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Functional Outcomes in Dual Plating of Schatzker 5 and 6 Tibial Plateau Fractures

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ABSTRACT

Objectives
The present research plan is to assess the functional and radiological outcomes of dual plating in the management of Schatzker type V and VI tibial plateau fractures and compare the technique's efficacy in promoting fracture union and functional recovery of the affected knee joint.
Materials and Methods
A comparative prospective controlled clinical study was undertaken in Schatzker type V and VI fractures patients. Both techniques incorporated dual plating, and the results were measured using the KSS and radiographic analysis. Forty consecutive male patients who underwent surgery for hip fracture within the 12 months of the study provided functional recovery assessments before and after surgery.
Results
According to the results, the KSS was raised from the preoperative 45 to 85 at the 12-month follow-up. The union rate was 98 %, and the rate of complications was low, with only 8% developing superficial infections. The average range of motion achieved post-operatively of knee flexion was 125 degrees, which proved that adequate restoration of the range of motion was done.
Conclusion
The study shows that dual plating is very effective for Schatzker type V and VI tibial plateau fractures. It results in increased union rates, better functional results, and a beneficial risk profile, which makes it advisable in healthcare management.

INTRODUCTION

Tibial plateau fractures are common injuries that affect the proximal tibia, leading to functional disability, and surgery is often needed to procedures alignment and function of the joint. Schatzker's classification with type V and type VI can be regarded as severe, open bicondylar fractures with significant soft tissue injury and complications' potential. Because of their multi-planar configuration, these fractures may necessitate medial and lateral plating to stabilize and facilitate early mobilization. This introduction will include an overview of the background, current treatment strategies, and literature review of Schatzker V & VI fractures to enter the main discussion of dual plating and its functionality for functional results.

The main treatment objectives in cases of tibial

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plateau fracture are to restore the joint surface as closely as possible and provide stability to allow early mobilization to minimize articular stiffness and maximize functional outcomes. Prior research advocates for the use of dual plating in attaining these goals, with a superior radiological and functional outcome compared to external fixators or single plating (2, 3). Dual plating is especially useful in bicondylar fractures because of the disruptions in the medial and lateral condyles; the use of the implants ensures stability when fixation is offered from both sides (4). According to the current literature review by Vasiliadis et al. (2022), the results of the combined plating technique describe the mid-term results as providing increased functional recovery and joint stability.

However, dual plating has its own issue. In bicondylar tibial plateau fractures, complications are ranked very high, and they include infection, delayed healing, and problems related to the implant used (5). But in some ways, early physical rehabilitation after surgery can reduce some of these complications because it helps to improve functional recovery and reduce joint stiffness, as Bawiskar et al. (2020) demonstrated in a case report (6). The sources state that there is a concern with the fixation of the fractures, yet it enables early mobilization using dual plating in managing fractures.

Comparisons between the other fixation methods, such as single and hybrid fixation, are also made to show how effective dual plating is in some circumstances. In their study, Sharma et al. (2023) further showed dual plating affords a more significant measure of range motion and muscle power than single plating for bicondylar fractures (7). Similarly, Joginath and Reddy (2021) observed that dual plating improved functional recovery and increased stability in different tibial plateau patterns, particularly complex metaphyseal fractures (8). While some authors suggested hybrid external fixation as an alternative, recent evidence from Ravinathan and Vasantharaman (2021) showed that when compared to the group that received dual plating, the patients with the latter reported better functional results (9).

In addition, clinical factors that dictate the selection of dual plating include the patient's age and the bone's quality. Elderly patients have a high risk of having osteopenia and may also have other related diseases that may affect healing and rehabilitation. Dekhne et al. (2022) summarized that although existing frequent use in elderly patients from the outcomes of this study, additional caution is warranted due to the higher possibility of difficulties and, correspondingly, a longer time for recovery after dual plating (10). Raj et al. (2023) provided an overview of the effectiveness of single and dual plating methods and the authors stated that both methods are effective; however, dual plating is more effective with the treatment of increased instability or comminution as in Schatzker V and VI injuries (11).

Measures of success following dual plating are frequently reported regarding function-related variables such as pain, articular mobility, and the control of deformity. Some of the ideal steps have been outlined by Kumar et al. (2021), showing specificity in the use of dual locking plates that provide stability, improved alignment, and thus better joint functions in the long run (12). Such outcomes conform to research by Gencer et al. (2022) that contrasted single and double plating and concluded that the last option yielded a better range of motion, muscle strength, and physical activity at the final follow-up (13). A functional assessment in patients under surgery care also includes a radiographical examination for joint position and healing status. Pandey and Bidary (2022) indicated that closed reduction and Ilizarov fixation are other options, but they present some challenges in providing adequate alignment and stability, particularly in bicondylar high-energy fractures (14).

Patient satisfaction and quality of life after surgery are also parameters that define the efficiency of the dual plating. Other authors established similar findings since patients with tibial plateau fractures had high satisfaction and functional recovery when managed surgically using dual plating, as identified by Nazibullah et al. (2021) (15). In the more recent comparative study by Ghori et al. (2023), the author compared dual plating to the Ilizarov technique in a group of patients with AO/OTA type C distal tibia fractures and found that patients in the dual plating group had better functional status and satisfaction scores than the Ilizarov group (16). Altogether, these observations speak for the potential of DP in attaining top-notch functional results in Schatzker

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V and VI fractures.

Objective: This study aims to assess the functional results of dual plating in the management of Schatzker type V and VI tibial plateau fractures. It is anticipated that through a comparative review of patients' clinical, radiological, and subjective data, this study aims to assess the effectiveness of dual plating in attaining anatomic stability, alignment, and early functional recovery in complex tibial fractures.

MATERIALS AND METHODS

Study Design

Cross sectional study

Study Setting

The present study was carried out on patients developing high-energy tibial plateau fractures in the orthopedic department of a tertiary care hospital.

Duration of the Study

Tissue samples were obtained during the 18-month study period, and all patients were followed up on for at least 12 months after surgery.

Inclusion Criteria

The target population was patients with Schatzker type V & VI fractures aged 18 to 65 years who underwent dual plating with the patient's informed consent.

Exclusion Criteria

Some patients were excluded from the study due to open fractures, pathological fractures, multiple injuries, a history of previous knee operations, or any medical condition that would contraindicate the operation.

METHODS

The patients selected for the study had their fracture pattern assessed through radiographic and CT scans before being planned for surgery. All surgeries were done by senior orthopedic surgeons following a common protocol of medial and lateral plate fixation. During the surgery, the alignment of the fractures and the anatomic reduction of the joint were confirmed by fluoroscopy.

Surgery management consisted of immobilization of the limb, then installation on a graduated program of active exercises, non-weight-bearing. Patients were followed up clinically at the 2 weeks, 6 weeks, 3 months, 6 months, and 1 year after the surgery to determine their functional results using the KSS and to assess the radiographic healing. Pain, range of motion, and complications were evaluated at each follow-up point. Orientation and consolidation of bones were ascertained via radiographic examination. Functional outcome was assessed at the last follow-up to evaluate the result of dual plating in managing joint instability and deformity.

RESULTS

This work addressed 50 patients with Schatzker type V and VI tibial plateau fractures managed by dual plating. Patients in this case were of average age 45.2 years with a standard variation of 7.1 years and aged between 18 – 65 years. As to the gender distribution, 32 men and 18 women took part in the study. Majority of the fractures were due to a high energy mechanism with RTA being most common cause. The average follow-up period was given to be one year. Details of the age distribution of the patients, their gender, and the manner in which they sustained their injuries are presented in the following table.

Table 1

Demographic Characteristics of Patients

Characteristic	Number of Patients (n = 50)
Mean Age (years)	45.2
Gender	
- Male	32
- Female	18
Mechanism of Injury	
- Road Traffic Accidents	35
- Falls	10
- Sports Injuries	5

The final follow-up consisted of functional evaluations, including knee society and pain scores. Of the patients, 75 had satisfactory outcomes, with 72 percent having little or no pain at 12 months. The mean KSS at the final follow-up showed substantial enhancement from 45 pre-surgery to 85 after the final follow-up. This has been perceived as a significant advancement in five days postoperatively regarding knee stability and the range of knee motion. The smoking status of patients was also assessed in the radiographic assessments, and the overall union rate was estimated to be 98% with only one instance of nonunion, thus implying the need for further

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surgical measures. Table 2 shows the functional and radiological results recorded during the study.

Table 2
Functional and Radiological Outcomes

Outcome Measure	Preoperative	Postoperative (12 Months)
Knee Society Score (KSS)	45	85
Pain (VAS)	Moderate-Severe	Minimal-No Pain
Union Rate	-	98%

Complications noted were wound infections in 8% of patients, all of which were superficial and responded to antibiotics. An early onset deep infection from an implant occurred in one patient and necessitated debridement. There was no instance of hardware failure or malalignment being noted during the study. The knee's range of motion after the operation was satisfactory, with an average of 125 flexions, thus enabling patients to go about their daily activities with little hindrance. The authors found that patients who complied well with postoperative physiotherapy regained relatively greater functional status. Table 3 presents the complication rates and management plans.

Table 3
Complications and Management

Complication	Incidence (n = 50)	Management
Superficial Infection	4 (8%)	Antibiotics
Deep Infection	1 (2%)	Surgical Debridement
Non-union	1 (2%)	Additional Intervention
Malalignment	0	-

dual plating technique for Schatzker type V and VI demonstrated promising results in terms of high union rate, significant improvement in function and Low incidence of complications. This method worked well in attaining stability, alignment, and satisfactory long-term functional results with reasonable low complication risks, facilitating the above conclusions.

DISCUSSION

Schatzker type V and VI tibial plateau fractures are still relatively tricky challenges in orthopedic surgery because of the severity and effect on the function of these injuries. This work also assessed these patients' research hypotheses and management using dual plating to obtain a desirable functional and radiological outcome. The findings also suggest that dual plating surgery can be viable for patients, which may result in noteworthy enhancements of knee function, steadiness, and increased patient satisfaction.

A high-energy mechanism of injury with instabilities and possible complications like post-traumatic arthritis characterizes tibial plateau fractures. The dual plating technique increases the stability due to better anchorage of the fracture fragments, especially in the bicondylar classification, where the traditional fixation methods may not suffice (1). A union rate of 98% was noted in this study, which compares with earlier studies on patients with similar fractures treated with dual plating. Successfully treated patients' percentages are usually high (2, 3). Essentials of this high union rate include that incidences of this nature may not require further intervention besides enhancing recovery.

Knee function was evaluated by KT score and the KSS, which improved from 45 preoperatively to 85 at the final 12-month follow-up. This improvement agrees with the results of other investigations that demonstrate that dual plating enhances remarkable functional recovery (4, 5). The improvement offered by dual plating may enable early weight-bearing and early rehabilitation, ease the patient's mobility, and strengthen his muscles faster.

The delivered postoperative monitoring of the range of motion found in our study with an average of 125 degrees flexion is also evidence that the procedure was effective. Research has postulated that maintaining ROM in the knee is essential in the partial prevention of long-lasting functional impairment while enhancing the patient's quality of life (6). It was surmised that dual plating confers stability to the fracture and maintains the active motion necessary to manage the fracture and return to work and sports. Followers of postoperative physiotherapy guidelines revealed superior results, underlining the necessity of integrated rehabilitation therapy and surgery.

It has been established that complications are a significant factor affecting tibial plateau fracture

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management. The study noted an 8% incidence of superficial wound infection, which is comparatively low compared to other studies where the infection rates can go up to 20% (7). Antibiotics can effectively manage these infections, and I came across only one case with a deep infection, which needed surgical intervention. These low complication rates have led to ample evidence to recommend that dual plating can be safely practiced in case suitable surgical approaches are used and effective management of postoperative care.

The incidence of non-union in our series is 2%, similar to previous reports on tibial plateau fractures managed by dual plating, where non-union ranges between 0 – 8% (8). Therefore, it emphasizes the values of accurate reduction of fractured bones and stable fixation, as these form the basis for healing. Based on our findings, it was concluded that dual plating yields a make-or-break technique that maintains the necessary alignment for healing to take place.

When comparing dual plating to other fixation techniques like hybrid external fixators or single plating, our results suggest that dual plating offers better results in managing complex tibial plateau fractures. For instance, Rijal et al. discussed that poor results from external fixation techniques are attributed to stability problems (9). Single plating was additionally accompanied by complications and less satisfactory results in the recovery of limb functions in the case of bicondylar fractures (10). This supports the suggestion of dual plating because of the increased fragmentation and displacement of the fractures considered in the study.

Nevertheless, there is a need to check on a few limitations of the study: The study adopted a relatively small sample size that, although appropriate for exploratory research, could be enlarged for greater generalizability of the conclusions. However, one could also argue that the present study has a relatively short follow-up period, and a longer follow-up might have offered even more information about the long-term functional results and possible late complications connected with dual plating. More studies are required, especially those involving randomized controlled trials, to support these observations and to set standard treatment methods for multi-facet tibial plateau fracture.

CONCLUSION

In conclusion, dual plating offers satisfactory surgical management of Schatzker type V and VI tibial plateau fractures with reasonable union rates and functional improvements. Regarding knee function and patient satisfaction evaluation, the Knee Society Score has improved on average from 45 preoperatively to 85 postoperatively. Significant complications were rare; the study's infection rate was 8%, indicating the procedure was safe. Since these fractures are challenging to treat and are often associated with a significant risk to the potential for average disability in the lower limb, dual plating is, therefore, a technique that should be advocated. Subsequent empirical studies recruiting more participants and a longer time frame to assess patients will be critical in confirming such observations while improving the knowledge and estimation of the long-term prospects of patients with such conditions. In general, while practicing dual plating, the fracture gets locked, but at the same time, the rehabilitation time and the return back to normalcy and independence in the patient's life are hastened.

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