



Case report

Neglected rotatory knee dislocation: A case report

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ABSTRACT

We report here a unique case of a 3 year neglected rotatory tibiofemoral dislocation associated with a lateral patellar dislocation. The rotational deformity was gradually corrected using a Taylor spatial frame and the patella was realigned by tibial tubercle osteotomy and transfer. The patient also underwent multiple soft tissue releases and quadricepsplasty to improve knee flexion. At nine year follow-up, the patient has good knee range of motion, a congruent knee joint and a good functional result.

Clinical relevance: Taylor spatial frame combined with other orthopedic approaches can be a useful tool while dealing with neglected knee dislocations.

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1. Introduction

Knee dislocations are relatively rare injuries, with 0.02–0.2% incidence of all orthopedic injuries [1–3]. About 40% of knee dislocations are anterior, 33% are posterior and only 5% have rotatory mechanism [4]. Most of these injuries are associated with extensive ligamentous disruption [5–7] in addition to vascular [8–10] and neurological injuries [7,9,11]. The majority of knee dislocations are reduced in emergency setting. However, closed reduction of rotatory dislocation can be challenging and it may require knee arthrotomy and open reduction [12, 13]. We report a unique case of neglected rotatory tibiofemoral dislocation associated with a lateral patella dislocation, which necessitated multiple surgical procedures, including gradual deformity correction with a Taylor spatial frame (TSF) and distal patella realignment. At nine year follow-up, the patient has a good functional result.

2. Case report

A 27 year old female presented to our limb lengthening and complex reconstruction service in December 2004. Her medical history was remarkable for multiple trauma injuries after being involved in a motor vehicle accident three years prior, where she had sustained a pelvic fracture, head trauma, fracture of the right tibia and rotatory dislocation of the left tibiofemoral joint with vascular complications. She was treated elsewhere by in situ external fixator across the left knee without

reduction of the joint and several vascular reconstructions of the left lower extremity. Prior to her treatment in our service, the patient suffered from an unstable knee, and needed a knee brace. She also complained of severe pain including night and rest pain, difficulty walking short distances and her knee was stiff with a limited range of motion (ROM). Upon presentation to our service, physical examination of the left lower limb showed a fixed external rotation deformity of the knee and lateral dislocation of the patella. The patient had an intact neurovascular status. Knee range of motion was full extension to 50° of flexion with thigh foot axis of 45° external rotation. There was no anterior–posterior instability, however, significant coronal instability (+2) was observed by both varus and valgus stress testing. Knee radiographs showed rotatory dislocation of the tibiofemoral joint (Fig. 1) and lateral dislocation of the patella (Fig. 2). The patient was planned for acute plus gradual correction of the knee external rotation deformity and patella alignment correction. In October 2005, the patient underwent left knee arthrotomy, lysis of adhesions, lateral retinacular release, and application of Ilizarov / Taylor spatial frame (TSF) across the knee joint (Fig. 3). Some modest acute correction was performed within safe parameters of soft-tissue tension. The fixator was then applied to perform the remaining gradual correction of the deformity. Relocation of the patella was anticipated with gradual internal rotation of the tibia. The TSF consisted of two rings: proximal and distal mounted on the femur and tibia, respectively, with three Ilizarov half pins or wires on each ring. TSF rings were connected by six telescopic struts at special universal joints. By adjusting only strut lengths, one ring with its attached bony segment could be repositioned with respect to the other relying on the principle of six axes of deformity correction [14]. The TSF in this case was mounted such that the proximal ring master tab (center) was aligned with the femoral trochlear notch in the AP plane. The distal ring anti-master tab was centered over the mal-aligned tibial tubercle. After mounting the frame on the lower

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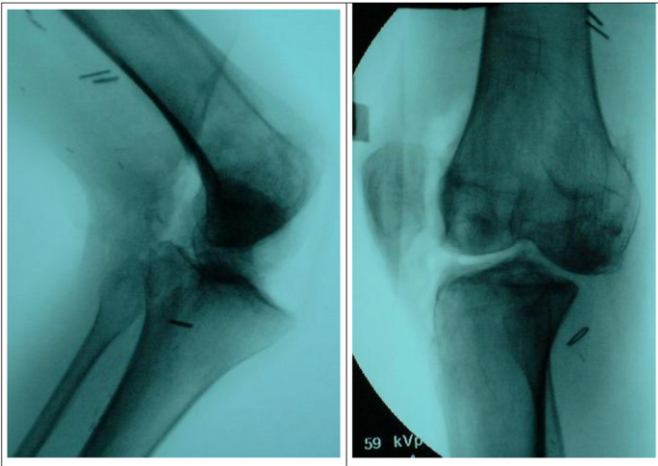


Fig. 1. Preoperative anteroposterior and lateral knee radiographs, three years following the knee injury.

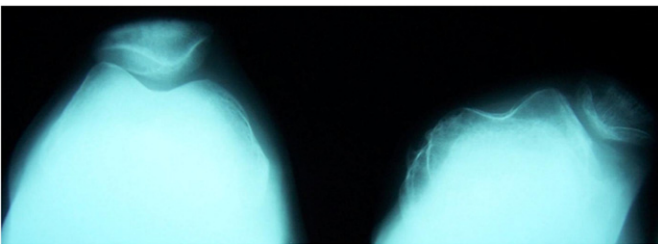


Fig. 2. Preoperative Merchant view radiographs, three years following the knee injury.



Fig. 3. Intraoperative photograph showing residual external rotation deformity of 40° following application of Ilizarov / Taylor spatial frame across the knee and acute correction of the deformity.



Fig. 4. The knee after 10 weeks of correction, the tibiofemoral rotation deformity was completely corrected.

extremity, the mounting parameters were recorded, which include the position of the rings in relation to the virtual hinge of deformity correction aforementioned [15]. The mounting parameters were then entered into the special TSF computer software together with the deformity parameters. Gradual correction of the residual rotational deformity was started on the second postoperative day. After 10 weeks of correction, the tibiofemoral joint was reduced (Fig. 4). However, residual patellar dislocation was still observed. Therefore, the patient underwent further surgery on December 2005, constituting a left tibial tubercle osteotomy and transfer (TTT). The tubercle was moved in a medial direction along an arc of 60° and a translation of three centimeters in relation to the original position of the tubercle. Medial and lateral retinacular release was also performed, in addition to knee manipulation. At the end of surgery, 90 degree flexion was achieved. Extensor mechanism and patellar tracking in the trochlea was normalized (Fig. 5). The Ilizarov frame was modified at this surgery from a static to a hinged frame, where hinges were placed at the axis of rotation of the knee at the intersection of the posterior femoral posterior cortex and Blumenstat's line [16]. This allowed the patient to flex and extend the knee in the constrained frame that maintained the congruency of the tibiofemoral joint. Physical therapy was immediately initiated after surgery to improve knee flexion. In March 2006, the Ilizarov fixator was removed and the patient was placed in a hinged knee brace. However, knee ROM was still severely restricted at 0° to 20° of flexion. Therefore, the patient underwent a quadricepsplasty in October 2006, using a short antero-medial incision, the medial retinaculum and intraarticular adhesions were released, and the suprapatellar pouch was mobilized. To achieve more flexion,

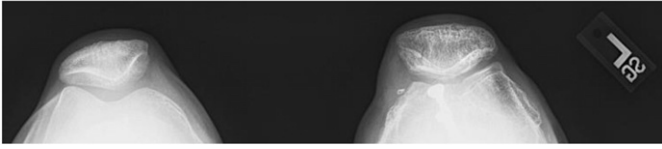


Fig. 5. Merchant view radiographs demonstrate the alignment of the patella following tibial tubercle osteotomy and transfer.

a poster lateral incision, five centimeters inferior to the greater trochanter to the lateral edge of the patella, was performed and the vastus lateralis was completely freed from the linea aspera and from the greater trochanter, and an extraperiosteal elevation of the vastus intermedius from the antero-lateral femoral surface was performed. Origins and insertions of the vastus medialis and the rectus femoris were not affected by this dissection. After completion of the procedure and gentle intra-operative manipulation, 90° of flexion was achieved.

At a follow up period of seven years from the latest surgery (December 2013), the patient was walking with a normal gait and foot progression angle, symmetrical to the contralateral right lower extremity, and had mild left patellofemoral pain. On examination, the knee and patella

were properly aligned with normal patellar tracking (Fig. 6). Knee motion ranged from 5° to 80°.

3. Discussion

Knee dislocation is a serious injury which may significantly impair the patient's ability to restore regular functioning and recreational activity. Eranki et al. [17] reported a series of 20 patients with knee dislocation who were treated operatively, none of the patients achieved the same level of function he had before the injury. And only 80% of the patients had satisfactory outcomes. Irreducible rotatory dislocations are a minor subgroup of knee dislocations with reported literature limited to a few case reports only [18–20]. As such, there are no clear recommendations for optimal treatment.

We report here a unique case of irreducible rotatory knee dislocation which was neglected for three years. Multiple approaches were used to deal with the presented case. The Ilizarov method was shown in previous studies to be accurate for deformity correction [21,22] and particularly as a useful tool for reduction of chronic joint dislocations [23–26], it enables gradual correction and soft tissue adaptation until fully congruent position is achieved with minimal soft tissue damage and devascularization, which was considered a critical issue in this

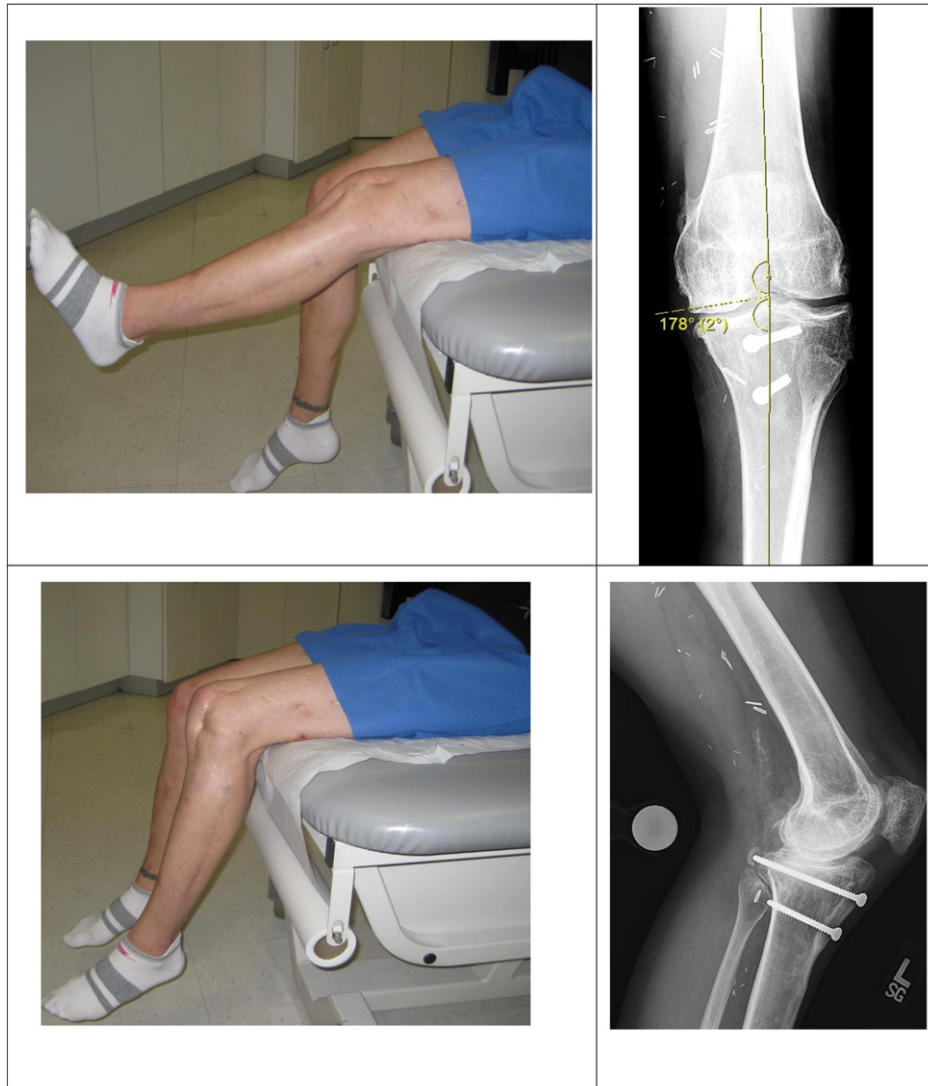


Fig. 6. Recent clinical photographs and weight bearing radiographs of the knee (December 2013, seven years from the latest surgery) showing good knee ROM and varus tibiofemoral angle of 2°.

case. Later, the Ilizarov frame was modified to include a hinge, making physical therapy possible and efficient in a significantly unstable knee. However, following complete correction of the rotational deformity and reduction of the tibiofemoral joint, the patient still suffered from patellar dislocation and anterior knee pain. Tibial tubercle osteotomy and transfer (TTT) is an effective method to correct the patellofemoral malalignment [27–29]. Excellent patellar tracking outcomes were reported following TTT in native [27] and replaced knees [30]. In the case presented here, complete reduction of the patellofemoral joint was achieved following TTT (Fig. 5), with good patellar tracking and restoration of knee extensor mechanism. Stiffness and loss of motion can be a serious complication following knee trauma and surgeries [31–33]. It may improve following manipulation [34,35] and adhesion release [36,37]. However, in severe cases, extensive procedures including quadricepsplasty [35,38,39] may be needed. As mentioned in the presented case, the improved ROM following multiple adhesion release procedures and knee manipulations was limited to short post-operative period, whereas good ROM was achieved after quadricepsplasty for prolonged period as shown with the nine year follow-up.

This paper discusses the option of using the Ilizarov/TSF in neglected cases of knee dislocation with vascular injury where gradual correction is needed. It also emphasizes the importance of combining multi-disciplinary approaches while dealing with complicated cases.

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