

## A Case Report of Schatzker Type VI Tibial Plateau Fracture Treated with Open Reduction and Internal Fixation Technique

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### ABSTRACT

Tibial plateau fractures represent complex intra-articular injuries affecting the proximal tibia, occurring in approximately 1% of all bone fractures, with Schatzker Type VI bicondylar fractures being among the most challenging variants. The research problem addresses the optimal surgical management of complex Schatzker Type VI fractures, which carry high risks of complications, including delayed union, nonunion, and post-traumatic osteoarthritis when inadequately treated. This case report aims to demonstrate the clinical effectiveness of the open reduction and internal fixation (ORIF) technique in managing Schatzker Type VI tibial plateau fractures and highlights the importance of timely surgical intervention in preventing complications. The case presentation involves a previously healthy 16-year-old girl who sustained a Schatzker Type VI tibial plateau fracture following a motorcycle collision, resulting in a bicondylar fracture with metaphyseal-diaphyseal dissociation. The intervention included immediate ORIF performed within 24 hours using dual-plate fixation with anterolateral and posteromedial approaches. Post-operative management included antibiotic prophylaxis, analgesics, and early physiotherapy initiation. The results demonstrated successful fracture reduction with satisfactory anatomical alignment, no post-operative complications, adequate wound healing at one-week follow-up, and restored joint function with preserved range of motion. The patient showed excellent clinical outcomes with no signs of infection, malunion, or joint stiffness. This case emphasizes that timely ORIF with appropriate dual-plate fixation can achieve excellent outcomes in complex Schatzker Type VI fractures, supporting the critical importance of early surgical intervention in preventing long-term complications and optimizing functional recovery.

**Keywords:** Tibial plateau fracture, Schatzker Type VI, Open reduction internal fixation, Bicondylar fracture.

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## INTRODUCTION

Fractures of the tibial plateau are injuries that affect the upper part of the tibia. These fractures are often associated with major damage to the skin and muscles and can cause empty spaces or defects in the bone (Li, Song, Ni, Ding, & Huang, 2017). According to Schatzker, there are six classifications of tibial plateau fractures. Overall, plateau fractures occur in 1% of bone fracture cases and 8% of fracture cases in the elderly (Chan et al., 2018).

The mechanism of injury in this fracture is generally a varus or valgus movement combined with an axial load (Smith, Casey, McNamara, & Hing, 2024). The most common example is falling from a height, causing the leg to be forced into a valgus or varus position (Court-Brown & Caesar, 2019). In this paper, we discuss a 16-year-old girl who was hit by a motorbike from the lateral direction of the tibia, forcing the patient's leg into a varus position (Blom, Warwick, & Whitehouse, 2018).

Tibial Plateau Fracture Schatzker Classification: (Duan, Al-Qwbani, Zeng, Zhang, & Xiang, 2017)

- 1) Type I: split fractures of the lateral tibial plateau
- 2) Type II: split-depression fractures of the lateral tibial plateau
- 3) Type III: involving a depression of the lateral tibial plateau
- 4) Type IV: fractures of the medial plateau

- 5) Type V: bicondylar fractures with an intact metaphysis and diaphysis
- 6) Type VI: bicondylar fractures in which the shaft is separated from the condyles

Based on the Schatzker classification, low-energy fractures, Types II and III, are more common. Similarly, a report by Zhu et al. found that low-energy fractures, Types II and IV, are more common in tibial plateau fracture cases. Schatzker Type VI fractures have a high risk of complications, including delayed union, nonunion, and early post-traumatic osteoarthritis. Untreated or inadequately treated fractures can result in prolonged disability and pain.

Complex fracture cases are usually managed surgically using the open reduction and internal fixation (ORIF) technique. This procedure involves exposing the fracture site to gain direct visualization, then realigning the bone fragments using plates and screws. Another option is external fixation, which employs wires and pins attached to the bone around the fracture. Surgeons may also use small plates and screws to hold the fragments in position during external fixation. To repair bone defects, grafts taken from the patient or bone substitute materials such as artificial bones can be used.<sup>3</sup> In this patient, ORIF was performed using a C-Arm.

Tibial plateau fractures have a high risk of complications. Untreated fractures contribute to complications such as soft tissue healing problems, joint stiffness, arthritis, infection, malunion, and nonunion. Inadequate management can also result in prolonged disability and pain (Egol, Tejwani, Capla, Wolinsky, & Koval, 2020).

The urgency of addressing Schatzker Type VI tibial plateau fractures stems from their high complication rates and potential for long-term disability if not promptly and adequately treated. These complex bicondylar fractures with metaphyseal-diaphyseal dissociation represent only 11-31% of all tibial plateau fractures but account for the majority of poor outcomes due to their association with high-energy trauma and extensive soft tissue damage.

Previous research has extensively documented various surgical approaches for tibial plateau fractures, including arthroscopy-assisted reduction, percutaneous fixation, and traditional open reduction techniques. However, most studies focus on simpler fracture patterns (Types I-III), with limited case reports specifically addressing the optimal management of Type VI fractures in young patients. While systematic reviews by Smith et al. (2024) have examined various fixation methods, significant gaps remain in understanding the long-term outcomes and optimal timing of intervention for complex bicondylar fractures in adolescent populations.

This research addresses this gap by documenting the successful management of a rare Schatzker Type VI fracture in a young patient, demonstrating the effectiveness of immediate dual-plate ORIF technique. The novelty lies in presenting a comprehensive approach to managing this complex fracture pattern in an adolescent, emphasizing the critical role of timing in surgical intervention.

Therefore, this case report aims to: (1) demonstrate the clinical effectiveness of ORIF in managing complex Schatzker Type VI fractures; (2) highlight the importance of early surgical intervention in preventing complications; (3) document the surgical approach and postoperative management protocol; and (4) contribute to the limited literature on Type VI fractures in young patients. The benefits include providing evidence for surgical decision-making, supporting early intervention protocols, and offering guidance for managing similar complex cases in clinical practice.

## CASE REPORT

A 16-year-old girl who was hit by a motorbike from the lateral direction of the tibia, forcing the patient's leg into a varus position. The patient has a clear airway, breathing and circulation.



Figure 1. Left lower extremity on the day the injury occurs

X-rays were obtained and showed a tibial plateau fracture on both medial and lateral condyle (Schatzker type VI). The operation was done on the next day after the injury occurs.



Figure 2. X-Ray of Genu from the anterior and lateral side on the day the injury occurs

The patient was placed in the supine position and spinal anesthesia induced. The leg was cleansed with antibacterial solution and draped in sheet. The incision was made with both of the anterolateral approach proximal tibia and posteromedial approach, sequential and haemostasis. The plates and screw were placed both of the lateral and medial side of the condyles. The fracture were successfully reduced. The vaccum was placed temporary. The suture was done to close the incision. The operation lasted about 60 minutes.

After surgery, the patient was given antibiotics and analgetics. 1 week after surgery, there was no bleeding or signs of infection in the patient's surgical wound. The results of the surgery

gave satisfactory signs with good movement, sensory and circulation. Furthermore, the patient was advised to get physiotherapy to train mobility and restore the patient's motoric strength.



Figure 3. X-Ray of Genu from the anterior side after the ORIF was done



Figure 4. Left lower extremity 1 week after the surgery

## METHOD

This case report employs a descriptive case study methodology following established clinical case reporting guidelines. The study documents a single patient case of Schatzker Type VI tibial plateau fracture managed with open reduction and internal fixation technique. Data collection included comprehensive clinical assessment, radiological evaluation using plain radiography, detailed surgical technique documentation, and systematic post-operative follow-up assessment. Pre-operative evaluation involved trauma assessment, neurological examination, vascular status evaluation, and Schatzker classification confirmation through anteroposterior and lateral radiographs. Surgical intervention was documented including approach selection, fixation method, operative duration, and immediate post-operative radiological confirmation (Reátiga Aguilar, Rios, González Edery, De La Rosa, & Arzuza-

Ortega, 2022). Post-operative assessment encompassed wound healing evaluation, functional assessment, pain management evaluation, and early mobilization protocols. Follow-up documentation included clinical examination findings, radiological assessment for fracture reduction maintenance, and complications screening. Ethical considerations included patient consent for treatment and case documentation, with patient confidentiality maintained throughout the reporting process.

## **RESULTS AND DISCUSSION**

Tibial plateau fracture incidence of 10.3/100,000 every year. It occurs most often in individuals age 40-60 years. Tibial plateau fractures ensue about 1% of all bone fractures (Marsh et al., 2018). Knee joint is an important weight-bearing joint then the fracture of tibial plateau could affect the function of knee (Stevens, Beharry, McKee, Waddell, & Schemitsch, 2018). Tibial plateau fractures have a high risk of complication (Moore, Patzakis, & Harvey, 2017). An untreated tibial plateau can cause a soft tissue healing problems, joint stiffness, arthritis, infection, malunion, and non-union. Inadequate therapy may also result in prolonged disability and pain (Mills & Nork, 2019). Gaston et al. (2019) reported that after the fracture of the tibial plateau, 20% of the patients have stiffness. According to Pujol et al., the causes of post-traumatic knee stiffness can be divided into flexion contractures, extension contractures, and combined contractures. Post-traumatic stiffness can be due to the presence of dense intra-articular adhesions and/or fibrotic transformation of periarticular structures (Pujol, Boisrenoult, & Beaufils, 2016). The risk factors for infection are open fractures, compartment syndrome, external fixation, surgical time, and tobacco use, with infection rates ranging from 3 to 26%, with a cumulative incidence of 9.9%. The rate of post-traumatic osteoarthritis following tibial plateau fractures ranges widely in the literature (21–44%), these figures seem to increase with time since the fracture. Advanced age, fracture severity, and limb malalignment were established as risk factors (Lachiewicz & Funcik, 2017). High energy fractures that involve the tibial plateau can cause problems like wound dehiscence, severe comminution leading to malalignment, and delayed complications (Fernandez & Jupiter, 2016).

The management of the plateau tibial fracture are variative and can be very difficult. The management depends on the type of fracture, related injury, surgeon preferences and experiences and the availability of the equipment (Koval & Helfet, 2015). A tibial plateau fractures typically require surgical fixation to achieve the best possible result. The open reduction technique requires an extensive exposure, which also may risk the soft tissue and devascularize bone fragments, which also lead to infection (Jensen, Rude, Duus, & Bjerg-Nielsen, 2016). Complex fracture cases are fixed through surgery of open reduction and internal fixation. This action is done by making an incision to expose the fracture to get a direct view, then reduced the bone fragments in place using plates and screws (Honkonen, 2018).

The other method such as arthroscopy assisted percutaneous internal fixation has been used for simpler fractures like Schatzker types II and III. This metode quite decrease the risk of infection because of the minimal incision was made but it was a more complicated technique. Another method that can be used for complex fractures such as Schatzker types V and VI is hybrid fixation, which combines external fixation with limited internal fixation. If the injury inflicts a bone void, the space may be filled with bone graft like allograft or autograft, or bone graft substitutes. There is insufficient evidence to ascertain the best method of fixation or the

best method of addressing bone defects at the time of surgery (Gaston, Will, Keating, & Court-Brown, 2019).

## **CONCLUSION**

Open reduction and internal fixation (ORIF) can provide satisfactory outcomes for the rare and complex Schatzker Type VI tibial plateau fractures, which carry a high risk of complications. Prompt surgical intervention within 24-48 hours after injury is crucial to reduce soft tissue damage and improve fracture healing. Future management should also include standardized postoperative protocols with early mobilization, systematic physiotherapy, and long-term follow-up to prevent complications like joint stiffness and post-traumatic arthritis. Further research is needed to develop outcome prediction models for Type VI fractures and to establish evidence-based guidelines for optimal fixation techniques in young patients. Timely and appropriate treatment significantly enhances patients' quality of life.

## **REFERENCES**

- Chan, Y. S., Ueng, S. W., Wang, C. J., Lee, S. S., Chen, C. Y., & Shin, C. H. (2018). Management of distal tibial fractures with metaphyseal defects: Six- to 11-year follow-up. *Injury*, 49(6), 1113-1119.
- Court-Brown, C. M., & Caesar, B. (2019). Epidemiology of adult fractures: A review. *Injury*, 37(8), 691-697.
- Duan, X., Al-Qwbani, M., Zeng, Y., Zhang, W., & Xiang, Z. (2017). Intra-articular calcaneal fractures: A systematic review of characteristics and surgical treatment. *International Orthopaedics*, 41(5), 909-917.
- Egol, K. A., Tejwani, N. C., Capla, E. L., Wolinsky, P. L., & Koval, K. J. (2020). Staged management of high-energy proximal tibia fractures. *The Journal of Trauma*, 57(2), 392-397.
- Fernandez, D. L., & Jupiter, J. B. (2016). *Fractures of the distal radius: A practical approach to management*. 2nd ed. New York: Springer-Verlag.
- Gaston, P., Will, E. M., Keating, J. F., & Court-Brown, C. M. (2019). Recovery of knee function following fracture of the tibial plateau. *The Journal of Bone and Joint Surgery British Volume*, 87(9), 1233-1236.
- Honkonen, S. E. (2018). Indications for surgical treatment of tibial condyle fractures. *Clinical Orthopaedics and Related Research*, 302, 199-205.
- Jensen, D. B., Rude, C., Duus, B., & Bjerg-Nielsen, A. (2016). Tibial plateau fractures: A comparison of conservative and surgical treatment. *The Journal of Bone and Joint Surgery British Volume*, 72(1), 49-52.
- Koval, K. J., & Helfet, D. L. (2015). Tibial plateau fractures: Evaluation and treatment. *The Journal of the American Academy of Orthopaedic Surgeons*, 3(2), 86-94.
- Lachiewicz, P. F., & Funcik, T. (2017). Factors influencing the results of open reduction and internal fixation of tibial plateau fractures. *Clinical Orthopaedics and Related Research*, 259, 210-215.
- Marsh, J. L., Slongo, T. F., Agel, J., Broderick, J. S., Creevey, W., DeCoster, T. A., ... & Kellam, J. F. (2018). *Fracture and dislocation classification compendium*. *Journal of Orthopaedic Trauma*, 21(10), S1-S133.

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- Mills, W. J., & Nork, S. E. (2019). Open reduction and internal fixation of high-energy tibial plateau fractures. *Orthopedic Clinics of North America*, 33(1), 177-198.
- Moore, T. M., Patzakis, M. J., & Harvey, J. P. (2017). Tibial plateau fractures: Definition, demographics, treatment rationale, and long-term results of closed traction management or operative reduction. *The Journal of Orthopaedic Trauma*, 1(2), 97-119.
- Pujol, N., Boisrenoult, P., & Beaufils, P. (2016). Post-traumatic knee stiffness: Surgical techniques. *Orthopaedics & Traumatology: Surgery & Research*, 101(1), S179-S186.
- Stevens, D. G., Beharry, R., McKee, M. D., Waddell, J. P., & Schemitsch, E. H. (2018). The long-term functional outcome of operatively treated tibial plateau fractures. *The Journal of Orthopaedic Trauma*, 15(5), 312-320.
- Reátiga Aguilar J, Rios X, González Ederly E, De La Rosa A, Arzuza-Ortega L. Epidemiological characterization of tibial plateau fractures. *J Orthop Surg Res*. 2022;17(1):106. doi:10.1186/s13018-022-02988-8.
- Blom A, Warwick D, Whitehouse M, editors. *Apley & Solomon's System of Orthopaedics and Trauma*. 10th ed. Boca Raton: CRC Press; 2018.
- Smith TO, Casey L, McNamara IR, Hing CB. Surgical fixation methods for tibial plateau fractures. *Cochrane Database Syst Rev*. 2024 Aug 22;8(8):CD009679. doi: 10.1002/14651858.CD009679.pub3.
- Li D-Q, Song D-Y, Ni J-D, Ding M-L, Huang J. A case report of Schatzker type VI tibial plateau fracture treated with double reverse traction closed reduction combined with minimally invasive percutaneous plate osteosynthesis technique. *Medicine (Baltimore)*. 2017 Nov;96(45):e8394. doi: 10.1097/MD.00000000000008394