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Case Report

Interprosthetic Fracture of Distal Femur Around Total Knee Replacement with Pre-Existing Dynamic Condylar Screw
發生在股骨遠端,介乎於動力髖螺釘和全膝關節置換假體之間的骨折:病例報告

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ABSTRACT

Treatment of interprosthetic fracture of distal femur around total knee replacement is difficult. Pre-existing hip implants further increase the technical challenges. In this case report, we present an 85-year-old patient who suffered from a displaced distal femur fracture with a pre-existing dynamic condylar screw and total knee replacement. Internal fixation with distal femur locking plate and incorporation of the locking plate with the pre-existing dynamic condylar screw provided a good treatment option for this difficult problem. It avoided the possible complication associated with removal of pre-existing implant and allowed sufficient overlap of the two plates to prevent any stress risers or fracture.

中 文 摘 要

摘要:治療位於全膝關節置換假體周圍股骨遠端的骨折是困難的。先前已裝置的動力髖螺釘會進一步增加技術難度。在這種情況下,我們報告了一個85歲的病例,當中病人患有股骨遠端骨折,介乎於動力髖螺釘和全膝關節置換假體之間。使用股骨遠端鎖定鋼板內固定術,並把鎖定鋼板和原有的動力髖螺釘作配合,是一個很好的治療選擇。它避免了拆除原有植入物可能引起的併發症,並允許兩塊鋼板有足夠的重疊,以防止任何壓力集中或骨折。

Introduction

With the aging population, there is certainly an increasing demand for total knee replacement (TKR) and inevitably more post-TKR related complications. One of the complications is interprosthetic fracture. In a previous study, the fracture rate 5 years after primary TKR was 0.6%.[1] The aging population is also more prone to suffer from peritrochanteric hip fractures. Thus, it is not uncommon for a patient with fracture around TKR to have a pre-existing hip implant for fracture fixation. Treatment of interprosthetic fracture of the distal femur is difficult because the bone stock around the knee prosthesis is limited and fixation of the distal fragment can be precarious. Pre-existing hip implants further increase the technical challenges by limiting the implant choice. Recently, there have been several series published on the topic of interprosthetic fracture. An interprosthetic fracture is defined as a fracture in between two implants on the same bone. However, in the literature, little has been written on the management of interprosthetic fracture of the distal femur around TKR with pre-existing plate fixation for hip fracture. In this report, we present a case of interprosthetic fracture between a dynamic condylar screw and TKR treated with distal femur locking plate.

Case Report

In April 2009, an 85-year-old woman presented to us with left distal thigh pain after a fall at home. Prior to injury, she walked with a quadripod and she had a history of bilateral TKR for osteoarthritis of both knees in 2002, and subtrochanteric fracture of the left femur with stainless steel dynamic condylar screw (DCS) in 2007. She

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has no documented history of osteoporosis, steroid use, metabolic disease, or malignancy. Physical examination revealed swelling and deformity over the left distal femur. Radiography showed a displaced interprosthetic fracture of the left distal femur around a well-fixed TKR (Rorabeck type II)[2] (Figure 1). Moreover, there was a well-fixed DCS for a healed subtrochanteric fracture in the ipsilateral proximal femur.

The patient underwent open reduction and internal fixation with a distal femur locking plate. Intraoperatively, lateral incision over the distal thigh with open reduction was performed and the distal five screws of the DCS were removed. Stainless steel distal femur locking plate was applied over the fracture site. Proximally, the distal femur locking plate overlapped with the distal part of the DCS through the mismatch between the proximal part of the distal femur locking plate. The two distal screw holes over the distal part of the DCS and two proximal screw holes over the distal femur locking plate were aligned. Two cortical screws were then inserted through the overlapped screw holes of both plates. Finally, locking screws were inserted proximal and distal to the fracture.

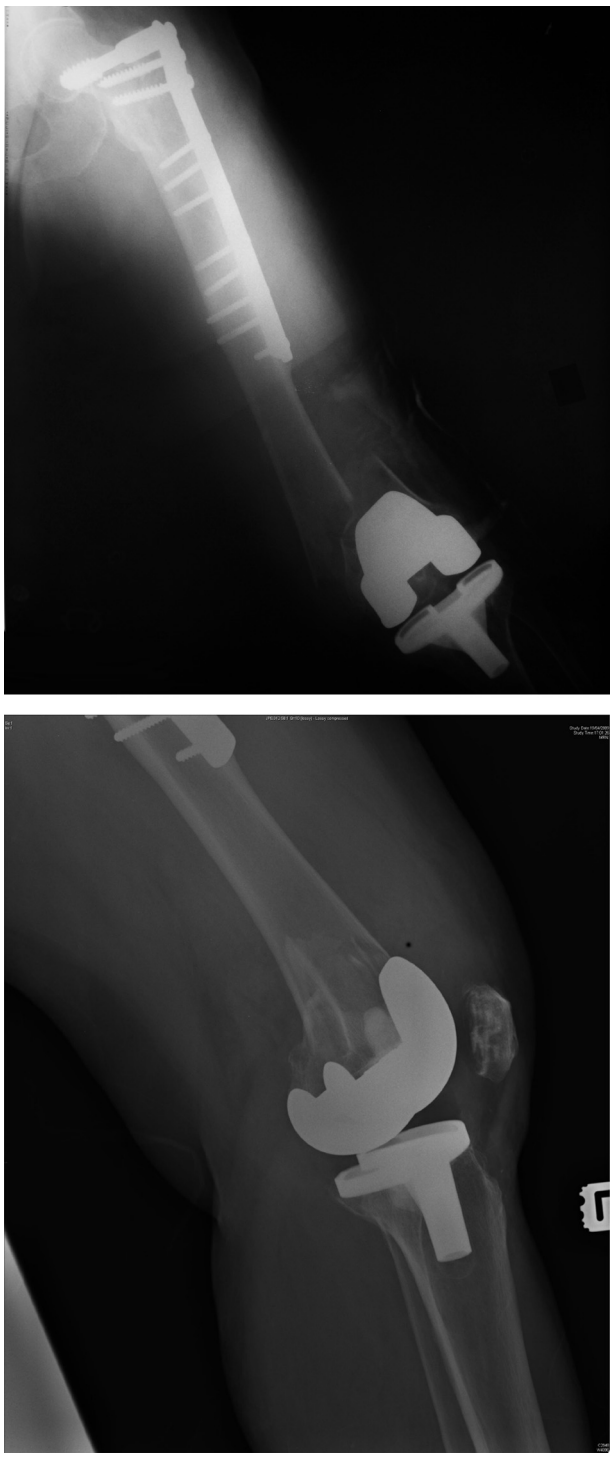

Figure 1. Post-injury film showing inter-prosthetic fracture of the left distal femur.

Postoperative radiography showed satisfactory alignment (Figure 2). Continuous passive motion exercise was used to improve the range of movement of the knee. The patient was instructed to maintain non-weight-bearing walking with a hinge brace. The weight-bearing status was gradually stepped up according to clinical and radiological findings of healing during subsequent follow-up. At 8 months postoperatively, the patient was started on full weight-bearing walking and 9 months postoperatively, the fracture was healed. At 1 year after surgery, the range of motion of the knee was 0–90°. The patient was able to walk satisfactorily with a cane. After 3 years postoperative follow-up, the alignment and implant were maintained (Figure 3).

Discussion

For interprosthetic fracture between hip and knee implants, the treatment options described previously have included conservative management, cerclage fixation, plating, nailing, and revision surgery.[3–5] The fixation for interprosthetic fracture was particularly challenging since the fixation must be able to protect the stress riser between the prostheses without disturbing their stability, and the injuries usually also involve osteoporotic bone, which adds to the difficulty for a stable construct.[3]

In the study by Mamczak et al,[3] plating was done with tissue-preserving exposure and reduction techniques without the use of

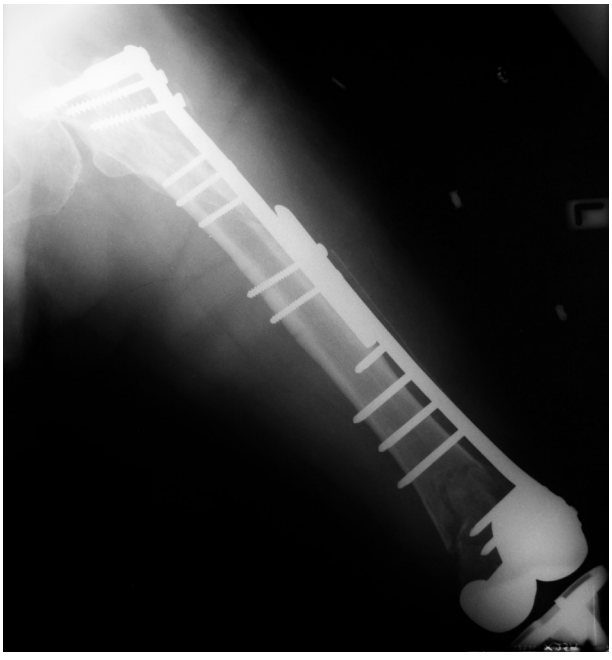

Figure 2. Immediate postoperative film with the locking plate over the dynamic condylar screw.

Figure 3. Latest follow-up in 2012 shows good bone healing and satisfactory alignment.

adjuvant bone grafting. The plate was either fixed with cable, locking or nonlocking screws. Their results showed that weight bearing as tolerated was allowed at an average of 13 weeks. All fractures successfully healed and nine of 16 patients returned to their preoperative ambulatory functions.[3] In another study by Platzer et al,[5] most of the 23 patients were treated with plating with or without cerclage wiring, and only two underwent revision arthroplasty with long-stem hip prosthesis, with the addition of cerclage wires. Eighty-six percent of patients had fracture healing within 6 months and 73% returned to pre-injury activity level.[5] Retrograde intramedullary nailing for periprosthetic fractures of TKR has also been described in the literature. Gliatis et al[6] reported a case series of nine patients with good stability and fracture union after retrograde nailing for TKR periprosthetic fracture; however, it was restricted to posterior cruciate ligament retaining TKR implants. Other reports have stated that not all posterior stabilized TKR implants can accommodate retrograde nailing.[4] Moreover, intramedullary nailing is limited in terms of distal purchase and fixation.[4]

As for the management of the interprosthetic fracture between DCS and TKR, little has been reported. The possible options include application of a short locking plate or removal of DCS with normal plating. The first method has several disadvantages: inadequate proximal fixation, and stress riser at the junction between the two plates. By contrast, if the DCS is removed and normal plating is done, there are screw holes above the new implant. These screw holes can become the stress riser for fracture in these osteoporotic bones. As reported in previous studies of healed hip fracture, femoral neck fracture can occur in up to 35% of patients after removal of implants for hip fractures.[7,8]

Since the locking plate is an internal–external fixator, direct contact between the plate and the bone is not necessary. A better solution is to keep the DCS and apply a distal femur locking plate with overlap of the two implants. Implant overlap creates a more stable construct. In our case, we did not apply the minimally invasive percutaneous plate osteosynthesis (MIPPO) approach. Application of MIPPO with the locking plate in future cases will minimize the vascular disruption and enhance the healing process.

To allow overlap of the two plates, one has to leave a gap between the proximal end of the distal femur locking plate and the proximal femur. In fact, this gap is present even without bending of the distal femur locking plate when applied to Asian femurs, although the plate was initially designed based on Caucasian anatomical measurements. A Korean study of application of distal femur locking plates to Asian patients showed that there was a mismatch of the proximal part of the plate with normal Asian adult femurs. The average gap between the inner surfaces of the plate to the cortex was 11.36mm.[9] In our case, we fully utilized this mismatch between the plate and the femur to accommodate the distal part of the DCS. In this way, we have avoided removal of the DCS. With this approach, less wound exposure was required and the operation was faster. More importantly, the possibility of re-fracture after removal of the DCS was avoided.

Addition of cerclage wiring after plating remains a controversial subject. Some argue that such a construct will cause more soft tissue damage, leading to local necrosis and fracture non-union. In addition to that, the cerclage wire might loosen with time and the tension will be reduced.[5,10]

In the studies mentioned above, some of the patients had postoperative complications such as wound infection, delayed union or non-union, malunion, loosening, fixation failure, and revision surgery.[3,5,11,12] Our patient showed promising postoperative recovery and bone healing was satisfactory.

In conclusion, this is a case report on the use of locking plates for interprosthetic fracture between TKR and DCS, with satisfactory outcome. We report this method since we are not aware of any similar case reports. We suggest that internal fixation with a distal femur locking plate and incorporation of the locking plate with the pre-existing DCS provides a good treatment option for this challenging condition.

Conflicts of interest

All authors declare no conflicts of interest.

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