



A RARE CASE REPORT OF METALLOSIS - LEFT HIP IMPLANT POST SURGERY

Pathology

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ABSTRACT

Introduction: Metallosis is deposition of metallic debris in peri-prosthetic soft tissue secondary to metal implantation in a joint. Metallosis in the hip joint is a very infrequent condition. **Case report:** We report a case of metallosis in a 42 year old female following implant surgery in the left hip joint. In the year 1998, the patient was operated for a left hip arthrodesis. Twenty-two years later, the patient developed pain and swelling and a total hip replacement surgery was attempted. Greyish-black tissue was found adhered to the implant intraoperatively and was sent for histopathological examination. **Conclusion:** In the absence of an infection, the cause of pain in the vicinity of a joint remains uncertain. Metallosis post-implant is a rare complication. Nevertheless, one must be aware of the relatable clinical signs and possibility of occurrence.

KEYWORDS

Metallosis, Hip joint surgery, metal implant, metallic debris, soft tissue complication

INTRODUCTION:

Metallosis is an uncommon complication that occurs after the usage of metal implants in the body. It is caused by the infiltration and accumulation of metallic debris into the peri-prosthetic structures which leads to a chronic inflammatory reaction.[1] The metal surfaces undergo friction releasing microscopic metal ions into the surrounding tissues and blood. It occurs more frequently in the hip joint than in the knee joint.

The actual incidence of metallosis is still unknown, however the estimated incidence in the hip prosthetic replacements is approximately 5%.[2] Hip metallosis has been significantly associated with female gender and obesity.[3] As the clinical presentation of metallosis includes very common symptoms such as pain, swelling, dislocations and inability to walk, therefore, it must be considered as a differential diagnosis during examination of a patient.

The presence of metallic debris around the joint gives rise to further source of friction, amplifying the process of metallosis. Thus, an early diagnosis will not only assist in preventing further progressive destruction of the joint but also avert the subsequent complications.

Case Report:

A 42 year old female presented with inability to walk along with severe persistent pain around the left hip region since 20 days. The patient did not have any comorbidity. On examination, the left lower limb was externally rotated and active Straight Leg Raise test (SLR) was not possible. There was shortening of left lower limb by 4 cm. On eliciting history, patient was diagnosed as a case of Perthes disease at B.Y.L. Nair Hospital in the year 1998. She was operated for left hip arthrodesis using a femoropelvic spoon plate made up of stainless steel as evident on the X ray (Image 1)



Image 1: An old X-ray of the hip joint showed an operated left hip with a metallic plate replacing the left acetabulum, head and neck of femur.



Image 2: The X-ray of the hip joint showed an operated left hip with broken metal implant and arthritic changes of the right hip joint.

Radiological findings suggested an operated left hip joint with a broken implant and resorption of the femoral head. The right hip joint showed arthritic changes. The right head of femur is sclerosed with irregular margin. The neck of the femur is collapsed and the joint space is reduced. (Image 2)

Since 20 years, the patient was walking with a limp associated with minimal pain. She developed severe pain 20 days ago with trivial trauma possibly causing implant breakage and was not able to walk since then. An implant removal surgery with a complex total hip replacement surgery was planned. During the surgery, the broken implant was removed and a layer of glistening black soft tissue was found beneath the implant adhered to the bone. The tissue was sent for histopathological examination.

Due to flattened acetabulum and deficient bone, total hip replacement was deferred and a Girdle Stone Arthroplasty was performed. After surgery the patient made a good recovery and was stable without any symptoms of pain or swelling.

Gross examination: Received single, greyish-black, soft to firm tissue piece measuring 1.2 x 1.2 cm.

Microscopic examination: H&E stained sections studied revealed lesion showing abundant fibrocollagenous tissue along with plenty of chronic inflammatory infiltrates comprising of lymphocytes, few plasma cells, few neutrophils and few foreign body giant cells. Also abundant black pigment deposits were seen in the sections studied. Histomorphological features were suggestive of metallosis.



Image 3 depicts intraoperative pictures of the procedure showing debridement of dark grey tissue attached to the bone surface beneath with irregular margins showing extensive metallosis and metal impregnation in the surrounding tissue.



Image 4 depicts the macroscopic appearance of the tissue excised showing greyish black metallic material.

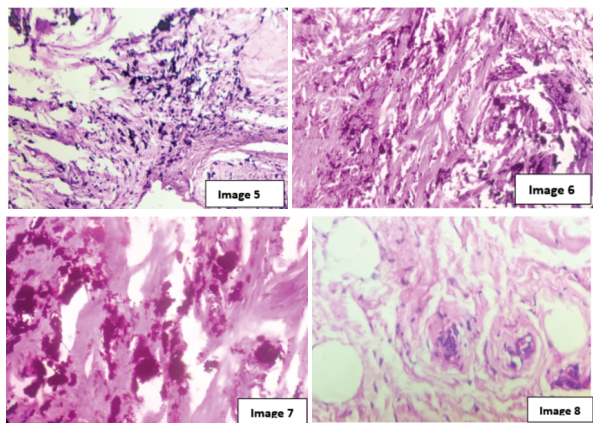


Image 5,6 and 7 (Haematoxylin & Eosin, 4X, 10X & 40X) show fibrocollagenous tissue along with accumulation of chronic inflammatory infiltrates and the presence of clearly evident black pigment interspersed within extensive fibrosis.

Image 8 shows a multinucleated foreign body giant cell.

DISCUSSION:

The metal implants utilized for restoring joint and bone functions have potential side effects which could be local or systemic, infectious or immunological as well as neoplastic. The occurrence of metallosis following hip implants is very uncommon. Metallosis mainly occurs after usage of metal-on-metal prostheses, however involvement of non-metal prostheses cannot be ruled out while making a diagnosis. There is a chronic inflammatory arthritis that follows as a result of metal hypersensitivity and the direct toxic effects of the metal particles.^[4,5]

Stainless steels, cobalt-chromium alloys, titanium alloys, alumina, zirconia and some porous ceramics are often used in orthopaedic surgeries and could lead to such complications.^[6,7] Metallosis is defined as the infiltration of friction related metallic debris into peri-prosthetic bones and soft tissues. On histopathology, there is diffuse granulomatous inflammation along with widespread lymphoplasmacytic and histiocytic infiltration around metal debris, foreign body giant cells, metal particles, extracellular metal deposits and intracytoplasmic debris in giant cells.^[8]

The metal particles after phagocytosis are migrated to the regional and distant lymph nodes giving rise to necrosis and fibrosis in organs such as spleen, liver and lungs.^[9] Metallic particles could be transported to dermis causing skin pigmentation.

Metallosis can manifest as cause pain, swelling, instability, decreased range of motion and can also be associated with systemic neurologic complications such as visual, auditory, cognitive problems, cardiac failure and hypothyroidism.^[10] Systemic effects occur due to elevated serum metal ion concentrates in the circulation.^[11,12]

Metallic debris causes massive local and systemic release of cytokines from the inflammatory cells, such as interleukin 1, interleukin 6, interleukin 8 and tumour necrosis factor.^[13,14] Immunohistological studies have shown the presence of predominantly T-helper cells in tissue membranes than T cytotoxic/suppressor cells. T-helper cells play a crucial role in macrophage activation or in B-cell activation and humoral immunity. After phagocytosis by macrophages, the ions are transported to lysosomes, which, in turn, release the metal ions into peri-prosthetic tissues following apoptosis and necrosis of the phagocytosing cells. Metallic particles may give rise to cystic lesions in the cancellous bone, contributing to loss of bone tissue which occurs in metallosis.^[14]

The radiological findings associated with metallosis are distinct, easy to identify and extremely helpful in making a diagnosis if existent. Radio dense lines called "bubble sign", "cloud sign" and "metal-line" are diagnostic.^[7] Computed tomography (CT) and Magnetic Resonance Imaging (MRI) might be used for recognising metallic debris in surrounding tissues.

Ollivere et al. reported a 3.1% rate of metallosis-related implant failure at five years in 463 primary metal-on-metal hip resurfacing arthroplasties.^[3] Chang et al. reported an overall 5.3% incidence of metallosis in 418 total hip arthroplasties.^[15] The incidence of metallosis is now gradually declining due to the developing technology and use of less reactional prosthetic material in recent times.

The differential diagnosis of metallosis includes conditions such as malignant melanoma due to the presence of pigment as well as giant cell tumours of the soft tissue due to the giant cells seen. It can be differentiated based on lack of peculiar cell morphology, such as round, fusiform or stromal cells.

CONCLUSION:

This final diagnosis of this case on histopathological examination was Metallosis. Metallosis is considered to be a rare condition characterized by deposit of metallic debris that can lead to considerable functional impairment. Long-term follow-up of patients with bone implants is thereby necessary for early diagnosis of complications such as metallosis.

Accuracy in removing the greatest possible amount of metallic debris during the process of debridement is vital in order to avoid further osteolysis and in preventing more extensive damage to the patient's joint after the revision surgery. In addition to this, there may possibly be infiltration into the adjacent structures such as muscles, blood vessels and nerves as well as metal related systemic side-effects in the patients. It is, therefore, essential to be aware of the possibility of occurrence of metallosis in patients with a metal implant in the body.

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