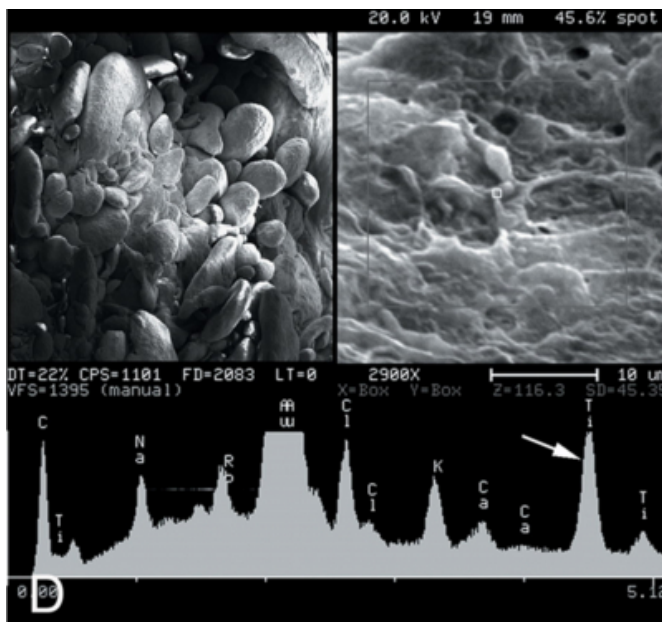


Figure 4



DISCUSSION

Metal-on-polyethylene prostheses as described in this case have an established role in articular replacement but may fail due to wear with loosening. To prevent this complication metal-on-metal prostheses have been developed which are expected to perform better.¹ Metallosis refers to the presence of metal particles in tissue, which are derived from prosthetic implants, which fail due to wear and tear. The

metal accumulates in histiocytes and synovial cells and may even be transported to regional lymph nodes.² Metallosis may be severe in metal-on-metal prosthesis and may be particularly pronounced in cases with incompatible metal combinations, it is less common in metal-on-polyethylene devices.^{1,3} Titanium metal particles liberated from prosthetic joints are essentially inert. Low grade inflammation is seen in soft tissues surrounding wearing joint prosthesis but whether this is due to the metal particles is not clear.^{1,4} Other metals frequently used in joint prostheses are chromium, cobalt and stainless steel. Although animal model experiments have shown that these metals may induce an inflammatory response the biological effects in humans are not clear, although inflammation and even necrosis has been described. Microscopic metal fragments which vary in size, may accumulate intra-cellular in macrophages or in extra-cellular tissue components. The type of metal cannot be determined by light microscopy, for this determination EDX analysis is required. The extensive fibrosis may result in a pseudo-tumorous appearance for which the name metalloma or titanoma has been suggested.⁵ The polyethylene inlay with which the metal component articulates likewise wears with liberation of irregular fragments. These particles are taken up by macrophages and evoke giant-cell formation and fibrosis.

In conclusion, we present a case of extensive metallosis in a unicompartimental knee prosthesis which owing to the type of prosthesis is unusual.

CORRESPONDENCE TO

M.A. den Bakker Dept. of Pathology Erasmus MC PO Box 1738 3000 DR Rotterdam Netherlands tel. +3110-4087901 fax. +3110-4089487 email: m.denbakker@erasmusmc.nl

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Author Information

Michael A. den Bakker, M.D., Ph.D.

Dept. of Pathology, Erasmus MC

Reinoud W. Brouwer, M.D.

Dept of Orthopedic Surgery, Martini Ziekenhuis