

Fracture of the knee endoprosthesis

Report of three cases of tibial component failure

Three cases of total knee replacement, in which the polyethylene tibial component was fractured, are presented. Two were Attenborough prostheses and the third was a Townley prosthesis. In all cases there were radiographic signs of loosening before the fracture occurred. They were all successfully reoperated with an arthrodesis, using the long Küntscher nail technique.

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Failure of high density polyethylene prosthetic components has been described in both the hip and the knee joint (Charnley 1979, Knutson et al. 1981). Fatigue fractures of the metallic femoral stem are well-known complications, especially earlier when stainless steel was used (Wroblewsky 1982). Fracture of the acetabular cup has been reported in a few cases (Salvati et al. 1979, Collins et al. 1982), but to our knowledge this complication has not been described in knee endoprostheses.

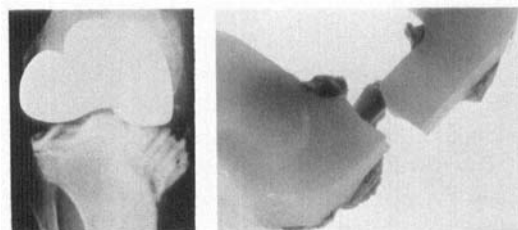
Three cases are presented in which the tibial plateau fractured: one Townley and two Attenborough prostheses.

Case reports

Case 1

A 78-year-old man, who had long-standing pain in both knees associated with medial arthrosis, was operated in April 1981 with an Attenborough prosthesis in his right knee and in June 1982 with a Townley prosthesis in his left knee. Three weeks after the latter operation, a hematoma was evacuated from the incision. The knee was immobilized, systemic antibiotics were given, and the wound then healed.

At 6-7 months, the patient experienced increasing pain in the left knee on weight-bearing. Radiography revealed bone resorption under the medial part of the tibial component. A revision was planned, but at 9 months there was an almost total resorption of the medial tibial condyle. The tibial component had tilted in a varus position. There was also resorption under the patellar component. The erythrocyte sedimentation rate was 43 mm/h. Cultures from joint aspiration and needle biopsy were negative.



A

B

1. The Townley prosthesis in Case 1.

A. The tibial component has loosened and is tilted in varus and the medial tibial condyle is eroded and fractured.

B. The extracted tibial component had fractured in the linkage between the lateral and the medial plateau.

The prosthesis was extracted at 12 months; the tibial component was found to be broken in the mid-portion (Figure 1). Under the tibial component, the medial tibial condyle was eroded and filled with granulation tissue. The femoral component was loose with bone erosions, especially medially. Five bacterial cultures from the granulation tissue were negative. An arthrodesis was performed with a 14 mm Küntscher nail (Knutson & Lidgren 1982), and the defect in the medial tibial condyle was replaced by cancellous bone. Two months postoperatively there was callus in the arthrodesis and the patient was fully weight-bearing.

Case 2

A 61-year-old woman who had long-standing knee pain with lateral gonarthrosis was operated in May 1979 on her right knee with an Attenborough prosthesis. The prosthesis was slightly overcorrected into varus. The patient was never free from pain postoperatively and had increasing pain on weight-bearing.

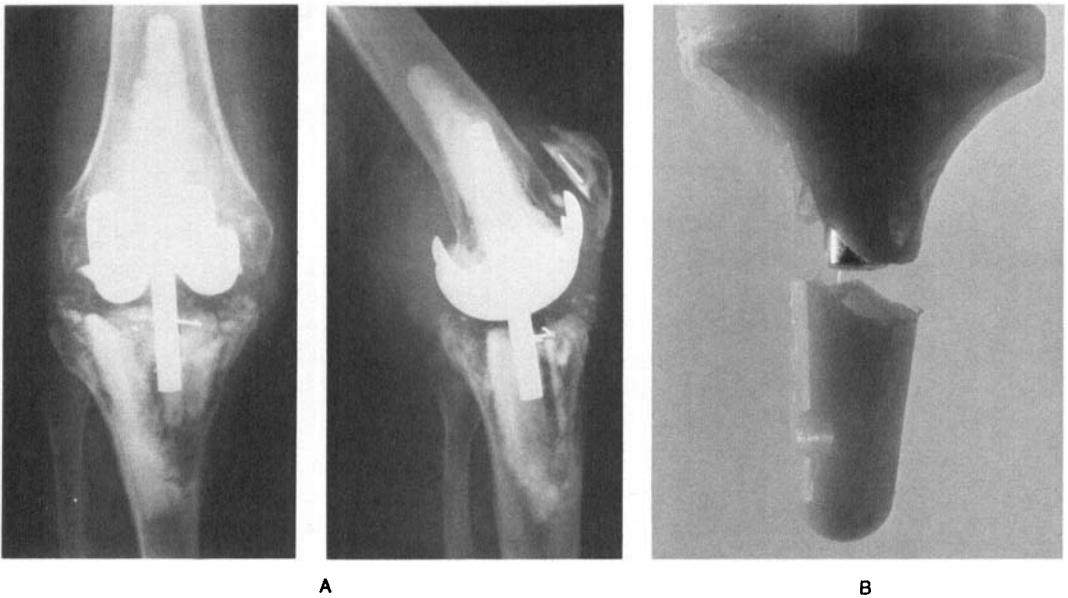


Figure 2. The Attenborough prosthesis in Case 2.

A. 2.5 years postoperatively there were signs of loosening of both the tibial and femoral components and also a suspicion of fracture of the tibial polyethylene stem.

B. The fracture of the tibial stem runs through the bottom of the canal of the stabilizing piston.

At 2 years she started using a stabilizing orthosis. The radiogram then showed that the Attenborough prosthesis had loosened, and there also was a suspicion that the tibial component had fractured.

The patient was referred to us and operated at 4.5 years, with extraction of the prosthesis and an arthrodesis with a long Küntscher nail. The prosthesis was loose, and the tibial component had a fractured stem (Figure 2). An undislocated fracture in the proximal tibia was noted. The bone defects were replaced with cancellous bone from the iliac crest. Five bacterial cultures taken at operation were negative. Postoperatively, the patient was mobilized, starting full weight-bearing at 6 weeks. Four months postoperatively the arthrodesis had healed.

Case 3

A 47-year-old man with classic rheumatoid arthritis since 1965 had synovectomy in both knees in 1970 and a resynovectomy in the right knee in 1971. In 1976, a Marmor arthroplasty was performed in his right knee laterally and medially.

He continued to have pain on weight-bearing. Scintimetry showed a five-fold uptake in the tibia on the medial side. The radiogram showed evidence of a stress fracture. The pain increased and the knee became unstable. Revision arthroplasty was performed

in January 1979, and the medial tibial component was found to be loose. An Attenborough prosthesis was inserted in slight varus position.

At 1 year, there was increasing pain on weight-bearing and radiographic signs of complete loosening of the prosthesis. The patient was reoperated at 22 months. The tibial component showed heavy wear and was fractured at the medial border. An arthrodesis was performed with a 14-mm and 680-mm-long Küntscher nail. The bony defects were replaced with iliac cancellous bone. Four months postoperatively, the arthrodesis had healed and the patient was pain-free.

Discussion

In three earlier cases with fracture of a high density polyethylene acetabular component, there were radiographic signs of loosening in two of the cases, and in the third case the positioning and cementation were poor (Salvati et al. 1979, Collins et al. 1982).

The fractured tibial components in our cases all had radiographic loosening, verified at the revision. In one of the cases there was a clinical, unverified suspicion of infection. In the Townley prosthesis the weak point is the nar-

row linkage between the lateral and medial plateau. When bone support of the medial plateau is lacking, there is increased stress on the mid-portion. This type of prosthesis has no indicator wire, and the fracture of the prosthesis was not discovered until revision. In the Attenborough prostheses there were two types of breakage. In the first case the fracture passed through a weak point of the tibial component where the canal for the stabilizing piston ends in the tibial stem. The breakage in the other Attenborough prosthesis was at the medial edge of the articular surface, which showed a combination of severe wear and fracture. The tibial component was loose, there was almost no bony support, and the varus malalignment increased the medial stress.

A nonprogressive loosening of a joint prosthesis does not always need to be reoperated because it may find a new stable position. It seems therefore to be important that the different endoprostheses should be designed to tolerate some overloading. Metal backing of the polyethylene component, which is increasingly used, has the advantage of distributing and lowering the stress, thereby reducing micro-movements.

The Attenborough prosthesis shares some disadvantages with the hinge endoprosthesis. In a follow-up of 74 Attenborough prostheses, Boegård et al. (1984) observed a high failure rate, and concluded that this design could not be recommended. The fracture of the tibial components described here is an additional criticism of the Attenborough prosthesis.

Acknowledgements

Grants were received from Konsul Thure Carlssons Minne, Alfred Österlund's Foundation and Greta and Johan Kock's Foundation.

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