Calcaneal reticular plate with cannulated screws fixation for comminuted Hoffa fracture: A case report

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ABSTRACT

Hoffa fracture is a general term for single condylar or double condylar coronal fractures of the distal femur. It is a rare intra-articular fracture. At present, there is no specific fixation method for such fractures. The traditional method to fix Hoffa fracture mainly includes cannulated screws, however, failures of this type of internal fixation have been reported from time to time. Therefore, many scholars have proposed a more solid internal fixation that used cannulated screws combined with a buttress plate or lateral plate to treat this type of fracture, which has been widely recognized. Currently, there is no specially designed anatomical plate for lateral fixation of comminuted Hoffa fractures. In this report, we demonstrate a comminuted Hoffa fracture fixed by cannulated screws combined with a calcaneal reticular plate. The patient was followed up for 14 months. The knee joint ROM was 0°–120°, and the KSS score was 90 at the last follow-up. The efficacy was excellent according to the evaluation of Letenneur function. There was no pain after the activity and recovered to the pre-injury movement and exercise ability.

Introduction

Hoffa fracture occurs in the coronal plane of the femoral condyle, usually in sports injuries, fall injuries, and motor vehicle accidents. This type of fracture is very rare and accounts for about 8.7% ~ 13% of distal femoral fractures [1]. Most scholars believe early open anatomical reduction and stable fixation should be carried out, which can ensure the safety of early functional exercise after operation [2–4]. However, due to the shear stress required to displace the fragments, the stability of the screw during flexion may be mechanically insufficient, especially in the early stages of rehabilitation [5]. In order to improve the stability of the fracture, some scholars have proposed cannulated screws combined with a lateral buttress plate to treat this type of fracture, and achieved favorable outcomes [6,7]. However, so far, there is no specially designed anatomical plate in the lateral side of condyle for fixation of comminuted Hoffa fractures. In this report, the author shows a case of comminuted Hoffa fracture treated by cannulated screws combined with the calcaneal reticular plate.

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Case report

A 54-year-old female, was admitted to the hospital because of left knee pain caused by falling and limited movement for one day. There is no damage to other parts of the body. The fracture of the lateral femoral condyle was diagnosed by Computed tomography (CT) suggested as Letenneur III Hoffa fracture (Fig. 1a & b). The operation was performed with spinal anesthesia in the lateral recumbent position. The anterolateral incision of the knee joint was used to expose the lateral femoral condyle and reduce the fracture. After satisfactory reduction of the fracture, two Kirschner wires were used to initially fix the fracture fragments. Two cannulated screws were placed based on the fracture fragments and the fracture line, one is placed from posterior to anterior and another is in anteroposterior direction. The appropriate size of calcaneal reticular plate (Stryker, America) was selected, and properly shaped to avoid the screw penetrating the joint surface. Radiograph and CT were reviewed the next day after operation (Fig. 2). A continuous passive motion system for knee joint exercises was used for three days following surgery and ankle dorsiflexion and quadriceps strengthening exercise were performed at the same time. The patients began to practice partial weight-bearing walking with the help of crutches 8 weeks after operation, and as long as bone union was indicated by X-ray examination, full weight-bearing was allowed. The patients were followed up for 14 months, including knee function examination and radiograph. Radiographs showed the fracture healed at 3 months follow-up (Fig. 3). At the last follow-up, the KSS score was 90 and letenneur function was excellent (Fig. 4). There was no pain after the activity, and the exercise and labor ability recovered to pre-injury.

Discussion

Hoffa fracture has a low incidence in limb fractures. It is more common in simple lateral condyle or medial condyle of femur, and double condyle fractures are rare. According to reports, the lateral femoral condyle is more commonly injured than the medial condyle.
At present, Letenneur classification [8] is the most commonly used classification of Hoffa fracture in clinical work. This injury was frequently overlooked, especially if not displaced or associated with distal inter-femoral or supracondylar fractures [9]. In order to avoid missing this fracture, the use of CT has been recommended in all patients. CT scans have important guiding significance in the classification and treatment of Hoffa fracture.

In the early days, most scholars used cannulated screws to fix Hoffa fracture, but the fracture displacement or nonunion often happens during early functional training due to weak fixation of the fracture [5,10]. Due to the large fracture fragments of this type of fracture and the attachment of the gastrocnemius muscle to the fragments, simple screw fixation was inadequate to fix the displaced fracture [5]. Cannulated screws combined with a buttress plate or lateral plate provide a new choice for the surgical treatment of Hoffa fracture in recent years [5–7]. This technique provides both coronal and sagittal stability, which is sufficient to resist the shear force between the medial and lateral femoral condyles and the tibial plateaued during the flexion position of the knee joint. The calcaneal reticular plate is an option for the fixation of comminuted Hoffa fracture. The locking plate can fix the small comminuted fracture block from the lateral side, which prevent the loss or displacement of small fractures and increase the stability of the fracture. It has obvious advantages for comminuted letenneur III Hoffa fracture. This reticular plate has more screw holes, and the direction of screw implantation is more selective to prevent the screw entering the articular surface. The thickness of the calcaneal reticular plate is thin,
which is easier to shape than other types of plates, fits better with femoral condyle, and has less disturbance to surrounding soft tissue.

In conclusion, calcaneal reticular plate combined with cannulated screws fixation for Hoffa fracture tend to be less disturbance to surrounding soft tissue and is easy to shape. This method shows firm fixation, and achieves satisfactory functional outcomes. Functional exercise can be carried out early to reduce the incidence of postoperative complications.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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References

[1] P.B. Patel, N.C. Tejwani, The hoffa fracture: coronal fracture of the femoral condyle a review of literature, J. Orthop. 15 (2) (2018) 726–731.
[2] S.L. Lewis, J.L. Pozo, W.F. Mairhead-Allwood, Coronal fractures of the lateral femoral condyle, J. Bone Joint Surg. (Br.) 71 (1) (1989) 118–120.
[3] A.S. Gavaskar, N.C. Tummala, M. KrishnaMurthy, Operative management of Hoffa fractures—a prospective review of 18 patients, Injury 42 (2) (2011) 1495–1498.
[4] A. Jain, Concomitant ipsilateral proximal tibia and femoral hoffa fractures, Acta Orthop. Traumatol. Turc. 48 (4) (2014) 383–387.
[5] J.J. Chang, J.C. Fan, H.Y. Lam, et al., Treatment of an osteoporotic hoffa fracture, Knee Surg. Sports Traumatol. Arthrosc. 18 (6) (2010) 784–786.
[6] B. Lu, S. Zhao, Z. Luo, et al., Compression screws and buttress plate versus compression screws only for hoffa fracture in Chinese patients: a comparative study, J. Int. Med. Res. 47 (1) (2019) 142–151.
[7] M.H. Arastu, M.C. Kokke, P.J. Duffy, et al., Coronal plane partial articular fractures of the distal femoral condyle: current concepts in management, Bone Joint J. 95-B (9) (2013) 1165–1171.
[8] J. Letenneur, P.E. Labour, J.M. Rogerz, Hoffa's fractures. Report of 20 cases, Ann. Chir. 32 (3-4) (1978) 213–219.
[9] S.E. Nork, D.N. Segina, K. Aflatoon, et al., The association between supracondylar-intercondylar distal femoral fractures and coronal plane fractures, J. Bone Joint Surg. Am. 87 (3) (2005) 564–569.
[10] M. Gao, J. Tao, Z. Zhou, et al., Surgical treatment and rehabilitation of medial hoffa fracture fixed by locking plate and additional screws: a retrospective cohort study, Int. J. Surg. 19 (2015) 95–102.