



Early failure of a knee replacement in a neuropathic joint A case report

Mohammed N. YASIN, Charalambos P. CHARALAMBOUS, Simon P. MILLS, Padmanabh M. PHALTANKAR,
Richard W. NUTTON

From the Royal Infirmary of Edinburgh, Edinburgh, Scotland.

Total knee arthroplasty in neuropathic (Charcot) joints is technically demanding. Most studies report significant improvement in knee function, despite a high incidence of complications. We present a case of idiopathic, unilateral neuropathic arthropathy of the knee treated with a modular stemmed, constrained total knee arthroplasty. Unscrewing of the stem of the tibial component was detected a year following surgery. The tibial component was revised to a custom made monobloc stemmed implant. Satisfactory knee function was noted at short term follow-up. This case highlights a potential problem of using modular long-stem implants in neuropathic joints and emphasises the need for close follow-up of these difficult cases.

Keywords: neuropathic joint ; Charcot arthropathy ; total knee replacement.

INTRODUCTION

Neuropathic (Charcot) arthropathy of the knee has been considered to be an absolute contraindication for total knee arthroplasty (TKA) by many authors (3,6,8). More recently several studies have reported satisfactory function after TKA in neuropathic joints (7,9,10), although the risk of potential complications remains high (5). We report a case highlighting a potential problem, not reported previously, with TKA in a neuropathic joint.

CASE REPORT

A 50-year-old lady presented with a history of discomfort in her right knee for several years. She complained of persistent swelling and inability to straighten the knee completely, with recurrent giving way. Despite her symptoms she was able to walk her dogs for one and a half hour. She had no symptoms related to any other joints.

-
- Mohammed N. Yasin, MRCS Ed, Specialist Registrar in Orthopaedics.
 - Padmanabh M. Phaltankar, FRCS (Tr & Orth), Consultant Orthopaedic Surgeon.
Orthopaedic Department, North Manchester General Hospital, Crumpsall, Manchester, UK.
 - Charalambos P. Charalambous, MSc, FRCS (Tr & Orth), Consultant Orthopaedic Surgeon.
Orthopaedic Department, Blackpool Victoria Hospital, Blackpool, UK.
 - Simon P. Mills, Medical Student.
University of Liverpool, School of Medical Education, MBChB Office, Liverpool, UK.
 - Richard W. Nutton, FRCS, Consultant Orthopaedic Surgeon.
Orthopaedic Department, Royal Infirmary of Edinburgh, Edinburgh, UK.
Correspondence : Mr C. P. Charalambous, Flat 204, 159 Hathersage Road, Manchester M13 0HX, UK.
E-mail : bcharalambos@hotmail.com
© 2011, Acta Orthopædica Belgica.
-

Examination revealed a normal alignment of the right lower limb. Examination of the knee revealed an effusion and a range of motion from 15° of fixed flexion deformity to 115° of flexion with crepitus arising from the medial compartment. The knee was stable on varus/ valgus stressing.

Radiographs showed loss of medial joint space and radio-opaque bodies in the suprapatellar pouch. Osteoarthritis was diagnosed and treated with conservative measures including anti-inflammatory medications.

After two years, the lady returned for consultation due to increasing pain in her knee, which was restricting walking and affecting activities of daily living. A varus deformity of 8° was noted with the range of motion being the same as before. Radiographs showed further narrowing of the medial joint space with erosion of the medial tibial condyle. She was advised to have a total knee arthroplasty to treat her symptoms, but she declined surgery.

Seven years after her first visit, she presented with a marked varus deformity of the knee. At this time, she was unable to walk without assistance as her knee was collapsing in varus on weight bearing, however pain in the knee was significantly less than would be expected with the degree of deformity. She also complained of numbness in both hands and pain in her neck.

Examination of her knee revealed a 15° varus deformity increasing to 25° on varus stressing and a range of motion of 15° to 90° of flexion. No obvious abnormality was noted on the neurological examination of the lower limbs, though wasting of thenar eminence and altered sensation was noted in the median nerve distribution of both hands.

Radiographs showed extensive bone loss affecting the medial tibial condyle, and heterotopic bone formation in the soft tissues around the joint (Fig. 1). A neurological opinion was sought as the clinical and radiological features suggested neuropathic



Fig. 1. — Extensive bone destruction and heterotopic bone in neuropathic knee joint

arthropathy. A detailed neurological examination suggested subtle features of an upper motor neuron pathology, but there was no evidence of ataxia. Investigations for syphilis and diabetes mellitus were negative. MRI of the cervical spine showed degenerative changes with myelomalacia at C3-C4 levels. Although the changes in cervical cord accounted for the neurological signs, it was not possible to attribute the unilateral neuropathic knee joint to these changes.

The option of arthrodesis against a constrained TKA with accompanying risk of implant loosening was discussed with the patient. It was decided to proceed with a constrained, modular, stemmed TKA.

A Kinemax (Stryker) rotating hinge TKA with modular stems (screwed connection) was carried out through a medial parapatellar approach. Intra-operatively, large loose bodies were found in the supra patellar pouch. The anteromedial portion of the medial tibial condyle was found to be detached from the tibia. The medial tibial defect extending to the midline was reconstructed with 20 mm tibial augments applied to the medial side of the tibial component. Modular stems (19 mm diameter femoral stem and 14mm diameter tibial stem) were used both on the tibial and femoral implants, which were 'torqued' to 180 in/lbs as per the manufacturer's recommendations. The implants were cemented to the distal femur and proximal tibia, but the stems were selected to be press fit within the medullary canals of the femur and tibia.

After linking the components via the rotating hinge, the knee was stable and in good alignment (Fig. 2). Post-operatively, the patient mobilised well and at six month follow-up was walking without walking aids. The range of motion was from 0° to 105° and the knee was stable.

At a one year review, the patient complained of recurrence of pain around the medial aspect of the knee particularly after walking. Though she had a good, pain free range of motion with no evidence of instability, stressing the knee in the coronal plane reproduced her pain. Radiographs showed unscrewing of the stem of the tibial component by a distance of about one centimeter (Fig. 3). There was a lift-off of the tibial tray with a gap under the



Fig. 2. — Post-op radiograph showing constrained, modular, long-stem TKA.

medial tibial augment. The stem appeared to be well fixed in the medullary cavity.

Due to concerns about progressive osteolysis of the proximal tibia, a revision arthroplasty was performed using a custom made monobloc tibial component incorporating a 20 mm medial augment and an 80 mm long stem with a diameter of 14 mm. Intra-operatively there was evidence of metallosis causing staining of soft tissues. The tibial component was loose and lifted easily from the medullary canal. There was no difficulty with retrieving the distal stem.

The patient was mobilised using protected weight bearing for three months. She was also



Fig. 3. — One year post-op radiograph showing unscrewing of stem of tibial component.

advised against prolonged walking and to use a stick in the opposite hand. At six month follow-up, she had no symptoms related to the knee and was noted to have a stable knee with 90° of flexion.

DISCUSSION

The diagnosis of neuropathic arthropathy (Charcot joint) is based on clinical and radiological features along with the characteristic histological features described by Eichenholtz (4). Roentgenographic changes demonstrate one of the three stages: 1. Fragmentation, 2. Coalescence of bony fragments or 3. Reconstitution (4), though all three may co-exist. Histological features include cartilage and/ or bone debris in the synovial tissue along with new bone formation and severe destruction of articular cartilage and subchondral bone.

Patients with typical changes as above but with no clear underlying neurological cause have been described as having Charcot-like joints (9). The diagnosis of neuropathic arthropathy can be difficult in early stages, as features may be similar to hypertrophic osteoarthritis (2). Following our diagnosis of Charcot arthropathy, it was important to investigate associated conditions, such as tabes dorsalis (due to untreated syphilis) and diabetes mellitus, both of which were excluded. Other differentials to consider in this case included osteomyelitis (unlikely given the length of history), Paget's disease, metastatic bone disease and peripheral neuropathy as a result of folate/B12 deficiency or chronic alcohol abuse. Charcot's arthropathy is also associated with syringomyelia, history of several intra-articular corticosteroid injections, leprosy and spina bifida (1).

Arthrodesis has been the traditional surgical treatment for neuropathic arthropathy of the knee joint (2). More recently TKA has shown to improve function in a Charcot joint (7,9,10). Parvizi *et al* (7) have emphasised following the basic principles of TKA, including ligament balancing, augmentation of bony defects and achieving good bony alignment. In addition use of long stem and constrained devices is advisable to achieve a stable configuration. High failure rate and increased complications in a recent study (5) have been attributed to patient selection with all the patients in this series having severe bony destruction and deformity of the knee with underlying neurosyphilis.

The outcome of TKA is reported to be inferior in neurosyphilis with presence or development of

ataxia (10). Complications of TKA for Charcot joint include intra-operative complications of medial collateral ligament avulsion and patellar tendon rupture (7). Post-operative complications include early loosening of prostheses, peri-prosthetic fractures, patellar dislocations and recurrent instability (5).

This case demonstrates the difficulty in diagnosing neuropathic arthropathy in the early stages and detecting underlying neurological cause. Unscrewing of the stem from the tibial tray was noted in our case, a year following TKA using a modular, long-stem, constrained (rotating hinge) prosthesis. We believe this to have happened due to inherent instability and overuse of the neuropathic joint leading to cyclical rotational couple being applied to the stem prosthesis interface. This complication has not been reported in the literature relating to TKA in neuropathic joints. We were unable to find the reporting of this complication after searching the implant company (Stryker) database relating to long-stem modular implant. Though we recognise the limitations of interpretation related to an isolated case report, use of monobloc custom made implant may be preferable to modular long-stem implants in TKA for neuropathic arthropathy with severe deformity and/ or instability. Close follow-up over a prolonged period is essential for these difficult

cases and will help in detecting occult problems at an early stage.

REFERENCES

1. **Berg EE.** Charcot arthropathy after acetabular fracture. *J Bone Joint Surg* 1997 ; 79-B : 742-745.
2. **Drennan DB, Fahey JJ, Maylahn DJ.** Important factors in achieving arthrodesis of the Charcot knee. *J Bone Joint Surg* 1971 ; 53-A : 1180-1193.
3. **Eftekhari NS.** Total knee arthroplasty : Results with the intramedullary adjustable total knee prosthesis. *J Bone Joint Surg [Br]* 1983 ; 65-A : 1-13.
4. **Eichenholtz SN,** ed. *Charcot Joints*. Charles C. Thomas, Springfield, USA, 1966.
5. **Kim YH, Kim JS, Oh SW.** Total knee arthroplasty in neuropathic arthropathy. *J Bone Joint Surg* 2002 ; 84-A : 216-219.
6. **Marmor L.** The Marmor knee replacement. *Orthop Clin North Am* 1982 ; 13 : 55-64.
7. **Parvizi J, Marrs J, Morrey BF.** Total knee arthroplasty for neuropathic (Charcot) joints. *Clin Orthop Relat Res* 2003 ; 416 : 145-150.
8. **Scott WN.** Semiconstrained knee prosthesis. In : Evarts C.M. (ed). *Surgery of the Musculoskeletal System*. Churchill Livingstone, New York, 1983, pp 289-308.
9. **Soudry M, Binazzi R, Johanson NA, Bullough PG, Insall JN.** Total knee arthroplasty in Charcot and Charcot-like joints. *Clin Orthop Relat Res* 1986 ; 208 : 199-204.
10. **Yoshino S, Fujimori J, Kajino A, Kiowa M, Uchida S.** Total knee arthroplasty in Charcot's joint. *J Arthroplasty* 1993 ; 8 : 335-340.