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Dr. Adarsh Thammaiah
MBBS, MS (Orthopaedics), Fellowship in Arthroplasty, Associate Professor in Orthopaedics, JSS Medical College, JSS Academy of Higher Education and Research, Mysuru, Karnataka, India

Dr. Kalidindi Rishyendra Varma
MBBS, Junior Resident in Orthopaedics. JSS Medical College, JSS Academy of Higher Education and Research, Mysuru, Karnataka, India

Corresponding Author:
Dr. Adarsh Thammaiah
MBBS, MS (Orthopaedics), Fellowship in Arthroplasty, Associate Professor in Orthopaedics, JSS Medical College, JSS Academy of Higher Education and Research, Mysuru, Karnataka, India

Can the implant used in the treatment of tibial plateau fractures affect the quality of life of the patient?

Adarsh Thammaiah and Kalidindi Rishyendra Varma

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Abstract
The aim of the study was to assess whether the implant used in treating tibial plateau fractures affect the patient's quality of life. All the patients operated for tibial plateau fracture with plates and screws or Ilizarovs were divided into 2 groups. Patients who were operated within or after 1 week were also grouped into 2. The Knee Society Score (KSS) and World Health Organisation -Quality of Life (WHO-QOL) scores were used to assess the functional outcome and quality of life between the 2 groups. Functional outcome using American knee society score in patients operated with plate and screws performed better than Ilizarov group. The WHO-QOL domains were used to assess the quality of life. The psychological domain was significantly affected (P-value <0.05). Other domains, such as physical, social, and environmental, were also altered. Fractures treated with implants affect the patient's physical and psychological health and disturb the social and environmental domains. Pre and post-operative counselling of the patients regarding the domains of quality of life is also an important part of the treatment. Efforts to rehabilitate the patient and improve their functional outcome to their preoperative status are obligatory and should be included in treating every orthopaedic patient.

Keywords: Tibial plateau fracture, Functional outcome, Quality of life, WHO-QOL, KSS

Introduction
Proximal tibial fractures are caused by low or high-energy trauma. They can be extra-articular or intra-articular, associated with soft tissue contusion, neurovascular injuries, ligamentous injury and deep vein thrombosis [1]. There have been improvements in understanding the fracture patterns, newer materials, and the design of implants. Both plate with screws and Ilizarovs fixator play a hugely satisfactory role in treating fractures of the tibial plateau. Nevertheless, tibia plateau fractures are still challenging because of their complexity and associated injuries. The variations in injury patterns to the tibial plateau are varied. The exposed knee may experience various forces, such as rotation, angulation, and shearing strains. When the person is standing, the body weight assists in the injury with axial compression forces, which adds to the severity of the injury [2].
Postoperative complications include skin infection, compartment syndrome, joint stiffness, malunion, nonunion, osteomyelitis, amputation and even death [3].
These fractures can be treated conservatively and surgically. Though there are studies comparing the outcomes of these fractures, implants used and complications, studies are extremely uncommon with functional outcomes and patients' quality of life following the completion of treatment. Hence in this study, an attempt is made to assess the quality of life and functional outcome in tibial plateau fractures treated surgically with plate and screws or Ilizarovs ring fixator.

Objectives
To assess the quality of life and functional outcome in operated tibial plateau fractures

Materials and Methods
Study Design
The study was a prospective observational study done for 18 months in the Department of Orthopaedics of a tertiary care hospital. The study sample was 40 patients.

Inclusion criteria

- Patients treated for proximal tibia plateau fractures surgically with plate and screws or Ilizarovs ring fixator.
- Age - 18 to 60 years of both sexes

Exclusion criteria

- Previous injuries and surgeries on the same limb
- Pre-existing osteoarthritis
- Pathological fractures
- Neurovascular injuries
- Patients who meet the inclusion criteria were included in this study. A detailed history focusing on the mode of injury was taken, followed by a detailed general and local examination. Radiographs were taken, fracture types were identified, and appropriate treatment was given depending on the fracture types.

After taking consent, pre-formatted proformas in english or the local language were filled by the patients after 1 month and 6 months after surgery.

The preformatted proformas used were the Knee Society Score (KSS)(4) and WHO-QOL scale [5].

The KSS is calculated on pain, flexion contracture, total range of flexion, alignment and stability. Functional score includes walking, climbing stairs and usage of walking aids. Grading is categorised into excellent, good, fair or poor, depending on the scores. The Clinical KSS evaluates pain in a total of 50 points, stability, 25 points, and range of motion, 25 points. The maximum score of 100 points is reached when there is no pain, with good alignment of the knee in extension, and at least 125° of range of motion, without any anteroposterior or mediolateral instability. The Function KSS evaluates the walking distance, totalling/ 50 points, and the act of climbing and descending stairs, 50 points. The maximum score of 100 points is attributed to the individual capable of walking unlimited distances without walking aids and of climbing and descending stairs normally.

WHO-QOL is the World Health Organisation Quality of Life. Each item of the WHO-QOL is scored from 1 to 5 on a response scale stipulated as a five-point ordinal scale. The scores are then transformed linearly to a 0-100 scale. It is divided into the physical domain, psychological domain, social relationship domain, and environmental domain. Various facets are incorporated within each domain. (Table 1)

Table 1: Various domains with their facets

Domain	Facets incorporated within the domain
Physical health	Activities of daily living Dependence on medicinal substances and medical aids Energy and fatigue Mobility Pain and discomfort Sleep and rest Work Capacity
Psychological	Bodily image and appearance Negative feelings. Positive feelings Self-esteem Spirituality/Religion / Personal beliefs Thinking, learning, memory, and concentration
Social Relationships	Personal relationships Social support Sexual activity
Environment	Financial resources Freedom, physical safety, and security Health and social care: accessibility and quality Home environment Opportunities for acquiring new information and skills. Participation in and opportunities for recreation/leisure activities Physical environment (pollution/noise/traffic/climate) Transport

Results

A total of 40 patients were included in the study. 1 patient with bilateral fracture lost follow-up after 1 month after surgery. 31 patients (77.5%) were males and 9 patients were females (22.5%). The mean age of all the patients was 45.1. Injury due to road traffic accidents contributed around 92.9% and 7.1% to self-fall. Open fractures were less common than closed fractures. 92.9% of them were closed, whereas only 7.1% of them were open fractures.

All types of fractures under Schatzker's classification were included in the study. 52.4% of the fractures were type 6, which were the commonest one. 19% constituted type 5, 16.7% to type 4, 9.5% to type 2 and 2.4% to type 3 respectively. 30% of the patients had comorbidities like diabetes, hypothyroidism, epilepsy, asthma, congenital heart disease and hypertension.

55% of the patients were operated within 1 week after injury whereas 45% were operated after 1 week after injury. The surgery was delayed due to swelling, blisters and ecchymosis.

50% of the patients were operated on with plate and screws, and 50% were operated on with an Illizarov ring fixator.

The limb was mobilised, and weight-bear walking was started on postoperative day 1 after Illizarov's surgery. In patients operated with plate and screws, knee mobilisation was started on day 2 and partial weight bearing was initiated after 6 weeks after signs of fracture callus was seen on x-rays.

Among patients with type II Schatzker's fracture, 50% of the fractures were fixed. with plates and screws, while 50% of them were treated with Ilizarovs ring fixator. 100% of the patients with type III, type IV and type V of Schatzker's fracture were treated with plates and screws. Among patients with type VI Schatzker's fracture, 54.5% were treated with Ilizarovs, while 45.5% of them were fixed with plate and screw.

When the domains of the WHO-QOL (Table 3) were observed, the psychological domain was the most affected. Here the patients operated on with Ilizarovs ring fixator were more affected psychologically in the initial first month when compared to the patients operated with plate and screws (P-value <0.05). The mean score in the Ilizarovs group was significantly lesser than the plate and screws group in the first month. The scores improved gradually in both groups by 6 months, but the score was better in patients with plates and screws. At the end of 6 months, the difference narrowed between the 2 groups.

Table 2: Knee Society Score - mean scores are calculated for both the groups and P-value is calculated after comparing the 2 groups.

	Plate and screws Mean scores		Ilizarov Mean scores		P value	
Time Interval	1 month	6 months	1 month	6 months	1 month	6 months
Knee score	46.8500	88.6500	42.9500	87.7500	0.093	0.761
Function Score	16.2500	87.7000	19.8500	84.2500	0.011	0.316

Table 3: Table showing mean values of various WHO-QOL domains at 1 and 6 months. P-value has been calculated after comparing the 2 groups.

	Plate and screws Mean scores		Illizarov Mean scores		P value	
Time Interval	1 month	6 months	1 month	6 months	1 month	6 months
Physical Domain	58.7500	79.7500	49.9500	78.2000	0.006	0.659
Psychological Domain	60.2000	79.7000	40.6000	72.6500	0.001	0.033
Social Relationships Domain	63.1000	83.9000	56.6500	81.0000	0.069	0.398
Environment Domain	62.6500	80.5500	57.4000	79.1500	0.058	0.557

Following this, the physical, social and environmental domains were also affected more in patients with Ilizarovs fixator than the patients with plates and screws. This may be due to the metal ring around the limb, which was cumbersome, uncomfortable and embarrassing to carry and perform their daily activities. But at the end of 6 months, patients were accustomed to the ring fixator and their quality of life improved.

In the physical domain, the patients with plate and screws performed better compared to the Ilizarovs group in the first month but the difference between the two was minimal at 6 months. But when both the groups were compared, the plate and screws group faired significantly better than the Ilizarovs group. This is because of better mobility, performing daily activities without any hindrance, better functional capacity, high energy, minimal pain, and good sleep.

In the social relationship domain, patients with Ilizarovs ring fixator scored lesser compared to patients with plates and screws in the first month. The causes were decreased personal relationships, reduced social support and sexual activities, which may be due to the appearance of the heavy external implant, which was always visible. The implant was concealed in the other group, and so the social domain was much better. The difference between the two became minimal at the end of 6 months as the patients adapted to the implant.

In the environment domain, patients with plates and screws performed better compared to the Ilizarovs group in the first month. During the early postoperative period, patients were conscious about physical safety, home environment, financial resources, accessibility to health and social care and transportation. But as the fracture healed, pain improved, financial expenditures were reduced and they were less dependent on others for transportation, the scores improved and the difference between the two groups reduced at 6 months. But when both the groups were compared, the plate and screws group faired better than the Ilizarovs group.

The knee society score and function were compared between the two groups of patients who were operated on with different implants within 1 week after injury. The mean knee scores were better in patients who were operated with plate and screws compared to the Ilizarovs group. Though the function score was better in the Ilizarovs group in the first month, the plate and screw group improved better at the end of 6 months. There was a surgical wound gaping in one patient who was operated on within one week. The wound healed after repeated dressings without any complications. The P value was insignificant.

In patients operated after one week, the knee score in patients of plate and screw group were better in the first month, but later the Ilizarovs group showed improvement at the end of 6 months. The function score in the Ilizarovs group was better in the 1st month, but the scores levelled in both groups at the end of 6 months. The P value remained insignificant. (Table 4, 5).

Table 4: Table showing the Knee Society Score in patients operated with plate and screws: Less than and more than one week. The P-value is calculated after comparing the 2 groups.

	Plate and screws Mean scores (Less than one week)		Plate and screws Mean scores (More than one week)		P value	
Time Interval	1 month	6 months	1 month	6 months	1 month	6 months
Knee Score	47.5000	93.2500	46.4167	85.5833	0.790	0.114
Function	16.8750	91.2500	15.8333	85.3333	0.509	0.185

Table 5: Table showing the Knee Society Score in patients operated with Ilizarovs: Less than and more than one week. The P-value is calculated after comparing the 2 groups.

	Illizarov Mean scores (Less than one week)		Illizarov Mean scores (More than one week)		P value	
Time interval	1 month	6 months	1 month	6 months	1 month	6 months
Knee score	42.4286	87.3571	44.1667	88.6667	0.525	0.741
Function	19.7857	83.5714	20.000	85.8333	0.934	0.704

Discussion

In this study, we are comparing the functional outcome in patients with tibial plateau fractures operated with either plate and screws or Ilizarovs ring fixator. We are also analysing the quality of life following such major surgeries.

In a study done by Egol *et al*., staged protocol was followed where the definitive internal fixation was delayed for the soft tissue to heal, which prevented various complications. In our study, there was no significant difference between early and late definitive fixation of proximal tibial fractures with both procedures [6].

In a study done by Tripati SK *et al*., an external fixator provides better functional outcomes and range of motion compared to open reduction and internal fixation in the treatment of complex tibial plateau fractures. But in our study, the functional outcome of plate and screws performed marginally better than the external fixator [7].

In a comparative study done by Oguzkaya *et al*., patients who had role limitations due to emotional problems, emotional well-being and in social functioning were operated on with Ilizarovs fixator when compared to patients operated on with plate and screws. In our study also, patients operated with Ilizarovs fixator were psychologically more affected (P-value <0.05), probably due to unpleasant bodily image and appearance. Physical, Social and Environmental domains were also affected in patients with external fixators compared to patients with plates and screws [8].

Conclusion

Surgical treatment of tibial plateau fractures leads to favourable functional outcomes. Preoperative and post-operative counselling of the patients regarding the domains of quality of life is also an important part of the treatment. Efforts to rehabilitate the patient and improve their functional outcome to their preoperative status are obligatory and should be included in treating every orthopaedic patient.

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