

A Study of Functional Outcome of Hoffa Fracture Fixation with Corticocancellous Screws

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Abstract: ***Aim:** To analyse the radiological and functional outcomes of patients after surgical treatment of Hoffa fractures of femoral condyle using CC screws. **Materials and method:** In this prospective study 15 cases were included which were treated with CC screws. Active knee mobilization exercises were started immediately on post operative day 1. Partial weight bearing started on 4-6 weeks progressed to full weight bearing after 12 weeks. Final results were assessed by Letteneur standards. Results were graded as excellent, good, general and poor. **Conclusion:** based on our observation Hoffa fracture fixation by 2 or more CC screws is viable option*

Keywords: Hoffa's fracture, CC screw, Letteneur standard

1. Introduction

The Hoffa fracture, which is a relatively uncommon type of coronal fracture of the distal medial and lateral condyles of the femur, accounts for a small proportion of all distal femoral fractures. The first recorded description of this fracture dates back to 1869 by Busch, with Hoffa later describing a similar coronal fracture of the femoral condyle in 1888. It was following Letteneur's classification of coronal fractures of the femoral condyle and the publication of the second edition of the "Manual of Internal Fixation," that Hoffa fracture gained wider recognition among orthopaedists. This type of fracture is usually caused by high-impact injuries, such as road traffic accidents or falls from a great height. As a result, the Hoffa fracture often involves the distal end and surrounding area of the femur. Diagnosis of a Hoffa fracture can be challenging and if treated non-operatively, it may result in displacement of the fracture and limited joint function. Currently, the preferred method of fixation is using two or more cannulated screws, either from the anterior or posterior side, which offers minimal invasiveness, fewer complications, and dependable fixation. In the present study, we employed a fixation technique that uses two or more cannulated screws to treat the Hoffa fracture.

Study design

Prospective observational study.

General data

A prospective analysis of 15 cases with Hoffa fractures of the lateral or medial femoral condyle admitted to our hospital from February 2021 to January 2022 was performed.

The following are the inclusion criteria:

- Post traumatic Hoffa fracture in patient >18 years.
- Patients had complete clinical data and were followed for at least 6 months.

Exclusion criteria:

- Post traumatic Hoffa fracture in patients <18 years
- Patients diagnosed with Hoffa fracture with metaphyseal comminution
- Patients who are unfit for surgery

Surgical Procedure

All patients underwent open reduction and internal fixation 5–7 days after injury under combined spinal-epidural anaesthesia. A supine position was taken; either anterolateral, medial or lateral parapatellar approach was taken based on fracture morphology. The articular capsule was cut open to expose the knee articular surface and the Hoffa fracture end. Fracture hematoma cleared; with knee flexion to restore the end of the Hoffa fracture under direct vision to ensure a smooth cartilage surface. Two or more 4.0 mm cannulated lag screws were drilled in the anteroposterior direction, perpendicular to the fracture line as much as possible; screw heads were buried below the cartilage of the articular surface, and the tails could not reach out of the articular surface of the contralateral posterior condyle. The stability of the internal fixation was evaluated by completely moving the knee joint prior to incision closure, as well as by stress test and T drawer test

Post-operative protocol

Postoperative external plaster immobilization was not used, and the drainage tube was taken out on post operative day 2. On the first day after the surgery, the patients performed active knee flexion and extension exercises, as well as passive knee joint range of motion exercises. The knee joint was passively moved 1 to 2 times when changing the dressing. Four weeks after the operation, the affected limb was allowed to touch the ground with the help of free-weight walking aids, and partial load walking began after 6 weeks. Full load walking was after the formation of the callus, which took place after 12 weeks.



Figure 1: 3d CT showing type 3 Letenneur Hoffa fracture of medial condyle femur



Figure 2: Post operative fixation by 3 cc screws for medial Hoffa fracture

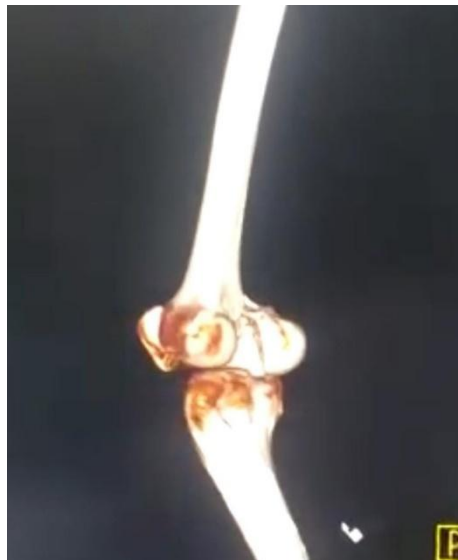


Figure 3: 3d Ct showing type 2 Letenneur Hoffa fracture of lateral condyle femur



Figure 4: Intra op reduction technique by reduction clamp and fixation with k wire

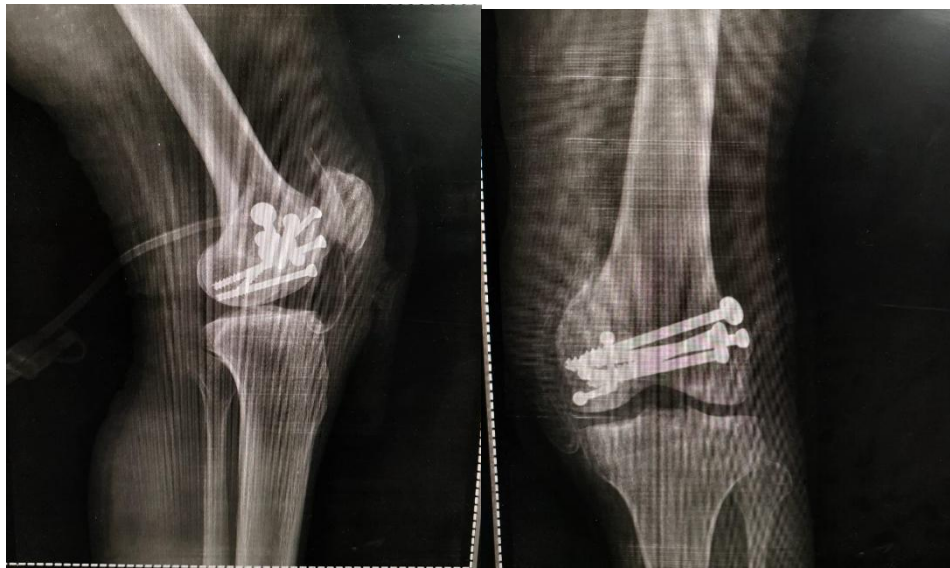


Figure 5: Post op xray of fixation of lateral Hoffa fracture by multiple cc screws



Figure 6: Follow up after 6 months clinical picture

Efficacy evaluations

Post-operatively the knee joint was evaluated using the Letenneur standard. Considering the range of movement, stability, pain, and assisted walking of the knee joint, the results were divided into four categories.

- **Excellent:** Movement range > 120°, stable, no pain, no assisted walking;

- **Good** Movement range > 120°, stable, slightly pained during exercise, no assisted walking;
- **General** Movement range 90°–120°, stable and occasional pain after exercise, without assisted walking;
- **Poor** Movement range < 90°, unstable and frequently painful, assisted walking.

Study was undertaken with approval from ethics committee

All methods were carried out according to relevant guidelines and regulations, and. Informed consent was obtained from all subjects and/or their legal guardians.

2. Results

Patient characteristics in this tertiary care centre prospective observational study; we evaluated the efficiency of treatment of two or more cannulated screw in 15 patients with Hoffa fractures of distal femoral condyle. According to the above criteria, in this study 15 cases were considered, including twelve men and three women, 20 to 60 years of age. Fourteen patients had sustained a road traffic injury, and one patient had a fall from height injury. All fractures were closed, X-ray, CT, 3D reconstruction, examination was performed for all patients. There were 11 cases of the lateral condyle Hoffa with 8 type I, and 3 cases of type III fracture, according to the Letenneur system. There were 4 cases of medial Hoffa fracture.

This group of patients was followed for 6 months. All fractures healed in 3 to 6 months, with an average healing time of 3 months. No complications developed such as infection, fracture non-union, malunion, loosening of the internal fixation, fracture, necrosis of the femoral condyle, etc.

In terms of knee joint function, eight cases were rated excellent, four cases good, and nil cases in the general and poor categories. The excellent and good cases were 60% and 40%, respectively.

3. Discussion

Hoffa fractures that affect the weight bearing articular surface of a joint are considered unstable and intra-articular. A common oversight in diagnosing Hoffa fractures is the failure to recognize those that are not displaced or linked to distal inter femoral or supracondylar fractures. To prevent this from happening, CT scans done for all patients. CT scans play a crucial role in accurately classifying and treating Hoffa fractures.

The area at the end of the fracture experiences significant shear force, and the gastrocnemius muscle often attaches to the back of the fracture's end. This attachment makes the end of the fracture highly unstable and susceptible to displacement, while prolonged immobilization and external fixation can lead to stiffness in the knee joint. For this reason, it is advisable to undergo early surgical intervention for Hoffa fractures, regardless of the displacement.

In the case of a Hoffa fracture, there is often concomitant damage to the adjacent distal femur. The fracture occurs when an axial force is applied to the lower extremity while the knee joint is flexed. This force causes significant shear stress on both the tibial plateau and femoral condyle, resulting in a coronal shear fracture of the posterior femoral condyle. Achieving optimal results requires accurate anatomical realignment and secure stabilization

Functional outcome of Hoffa fracture after cannulated screws with follow-up of 6 months after the operation was studied. We used two or more 4.0 mm cannulated screws to fix the Hoffa fracture of the femoral condyle. The outcome showed that the patients have an average healing time of 3 months and full functional recovery of the knee was presented. These findings added on our understanding of the treatment of the Hoffa fracture the femoral condyle and suggested that cannulated is useful implant for the Hoffa fracture. The data showed that the use of cannulated cortico-cancellous screws resulted in a 60% rate of excellent cases and a 40% rate of good cases. This suggests that this type of screw may lower the risk of fracture block displacement.

4. Conclusions

Based on the cannulated screw fixation for Hoffa fracture we found a satisfactory clinical result, which can be repeated. Therefore, two or more cannulated screw fixation in the treatment of Hoffa fracture is viable and economic option. It requires a perfect articular reduction and good post-operative rehabilitation for excellent outcome.

References

- [1] Jain S: Distal Femur AO type 33 B-surgical options, results and complications (including Hoffa's fracture). *Trauma International*.2016, 2: 20-3.
- [2] Holmes SM, Bomback D, Baumgaertner MR: Coronal fractures of the femoral condyle: a brief report of five cases. *J Orthop Trauma*.2004, 18: 316-9.10.1097/00005131-200405000-00010
- [3] Ostermann PA, Neumann K, Ekkernkamp A, Muhr G: Long term results of unicondylar fractures of the femur. *J Orthop Trauma*.1994, 8: 142-6.10.1097/00005131-199404000-00011
- [4] Tscherne H: Femoral shaft and distal femur. *Manual of Internal Fixation*. Müller ME, Allgöwer M, Schneider R, Willenegger H (ed): Springer-Verlag, New York; 1991.535-52.10.1007/978-3-662-02695-3_12
- [5] Shelbourne KD, Brueckmann FR: Rush-pin fixation of supracondylar and intercondylar fractures of the femur. *J Bone Joint Surg Am*.1982, 64: 161-9.
- [6] Siliski JM, Mahrng M, Hofer HP: Supracondylar-intercondylar fractures of the femur. Treatment by internal fixation. *J Bone Joint Surg Am*.1989, 71: 95-104.
- [7] Neer CS 2nd, Grantham SA, Shelton ML: Supracondylar fracture of the adult femur. A study of one hundred and ten cases. *J Bone Joint Surg Am*.1967, 49: 591-613.
- [8] Mooney V, Nickel VL, Harvey JP Jr, Snelson R: Cast-brace treatment for fractures of the distal part of the femur. A prospective controlled study of one hundred and fifty patients. *J Bone Joint Surg Am*.1970, 52: 1563-78.
- [9] Trikha V, Das S, Gaba S, Agrawal P: Analysis of functional outcome of Hoffa fractures: a retrospective review of 32 patients. *J Orthop Surg (Hong Kong)*.2017, 25: 10.1177/2309499017718928
- [10] Lewis SL, Pozo JL, Muirhead-Allwood WF: Coronal fractures of the lateral femoral condyle. *J Bone Joint*

- Surg Br.1989, 71: 118-20.10.1302/0301-620X.71B1.2914979
- [11] Papadopoulos AX, Panagopoulos A, Karageorgos A, Tyllianakis M: Operative treatment of unilateral bicondylar Hoffa fractures. *J Orthop Trauma*.2004, 18: 119-22.10.1097/00005131-200402000-00012
- [12] Kumar R, Malhotra R: The Hoffa fracture: three case reports. *J Orthop Surg (Hong Kong)*.2001, 9: 47-51.10.1177/230949900100900210
- [13] Hak DJ, Nguyen J, Curtiss S, Hazelwood S: Coronal fractures of the distal femoral condyle: a biomechanical evaluation of four internal fixation constructs. *Injury*.2005, 36: 1103-6.10.1016/j.injury.2005.02.013
- [14] Jarit GJ, Kummer FJ, Gibber MJ, Egol KA: A mechanical evaluation of two fixation methods using cancellous screws for coronal fractures of the lateral condyle of the distal femur (OTA type 33B). *J Orthop Trauma*.2006, 20: 273-6.10.1097/00005131-200604000-00007
- [15] Arastu MH, Kokke MC, Duffy PJ, Korley RE, Buckley RE: Coronal plane partial articular fractures of the distal femoral condyle: current concepts in management. *Bone Joint J*.2013, 95-B: 1165-71.10.1302/0301-620X.95B9.30656
- [16] McCarthy JJ, Parker RD: Arthroscopic reduction and internal fixation of a displaced intraarticular lateral femoral condyle fracture of the knee. *Arthroscopy*.1996, 12: 224-7.10.1016/s0749-8063(96)90016-x
- [17] Patel PB, Tejwani NC: The Hoffa fracture: coronal fracture of the femoral condyle a review of literature. *J Orthop*.2018, 15: 726-31.10.1016/j.jor.2018.05.027
- [18] Zhou Y, Pan Y, Wang Q, Hou Z, Chen W: Hoffa fracture of the femoral condyle: injury mechanism, classification, diagnosis, and treatment. *Medicine (Baltimore)*.2019, 98: e14633.10.1097/MD.00000000000014633
- [19] Siddiqui SS, Joshi JB, Patel R, Dindod V: Functional outcome of ORIF of distal femur fracture AO. *Int J Biomed Res*.2014, 5: 673-6.10.7439/ijbr.v5i11.785
- [20] Singh R, Singh RB, Mahendra M: Functional outcome of isolated Hoffa fractures treated with cannulated cancellous screw. *Malays Orthop J*.2017, 11: 20-4.10.5704/MOJ.1707.0165.
- [21] Huang, C., Fu, Z., Wang, Q. et al. Treatment of the Hoffa fracture of the lateral femoral condyle with cannulated screws in combination with an anti-gliding steel plate, a retrospective observational study. *BMC Surg* 22, 354 (2022). <https://doi.org/10.1186/s12893-022-01803-9>
- [22] Kurahatti A, Seenappa H, Shanthappa AH, S NJ. The Functional and Radiological Outcome of Hoffa's Fracture Treated With Cannulated Cancellous Screws. *Cureus*.2022 Apr 4; 14 (4): e23829. doi: 10.7759/cureus.23829. PMID: 35530908; PMCID: PMC9072288.