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Case Report

Open Reduction and Internal Fixation with Tension-Band Wiring and Cerclage for 8 Years Neglected Patellar Fracture: A Case Report

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Abstract

Introduction: Fractures of the patella are serious injuries commonly caused by direct trauma of the anterior knee surface. Various techniques such as tension band wiring (TBW) and cerclage wiring have been proposed.
Case: A 55-year-old woman who had a neglected left patellar fracture for 8 years. Radiographic evaluation revealed complete fracture of the left patellar bone with displacement and visible callus, fusion of the superior patellar fragment with the epi-metaphysis of the right femur with soft tissue swelling, malunion impression, left patellar subluxation anteriorly and grade III osteoarthritis. An open reduction internal fixation using tension band wire and cerclage was performed and post-operative evaluation revealed acceptable alignment of the patella and implant. Total Bostman knee was 28 points to analysis knee function.
Discussion: TBW is one of treatment methods for patella fracture fixation by counteracting muscle traction, maintaining the reduction and transforming the tensile forces between the quadriceps muscle and the anterior tibia tuberosity to compress the patella articular cortex during knee flexion. It also stabilizes the fracture and enhances bone healing by closing the fracture gap and maintaining the interfragmentary contact. Cerclage wire is passed through the quadriceps and patellar tendon. Knee immobilization is unnecessary and the functional outcome is always adequate.
Conclusion: TBW with cerclage is favorable to stabilize a neglected transverse patella fracture. It is associated with satisfying clinical outcome and less complications. The placing of the tension band close to the patella decreases the rate of major loss of reduction and implant failure.

Introduction

Fractures of the patella are serious injuries with a broad range of subtypes. These injuries account for about 1% of all skeletal injuries and are most prevalent within the age group of 20-50 years, commonly caused by direct trauma of the anterior knee surface. Epidemiologic studies demonstrated that the incidence in men is twice as high as in women. Because of the subcutaneous anterior location, the biomechanical function and the high level of force transmission during extension and flexion, stable reconstruction of patellar fractures continues to represent a major surgical challenge.[1] The majority of cases are caused by direct injury mechanism. The resulting fracture type depends on the trauma mechanism (i.e., direct or indirect), the energy transmitted to the bone and the bone quality. The most common fracture pattern is a simple 2-part diversion caused by a direct blow (i.e., dashboard injury). As a result of the bony lesion, the extensor mechanism of the knee joint can become insufficient. The degree of insufficiency depends among other factors on accompanying damage to the reserved extensor mechanisms. Additional injuries to the adjacent bones are rare but can affect the articular surface of the distal femur. The most frequent indirect

mechanism is fall on the feet with eccentrically contracted quadriceps muscle. Depending on the velocity of the fall and the resistance of the extensor mechanism, either the patella or the adjacent tendons might fail.[2] Surgical treatment is suggested for displaced fractures of the patella to restore the extensor mechanism. Various techniques such as tension band wiring and cerclage wiring have been proposed for treating such fractures.[1]

We reported a case of a 55-year-old woman with a neglected left patellar fracture for 8 years. The patient went to traditional bone setter for more than 10 times. After the first time visiting orthopedic clinic, the patient decided and agreed to undergo an open reduction and internal fixation surgery using TBW and cerclage technique.

Case Presentation

A 55-year-old woman presented at the clinic complaining difficulty to straighten her left knee since April 2013. She had a history of falling down from her motorbike in a traffic accident with her left knee bumping onto the asphalt 8 years ago. Following the accident, she did not seek any medical treatment, instead she went to a traditional bone setter and felt better after getting traditional massages for more than 10 times. Ever since, she got a difficulty to extend her knee but could still walk properly without any walking aid. Eight years after the accident she decided to seek medical treatment for her complaint. From pre-operative physical examination, patellar gap at the left knee was obviously seen. Neither sign of acute inflammation nor any deformity was seen. When palpated, no tenderness was noted, however, the superior pole of the patella was mobile and inferior pole was fixed (Figure 1). The patient was able to walk normally without any walking aid. She could extend her knee to 0° and flex her knee to 120°. There was no pain during flexing and extending the knee but weakness of the extensor mechanism of the left knee was observed.

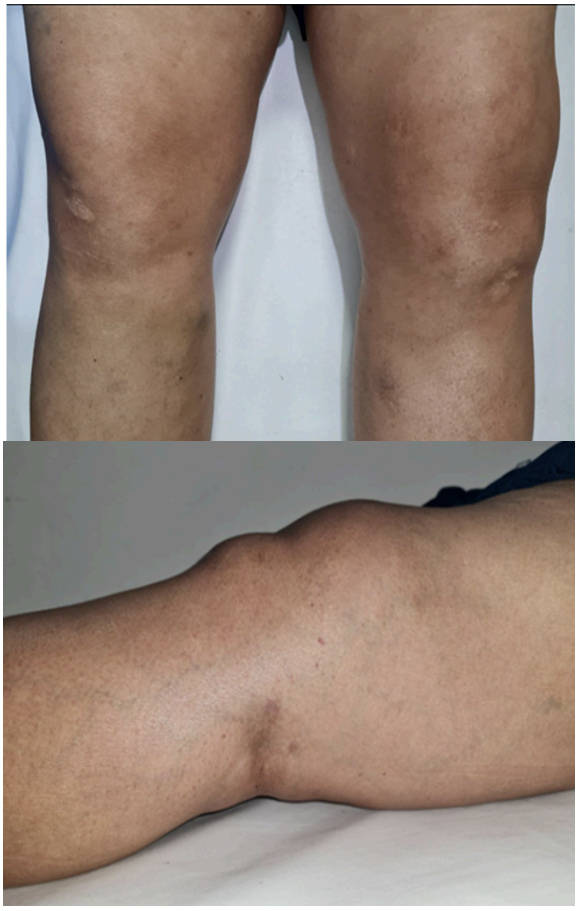


Figure 1. Clinical picture of the left knee with an obvious patellar gap

Radiograph was taken, revealing complete fracture of the left patellar bone with displacement, accompanied with some visible callus around it, with fusion of the superior patellar fragment with the epimetaphysis of the right femur with soft tissue swelling around it, malunion impression left patellar subluxation anteriorly and also OA grade III according to the classification of Kellgren and Lawrence (Figure 2). All these findings supported the diagnosis of neglected closed fracture left patella. Open reduction and internal fixation by using tension band wire and cerclage technique was planned and the patient agreed to surgery.

During surgery, the patient was positioned in supine position. Mid-axial longitudinal approach incision was performed on the anterior of the left knee. Callus formation around patellar bone fragment was

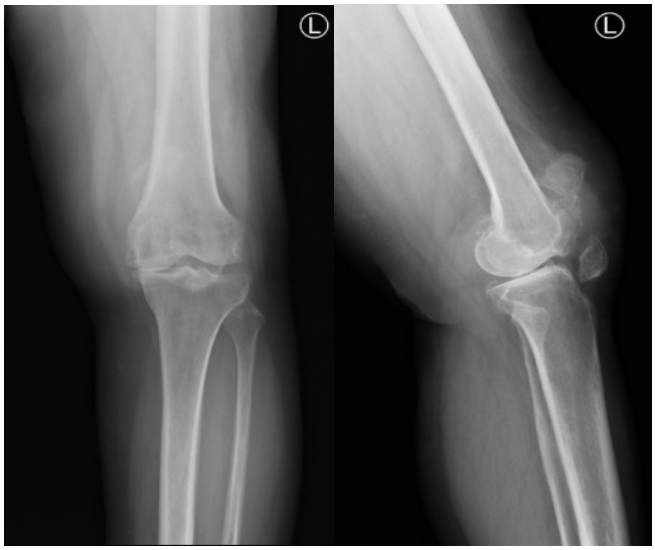


Figure 2. Left knee radiograph showing complete fracture of the left patellar bone with displacement, some visible callus around it, with fusion of the superior patellar fragment with the epi-metaphysis of the right femur with soft tissue swelling around, malunion impression left patellar subluxation anteriorly and OA grade III (according to the classification of Kellgren and Lawrence)

then identified. Next, osteoclasis for cleaning fracture fragments from callus for easier reduction and fixation was performed. Anatomical reduction of the patellar bone fragment was performed, subsequently continued with fixation using S-Wire 1.2mm with cerclage method, then followed by placing 2 K-Wires 1.8mm perpendicular with the fracture line with 5 cm distance between each K-Wire and followed by applying a figure-of-eight using 1.2mm S-Wire for additional compression of the fracture site (Figure 4). An acceptable alignment of the patella and implant was observed postoperatively (Figure 3).

On a follow-up evaluation three months post-operatively, there was no pain in the affected knee, no pus and inflammation sign observed. Evaluation using Bostman Knee Score, showed that the patient was able to move the knee at about 135 degree flexion and 0 degree extension. The patient was also able to walk without assistance and perform daily routine task such as climbing stairs and sitting. The patient was also able to return to work with a total score of 28 points, an excellent result. Fracture line was no longer visible on a 3-months post operative radiograph (Figure 6).

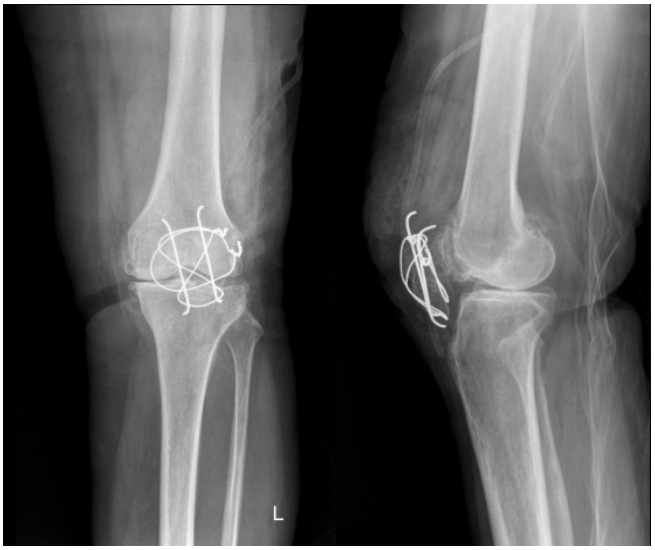


Figure 3. Postoperative left knee radiograph of anteroposterior and lateral view showing the bones and the wires in good alignment



Figure 4. Intraoperative clinical picture of the left knee



Figure 5. Postoperative clinical picture of the left knee (A), and one week after (B).

Discussion

Conservatively, the technique involves two parallel K-wire upright to the fracture line and one figure of eight wire passing anteriorly concluded the patella and behind the K-wire. Tension band wiring is one of treatment approaches for patella fracture fixation, especially for transverse fracture. It counteracts muscle traction, maintaining the reduction and transforming the tensile forces among the quadriceps muscle and the anterior tibia tuberosity to compress the patella articular cortex during knee flexion. By ensuring recurrent compressive force when the knee is flexed, the fracture healing progression can be enforced. It also stabilizes the fracture and enhances bone healing by finishing the fracture gap and sustaining the interfragmentary contact cerclage wire is passed through the quadriceps and patellar tendon. Adding it with two Kirschner wires is suggested by the AO (*Arbeitsgemeinschaft für osteosynthesefragen*) group to fix this defect.[3,4]

Knee immobilization is unnecessary, and the functional outcome is always adequate. In this case, two K-wires traversing the fragment can prevent collapse then the cerclage wire is tightened. K-wire is extra effective than a lag screw when the tension band procedure is applied.

Patella contains of cancellous bone, therefore bony healing progression will be fast as long as the stability can be sustained. Bony union is predictable, and the period is shorter than in other bones. Though, in neglected fractures, it is better to add cancellous bone in the lesion site to support osteogenesis.[5]

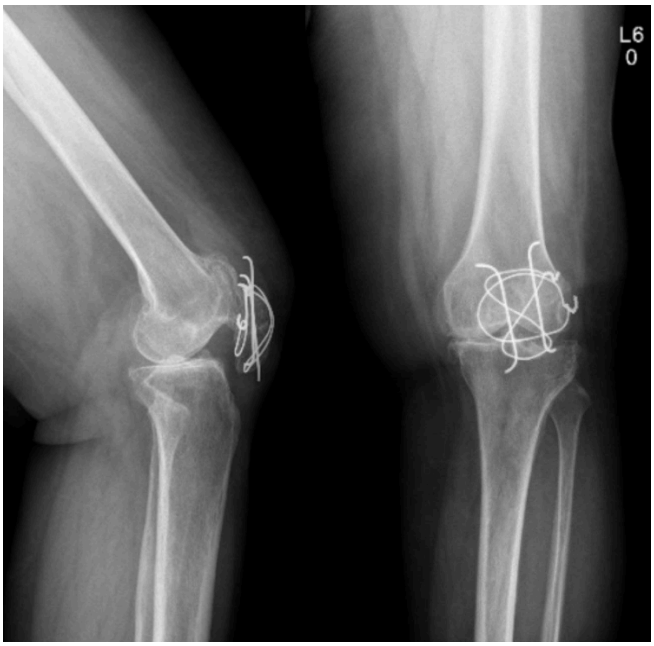


Figure 6. Postoperative left knee radiograph of anteroposterior and lateral view showing the bones and the wires in good alignment

In principle, total patellectomy should be avoided due to the importance of the patella as the extensor mechanism. Even though TBW is one of the most common used procedures to fixed patellar fracture fixation, poor clinical outcomes have been reported in up to 55% of the cases. In this case, we bend the both ends of the K-wire. K-wire bending still controversial, however, it is supposed to provide higher stability by preventing the figure-eight-wire migration. Single proximal bending of the K-wire saves the operating time during implantation or removal.[6] Complication within our case is minor. The skin may be irritated but the wire does not migrate and no loss of fragment reduction.

Bostman in 1981 created a functional outcome scoring for patient who undergo patella surgery. Bostman knee score, which takes into consideration factors such as range of motion, pain, ability to return to work, muscle atrophy, use of aids, effusion, instability of the knee and ability to climb stairs. Out of a maximum score of 30 points, an excellent outcome is between 30 and 28 points, a good outcome between 27 and 20 points and a poor outcome is less than 20 points. In this case the patient able to flex the knee 135 degree without pain. No effusion was observed. The patient also able to perform simple task such us climbing and walking without assistant. The Bostman knee score in this patient was 28 points which indicated excellent result.[7] Presently, there is no current available study on pressure distribution in the, displacement, rotational movement and patellar fracture gap at the fracture site, related to knee flexion and extension during the early mobilization phase, proving that tension band wiring by using K-wire is an effective surgical treatment.[3]

Conclusion

Tension band wiring with cerclage is favorable method to stabilize and fixate a neglected transverse patella fracture. It is associated with satisfying outcome and minor complications. The placing of the tension band close to the patella reduce the rate of major loss of reduction and implant failure

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