



Delayed periprosthetic tuberculosis after total knee replacement : Is conservative treatment possible ?

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Tuberculosis of a prosthetic knee joint is rare. Early diagnosis would improve the outcome, but this is usually not achieved. We report the case of a 73-year-old woman who presented with a painful and swollen knee joint, 14 years after total knee arthroplasty. Radiographs and haematological investigations were inconclusive. Synovial tissue and pus obtained by needle biopsy did not reveal any microorganism on smear examination nor in culture. A diagnosis of tuberculosis was made on the basis of a positive polymerase chain reaction. The patient made a complete recovery following brace immobilization for 3 weeks and administration of anti-tubercular drugs for 18 months. There was no recurrence after a follow-up period of 3 years. Awareness of delayed tuberculosis as an important differential diagnosis in infected prosthetic joints helps to avoid delay in management. The authors found 23 other cases of periprosthetic tuberculosis after total knee or hip replacement. Their case is probably the only periprosthetic knee tuberculosis in the literature which healed with medication only. This shows that conservative treatment is possible when there is no loosening of the implant. However, surgical treatment is necessary in most cases and must be individualized.

Keywords : prosthetic joint ; tuberculosis ; treatment.

INTRODUCTION

Tuberculosis (TB) is now one of the most challenging health problems, due to global spread of HIV and emergence of drug resistant strains of

Mycobacterium tuberculosis. Should tuberculosis infection occur in a joint that has undergone prosthetic arthroplasty, early detection and adequate treatment is essential to avoid revision arthroplasty, particularly in the developing countries, considering the socio-economic constraints.

CASE REPORT

A 73-year-old woman presented with pain and diffuse swelling of the right knee since two months, 14 years after total knee replacement (TKR) for osteoarthritis. The pain was insidious in onset, increased by walking, and relieved by rest. Swelling and inability to bear weight subsequently appeared. There was no history of trauma, fever, loss of appetite, weight loss, previous septic arthritis, pulmonary or extrapulmonary TB. Clinical examination showed diffuse swelling, redness and a midline scar of 10 cm, healed by primary intention (fig 1).

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Fig. 1. — Swollen right knee at presentation in February 2005.



Fig. 3. — Right knee 3 years after treatment with tuberculostatic drugs.



Fig. 2. — AP and lateral radiographs of the right knee showing periprosthetic osteopenia without evidence of loosening.

The swelling was tense, and cystic in consistency, with little local heat. Both flexion (0-60°) and extension were painful. There was no ligamentous instability. The left knee, spine and other joints were normal. Blood tests were within normal limits, except for an erythrocyte sedimentation rate of 40 mm/hr. Plain radiographs (fig 2) showed periprosthetic osteopenia, but absence of loosening. MRI was impossible because of the presence of the

prosthesis. Chest radiographs were normal. The Mantoux test showed an induration, 13 mm in diameter. On closed core biopsy about 100 ml of thick pus was aspirated and cheesy synovial tissue was obtained. Pus and synovial tissue were sent for staining and culturing for bacteria, fungi and *Mycobacterium tuberculosis* (MTB): all examinations were negative. Histopathological examination of the synovial tissue showed epithelioid granulomas with caseation, consistent with tuberculosis. Polymerase Chain Reaction (PCR) (Myco -3 DNA) on the synovial tissue confirmed the diagnosis of TB.

Anti-tubercular drugs (ATD) were started: rifampicin (R), isoniazid (I), ethambutol (E) and pyrizinamide (P) for 4 months, followed by three drugs (R, I, P) for 3 months, and two drugs (R, I) for eleven months, which is the standard regimen in our institution. The right knee was immobilized for 3 weeks in a knee brace. The patient made a complete recovery (fig 3) with a good painless range of movement (0 to 90°) and without any radiological deterioration (fig 4). There was no recurrence after a follow-up period of 3 years.

DISCUSSION

Total hip replacement has an infection rate of less than 1%, and total knee replacement of 0.5 to 2% (9).



Fig. 4. — AP and lateral radiographs of the right knee, 3 years after antituberculous medication.

TB in a prosthetic joint without any prior history of TB is rare, with only 24 cases reported (table I). *Mycobacterium tuberculosis* can involve a prosthesis site by haematogenous spread from a reactivated latent distant focus, or by local reactivation of dormant bacteria in a previously exposed individual (16). Reactivation of TB may occur as a result of decreased immunity due to poor nutrition, old age, systemic diseases (diabetes), steroids, chemotherapy or HIV (9). Local trauma to periprosthetic tissue and mechanical grinding of synovial tissue may lead to breakdown of old TB granulomas and subsequent reactivation of tuberculosis (9). The time interval between onset of symptoms and diagnosis in cases of TB in joint replacements has ranged from 5 weeks to 2 years (1). Local pain and joint swelling are the two most common presenting features of prosthetic tubercular infection (13). A documented prior TB infection involving another system should raise clinical suspicion of similar infection in a prosthetic joint (9). However only about half of the patients have such a prior history, and less than 30% have abnormal chest radiographs (1). ESR is usually elevated but is non-

specific (6). Radiological changes are also slow to develop and are non-specific (6). Diagnostic tests for TB are not very sensitive and multiple specimens may be necessary (1). Stained smears of synovial fluid are positive in only 10% of the cases; the same is true for synovial tissue (20%) and bone (10%); cultures are found positive in 30 to 60 % of the cases (18). Histopathology may reveal MTB or simply an epithelioid granuloma with or without central caseation, however without certainty for TB (18). ELISA and PCR are faster than Loewenstein cultures, which take 3 to 8 weeks (18). The combination of direct smear, culture and histopathology may confirm the diagnosis in more than 90% of the cases (6). PCR on joint tissue appears promising in the early diagnosis of tuberculous arthritis, and is very sensitive.

Treatment of prosthetic TB varies among surgeons. The small number of cases in the literature does not allow for generalizations (table I). Medical treatment with ATD varies as to duration (6 months to 36 months) and choice of drugs (2-4 drugs) (table I). Nearly all the reported cases of tubercular prosthetic infection required surgical treatment ranging from débridement, removal of prosthesis followed by arthrodesis, or resection arthroplasty, to revision arthroplasty (16). Little research has been performed regarding the use of cement impregnated with ATD. Khater *et al* (9) have implanted vancomycin and rifampicin-loaded beads after prosthesis removal, but the risk of drug toxicity and poor elution of these drugs preclude their use until further research is performed (13).

The periprosthetic tuberculous knee infection reported here is apparently the only one in the literature in which cure was achieved with medication only.

One can conclude that the surgeon should be aware of tuberculosis as an important differential diagnosis in infected prosthetic joints, in order to avoid delay in management. Smear, culture, histopathological examination and PCR will establish the diagnosis in most cases. Patients without loosening of the implant can be managed with ATD alone. Surgical treatment has to be individualized, particularly in the developing countries due to the socio-economic restraints.

Table I. — Late onset of periprosthetic tuberculosis after total knee or hip replacement. Review of the literature

Author	Joint	Age /Sex	Time elapsed	Clinical picture	Anti-tubercular drugs & duration (months)	Treatment	Follow-up	Outcome
McCullough 1977 (14)	Hip	70/F	7.8y	Pain, sinus, discharge	S (2), I,R (18)	Débridement	6 m	Good
Bryan <i>et al</i> 1980 (5)	Knee	72/F	8y	Pain , swelling	I,E,R (24)	Arthrodesis	3y	Good
Zeiger <i>et al</i> 1984 (20)	Knee	40/F	4y	NS	NS	Resection arthroplasty	NS	NS
Wolfgang <i>et al</i> 1985 (19)	Knee	62/M	1y	Pain, swelling	I,R (24)	Staged exchange	12 m	Good
Levin 1985 (11)	Hip	81/F	4y	Tenderness	S (3.5), I,R (36)	Resection arthroplasty	2.5 m	Good
Baldini <i>et al</i> 1988 (2)	Hip	61/M	1.7y	Sinus	NS	Resection arthroplasty	4 m	NS
Tokumoto <i>et al</i> 1995 (17)	Knee	71/F	1.7y	Pain, swelling	I,E (18)	Débridement	8 y	Good
Tokumato <i>et al</i> 1995 (17)	Hip	72/F	38y	Spontaneous drainage	I,R (12)	Arthrodesis	2 y	Good
Lusk <i>et al</i> 1995 (12)	Knee	75/F	15y	Pain, swelling	I,E,P (6)	Resection arthroplasty	6 m	Died
Spinner <i>et al</i> 1996 (16)	Knee	70/F	6y	Fever, purulent discharge	I,E,P (9)	Débridement	2.5y	Good
Kreder <i>et al</i> 1996 (10)	Hip	66/F	4y	Pain	I,E,P (9)	Acetabulum revised	18 m	Good
Berbari <i>et al</i> 1998 (3)	Hip	52/F	10y	Pain, sinus	I,R (15)	Staged exchange	7 y	Good
Berbari <i>et al</i> 1998 (3)	Hip	44/F	23y	Pain, sinus	I,E (16)	Resection arthroplasty	8 y	Good
Berbari <i>et al</i> 1998 (3)	Hip	60/M	30y	Pain, sinus	R(1), I,E (19)	Resection arthroplasty	10 y	Good
Al-Shaikh <i>et al</i> (1)	Knee	73/F	8 m	Pain, swelling	I,R,P (12) E	Arthrodesis	1 y	Good
Boéri <i>et al</i> 2003 (4)	Hip	55/F	2 y	Pain, sinuses.	I,R (17), E,P (4)	After 3 revisions : medical treatment.	6 y	Good
Fernández-Valencia <i>et al</i> 2003 (7)	Hip	78/M	6 m	Septic loosening	I,R (12) E(3)	Resection arthroplasty	6 y	Good
Marmor <i>et al</i> 2004 (13)	Knee	77/F	4 m	Pain, swelling	I,E,P (8)	Débridement	18 m	Good
Marmor <i>et al</i> 2004 (13)	Knee	66/M	2 m	Pain, swelling	I,R,P (6)	Revision arthroplasty	5 y	Good
Marmor <i>et al</i> 2004 (13)	Knee	65/F	3 m	Pain, swelling	I,R,P (6)	Revision arthroplasty	7 y	Good
Kaya <i>et al</i> 2006 (8)	Hip	72/F	9 y	Swelling, discharge	I,E,P (NS)	Resection arthroplasty	NS	NS
Khater <i>et al</i> 2007 (9)	Knee	75/F	3 m	Discharge	I,E (18), R,P (NS)	Resection arthroplasty	NS	NS
Shanbhag <i>et al</i> 2007 (15)	Hip	59/F	15 m	Pain, swelling	R,E,P (12)	Débridement	18 m	Good
Current case	Knee	73/F	14 y	Pain, swelling	I,R (12), E,P (4)	Medication only	3 y	Good

E – Ethambutol ; I – Isoniazid ; P – Pyrazinamide ; R – Rifampicin ; S – Streptomycin ; M - Male ; F – Female ; m – months ; y – years ; NS – not specified.

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