

# Advances in Surgical Management of Schatzker III Tibial Plateau Fractures

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## Introduction:

The tibial plateau Schatzker type III fracture is a simple lateral collapse fracture, which is mainly seen in the low energy injuries of the knee joint in older patients with osteoporosis. (1-3) The treatment options for this type of fracture are open reduction and internal fixation. Repairing the alignment of the collapsed joint surface and the tibial force line is the final goal of surgical treatment. Usually the choice of internal fixation is the combination of ship valve screw arrangement and support steel plate. (4) Many authors recommend avoiding the use of simple hollow screws, especially in comminuted fractures with more severe joint defects, as this can easily lead to secondary collapse of the joint.(5)The traditional surgical method is an anterior-lateral approach with open reduction and internal fixation. Due to the long incision, large trauma, and poor medical compliance of the elderly, it is prone to complicated knee stiffness and traumatic arthritis. The surgical effect is not satisfactory.

Recently, the continuous development of minimally invasive surgical methods for the treatment of tibial plateau Schatzker type III fractures has reduced the incidence of complications and improved knee function after surgery. These early studies showed a low incidence of complications and satisfactory clinical and radiological results.(6-9)

A thorough understanding of the clinical and imaging anatomy of the tibial plateau and the tibial plateau is essential when trying to perform less invasive surgery on intraarticular plateau fractures. All these new technologies have achieved good clinical results. This article discusses various surgical methods to provide new treatment ideas for clinicians. Therefore, this article reviews the progress of treatment of tibial plateau Schatzker III fractures.

## 1. Classification and characteristics of tibial plateau fractures

Type I, the lateral platform is simply split, often the result of bending and axial violence. It is more common in young people, and it is not easy to combine

joint compression, sometimes combined with meniscus injury. Large, the subchondral bone is weaker at this age. After the impact of the joint, apart from the split or wedge-shaped bone mass, there is also the compression of the articular surface of the remaining part of the lateral platform. Type III, the lateral platform is simply collapsed. It is more common in the elderly. Type IV, lateral and posterior collapse is unstable; Type IV: Medial condylar fracture, varus axial violence, often accompanied by vascular and nerve damage; Type V, bilateral condylar fracture, both platforms undergo axial impact Force, usually no compression of the articular surface; type VI, bilateral condylar fractures, is the most complex fracture type, often caused by high energy, involving the metaphysis, often accompanied by soft tissue damage around the knee joint, vascular and nerve damage, Osteofascial compartment syndrome and other related complications.

## Technical progress:

### 2.1 C-arm machine and arthroscopy assisted window-opening rod reduction and internal fixation

C-arm machine perspective window top rod reduction and internal fixation or percutaneous screw reduction and internal fixation for the treatment of tibial plateau Schatzker type III fractures has a long time application. However, because the C-arm machine can only obtain a two-dimensional image during fluoroscopy, it cannot obtain a good articular surface evaluation. In some cases, even the postoperative CT found that the articular surface of the lateral tibial bone has not been well restored .At the same time, Ringus et al. (11) found that compared with the tibial plateau articular surface collapse of less than 10mm, the tear of the lateral meniscus increased more than 10mm. Daniel Stahl et al. (12) found that about 30% of the meniscus needed to be repaired during the operation, while Park HJ et al. Performed 661 simultaneous repairs of the lateral tibial plateau and meniscus at the same time, and achieved good knee function after operation (13) .Therefore, the current combination of C-arm machine and arthroscopy for the treatment of tibial plateau Schatzker III fractures has become a trend. Arthroscopic visualization surgery is a very beneficial

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technique. This operation has the following advantages: 1) The tibia can be viewed directly. Reduction of the articular surface of the platform; 2) One-stage repair of damaged soft tissue of the tibial plateau under arthroscopy; 3) The use of arthroscopy can reduce the use of C-arm machines and reduce the amount of surgical radiation, which is beneficial to both patients and surgeons. A prospective study by Rossi et al. (14) confirmed that arthroscopy-assisted limited incision and reduction internal fixation has good safety and feasibility for fractures and intra-articular injuries, and is an optional method for treating tibial plateau fractures. Studies have shown that arthroscopy minimally invasive treatment of Schatzker type III tibial plateau fractures has achieved satisfactory results (15-16). Among them, Schatzker type III tibial plateau fractures have been selected for arthroscopy reduction and fixation, and the effect is affirmed. Compared with traditional incision, reduction and fixation for tibial plateau fractures, the application of arthroscopy can reduce soft tissue damage around the knee joint, necrosis and infection of surrounding tissues. It improves the stability of joints, has the characteristics of fast recovery, and reduces patient pain (17). The study by Park et al. (18) showed that the application of arthroscopic treatment of Schatzker II and III tibial plateau fractures was satisfactory.

## 2.2 C-arm machine assisted PKP reduction and internal fixation

PKP (percutaneous balloon dilatation vertebroplasty) technology is currently mainly used in vertebral compression fractures. C. Doria et al. Applied pkp technology to tibial plateau Schatzker type III fractures (6), they conducted a random comparison In the study, 14 patients underwent traditional surgery (anterior and lateral incision and reduction and internal fixation), and 14 patients underwent pkp. Results After reviewing CT or knee function after operation, the effect of pkp grouping was better. The advantage of this technology is that it reduces the bone window to the drill hole, while the airbag increases the area of force transmission, which effectively resets the articular surface, minimizes trauma, and minimizes the wounds on the weak skin around the knee. complication.

## 2.2 About bone fillings

2.3 For patients with collapse > 6 mm or age > 55 years with osteoporosis, filling bone defects is considered necessary. Because such patients have an increased risk of articular surface collapse. (19) Autogenous bone, allogeneic bone, and calcium phosphate cement are used more frequently in bone fillings. According to a biomechanical study by McDonald E et al., It has been confirmed that calcium phosphate cement has significantly higher fatigue strength and ultimate load than autogenous bone / allograft bone, and may increase the immediate load-bearing capacity of the tibial plateau after repair (20), and Calcium phosphate bone cement absorbs itself, so calcium phosphate bone cement has greater advantages. Regarding the order of

screw fixation or bone filling first after reduction, biomechanical research by Blunket et al. Showed that calcium phosphate cement was first applied to completely fill the defect, which can significantly reduce clinically relevant parts under cyclic loading. Secondary Loss of Weighted Depression Fracture Fracture Reduction. The permeability of incompletely solidified calcium phosphate cement can also be transferred to the tibial plane for reduction before new bone defects appear. Therefore, it is necessary to maintain the reduction with a Kirschner wire, and then inject calcium phosphate bone cement, and then screw it after it has spread sufficiently. (21)

## Conclusion

The optimal treatment of tibial plateau Schatzker type III fractures is still unknown, however, in those patients undergoing surgery, complications may decrease with the latest advances in surgical technology, including C-arm machine and arthroscopic assisted window opening Top stick reduction and internal fixation, C-arm machine assisted PKP reduction and internal fixation. Research on the biomechanics of bone substitute materials is also ongoing. These emerging technologies are promising, but data on their overall utility and long-term benefits are limited. Less invasive methods may also be beneficial for patients with soft tissue damage and more chronic conditions that are difficult to tolerate larger procedures. Future prospective, randomized controlled studies are needed to clarify the exact indications of the above procedures, as well as the short-term and long-term clinical outcomes of each procedure.

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