



Delayed total hip arthroplasty infection with *Mycobacterium Tuberculosis* complex

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Total Hip Arthroplasty (THA) joint infection is an uncommon (0,3-1,7%) (20) but devastating complication after THA. While mostly caused by Gram-positive bacteria, with staphylococci and streptococci accounting for up to 76% of cases (21), orthopaedic surgeons are sometimes faced with atypical germs such as fungi or mycobacteria. We present a case of THA joint infection caused by *Mycobacterium tuberculosis* (MT) in a patient without a previous history of MT infection. A literature review was performed, and the treatment is discussed.

Keywords : Total hip arthroplasty infection ; *Mycobacterium tuberculosis*

INTRODUCTION

Mycobacterium tuberculosis (MT) infections of Total Hip Arthroplasties (THA) without a prior history of tuberculous coxitis are rare, with only 20 cases described in the English, French and Spanish medical literature since 1990. Albeit infrequent, this aetiology should be included in the differential diagnosis for patients presenting with a clinically chronically infected implant and a negative infection workup, which represents 7 to 12% of cases (13), as it requires specific investigations and treatment.

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This case illustrates that the diagnosis can be achieved with a combination of bacterial cultures on special mediums, specific 16s RNA PCR and histology, and that a two stages implant exchange procedure complemented by an antituberculous chemotherapy may be a suitable treatment option.

CASE PRESENTATION

An 84 years old female patient was referred to our institution in July 2014 for a suspected infection of her left hybrid THA (cemented cup, uncemented stem). The primary surgery was performed in 2012 in another institution. The post-operative period was marked by an early superficial wound infection which required a prolonged hospital stay due to the use of a vacuum assisted wound closure device and a course of intravenous (IV) antibiotics. A non-

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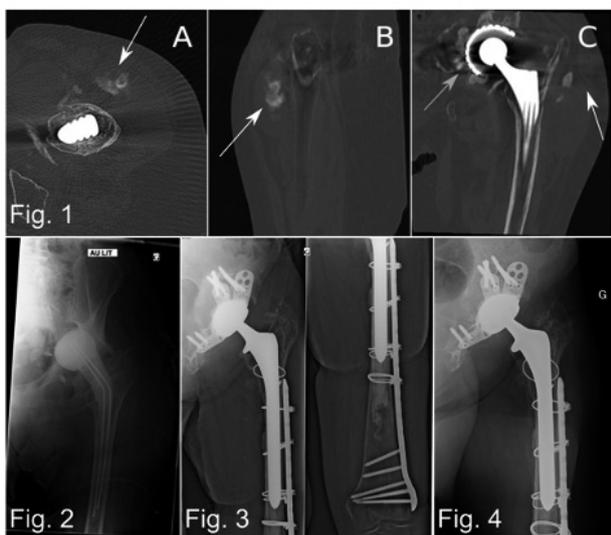


Figure 1. — Pre-operative arthro-scan. A : Axial view showing multiple collections (arrow). B : Sagittal view showing anterior collection (arrow). C : Coronal view showing acetabular defect (grey arrow) and lateral collection (white arrow).

Figure 2. — Post-operative AP X-ray following implant removal.

Figure 3. — AP post-operative X-rays.

Figure 4. — 3 years post-operative AP X-rays.

resistant *Staphylococcus aureus* was detected in the microbiological samples obtained from the wound. After wound closure was obtained, the patient was discharged and was admitted to a revalidation clinic where she continued to receive an antibiotic treatment consisting of ciprofloxacin 500mg twice daily and rifampicin 300mg once daily for 6 weeks in total.

The initial physical examination showed a closed wound, slightly swollen and painful to touch. The mobility of the hip was limited (Flexion 80°/Extension 0°, Abduction 0°/Adduction 10°, External rotation 20°/Internal rotation 10°) and Trendelenburg sign was positive.

The pre-operative workup consisted of blood tests and an arthro-CT of the hip with joint fluid aspiration which was later sent for bacteriological cultures and PCR testing.

Blood tests showed an inflammatory syndrome with a slightly elevated C-reactive protein (CRP) at 17.0 mg/L (NI value < 10mg/l), a normal white blood cell (WBC) (7.670 leucocytes/ml, 5.540

neutrophils/ml, 1.050 lymphocytes/ml) and normal platelets count (360.000/ μ L).

The CT scan showed multiple liquid collections advocating for an infectious process, but no loosening of the stem nor of the acetabular cup, as well as a Paprosky type 2C acetabular defect (Figure 1 A-C).

The articular fluid was aspirated and sent for analysis. Aerobic and anaerobic cultures remained negative and PCR aimed at gram positive and negative bacteria were also negative. Direct examination for acid-fast bacilli was negative. The cultures showed the presence of *Mycobacterium tuberculosis complex* (MTC) and 16s RNA PCR confirmed the presence of MTC sensitive to Rifampicin, Isoniazid, Pyrazinamide and Ethambutol.

Based on those results and the previous history of *Staphylococcus aureus* infection, we decided to proceed with a two-stage revision procedure with an intercurrent period of 6 weeks. The first stage surgery was uneventful. The uncemented femoral stem and cemented acetabular cup were easily removed, and a Gentamicin impregnated cement spacer was inserted (Figure 2). Afterwards, we prescribed a 9-month course of antituberculous drugs with Rifampicin 600mg once daily, Pyrazinamide 1.5g daily, Ethambutol 1.2g daily and Isoniazid 300mg once daily for 2 months followed by a 7 months course of Rifampicin and Isoniazid. The per-operative bacteriological samples taken from the deep tissues showed the same *Mycobacterium tuberculosis complex* with the same resistance profile. The histological samples showed caseous necrosis, but the acid-fast staining was negative. We observed no complications during the six weeks preceding the second stage.

The reconstruction was performed at the second stage using a cemented revision stem and an acetabular reinforcement ring. The surgery was complicated by an intra-operative fracture of the femur which required the use of a plate and of cables and a restriction concerning weight bearing (Figure 3). The per-operative samples were negative except for the ones taken on the cement spacer which were positive for *Mycobacterium tuberculosis complex* after 35 days of culture. The post-operative

period was non-complicated, and the patient was discharged to a revalidation hospital.

The patient has now been followed for three years. Her evolution has been favourable with a reduction of her pain level and gradually improved walking distances. Anti-tuberculous chemotherapy was stopped at 9-month post-op. At the three years follow-up, the patient was able to walk with ease, and her hip showed a good mobility (Flexion 100°/Extension 0°; Abduction 40°, External rotation 10°/Internal rotation 40°). Control X-rays showed no signs of implant loosening and a healed femoral fracture (Figure 4). The blood tests exhibited no abnormalities (CRP 1,0mg/dL, 6060 leucocytes/ml, 4510 neutrophils/ml, 990 lymphocytes/ml).

DISCUSSION

We reviewed the literature searching on PubMed using the terms *Mycobacterium tuberculosis*, hip prosthesis and infection, limiting the search to articles written in English, French and Spanish, and published after 1990, yielding a total of 32 articles of which 12 (1,2,4-6,8-11,15,16,18) were case reports of THA infected with MT without prior tuberculous coxitis history. A second search using the terms *Mycobacterium tuberculosis*, hip, infection, with the same sub-criteria as mentioned above, yielded 100 results from which we isolated 4 reporting 5 additional cases of THA infections involving MT without a prior history of tuberculous coxitis (3,12,14,17).

Most of the cases described (14/20) were of patients with no known history of MT infection, 4 patients had a clear history of prior MT infection and 2 were of uncertain status.

The symptoms developed between 5 weeks and 10 years after the initial surgery with most cases occurring between two and four years, and a mean time to development of symptoms of 33 months. The patients presented themselves for evaluation between 5 weeks and three years after the onset of the symptoms, demonstrating a great variability in the initial severity of the symptoms.

The diagnostic methods usually yielding a positive result were mostly culture on a specific medium (18/20). Histology and acid-fast staining were posi-

tive in 11/14 cases. Polymerase Chain Reaction was only performed in three cases and was positive for MT in each instance.

The surgical treatment strategies were extremely varied, with 6/20 patients submitted to a two-stage implant exchange, 4/20 to a Girdlestone arthroplasty, 4/20 to no surgical treatment, 3/20 to a single stage implant exchange, 2/20 to 2/20 to a simple debridement and irrigation procedure and 1/20 to an implant removal simple debridement and irrigation procedure and 1/20 to an implant removal with the use of a cement spacer without further surgery.

All patients received an antituberculous chemotherapy, but the treatment regimen and duration were extremely variable, with a treatment duration varying between 5 and 32 months of antituberculous drugs, and most of the patients being treated for 9 to 12 months.

All patients were free from infection at their last follow up with a mean of 31 months of follow-up. 2 patients were lost to follow-up after surgery, 1 patient was lost 6 months after surgery and one died 7 months after surgery.

A recent review of MT periprosthetic infections affecting the knee and hip joints (19) shows a similar trend concerning THA infections, whereas, for total knee infections, the majority of patients were treated non-surgically or with simple debridement combined with an antituberculous chemotherapy.

The treatment offered to our patient is consistent with the current literature, with a two-stage exchange and a 9-month anti-tuberculous chemotherapy. At the three years mark, the patient is still free of disease recurrence and show a marked clinical improvement from the pre-operative situation.

CONCLUSION

MT infection after THA is a rare occurrence that must be included in the differential diagnosis of long-standing symptoms. Specific diagnostic tests are required, including specific medium culture, acid-fast staining, histopathology and 16sRNA PCR, and should be asked for specifically in this setting. Surgical treatment is currently not consensual, but implant exchange or removal seems to be the

most favoured option for THA infections. A DAIR approach seems to be a suitable option in cases of TKA infections and has also been used with success in a few THA cases and should be considered for patients with a well-fixed implant and a non-resistant germ. This could be explained by the low propensity of MT to form biofilms on the surface of implants compared to Gram-positive bacteria (7). Antituberculous chemotherapy should be given for a period ranging from 9 to 12 months as it seems to give consistent results.

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