The results of primary total knee replacement performed on a group of haemophiliac patients in a single institution by the same surgeon using the same surgical technique and prosthesis are reported.

A total of 35 primary replacements in 30 patients were carried out between 1996 and 2005 and were reviewed retrospectively. The mean age of the patients was 31 years (24 to 42) and the mean follow-up was for 7.5 years (1 to 10). There were 25 patients with haemophilia A and five with haemophilia B. The HIV status and CD4 count were recorded, and Knee Society scores determined. Two patients had inhibitors to the deficient coagulation factor.

There were no early wound infections and only one late deep infection which required a two-stage revision arthroplasty, with a good final result. The incidence of infection in HIV-positive and negative patients was thus similar. One knee in a patient with inhibitor had excessive bleeding due to a pseudoaneurysm which required embolisation. The results were excellent in 27 knees (77%), good in six (17%) and fair in two (6%). The survival rate at 7.5 years taking removal of the prosthesis for loosening or infection as the end-point was 97%.

The mechanical survival of total knee replacements in haemophiliacs is very good. Our results confirm that this is a reproducible procedure in haemophilia, even in HIV-positive patients with a CD4 count > 200 mm$^3$ and those with inhibitors. Our rate of infection was lower than previously reported. This could be due to better control of the HIV status with highly active anti-retroviral therapy and the use of antibiotic-loaded cement.

The knee is the most commonly involved joint in haemophilia. In end-stage disease, chronic synovitis causes haemophilic arthropathy.$^{1,3}$ Severe pain, impaired function and restricted movement are the usual indications for total knee replacement (TKR) in such patients.

Although good short-term results are available,$^{4,10}$ few studies have involved a mean follow-up of more than five years.$^{10-16}$ Although the results of TKR in these patients were favourable,$^{4,6,7,9,14-18}$ many authors found a high rate of complications, often related to infection and stiffness.$^{5,6,13,14,19-21}$

This study evaluates the medium-term results of primary TKR in a group of haemophiliacs treated at a single institution by one surgeon using the same surgical technique and prosthesis.

**Patients and Methods**

Between January 1996 and December 2005, 35 primary TKRs were performed in 30 patients. The mean age at the time of surgery was 31 years (24 to 42) and the mean follow-up was for 7.5 years (1 to 10). A total of 25 patients (83.4%) had haemophilia A and five had haemophilia B (16.6%). In addition, 19 (63.3%) were HIV positive and their mean pre-operative CD4 count was 450 cells/mm$^3$ (42 to 1230). Two patients (6.6%) had inhibitors against clotting factor.

After medical and haematological evaluation, clotting factor was infused pre-operatively until a minimum level of 100% of normal was achieved. This level was maintained at 60% for 14 days after operation. Further replacement was infused to obtain a level of 30% before rehabilitation sessions for eight to ten weeks. Factor concentrates were used post-operatively for up to ten weeks.

Patients with inhibitors were managed with recombinant factor VII (rFVIIa) or factor VIII inhibitor bypassing agent (FEIBA). FEIBA was started at 100 Iu/kg, followed by a second dose of 50 Iu/kg after six hours, continuing with 50 Iu/kg every 12 hours for a total of 40
The doses of rFVIIa were 240 µg/kg every two hours for a total of 300 doses.

The operations were undertaken in a standard operating theatre under tourniquet control and using a standard technique. Precautions recommended by the Centers for Disease Control for prevention and transmission of HIV or hepatitis C to healthcare personnel were followed. The prosthesis which was used was a posterior-stabilised NexGen (Zimmer, Warsaw, Indiana) total knee replacement in all cases, using antibiotic-loaded cement for all components. Drains were used in all cases, and antibiotic prophylaxis administered for two days. Chemical antithrombotic prophylaxis was not used.

Intensive rehabilitation was started on the third post-operative day and continued twice daily while the patient was in hospital. After discharge, rehabilitation was continued for five days a week for between six and eight weeks. Clinical evaluation was according to the Knee Society.

**Results**

An early acute haemarthrosis occurred in one patient with an inhibitor. This was due to a pseudoaneurysm of a geniculate artery and was treated successfully by embolisation.

The mean flexion contracture of the knee improved from 20˚ (0˚ to 40˚) pre-operatively to 10˚ (0˚ to 30˚) at the latest follow-up. The mean total arc of flexion improved from 60˚ (10˚ to 120˚) pre-operatively to 75˚ (30˚ to 120˚) in the early post-operative period and to 75˚ (0˚ to 125˚) at the latest follow-up. No knee required manipulation after operation.

There were no early post-operative infections. One knee (3%) required removal of a component because of staphylococcal infection four years after operation.

The mean CD4 count at the time of surgery in this HIV-positive patient was similar to that in the 18 HIV-positive patients in whom an infection did not develop (435 cells/mm³, com-

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*Fig. 1a* Anteroposterior and *Fig. 1b* lateral views before revision showing osteolysis; *Fig. 1c* anteroposterior view showing articulated antibiotic-loaded spacer. After six weeks with the spacer a rotational hinge prosthesis was implanted, with satisfactory results, and *Fig. 1d* lateral view six months after the second stage of the revision procedure.

*Fig. 2a* Anteroposterior and *Fig. 2b* lateral views at seven years. Although the patient was asymptomatic, there were areas of radiolucency under the tibial component and in front of the anterior aspect of the femoral component.

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**Infected left total knee replacement in a 38-year-old HIV positive/HCV positive haemophiliac patient, two years post-operatively. A two-stage revision arthroplasty with an articulated spacer and a rotational hinge prosthesis was performed, with satisfactory short-term results.**

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**Left total knee replacement in a 41-year-old haemophiliac patient. Note the severe degree of arthropathy. The outcome at seven years follow-up was excellent. Radiographs showing a) the anteroposterior and b) the lateral pre-operative view, c) anteroposterior and d) lateral view at seven years.**
pared with 450 cells/mm³). This patient was managed successfully by a two-stage revision arthroplasty (Fig. 1).

The survival rate at 7.5 years of the knee replacements, with component removal as the end-point, was 97%. The mean clinical score was 80.5 points (55 to 95). The outcome as assessed by the Knee Society Score was excellent (Fig. 2) in 27 knees (77%), good in six and fair in two (6%).

**Discussion**

The results of TKR in patients with haemophilia have varied considerably, with the incidence of infection ranging from 0% to 17%, and a rate of survival of the prosthesis of 90% after five years. When component removal, survival free of infection, and mechanical failure were considered as the end-points, the ten-year survival rates were 83%, 77% and 96%, respectively. This variability could be explained by data from many surgeons and centres.

Late infection is the main concern after joint arthroplasty in patients with haemophilia. In a recent study the incidence of infection was 16%, but in the present study it was 3%, similar to the 1% to 2% seen after TKR in non-haemophiliacs. It is unclear whether our use of antibiotic-loaded cement was of benefit.

The Knee Society scores indicated suboptimal knee movement because of fibrosis, but demonstrated excellent pain control. Despite restricted movement, 94% of the patients (33 knees) had excellent or good function, which is similar to the 97% reported by Silva and Luck, despite a higher rate of infection.

The survival rates of TKR, with revision as the end-point, are reported to be 91% and above in non-haemophiliac patients. Despite the anatomical challenges, this study indicates that the survival rate in haemophiliac patients (97% at 7.5 years) is equivalent to that in unaffected patients and better than in other series.

The improvements in quality of life after TKR in haemophilia are substantial but must be weighed against the risks of operation. Our results confirm that TKR is a reproducible procedure in haemophilia, even in HIV-positive patients, with CD4 counts > 200 mm³ and patients with inhibitors. Our low rate of infection may be related to better control of HIV status with highly active antiretroviral therapy.

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**References**


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