

To Analyse the Functional Outcome of Plate Assisted Buttressing Along With Cancellous Screw Fixation in Hoffa Fracture

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Abstract

Background: Hoffa fractures are uncommon intra-articular coronal fractures of the distal femoral condyle that require anatomical reduction and stable fixation to restore knee function and prevent complications.

Objectives: This study evaluated functional and radiological outcomes following fixation with cannulated cancellous screws augmented by a buttress plate.

Methods: A prospective case study was conducted among 30 adults with radiologically confirmed AO/OTA 33-B3 Hoffa fractures treated at Silchar Medical College and Hospital from November 2024 to October 2025. Patients underwent open reduction and internal fixation using cannulated cancellous screws with buttress plate augmentation. Outcomes included radiological union, Knee Society Score, knee range of motion, weight-bearing milestones, return to normal activity, and postoperative complications.

Results: Mean age was 36.8±9.4 years, and 70.0% were male. Road traffic accidents accounted for 66.7% of injuries, while the lateral condyle was involved in 73.3%. Mean radiological union time was 13.8±2.1 weeks. Mean Knee Society Score improved from 58.4±6.2 at six weeks to 91.6±5.9 at twelve months (p<0.001). At final follow-up, 66.7% had excellent, 26.7% good, and 6.7% fair outcomes. Mean knee range of motion was 122.4±8.6°. Postoperative complications occurred in 16.7%, most commonly knee stiffness. No nonunion or implant failure occurred. Earlier weight bearing, younger age, and less complex Letenneur fracture patterns were significantly associated with better functional outcomes.

Conclusion: Cannulated cancellous screw fixation augmented with a buttress plate achieved reliable union, progressive functional recovery, satisfactory knee motion, and a low major complication rate in Hoffa fractures and supported postoperative rehabilitation without documented fixation failure during follow-up period.

Keywords: Femoral Fractures; Fracture Fixation, Internal; Bone Plates; Bone Screws; Treatment Outcome.

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Introduction

Hoffa fractures are uncommon intra-articular coronal-plane fractures of the distal femoral condyle and represent a distinct subset of partial articular distal femoral injuries. They most often follow high-energy trauma, particularly when axial loading is transmitted through a flexed knee, and the lateral condyle is affected more frequently than the medial condyle [1,2]. Because the fracture plane lies in the coronal orientation, routine anteroposterior radiographs may underestimate or miss the lesion, especially when it accompanies more complex distal femoral fractures. Computed tomography is therefore important for defining

fracture morphology, displacement, comminution, and fragment size and for planning the operative approach and fixation strategy [2,3]. The intra-articular location and posterior position of the Hoffa fragment create important mechanical and biological challenges. Shear forces generated during knee motion and weight bearing tend to displace the fragment, while inadequate reduction can compromise articular congruity and predispose to stiffness, nonunion, malunion, and post-traumatic osteoarthritis [1,4]. Long-term follow-up studies have shown that radiographic union does not invariably translate into optimal function, with

degenerative changes and restricted motion remaining clinically relevant concerns [5]. Consequently, treatment aims to achieve anatomical reduction, stable fixation, preservation of the articular surface and blood supply, and sufficiently rigid stability to permit early knee mobilization [4,6]. Open reduction and internal fixation is generally preferred for displaced Hoffa fractures. Lag or cannulated cancellous screws placed as perpendicular as possible to the fracture plane provide interfragmentary compression and remain a fundamental component of fixation [6,7]. However, screw-only constructs may provide limited resistance to posterior shear and rotational forces in large, comminuted, osteoporotic, or otherwise unstable fragments. For this reason, supplementary buttress or locking plates have been used to reinforce screw fixation and protect the reduction during rehabilitation [8,9]. Clinical series using combined plate-and-screw constructs have reported reliable union, satisfactory knee motion, and favorable functional recovery [9,10]. This hybrid construct combines direct interfragmentary compression with resistance to shear, supporting articular reduction during progressive postoperative rehabilitation and weight bearing.

Comparative evidence also suggests a potential mechanical and clinical advantage of plate augmentation. Lu et al. reported superior Knee Society Scores and range of motion with compression screws plus a buttress plate compared with compression screws alone [11]. More recent biomechanical work has further demonstrated that fixation configuration materially influences construct stability under repetitive loading [12]. Nevertheless, Hoffa fractures remain rare, available clinical series are generally small, and outcomes vary with fracture morphology, fixation method, surgical exposure, rehabilitation, and duration of follow-up [1,5,6]. The present study therefore evaluated the functional and radiological outcomes of Hoffa fractures treated with cancellous screw fixation augmented by a buttress plate, with particular emphasis on fracture union, Knee Society Score, knee range of motion, weight-bearing milestones, return to normal activity, and postoperative complications.

Materials and Methods

Study Design and Setting: A prospective case-study design was used to evaluate the functional and radiological outcomes of Hoffa fractures treated with cancellous screw fixation augmented with a buttress plate. The study was conducted in the Department of Orthopaedics, Silchar Medical College and Hospital, Silchar, Assam, India. All clinical examinations, radiological assessments, operative procedures, postoperative care, and follow-up evaluations were performed within the department. The study was carried out over a

period of one year, from November 2024 to October 2025.

Study Population: Patients presenting to the Orthopaedics outpatient department, casualty, or inpatient services with a diagnosis of Hoffa fracture were screened for eligibility. Adult patients with radiologically confirmed Hoffa fractures classified as AO/OTA type 33-B3 were considered for inclusion.

Patients were included if they were aged 18 years or older, had a radiologically confirmed Hoffa fracture, and provided written informed consent for participation. Patients with open Hoffa fractures, pathological fractures or refractures, inadequate or irregular follow-up, clinical or radiological evidence of an already united fracture at presentation, or those who were considered medically or anaesthetically unfit for operative treatment were excluded from the study.

Sample Size and Sampling Technique: The sample size was calculated before commencement of the study using Daniel's sample-size formula. An expected prevalence of Hoffa fracture of 1.4%, a 95% confidence level corresponding to a Z value of 1.96, and an absolute precision of 5% were considered. The initially calculated sample size was 20 patients. To improve representation and statistical power, the final target sample size was increased to 30 patients.

Simple random sampling was used for participant selection. Eligible patients presenting during the study period were assigned identification numbers, and participants were selected using a random-number table until the required sample size of 30 patients had been achieved.

Preoperative Evaluation: Patients fulfilling the eligibility criteria were evaluated clinically and radiologically at presentation. Initial trauma stabilization was performed where required, followed by a detailed examination of the affected limb. Standard anteroposterior and lateral radiographs of the knee were obtained in all patients. Oblique radiographs or computed tomography were performed when the fracture configuration was not adequately delineated on routine radiographs. These investigations were used to confirm the Hoffa fracture, assess condylar involvement and displacement, and facilitate operative planning.

Following confirmation of the diagnosis, routine preoperative investigations were performed. Laboratory investigations, electrocardiography, and anaesthetic fitness assessment were completed before surgery. Patients were counselled regarding the proposed operative procedure, potential complications, postoperative rehabilitation, and anticipated recovery. The injured limb was

immobilized temporarily in an above-knee splint while surgery was awaited.

Surgical Technique: Surgery was performed under regional or general anaesthesia according to the anaesthesiologist's assessment. Patients were positioned supine on a radiolucent operating table, and a proximal pneumatic tourniquet was applied. The surgical approach was selected according to the condyle involved and fracture configuration. Lateral parapatellar, medial parapatellar, or direct lateral approaches were used as considered appropriate for adequate visualization of the fracture.

Following exposure, the fracture fragment was identified, and haematoma and interposed soft tissues were cleared. The articular fragment was mobilized, and anatomical reduction was achieved under direct visualization using reduction clamps. Fluoroscopic imaging was used to verify restoration of the articular surface and condylar alignment.

After satisfactory reduction had been obtained, provisional fixation was performed with Kirschner wires. Definitive fixation was subsequently achieved using cannulated cancellous screws positioned perpendicular to the fracture plane to obtain interfragmentary compression. A contoured buttress plate was then applied posteriorly or laterally according to the fracture configuration to resist posterior shear forces and augment construct stability. The plate was secured using cortical or locking screws as required.

Reduction, screw placement, and plate position were reconfirmed fluoroscopically in multiple planes. The operative field was irrigated with normal saline, haemostasis was achieved, and the wound was closed in layers. A sterile dressing was applied, and the operated limb was supported temporarily in an above-knee splint.

Postoperative Management and Rehabilitation: Following surgery, patients were transferred to the recovery area and subsequently to the orthopaedic ward after clinical stabilization. Postoperative analgesics, antibiotics, and thromboprophylaxis were administered according to departmental protocol.

Early knee mobilization was initiated after pain had subsided and the temporary splint had been removed. Weight bearing was initially restricted and was progressively advanced according to clinical recovery and radiological evidence of fracture healing. Compliance with the prescribed rehabilitation programme and progression of weight bearing were monitored during follow-up.

Outcome Assessment and Follow-up: Clinical, radiological, and functional evaluations were

undertaken during postoperative follow-up. The principal outcomes assessed included radiological fracture union, Knee Society Score (KSS), knee range of motion, time to partial and full weight bearing, return to normal activities, and postoperative complications.

Functional outcome was assessed using the Knee Society Score, while knee range of motion was evaluated clinically. Radiographs were reviewed during follow-up to assess fracture healing and maintenance of reduction. The occurrence of complications, including knee stiffness, superficial infection, implant prominence, nonunion, implant failure, and early post-traumatic arthritis, was recorded.

The follow-up visits were done on 2 weeks, 4 weeks, 3 months, 6 and 12 months, during which clinical examination, radiographic evaluation, functional assessment, complication surveillance, and rehabilitation compliance were documented.

Ethical Considerations: Ethical approval was obtained from the Institutional Ethics Committee of Silchar Medical College and Hospital before initiation of the study. Written informed consent was obtained from all participants after the nature and purpose of the study, potential benefits, possible risks, and study procedures had been explained.

Patient confidentiality was maintained throughout the study. Participation remained voluntary, and participants were permitted to withdraw at any stage without any effect on their subsequent clinical management. The study procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki.

Statistical Analysis: Data were compiled and analysed using IBM SPSS Statistics, version 22.0. Continuous variables were summarized using mean and standard deviation, while categorical variables were expressed as frequencies and percentages. Associations between categorical variables were evaluated using the chi-square test or Fisher's exact test, as appropriate. Comparisons of continuous variables between groups were performed using Student's t-test. A two-sided p value of <0.05 was considered statistically significant.

Results

A total of 30 patients with radiologically confirmed Hoffa fractures who underwent fixation with cannulated cancellous screws augmented by a buttress plate were included in the final analysis. The mean age of the study population was 36.8 ± 9.4 years. The largest proportion of patients belonged to the 31–40-year age group [10 (33.3%)], followed by 18–30 years [8 (26.7%)], 41–50 years [7 (23.3%)], and 51–60 years [5

(16.7%)]]. There was a male predominance, with 21 (70.0%) males and 9 (30.0%) females. Road traffic accidents constituted the most frequent mechanism of injury, accounting for 20 (66.7%) cases, followed by falls from height in 6 (20.0%) and sports-related injuries in 4 (13.3%) patients. The lateral femoral condyle was involved in 22 (73.3%)

patients, the medial condyle in 6 (20.0%), and bicondylar involvement was present in 2 (6.7%) patients. According to the Letenneur classification, Type II fractures were most frequent [13 (43.3%)], followed by Type I [11 (36.7%)] and Type III [6 (20.0%)] fractures (Table 1).

Table 1: Demographic and injury characteristics of the study population (n = 30)

Characteristic	Category	n (%) or mean $\pm$ SD
Age, years	Mean $\pm$ SD	36.8 $\pm$ 9.4
	18–30	8 (26.7)
	31–40	10 (33.3)
	41–50	7 (23.3)
	51–60	5 (16.7)
Sex	Male	21 (70.0)
	Female	9 (30.0)
Mode of injury	Road traffic accident	20 (66.7)
	Fall from height	6 (20.0)
	Sports-related injury	4 (13.3)
Condylar involvement	Lateral condyle	22 (73.3)
	Medial condyle	6 (20.0)
	Bicondylar	2 (6.7)
Letenneur classification	Type I	11 (36.7)
	Type II	13 (43.3)
	Type III	6 (20.0)

The mean duration of surgery was 95 $\pm$ 18 minutes, while the mean intraoperative blood loss was 165 $\pm$ 40 mL. The mean duration of hospital stay was 6.2 $\pm$ 1.5 days. The mean time to radiological union was 13.8 $\pm$ 2.1 weeks. Union was documented within 10–12 weeks in 12 (40.0%) patients, between 13 and 16 weeks in 15 (50.0%), and after 16 weeks in 3 (10.0%) patients. The mean time to partial weight bearing was 6.4 $\pm$ 1.2 weeks, while full weight bearing was achieved at a mean of 13.2

$\pm$ 2.4 weeks. Return to normal activities occurred after a mean duration of 18.6 $\pm$ 3.1 weeks. Five patients (16.7%) were classified as having at least one postoperative complication. Knee stiffness was the most frequent complication and occurred in 3 (10.0%) patients. Superficial infection, implant prominence, and early post-traumatic arthritis were each observed in 1 (3.3%) patient. No cases of nonunion or implant failure were recorded (Table 2).

Table 2: Operative, radiological, rehabilitation, and postoperative outcomes (n = 30)

Domain	Outcome	Value
Operative characteristics	Duration of surgery, min	95 $\pm$ 18
	Intraoperative blood loss, mL	165 $\pm$ 40
	Hospital stay, days	6.2 $\pm$ 1.5
Radiological union	Mean time to union, weeks	13.8 $\pm$ 2.1
	Union at 10–12 weeks	12 (40.0)
	Union at 13–16 weeks	15 (50.0)
	Union after >16 weeks	3 (10.0)
Rehabilitation milestones	Partial weight bearing, weeks	6.4 $\pm$ 1.2
	Full weight bearing, weeks	13.2 $\pm$ 2.4
	Return to normal activities, weeks	18.6 $\pm$ 3.1
Postoperative complications	Patients classified as having $\geq$ 1 complication	5 (16.7)
	Knee stiffness	3 (10.0)
	Superficial infection	1 (3.3)
	Implant prominence	1 (3.3)
	Early post-traumatic arthritis	1 (3.3)
	Nonunion	0
	Implant failure	0

A progressive increase in the Knee Society Score (KSS) was observed during postoperative follow-

up. The mean KSS was 58.4 $\pm$ 6.2 at 6 weeks, 74.8 $\pm$ 7.5 at 3 months, 85.2 $\pm$ 6.8 at 6 months, and 91.6

± 5.9 at 12 months. The overall change in KSS across follow-up was statistically significant ($p < 0.001$). At final follow-up, 20 (66.7%) patients had an excellent functional outcome, 8 (26.7%) had a good outcome, and 2 (6.7%) had a fair outcome. No patient had a poor functional outcome. The

mean final knee range of motion was $122.4^\circ \pm 8.6^\circ$. Eighteen (60.0%) patients achieved a final range of motion of 120° – 130° , 9 (30.0%) achieved 110° – 119° , and 3 (10.0%) achieved 100° – 109° . No patient had a final knee range of motion below 100° (Table 3).

Table 3: Functional outcome during follow-up and at final assessment (n = 30)

Outcome	Follow-up/category	Value
Knee Society Score	6 weeks	58.4 ± 6.2
	3 months	74.8 ± 7.5
	6 months	85.2 ± 6.8
	12 months	91.6 ± 5.9
Final KSS category	Excellent (85–100)	20 (66.7)
	Good (70–84)	8 (26.7)
	Fair (60–69)	2 (6.7)
	Poor (<60)	0
Final knee ROM	Mean ROM, degrees	122.4 ± 8.6
	120° – 130°	18 (60.0)
	110° – 119°	9 (30.0)
	100° – 109°	3 (10.0)
	< 100°	0

Final KSS grades differed according to Letenneur fracture type. Among patients with Type I fractures, 10 of 11 (90.9%) achieved an excellent outcome and 1 (9.1%) had a good outcome.

Among patients with Type II fractures, 8 of 13 (61.5%) had an excellent outcome, 4 (30.8%) had a good outcome, and 1 (7.7%) had a fair outcome. Among those with Type III fractures, 2 of 6 (33.3%) had an excellent outcome, 3 (50.0%) had a good outcome, and 1 (16.7%) had a fair outcome. The reported association between Letenneur classification and final KSS category was

statistically significant ($\chi^2 = 8.42$, $p = 0.038$). Final functional outcome did not differ significantly according to the condyle involved ($\chi^2 = 2.14$, $p = 0.709$). Excellent outcomes were observed in 15 of 22 (68.2%) lateral condyle fractures, 4 of 6 (66.7%) medial condyle fractures, and 1 of 2 (50.0%) bicondylar fractures.

Patients with Letenneur Type I or II fractures had a significantly greater final knee range of motion than those with Type III fractures ($125.1^\circ \pm 6.3^\circ$ vs. $110.8^\circ \pm 8.9^\circ$, respectively; $t = 3.94$, $p < 0.001$) (Table 4).

Table 4: Association of fracture morphology with final functional outcome

Fracture characteristic	Category	n	Final functional outcome	Test statistic	p value
Letenneur classification	Type I	11	Excellent: 10 (90.9%); good: 1 (9.1%); fair: 0	$\chi^2 = 8.42^\dagger$	0.038
	Type II	13	Excellent: 8 (61.5%); good: 4 (30.8%); fair: 1 (7.7%)		
	Type III	6	Excellent: 2 (33.3%); good: 3 (50.0%); fair: 1 (16.7%)		
Condylar involvement	Lateral	22	Excellent: 15 (68.2%); good: 6 (27.3%); fair: 1 (4.5%)	$\chi^2 = 2.14$	0.709
	Medial	6	Excellent: 4 (66.7%); good: 1 (16.7%); fair: 1 (16.7%)		
	Bicondylar	2	Excellent: 1 (50.0%); good: 1 (50.0%); fair: 0		
Letenneur type and final ROM	Types I & II	24	$125.1 \pm 6.3^\circ$	$t = 3.94$	<0.001
	Type III	6	$110.8 \pm 8.9^\circ$		

Among the 18 patients who commenced weight bearing at ≤ 6 weeks, 16 (88.9%) achieved an excellent functional outcome, compared with 4 of 12 (33.3%) patients who commenced weight bearing after 6 weeks. The association between earlier weight bearing and an excellent final

outcome was statistically significant ($\chi^2 = 10.62$, $p = 0.001$). Patients aged ≤ 40 years had a higher mean final KSS than those aged >40 years (94.3 ± 4.2 vs. 87.8 ± 6.1 , respectively), and the difference was statistically significant ($t = 3.36$, $p = 0.002$). Among the five patients classified as having

postoperative complications, 1 (20.0%) achieved an excellent outcome and 4 (80.0%) had good or fair outcomes. In comparison, among the 25 patients without complications, 19 (76.0%) achieved an excellent outcome and 6 (24.0%) had good or fair outcomes.

The association between postoperative complications and final KSS category was statistically significant ($\chi^2 = 6.98$, $p = 0.008$) (Table 5).

Table 5: Factors associated with final functional outcome

Factor	Category	n	Functional outcome	Test statistic	p value
Timing of weight bearing	≤6 weeks	18	Excellent: 16 (88.9%); non-excellent: 2 (11.1%)	$\chi^2 = 10.62$	0.001
	>6 weeks	12	Excellent: 4 (33.3%); non-excellent: 8 (66.7%)		
Age	≤40 years	18	Final KSS: 94.3 ± 4.2	$t = 3.36$	0.002
	>40 years	12	Final KSS: 87.8 ± 6.1		
Postoperative complications	Present	5	Excellent: 1 (20.0%); good/fair: 4 (80.0%)	$\chi^2 = 6.98$	0.008
	Absent	25	Excellent: 19 (76.0%); good/fair: 6 (24.0%)		

Figure 1 represented Preoperative X-ray. Fig 2 represented Buttress plate with cancellous screw and Fig 3 represented Postoperative X-ray.

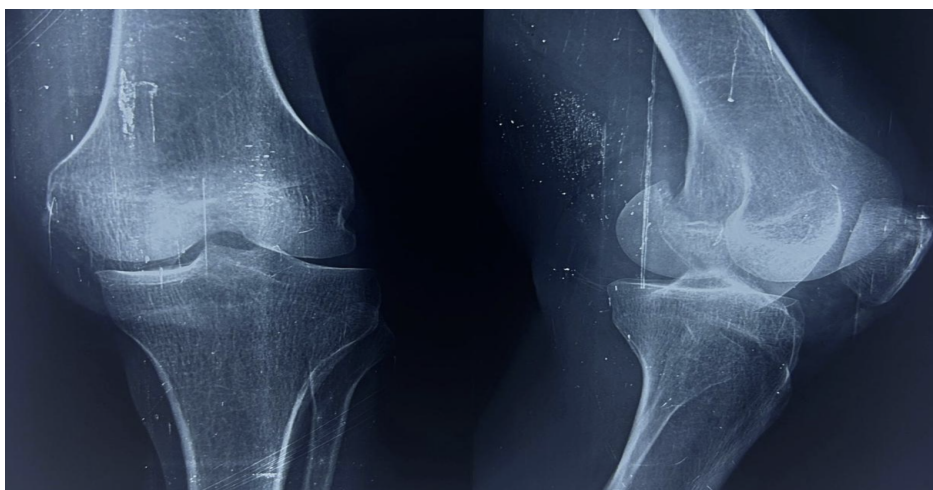


Fig 1: Preoperative X-ray

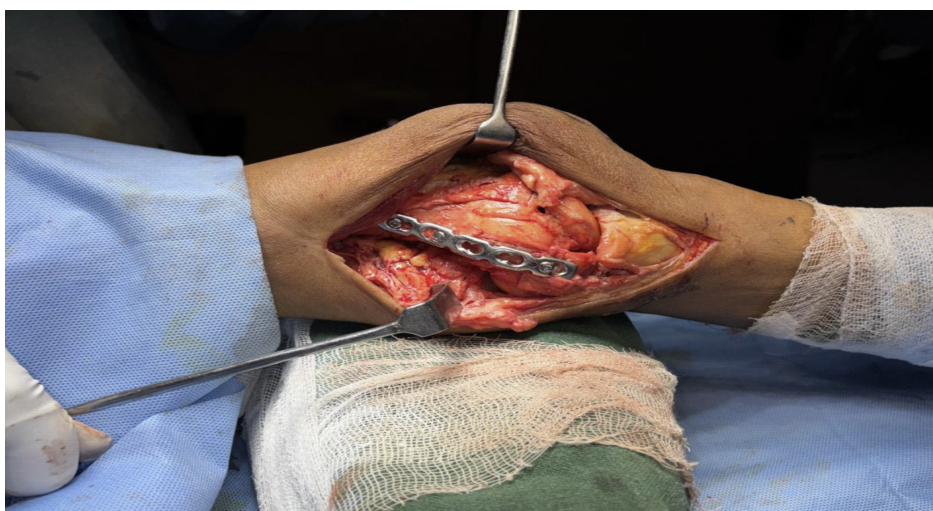


Fig 2: Buttress plate with cancellous screw



Fig 3: Postoperative X-ray

Discussion

The present study evaluated 30 patients with Hoffa fractures treated using cannulated cancellous screws augmented by a buttress plate and demonstrated favorable radiological and functional outcomes. The predominance of younger adults, males, road traffic accidents, and lateral condylar involvement was consistent with previous clinical series. Trikha et al. reported a mean age of 34.7 years, male predominance, road traffic accidents as the principal mechanism, and lateral condylar involvement in 65.6% of patients [13].

A systematic review by Rabelo et al. similarly found lateral coronal fractures to be more frequent than medial fractures and emphasized their occurrence within the weight-bearing portion of the condyle [14]. Fracture morphology influenced outcome. Type I fractures showed the highest proportion of excellent KSS results, whereas Type III fractures demonstrated lower final range of motion. Chandrabose et al. observed that increasing articular and posterior cortical comminution adversely affected prognosis despite operative treatment, supporting the importance of fracture morphology in determining recovery [15]. Singh et al. reported functional improvement following cancellous screw fixation with posterior buttress plating in Letenneur Type I fractures, with KSS and range of motion improving through 12 months [16].

The mean radiological union time of 13.8 weeks was comparable with reported healing intervals. The improvement in KSS from 58.4 at 6 weeks to 91.6 at 12 months, together with a mean final knee range of motion of 122.4°, indicated postoperative recovery. Peez et al. demonstrated greater failure loads and reduced displacement with plate-augmented constructs compared with isolated screw fixation [17]. Yao et al. showed that alternative screw trajectories can provide

comparable mechanical stability in selected fracture configurations [18], while Xu et al. reported satisfactory healing and functional outcomes with different screw-based fixation strategies [19].

The low complication burden was important. Knee stiffness occurred in 10% of patients, while no nonunion or implant failure was documented. Sahu and Gupta reported satisfactory clinico-radiological outcomes following operative fixation and emphasized rigid fixation to facilitate early rehabilitation [20]. Sun et al. demonstrated superior axial stiffness and resistance to displacement with plate-supported constructs compared with screw-only fixation [21]. The findings are also compatible with earlier observations that coronal fracture components may be under-recognized in complex distal femoral injuries [22] and that formal open reduction with stable internal fixation can produce satisfactory outcomes [23].

Early weight bearing was significantly associated with excellent KSS outcomes in this cohort. This finding should be interpreted cautiously because earlier weight bearing may also reflect less complex fractures and more rapid recovery rather than an independent treatment effect. Contemporary reviews emphasize stable fixation and early controlled mobilization as central principles in Hoffa fracture management [24].

The absence of nonunion contrasts with reports describing neglected or inadequately stabilized Hoffa fractures progressing to nonunion and stiffness [25]. Overall, these findings support cancellous screw fixation supplemented by buttress plating as a stable strategy capable of achieving reliable union, progressive functional recovery, and a low rate of major complications, although the small single-centre sample and absence of a comparison group limit conclusions regarding superiority over alternative fixation methods.

Conclusion

Buttress plate augmentation with cannulated cancellous screw fixation provided reliable union, progressive functional recovery, satisfactory knee range of motion, and a low rate of major complications in patients with Hoffa fractures.

Earlier weight bearing, younger age, and less complex fracture patterns were associated with better functional outcomes. These findings support this fixation strategy as an effective option for achieving stable fixation and favorable short-term outcomes in Hoffa fractures.

References

1. 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(8):e14633. doi:10.1097/MD.00000000000014633.
2. Xie X, Zhan Y, Dong M, He Q, Lucas JF, Zhang Y, et al. Two and three-dimensional CT mapping of Hoffa fractures. *J Bone Joint Surg Am*. 2017;99(21):1866-1874. doi:10.2106/JBJ.S.17.00473.
3. White EA, Matcuk GR, Schein A, Skalski M, Marecek GS, Forrester DM, et al. Coronal plane fracture of the femoral condyles: anatomy, injury patterns, and approach to management of the Hoffa fragment. *Skeletal Radiol*. 2015;44(1):37-43. doi:10.1007/s00256-014-2015-2.
4. Arastu MH, Kokke MC, Duffy PJ, Korley REC, Buckley RE. Coronal plane partial articular fractures of the distal femoral condyle: current concepts in management. *Bone Joint J*. 2013;95-B(9):1165-1171. doi:10.1302/0301-620X.95B9.30656.
5. Onay T, Gülabi D, Çolak İ, Bulut G, Gümüştaş SA, Çeçen GS. Surgically treated Hoffa fractures with poor long-term functional results. *Injury*. 2018;49(2):398-403. doi:10.1016/j.injury.2017.11.026.
6. Gavaskar AS, Tummala NC, Krishnamurthy M. Operative management of Hoffa fractures—a prospective review of 18 patients. *Injury*. 2011;42(12):1495-1498. doi:10.1016/j.injury.2011.09.005.
7. Singh R, Singh RB, Mahendra M. Functional outcome of isolated Hoffa fractures treated with cannulated cancellous screw. *Malays Orthop J*. 2017;11(2):20-24. doi:10.5704/MOJ.1707.016.
8. Tetsunaga T, Sato T, Shiota N, Yoshida M, Mochizuki Y, Tetsunaga T, et al. Posterior buttress plate with locking compression plate for Hoffa fracture. *J Orthop Sci*. 2013;18(5):798-802. doi:10.1007/s00776-013-0410-5.
9. Min L, Tu CQ, Wang GL, Fang Y, Duan H, Liu L, et al. Internal fixation with headless compression screws and back buttress plate for treatment of old Hoffa fracture. *Chin J Traumatol*. 2014;17(2):79-83.
10. Gao M, Tao J, Zhou Z, Liu Q, Du L, Shi J. Surgical treatment and rehabilitation of medial Hoffa fracture fixed by locking plate and additional screws: a retrospective cohort study. *Int J Surg*. 2015;19:95-102. doi:10.1016/j.ijssu.2015.05.027.
11. Lu B, Zhao S, Luo Z, Lin Z, Zhu Y. Compression screws and buttress plate versus compression screws only for Hoffa fracture in Chinese patients: a comparative study. *J Int Med Res*. 2019;47(1):142-151. doi:10.1177/0300060518798224.
12. Pires RE, Rabelo JMG, Cimini CA, de Las Casas EB, Neder Filho AT, Giordano V, et al. Biomechanics of internal fixation in Hoffa fractures—a comparison of four different constructs. *Injury*. 2024;55(2):111219. doi:10.1016/j.injury.2023.111219.
13. 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(8):e14633. doi:10.1097/MD.00000000000014633.
14. Xie X, Zhan Y, Dong M, He Q, Lucas JF, Zhang Y, et al. Two and three-dimensional CT mapping of Hoffa fractures. *J Bone Joint Surg Am*. 2017;99(21):1866-1874. doi:10.2106/JBJS.17.00473.
15. White EA, Matcuk GR, Schein A, Skalski M, Marecek GS, Forrester DM, et al. Coronal plane fracture of the femoral condyles: anatomy, injury patterns, and approach to management of the Hoffa fragment. *Skeletal Radiol*. 2015;44(1):37-43. doi:10.1007/s00256-014-2015-2.
16. Arastu MH, Kokke MC, Duffy PJ, Korley REC, Buckley RE. Coronal plane partial articular fractures of the distal femoral condyle: current concepts in management. *Bone Joint J*. 2013;95-B(9):1165-1171. doi:10.1302/0301-620X.95B9.30656.
17. Onay T, Gülabi D, Çolak İ, Bulut G, Gümüştaş SA, Çeçen GS. Surgically treated Hoffa fractures with poor long-term functional results. *Injury*. 2018;49(2):398-403. doi:10.1016/j.injury.2017.11.026.
18. Gavaskar AS, Tummala NC, Krishnamurthy M. Operative management of Hoffa fractures—a prospective review of 18 patients. *Injury*. 2011;42(12):1495-1498. doi:10.1016/j.injury.2011.09.005.
19. Singh R, Singh RB, Mahendra M. Functional outcome of isolated Hoffa fractures treated with cannulated cancellous screw. *Malays Orthop J*. 2017;11(2):20-24. doi:10.5704/MOJ.1707.016.

20. Tetsunaga T, Sato T, Shiota N, Yoshida M, Mochizuki Y, Tetsunaga T, et al. Posterior buttress plate with locking compression plate for Hoffa fracture. *J Orthop Sci.* 2013;18(5):798-802. doi:10.1007/s00776-013-0410-5.
21. Min L, Tu CQ, Wang GL, Fang Y, Duan H, Liu L, et al. Internal fixation with headless compression screws and back buttress plate for treatment of old Hoffa fracture. *Chin J Traumatol.* 2014;17(2):79-83.
22. Gao M, Tao J, Zhou Z, Liu Q, Du L, Shi J. Surgical treatment and rehabilitation of medial Hoffa fracture fixed by locking plate and additional screws: a retrospective cohort study. *Int J Surg.* 2015;19:95-102. doi:10.1016/j.ij su.2015.05.027.
23. Lu B, Zhao S, Luo Z, Lin Z, Zhu Y. Compression screws and buttress plate versus compression screws only for Hoffa fracture in Chinese patients: a comparative study. *J Int Med Res.* 2019;47(1):142-151. doi:10.1177/0300060518798224.
24. Pires RE, Rabelo JMG, Cimini CA, de Las Casas EB, Neder Filho AT, Giordano V, et al. Biomechanics of internal fixation in Hoffa fractures—a comparison of four different constructs. *Injury.* 2024;55(2):111219. doi:10.1016/j.injury.2023.111219.
25. Singh A, Singh N, Siwach G, Bansal M, Jain H, Raichandani K. Novel approach of plate assisted buttressing in Hoffa fracture. *Chin J Traumatol.* 2025;28(3):175-180.