

Delayed-Onset *Mycobacterium tuberculosis* Prosthetic Joint Infection after Hip Hemiarthroplasty: A Case Report and Review of the Literature

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Abstract

Prosthetic joint infection (PJI) due to *Mycobacterium tuberculosis* (MTB) without previous history of tuberculosis is an extremely rare complication. We report the case of an 80-year-old man, with no prior history of tuberculosis. The patient underwent replacement arthroplasty and the infection was successfully treated with combination of oral anti-tuberculous drugs for one year.

Introduction

One-third of world population are infected with *Mycobacterium tuberculosis* (MTB) [1,2]. After exposure to MTB 30 % of the cases will develop latent infection, with a 5-10% lifetime risk of progression to active tuberculosis (TB) [2,3]. Extrapulmonary TB is observed in about 20% of the total cases. Although pulmonary and extrapulmonary tuberculosis cases have both decreased during the last years, extrapulmonary disease has increased as a proportion of the total. Among extrapulmonary cases approximately 10% represents bone and joint infections, with peripheral arthritis being responsible for 30% of osteoarticular TB [2,4,5]. Usually a single joint is involved, with the hip joint being the most common [5].

Prosthetic joint infection (PJI) due to MTB with no previous history of pulmonary or extra pulmonary TB is an extremely rare complication. Only 30 cases have been reported in the literature [5-25]. PJI due to MTB is caused by reactivation of a dormant nidus of infection or by haematogenous dissemination of MTB and is usually presented with clinical findings of an infected, painful and malfunctioning prosthesis [16].

Diagnosis is often delayed due to lack of TB history, while optimal treatment remains unclear as literature is based only on few case reports [5-25].

We report the case of a patient with MTB PJI complicating a hip hemiarthroplasty, 13 months after surgery for subtrochanteric fracture, with no previous TB history. Treatment with removal and replacement of the artificial joint and medical with adequate anti TB drugs led to full recovery.

Case report

An 80-year-old man had sustained a left hip fracture. Hip hemiarthroplasty was performed. No features suggesting acute joint infection were noted intra-operatively. Preoperative chest radiograph did not reveal TB suggestive findings neither TB history nor MTB contacts were known.

The post-operative period was uneventful. Thirteen months after surgery, the patient was re-admitted to the hospital with excruciating pain and limitation of movement of the left hip. No fever or swelling around the hip has been noted on admission. Chest radiograph was normal without any sign of previous MTB infection. Blood investigations demonstrated white blood cells (WBC): 8.2 K/ μ l, erythrocyte sedimentation rate (ESR): 90 mm/hr, C-reactive protein (CRP): 8.69 mg/dl, hematocrit (Hct): 33.6 % and hemoglobin (HGB):

11.1 g/dl. The gram stain from the aspirated synovial fluid and tissue were both negative. Computed tomography and bone scan were also negative. The aspirated synovium fluid cultured on Löwenstein-Jensen medium grew MTB 28 days after inoculation.

The patient has been treated initially with removal and replacement of the artificial joint. After synovial cultures were available the patient has been commenced on a combination of four antituberculous agents (rifampicin 600mg o.d., isoniazid 300 mg o.d., ethambutol 1000 mg o.d., pyrazinamide 2 g o.d.), for the first two months and then he continued with two drugs (rifampicin 600 mg o.d., with isoniazid 300 mg o.d.), for a total year. At post operative follow-up the CRP level returned to normal within three months time, while the pain totally disappeared and the patient regained mobility of the hip joint. Two years after the last surgery, no evidence of TB recurrence was observed during his regular follow-up exams.

Discussion

A rare case of a delayed-onset PJI due to MTB in an 80-year-old patient with no prior history of TB successfully treated with replacement arthroplasty and a combination of anti-TB drugs is described.

Osteoarticular TB is observed in about 10% of the cases of extrapulmonary disease [2,4]. Usually a single joint is involved with the hip being the most common [5]. However, PJI due to MTB in patients without previous TB is an extremely rare complication [5]. There are only 30 cases reported in literature of MTB prosthetic joint infection with no previous history of tuberculosis [5-25]. Fifteen of these cases (50%) refer to total hip replacement (Table 1). It is of note that in a study of 2116 episodes of PJI over a period of 22 years, only 0.3% was due to MTB [5]. Infection of the prosthetic joint may occur not

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Case	Author (Reference),Year	Age, years/sex	Joint	Time from Arthroplasty to Joint Infection	Medical Therapy And Duration (months)	Surgery	Follow-up	Outcome
1	Baldini et al. [2]	ND	Hip	1,7 years	NA	Resection Arthroplasty	4 months	Recovered
2	Al-Shaikh et al. [3]	ND	Knee	8 months	INH, RIF, PZA (12), EMB (9)	Arthrodesis	1 year	Recovered
3	Berberi et al. [4]	ND	Hip	30 years	INH (19), RIF (1), EMB (19)	Resection Arthroplasty	10 years	Recovered
4	Berberi et al. [4]	ND	Hip	23 years	INH, EMB (16)	Resection Arthroplasty	8 years	Recovered
5	Berberi et al. [4]	ND	Hip	10 years	INH, RIF (15)	Staged exchange	7 years	Recovered
6	Boeri et al. [5]	59/W	Hip	24 months	INH, RIF (13), EMB, PZA(4)	No surgery	6 years	Recovered
7	Bryan et al. [6]	72/W	Knee	8 years	INH, RIF, EMB (24)	Arthrodesis	3 years	Recovered
8	Fernandez-Valencia et al. [7]	ND	Hip	6 months	INH, RIF (12), EMB (3 m)	Resection Arthroplasty	6 years	Recovered
9	Kreder et al. [8]	66/W	Hip	4 years	INH, EMB, PZA (9)	Acetabulum Revised	18 months	Recovered
10	Levin et al. [9]	ND	Hip	4 years	STM (3.5), INH, RIF (36)	Resection Arthroplasty	2.5 years	Recovered
11	Lusk et al. [10]	ND	Knee	15 years	INH, EMB, PZA (6)	Resection Arthroplasty	6 months	Recovered
12	Marmor et al. [11]	66/W	Knee	3 months	INH, RIF, PZA (6)	Revision Arthroplasty	7 years	Recovered
13	Marmor et al. [11]	66/M	Knee	2 months	INH, RIF, PZA (6)	Revision Arthroplasty	5 years	Recovered
14	Marmor et al. [11]	77/W	Knee	4 months	INH, EMB, PZA (8)	Debridement	18 months	Recovered
15	McCullough et al. [12]	ND	Hip	7.8 years	STM(2), INH, RIF(18)	Debridement	6 months	Recovered
16	Spinner et al. [13]	70/W	Knee	4 years	INH, EMB, PZA (9)	Debridement	2.5 years	Recovered
17	Tokumoto et al. [14]	ND	Hip	38 years	INH, RIF (12)	Arthrodesis	2 years	Recovered
18	Tokumoto et al. [14]	ND	Knee	1.7 years	INH, EMB (18)	Debridement	8 years	Recovered
19	Ueng et al. [15]	ND	Hip	1.5 years	INH, RIF, EMB (24)	Staged Exchange	3 years	Recovered
20	Ueng et al. [15]	ND	Hip	14 years	INH, RIF, EMB (12)	Resection Arthroplasty	2 years	Recovered
21	Wolfgang et al. [16]	61/M	Knee	1 year	INH, RIF (24)	Staged Exchange	12 months	Recovered
22	Zeiger et al. [18]	40/W	Knee	4 years	NA	Resection Arthroplasty	Not supplied	Recovered
23	Shanbhag et al. [19]	59/W	Hip	14 months	RIF, EMB, PYR, PZA (12)	No surgery	18 months	Recovered
24	Lee et al. [20]	79/W	Knee	2 months	RIF, INH, EMB (12)	No surgery	13 months	Recovered
25	Carrega et al. [24]	72/W	Knee	NA	RIF, INH, EMB (12)	No surgery	12 months	Recovered
24	Carrega et al. [24]	79/W	Hip	1 month	RIF, INH, EMB (5)	No surgery	12 months	Recovered
24	Carrega et al. [24]	92/W	Hip	NA	RIF, INH, EMB (9)	No surgery	13 months	Recovered
24	Carrega et al. [24]	80/W	Knee	2 months	RIF, INH, EMB (12)	Debridement	6 months	Recovered
24	Mete et al. [20]	32/W	Knee	NA	RIF, INH, EMB, PZA (12)	Revision Arthroplasty	12 months	Recovered

NA: not available, RIF: rifampicin, INH: isoniazid, EMB: ethambutol PZA: pyrazinamide

Table 1: Treatment and outcome of knee and hip prosthetic joint infections infected with *Mycobacterium tuberculosis*.

only during surgery, but also during the entire lifetime of the implant. Both early (less than 3 months after surgery) as well as delayed-onset (3 to 24 months after surgery) infections are usually acquired during implantation of the prosthesis, while late infections (more than 24 months) are predominantly acquired by hematogenous route [26]. Trauma or tissue injury around the prosthesis is probably the reason for reactivation of a dormant nidus of inactive infection [16]. The present patient presented the MTB PJI thirteen months after surgery. However, the pathophysiology of the present case remains unclear.

The majority of the cases existing in the literature describe patients with late-onset MTB joint infection with painful, malfunctioning prostheses. Hence, as in the present case prosthesis removal had been required for cure [5-9,11,12,15-19,21,24,25]. Osteoarticular TB is difficult to diagnose. Identification of MTB is essential for the diagnosis. Acid-fast stains of the joint fluid are positive in 20-25% of the cases, while cultures are positive in approximately 60 to 80%; histological features are non specific [2,27].

The optimal management of PJI due to MTB remains unclear. Pulmonary and extrapulmonary MTB infections typically require treatment with multiple antimicrobials for 6-9 months to avoid re-emergence of the disease [2]. The pathophysiology for the need of such an extended treatment remains unclear as antimicrobials kill MTB during the first 14 days of treatment [2]. Biofilm formation could provide an explanation for persistent infection and/ or resistance. In this context PJI due to MTB may require more prolonged treatment than other sites of pulmonary and extrapulmonary infection [28]. However, data are lacking as literature is based only on few case reports [5-25].

The main goal of treatment is the retention of the prosthesis and this can be possible when the infection is diagnosed early, within 6 weeks of arthroplasty [26]. However, of a total of 30 cases with PJI due to MTB only 3 have been diagnosed within the first 3 months after surgery [14,23]. In the majority of cases, especially in patients with late onset of MTB PJI, surgical removal of all infected tissues and implants,

in combination with a long-term anti-TB therapy, was often required [5,16,17,23-25].

Identifying and subsequently treating with isoniazid individuals with latent tuberculosis infection reduces the risk of future disease by 75-90%, although existing screening tests are lacking sensitivity. In patients with history of previous TB, cured or latent, some investigators have suggested the administration of anti TB treatment with isoniazid for 2 to 3 weeks before and 3 weeks after the operation [29].

Since the number of patients aged > 65 is on the rise in industrialized countries and the number of patients requiring orthopaedic implants and implant-related infections will continue to grow, new preventive strategies should be developed to include TB screening and treatment. In this context we do believe that clinicians should consider screening their patients at risk for latent TB, pre-perioperatively and treat individuals with latent disease accordingly.

In conclusion, the present case indicates that TB should always be included in the differential diagnosis of PJI, especially in cases with negative cultures, as early diagnosis and appropriate treatment could decrease morbidity and health care costs. Furthermore, screening and treatment strategies should be developed as the population at risk for implant infections will continue to grow.

References

1. WHO. Global Tuberculosis control 2012.
2. Fitzgerald DW, Sterling TR, Haas DW. *Mycobacterium tuberculosis*. In Mandell, Douglas, Bennett's Principles and Practice of Infectious Diseases, 7th ed. Philadelphia: Elsevier Churchill Livingstone, 2010;3129-3163
3. Grzybowski S, Barnett GD, Styblo K (1975) Contacts of cases of active pulmonary tuberculosis. Bull Int Union Tuberc 50: 90-106.
4. Peto HM, Pratt RH, Harrington TA, LoBue PA, Armstrong LR (2009) Epidemiology of extrapulmonary tuberculosis in the United States, 1993-2006. Clin Infect Dis 49: 1350-1357.
5. Barbari EF, Hanssen AD, Duffy MC, Steckelberg JM, Osmon DR (1998) Prosthetic joint infection due to *Mycobacterium tuberculosis*: a case series and review of the literature. Am J Orthop (Belle Mead NJ) 27: 219-227.
6. Baldini N, Toni A, Gregg T, Giunti A (1988) Deep sepsis from *Mycobacterium tuberculosis* after total hip replacement. Case report. Arch Orthop Trauma Surg 107: 186-188.
7. Al-Shaikh R, Goodman SB (2003) Delayed-onset *Mycobacterium tuberculosis* infection with staphylococcal superinfection after total knee replacement. Am J Orthop (Belle Mead NJ) 32: 302-305.
8. Boéri C, Gaudias J, Jenny JY (2003) [Total hip replacement prosthesis infected by *Mycobacterium tuberculosis*]. Rev Chir Orthop Reparatrice Appar Mot 89: 163-166.
9. Bryan WJ, Doherty JH Jr, Sculco TP (1982) Tuberculosis in a rheumatoid patient. A case report. Clin Orthop Relat Res : 206-208.
10. Fernández-Valencia JA, García S, Riba J (2003) Presumptive infection of a total hip prosthesis by *Mycobacterium tuberculosis*: a case report. Acta Orthop Belg 69: 193-196.
11. Kreder HJ, Davey JR (1996) Total hip arthroplasty complicated by tuberculous infection. J Arthroplasty 11: 111-114.
12. Levin ML (1985) Miliary tuberculosis masquerading as late infection in total hip replacement. Md Med J 34: 153-155.
13. Lusk RH, Wienke EC, Milligan TW, Albus TE (1995) Tuberculous and foreign-body granulomatous reactions involving a total knee prosthesis. Arthritis Rheum 38: 1325-1327.
14. Marmor M, Parnes N, Dekel S (2004) Tuberculosis infection complicating total knee arthroplasty: report of 3 cases and review of the literature. J Arthroplasty 19: 397-400.
15. McCullough CJ (1977) Tuberculosis as a late complication of total hip replacement. Acta Orthop Scand 48: 508-510.
16. Spinner RJ, Sexton DJ, Goldner RD, Levin LS (1996) Periprosthetic infections due to *Mycobacterium tuberculosis* in patients with no prior history of tuberculosis. J Arthroplasty 11: 217-222.
17. Tokumoto JI, Follansbee SE, Jacobs RA (1995) Prosthetic joint infection due to *Mycobacterium tuberculosis*: report of three cases. Clin Infect Dis 21: 134-136.
18. Ueng WN, Shih CH, Hseuh S (1995) Pulmonary tuberculosis as a source of infection after total hip arthroplasty. A report of two cases. Int Orthop 19: 55-59.
19. Wolfgang GL (1985) Tuberculosis joint infection following total knee arthroplasty. Clin Orthop Relat Res : 162-166.
20. Wray CC, Roy S (1987) Arthroplasty in tuberculosis of the knee. Two cases of missed diagnosis. Acta Orthop Scand 58: 296-298.
21. Zeiger LS, Watters W, Sherk H (1984) Scintigraphic detection of prosthetic joint and soft tissue sepsis secondary to tuberculosis. Clin Nucl Med 9: 638-639.
22. Shanbhag V, Kotwal R, Gaitonde A, Singhal K (2007) Total hip replacement infected with *Mycobacterium tuberculosis*. A case report with review of literature. Acta Orthop Belg 73: 268-274.
23. Lee CL, Wei YS, Ho YJ, Lee CH (2009) Postoperative *Mycobacterium tuberculosis* infection after total knee arthroplasty. Knee 16: 87-89.
24. Carrega G, Bartolacci V, Burastero G, Finocchio GC, Ronca A, et al. (2013) Prosthetic joint infections due to *Mycobacterium tuberculosis*: A report of 5 cases. Int J Surg Case Rep 4: 178-181.
25. Bilgul Mete, Mucahit Yemisen, Selda Aydin, Muharrem Babacan, Resat Ozaras, et al. (2012) An unusual cause of prosthetic joint infection: *Mycobacterium tuberculosis*. J Microbiol Infect Dis 2: 72-75
26. Zimmerli W, Trampuz A, Ochsner PE (2004) Prosthetic-joint infections. N Engl J Med 351: 1645-1654.
27. Erdem H, Baylan O, Simsek I, Dinc A, Pay S, et al. (2005) Delayed diagnosis of tuberculous arthritis. Jpn J Infect Dis 58: 373-375.
28. Ojha AK, Baughn AD, Sambandan D, Hsu T, Trivelli X, et al. (2008) Growth of *Mycobacterium tuberculosis* biofilms containing free mycolic acids and harbouring drug-tolerant bacteria. Mol Microbiol 69: 164-174.
29. Eskola A, Santavirta S, Kontinen YT, Tallroth K, Lindholm ST (1988) Arthroplasty for old tuberculosis of the knee. J Bone Joint Surg Br 70: 767-769.