



## Tips to Optimize Management of Tibial Plateau Fractures Offered

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The available evidence and surgical techniques that can be applied to the management of tibial plateau fractures, including unusual variants of these injuries, was addressed in a symposium.

Ross K. Leighton, MD, Dalhousie University, Halifax, Nova Scotia, Canada, said that although autogenous cancellous bone graft has been referred to as the gold standard for the management of subarticular defect in tibial plateau fractures, no published studies support this contention. Autogenous iliac bone graft (AIBG) was compared with a bone substitute material (alpha-BSM), a calcium phosphate cement, in a randomized study to fill a defect void in 120 fractures of the lateral tibial plateau in 119 adults [Russell TA et al. *J Bone Joint Surg Am.* 2008]. All fractures underwent open reduction and internal fixation (ORIF) with use of standard nonlocking plate-fixation techniques. After reduction of the articular fracture, the subarticular defect was packed with either morselized corticocancellous AIBG or alpha-BSM.

There was a trend toward an increase in knee extension and range of motion at 6 and 12 months, respectively, in the alpha-BSM group vs the cancellous bone graft group. In addition, there was a significantly higher rate of articular subsidence in the autogenous bone graft group compared with the alpha-BSM group at follow-up  $\geq 12$  months ( $P=.009$ ).

Prof Leighton noted that AIBG procurement requires a second surgical procedure with loss of previously uninjured tissues, which induces pain at the donor site, and iatrogenic complications are possible. He concluded that it should no longer be considered the gold standard for managing subarticular defects in tibial fracture plateaus.

In the treatment of bicondylar tibial plateau fractures, consider the fracture morphology in the treatment strategy, said Paul Tornetta III, MD, Boston University, Boston, Massachusetts, USA. Tibial plateau fracture has various fracture patterns with differing degrees of articular displacement. Bicondylar tibial plateau fractures can be treated with locked plating applied from the lateral side or dual plating (addition of a medial plate). The medial fragment is the key in deciding which patients require a single plate or a dual plate. For patients with a posteromedial fragment, treatment with dual plating is associated with less loss of reduction compared with lateral locked plating. A large or axially stable medial fragment can be treated adequately with a locked plating technique.

The evidence is strong that the incidence of associated ligamentous injuries in tibial plateau fractures is high, said Aaron Nauth, MD, Queen's University, Toronto, Ontario, Canada. Unfortunately, there is little guidance on management in the literature and there is no direct evidence for surgical management. Surgical treatment decisions must be based on existing literature on isolated plateau fractures and multiligament injuries coupled with surgical principles, Prof Nauth said. From the literature on tibial plateau fracture,

alignment and stability of the knee is an important principle. The literature with respect to isolated plateau fractures indicates that surgical treatment is generally associated with good outcomes. Operative treatment has been shown to be superior to nonoperative treatment of multiligament injury, and reconstruction is generally preferred over repair.

With the goal of a stable, well-aligned knee, Prof Nauth's approach is to perform acute fixation of ligamentous avulsion injury whenever possible in combination with plateau fixation. Occasionally, he will reconstruct major ligamentous injuries acutely; otherwise, he does a delayed reconstruction.

Emil H. Schemitsch, MD, University of Toronto, Toronto, Ontario, Canada, discussed the management of complications in tibial plateau surgery. Typical complications following tibial plateau fractures include infection, post-traumatic arthritis, stiffness, malunion or nonunion, painful hardware, and compartment syndrome/neovascular injury.

A surgical infection rate of 7.8% was reported for 256 consecutive cases of tibial plateau fractures [Lin S et al. *Eur J Orthop Surg Traumatol.* 2014]. Risk factors for infection are open fracture, smoking, and compartment syndrome requiring fasciotomy [Morris BJ et al. *J Orthop Trauma.* 2013]. Little Level I evidence exists for management of infection after a tibial plateau fracture; options include irrigation and debridement, targeted systemic antibiotic therapy, local antibiotic therapy, removal of hardware, revision of internal fixation/external fixation, and a 2-stage revision total knee replacement. Multiple debridement procedures are usually necessary to eradicate infection, Prof Schemitsch said. In the setting of incomplete fracture healing, the management of implants is one of the challenges of acute infection. Irrigation and debridement and antibiotic therapy with retention of hardware were associated with resolution of infection in 71% of postoperative infection after ORIF of upper and lower extremity injuries [Berkes M et al. *J Bone Joint Surg Am.* 2010].

External fixation can be used as definitive fixation in revision surgery. Stiffness following operative management of tibial plateau fractures is variably reported; stiffness requiring reoperation ranges from 0% to 5%. Knee stiffness requiring manipulation after periarticular fracture is related to the severity of injury. Prevention is the most effective intervention for avoidance of postoperative knee stiffness, and treatment (manipulation under anesthesia, arthroscopy, quadriceps-plasty) is largely dependent on the timing of presentation postoperatively. Joint incongruity can predispose to osteoarthritis after high-energy fractures; optimizing overall joint congruity and restoring the sagittal and coronal plane alignment should be emphasized, said Prof Schemitsch.

Total knee arthroplasty after plateau fracture is uncommon as it often requires specialized techniques and implants, and it is associated with a high risk of perioperative complications as evidenced by a substantial rate of reoperation.