

Treatment Experience of 16 Cases in Combined with Posterior Condylar Fractures Schatzker Types II and III Tibial Plateau Fracture

Yuwu Wang*, Chengtang Lv, Wenfeng Zhu, Fengchao Shi and Zhe Zhang

The Third People's Hospital of Jiangsu Province, Yancheng, Jiangsu 224001, China

ABSTRACT Objective: Exploring the treatment of combined posterior lateral approach with open reduction and internal fixation for the treatment of combined fractures of the ankle on the treatment of tibial plateau fractures with Schatzker types II and III. **Method:** Between April 2012 and March 2015, 16 cases of Schatzker types II and III tibial plateau fractures were treated with T or L type limited contact dynamic compression plate (LC-DCP). **Results:** All 16 cases were followed-up for 12 to 36 months, with an average of 18.3 months. According to the Merchant score, 10 cases were excellent, good in 4 cases, and in 2 cases, the excellent and good rating was 87.5%. **Conclusion:** After treatment, anatomical reduction and stability of the posterior condyle was emphasized, and there were early functional usage and recovery of the joint functions. At the same time, the external side of the incision can be used to restore the external and rear sides to avoid replacement of the body position and improve the operation efficiency.

KEYWORDS

Tibia plateau
Posterior condylar fracture
Posterior lateral approach
Internal fixation

1. Introduction

Tibial plateau fracture is a common joint fracture which accounts for 4% of the whole body fracture. Lateral tibial plateau fracture is caused by a powerful axial force, which is often due to the collapse of the posterior articular surface. With rapid development of transportation and high energy factor, patients with this kind of injury have gradually increased. However, few literatures have reported the treatment of this type of fracture. Conservative treatment is difficult and the results are not always satisfactory. Traditional surgical approach is unable to carry out effective exposure, reduction and fixation of the fractured block. Therefore, for this kind of fracture, choosing the best treatment plan has been the focus of controversy and also a difficult problem in orthopedics. From April 2012 to March

2015, 16 cases of patients with Schatzker types II and III tibial plateau fractures treated with T or L type limited contact dynamic compression plate (LC-DCP) produced satisfactory results. Surgical treatment technology and retrospective analysis of the treatment were explored in this study [1].

2. Data and Methods

2.1. Clinical Data

16 cases; 7 males and 9 females aged 71 to 27 years old, with an average age of 47 years old were observed. Preoperative radiography examination showed that the closure of the epiphyseal lines were fresh closed fractures with 10 on the left side, 6 on the right, and 1 combined fibula fractures with a common injury of the peroneal nerve. Osteoarthritis was observed in 3 cases with cruciate ligament tear off, 4 cases with meniscus injury, and 1 case of crural fascia space comprehensive syndrome (after open decompression and delayed operation).

2.2. The Cause of Injury

13 cases of traffic accident injury, 1 case of falling injury, and 1 case of sports-related injury. The shortest time of treatment was 1 hour and the longest was 2 days. According to the AO/ASIF classification [2], 1 case was type B1, 5

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*Corresponding author: The Third People's Hospital of Jiangsu Province, Yancheng, Jiangsu 224001, China. E-mail: wang_yuwu@126.com

cases were type B2, and 10 cases were type B3. There were 14 cases with Schatzker type II and 2 cases with Schatzker type III. Soft tissue injury assessment criteria for the Tschernke closed fracture classification were graded [3] accordingly, Grade Fr. C 0: mild and soft tissue injury (8 cases); Fr. C I: superficial soft tissue contusion caused by internal fracture block (4 cases); Grade Fr. C II: direct violence causing deep soft tissue injury (3 patients); grade Fr. C III: 1 case of lower leg compartment syndrome. There were several cases with combined injuries, 1 case of abdominal trauma, 1 case of traumatic brain injury, 1 case of lumbar vertebral compression fractures, 1 case of ipsilateral Barton fractures, with 72 cases in 2 hours after injury, 1 case in 5 weeks, and 2 cases in 9 weeks. All cases underwent X-ray, CT and MRI scans.

2.3. Operation Method

After successful continuous epidural or general anesthesia, a pillow was kept under the knees and pneumatic tourniquet was kept at hyperextension during surgery. A knee posterolateral inverted L-shaped incision was done, with incisions at the popliteal transverse striation about 1–2 cm beginning in the inner side of the popliteal fossa midline, along the skin crease towards the lateral outward side by-pass before the head of the distal extension fibula creating a blunt free, set of full thickness skin flap. The flap was turned inwards below the popliteal fascia opening, paying attention to protect the deep medial and lateral sural cutaneous nerve. In the outer upper quadrant of the wound, the two heads of the femoral head was exposed.

Deep separations of the lateral head of the gastrocnemius muscle and soleus muscles were executed. The lateral head of gastrocnemius muscles were placed together with the popliteal artery and vein into the stretch, carefully separating and attaching the fibular head of the soleus muscle, pulling them downwards. To reveal the popliteus and shallow surface surah veins, the lateral edge of the popliteal muscle was pulled inwards along the popliteus and proximal tibiofibular joints and the tibial lateral cortex was exposed. Posterior articular capsules were exposed to the rear platform and articular surface. If there is a need for full bone graft, the collapse or split of the rear platform would be temporarily fixed and the foot flex bone LC-DCP plastic were placed in the rear, as a supporting fixation. The incision was extended to the distal end of the lateral approach, and the external platform was exposed to the lateral approach while the bone graft was fixed with the T or L types. The meniscus injury was sutured. The avulsion fracture of the cruciate ligament was treated with non-absorbable sutures, and the suture was fixed with a figure 8 suture and the lead in the front. 2 negative pressure drainage tubes were placed in the incision during and 48 h after operation. Continuous passive motion (CPM) rehabilitation exercises of the lower limbs were done 3 d after operation (Figure 1 and 2).

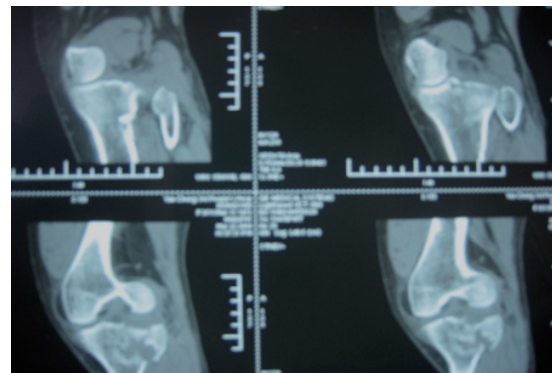


Figure 1. X-rays image of knees.



Figure 2. X-rays image of knee posterolateral inverted L-shaped incision.

3. Results

16 patients were followed up for 12 to 36 months, with an average of 18.3 months. All the fractures reached anatomical reduction and clinical healing. Healing time ranged from 12 to 20 weeks, with an average of 17.3 weeks and 12 to 18 weeks, with an average of 16.3 weeks. No deformity, infection and internal fixation failures were reported. One week after operation, knee flexion of 70–90 degrees, straight -5 degrees to 5 degrees were observed, and buckling of 100–135 degrees, straight -5 degrees to 5 degrees were observed 3 months after the operation. According to the Merchant score, 4 cases were excellent, good in 10 cases, good in 4 cases, good in 2 cases, with excellent rating of 87.5%.

4. Discussion

Posterior condylar fractures combined with Schatzker II and III tibial plateau fractures are due to knee joint semi flexion or subjected to a vertical force of the rear platform of the femoral condyle caused by collision and coronal splitting. This results in a very large and violent injury which could lead to knee joint subluxation and cruciate ligament injury, along with popliteal artery injury. X-rays are often unclear and it is easily misdiagnosed. CT scans and three-dimensional reconstructions can give a good

indication of the fracture and it has been used as a routine examination in patients with tibial plateau fractures. A knee joint MRI can also be considered to further understand the injury of the ligaments and meniscus [4–6].

The internal fixation of the posterior tibial plateau fractures involves the articular surface. Principle treatments for intra-articular fractures are to reduce the articular surface and to restore normal force line relationship with strong internal fixation for early functional usage. Although clinically, most of the tibial plateau fractures were treated with the anterior approach surgery, for plateau posterior fracture, the anterior approach could not reduce the opening size due to the fracture line. Thus anatomical reduction through the fracture reset window is difficult to achieve. From the perspective of fixation stability, the anterior approach is done from the front to the back of the placement of lag screw fracture fixations. The fracture stability would rely mainly on the fracture lag screws provided by the pressure maintain. Because of the shear stress at the back side of the knee joint, mechanical stability of the platform is better when the plate is fixed onto the platform. We chose LC-DCP as the radius and ulna internal fixation can provide enough supporting force [7].

Surgical approach selection for the 3 types of fracture of the tibia plateau fractures depended on a few factors. For simple posterior tibial plateau fractures, the posteromedial and lateral condyles were selected after medial incision or posterolateral incision. Medial and lateral incisions were executed to avoid injury of popliteal artery vein and nerve advantages. The approach of the inverted L-shaped incision was in the popliteal transverse striation 1–2 cm beginning in the medial popliteal fossa midline, along the skin crease to the outside, and the outer side of the bypass before the head of fibula direction distal extension, creating a blunt free, set of full thickness skin flap. The flap was turned inward below the popliteal fascia opening, with an attention to protect the deep medial and lateral sural cutaneous nerve in the outer upper quadrant of the wound where the two heads of the femoral was exposed. The soleus muscle separating the lateral head of the gastrocnemius muscle and the deep, lateral head of the gastrocnemius muscle with popliteal artery vein were pulled inside. The flounder attached to the head of the fibula was carefully separated, pulling it down to expose the popliteus and shallow surface sural vein along the lateral edge of the popliteal muscle. The popliteus and proximal tibiofibular joints were pulled inwards and the tibial lateral cortex can be exposed. Finally, the posterior articular capsule is exposed to the rear platform and articular surface.

The advantages of Schatzker II and III types of tibial plateau fractures treated with the posterior lateral approach in the treatment of combined posterior condylar fractures are:

(1) Although the posterior lateral approach is more complex than the conventional approach, it can effectively restore anatomic structure of the posterior platform and provide adequate buckling and stability allowing early mo-

bilization.

(2) If combined with the PCL avulsion fracture, the incision can be fully exposed and fixed.

(3) Incisions to the distal extension along with the standard lateral patellar side approach to expose the lateral tibial plateau, reduces opening and bone grafting for T or L type plate fixations, avoiding intraoperative turn again in the anterior lateral approach surgery, saving time and reducing the risk of infection [8].

5. Conclusion

Schatzker II and III types tibial plateau fractures treated with the posterior lateral approach combined with posterior condylar fractures, although exposing deep, complex structures with a risk of injury to the popliteal vessels and nerves, can achieve perfect exposure. The anatomic structure of the rear platform can be effectively restored providing adequate flexion and stability to allow early activities, avoiding long-term external fixation of the knee joint dysfunction, and avoiding reoccurrences. In the same incision, the former is fixed, saving operation time and reducing risk of infection.

Conflicts of interest

These authors have no conflicts of interest to declare.

Authors' contributions

These authors contributed equally to this work.

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