Salvage surgery with a tumor prosthesis for femoral condylar nonunion at the very advanced age of 90 years

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Salvage surgery with a tumor prosthesis for femoral condylar nonunion at the very advanced age of 90 years : a case report

Abstract

We report an unusual case of multifragmentary condylar femoral nonunion with severely synovitis and bone loss in a 90-year-old female. At the initial treatment of condylar femoral fracture, conservative treatment was indicated because fracture was severely comminuted and she was very advanced in age. Unfortunately, fracture was failed to union. Salvage surgery with a total knee tumor endoprosthetic replacement was performed. Four years postoperatively, the patient walked without knee pain using a walker. We believe that the present results justify the use of a megaprosthesis in the treatment of benign conditions even in oldest-old patients.

Keywords:

distal femoral fracture

nonunion

salvage surgery

tumor prosthesis

INTRODUCTION

Fractures of the distal femur in the elderly are usually caused by low-energy, ground-level falls onto a flexed knee. Pre-existing osteoarthritis and juxta-articular osteopenia in this age group result in high levels of comminution and articular damage at the time of injury, which challenges both management and treatment outcomes.[1] Some fractures may not be candidates for internal fixation because of severe comminution, and many orthopaedic surgeons may select conservative treatment for such cases, particularly in patients at a very advanced age.[2,3] However, these intraarticular fractures have a greater tendency to result in nonunion. The purpose of this case report was to document the use of a distal femoral tumor endoprosthesis (megaprosthesis) originally developed for use in musculoskeletal tumor surgery as a treatment option in severely osteoporotic patients who have persistent nonunion after multifragmentary femoral condylar fracture.

CASE REPORT

In August 2006, a 90-year-old woman fell at home, and was transferred to a nearby general hospital and diagnosed with a left femoral condylar fracture. X-rays and CT scans revealed that the fracture was severely multifragmented with severe osteoporosis (Fig. 1). The operative reduction and fixation was not given because of the surgeon's concern of severe comminution and osteoporosis, so conservative treatment with long-leg casting was performed. However, she continued to endure painful nonunion, and was bedridden 5 months after the injury. In January 2007, she was referred to our hospital seeking surgical treatment. At examination, she had severe instability of the left knee and her knee joint was severely swollen due to synovitis. She had contracture of the knee and active ROM from 0° to 10° of flexion. Blood analysis showed no signs of infections. Radiographs revealed femoral condylar nonunion with considerable bony defects (Fig. 2). To treat her persistent left femoral condylar nonunion, salvage surgery with a total knee tumor endoprosthetic replacement was planned.

The salvage surgery was performed under general or spinal anaesthesia, under tourniquet control using a midline longitudinal incision and a medial parapatellar approach. We excised the morbidly outgrowing synovial membrane, the appropriate length of femur containing multifragmentary fractured femoral condyle with its attached collateral ligaments and the tibial articular surface. We used a HMRS Modular Resection System (Stryker, Kalamazoo, MI,

USA) as prosthesis for reconstruction of knee joint and massive bone defect. This prosthesis was non-customised implant with long-stemmed femoral and tibial components linked intra-operatively using a transverse metal rod and polyethylene bushings. Distal femoral canal was reamed and prepared for intramedullary stem of the implant. Tibia was prepared in usual fashion, and the resurfacing of patella was done. Trial components were initially assembled uncemented to ensure adequate anatomical restoration of the joint line and soft-tissue tensioning, and patellar tracking was checked. After medullary lavage and drying of the medullary canals, femoral component was inserted with cementless technique and fixed with three screws, and cemented long-stem modular tibial tray with a modular polyethylene liner was used. Wound closure was done over closed suction drains that were removed after 48 h. The quantity of operative hemorrhage was 200 mL, and the total operating time was 3 hours (Fig. 3).

Postoperatively, no splints or orthoses were used and the patient immediately began ROM exercises using continuous passive motion equipment and began weight-bearing as tolerated. At the latest follow-up, 4 years postoperatively, her knee ROM was maintained from 0° to 110°. The patient had marked improvement in motion pain and currently walks without knee pain using a walker. Radiographs showed no radiolucent lines around the femoral and tibial components (Fig. 4).

The patients gave the informed consent prior being included into the study.

DISCUSSION

Our patient was 90 years old, an age at which orthopaedic surgery is challenging. To our knowledge, this is the oldest case of reconstruction with a tumor prosthesis for a non-tumoral disorder. Four years have passed since the patient underwent surgery, and she has experienced a favorable outcome.

The aim of treatment of supracondylar and intercondylar femoral fractures is restoration of knee mobility and the earliest possible return to pre-injury function. Nonsurgical management is associated with a high incidence of complications,[4,5] and internal fixation has therefore been advocated;[6-8] however, this may be difficult if the bone is extremely porotic or if the bone stock is inadequate. Considerable problems have been encountered in using conventional internal fixation techniques in patients over 60 years of age.[2,3] Extensive metaphyseal or diaphyseal comminution may necessitate the use of a modular prosthesis. Moreover, in the case of aggravated nonunion, it is impossible to fix fracture fragments with internal fixation techniques because of poor bone stock.

Nonunion of supracondylar distal femoral fractures occur mostly in patients with poor bone quality or unfavorable fracture patterns. Internal fixation and prosthetic replacement are the described methods of treating nonunions.[9-11] In elderly patients with poor bone stock, osteosynthesis is not a feasible option. Total knee arthroplasty is a recognized therapeutic

option but its efficacy and durability have not been established in supracondylar fractures where bone loss needs to be augmented with allograft.[12]

In the field of musculoskeletal oncology, good long-term results have been achieved with hinge endoprostheses following tumor resection around the knee joint. The 5-year survival rate of such reconstructions has been reported to be approximately 80%–90%.[13,14] As the success of megaprostheses becomes more predictable, the indications for using them are expanding. Some authors have reported good results for distal femoral replacement in elderly patients with acute distal femoral fractures or nonunions.[1,15,16] However, other authors have reported high rates of postoperative infection associated with reconstructive procedures involving a tumor prosthesis. Freedman et al. reported that 2 of 5 cases reconstructed with a hinge prosthesis experienced postoperative infectious complications.[1] Springer et al. reported five postoperative deep infections after use of the Modular Kinematic Rotating Hinge for nonneoplastic limb salvage, and noted that potential causes of infection included the very invasive approach, long operating time, and poor soft tissue condition due to multiple surgeries.[17] Haidukewych et al. also reported a relatively high rate of complications, and recommended that this salvage procedure should be reserved primarily for elderly and sedentary patients[18]. According to these recommendations, the selection of our patient was appropriate for this reconstructive procedure. We also recommend this treatment modality in selected osteopenic elderly patients with difficult distal femoral reconstructive problems.

There are more alternatives such as condylar constrained knee or rotating hinge prostheses with a cemented femoral long stem to manage the situation like this case. However, a condylar constrained knee prostheses need either MCL or LCL to obtain functional excellent outcome, and nontumoral rotating hinge prostheses could not fill femoral bone defect with 10 to 25 mm spacers in this case.

Hinged knee replacement should be used for most supracondylar or intercondylar fractures, as the collateral and cruciate ligaments are removed with the distal femur. In the present case, we judged she was a suitable candidate for using a modular megaprosthesis to salvage the persistent painful nonunion. This reconstruction could only be expected to provide excellent pain relief, good knee ROM immediately after surgery, and early weight-bearing. Megaprostheses cost higher than other knee prostheses and fracture fixation implants such as plate and nails. However, the use of megaprosthesis is a one-stage solution of this complex problem, it can be considered as a cost-effective measure, despite its higher cost. The long-term durability of such a modular megaprosthesis is also a concern; longer clinical follow-up will help determine the true efficacy of reconstructive procedures for such a condition.

In conclusion, we believe that the present results justify the use of a megaprosthesis in the treatment of multifragmentary intercondylar femoral fracture in elderly patients who have severe osteoporosis, nonunion, and inadequate bone stock.

Conflict of interest: None.

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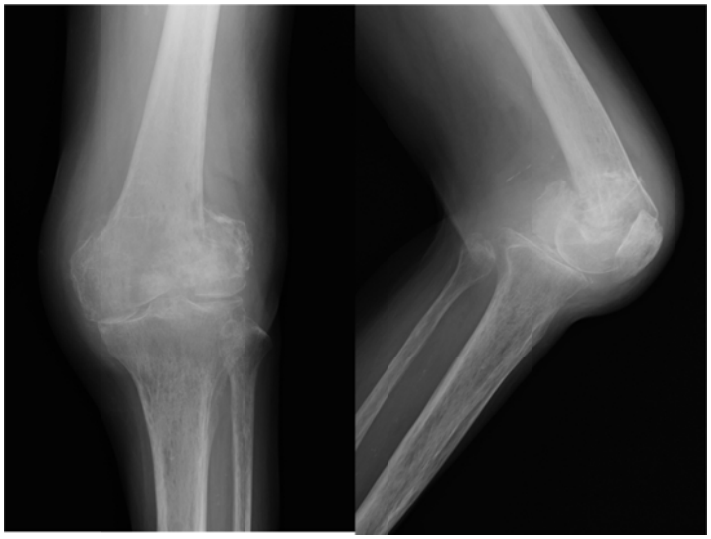
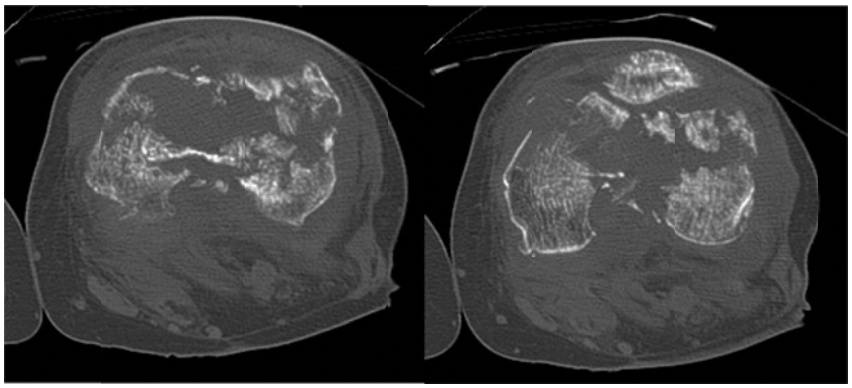
LEGENDS FOR FIGURES

Fig. 1 (A) Anteroposterior and lateral radiographs showed a displaced comminuted supracondylar and intercondylar fracture. **(B)** Coronal CT scan images revealed extensive comminution of the bilateral condyle and avulsed fragments of the collateral and cruciate ligaments.



(A)



(B)

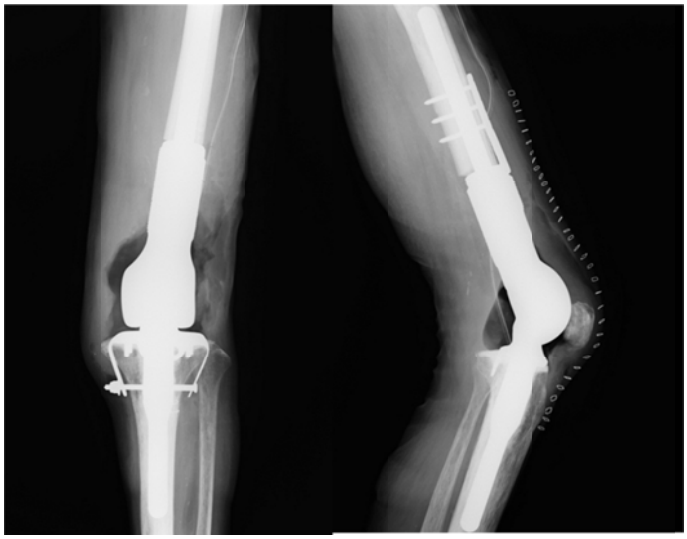
Fig. 2 (A) Radiographs at 4 months after injury showed abortive conservative treatment: femoral supracondylar and intercondylar nonunion with considerable bony defects. **(B)** The knee joint was severely deformed posteriorly and swollen due to synovitis.

(A)

(B)

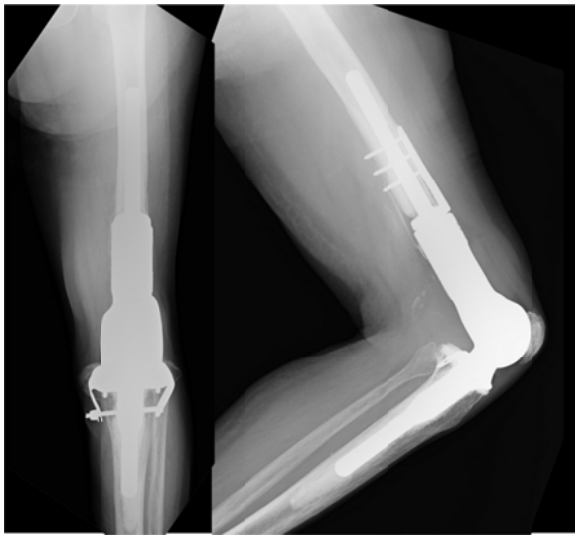
Fig. 3 (A) Multifragmentary necrotic bone and synovial proliferation were excised, and reconstruction using a megaprosthesis was then performed. **(B)** The femoral component was fixed without cement, and the tibial component was fixed with cement.

(A)



(B)

Fig. 4 (A) Radiographs at the latest follow-up, 4 year postoperatively, showed no radiolucent lines around the femoral and tibial components. **(B)** The knee ROM was maintained from 0° to 110°



(A)

(B)