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REVIEW ARTICLE

Comminuted intraarticular fractures of the tibial plateau lead to posttraumatic osteoarthritis of the knee: Current treatment review

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Summary Posttraumatic osteoarthritis (PTOA) of the knee is a common complication after intra- and extra-articular fractures. Moreover, PTOA may also be a result of isolated cartilage defects, meniscus resections, and ligament injuries. There are various methods of treatment of knee joint fractures. However, in the final stage of a PTOA, when nonoperative treatment fails, endoprosthesis joint replacement is the method of choice. Primary total knee replacement (TKR) for the treatment of a fracture of the knee joint is a rare indication, even at major treatment centers. It is performed in elderly patients with the inability to be mobilized with partial- or non-weight bearing; in cases with considerable bone destruction; in cases with symptomatic osteoarthritis (OA) in the elderly; and, it is often associated with the primary use of a modular implant. However, TKR in the acute situation should always be an individual decision. Secondary TKR after knee joint fracture shows overall good functional results. However, the results are inferior when compared with TKR for primary OA. In addition, the complication rates of TKR for PTOA are much higher. Problems with the extensor mechanism after tibial plateau fractures are common. There are also problems caused by preexisting scars, nonunion (possibly due to a low grade infection), malalignment, restricted movement, or instability.

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1. Introduction

Fractures of or around the knee joint, ligament injuries, resection of the meniscus, and isolated cartilage defects may contribute to the development of posttraumatic osteoarthritis (PTOA). The following factors influence degeneration of the joint: increased load/reduction of the contact area; instabilities/nonphysiological shear stress; and inappropriate mechanical load/axial deviations/malalignment.

Up to 45% of patients develop arthritic changes after intraarticular fractures or fractures around the knee joint.¹ The principal treatment options are: conservative; joint reconstruction by osteosynthesis; and joint replacement by an endoprosthesis.

Classification of these fractures is essential for determining the epidemiology, facilitating communication between orthopedists, and defining treatment algorithms. In addition to the AO system described by Müller et al² for fractures of the long bones in adults, classification by Schatzker et al³ is specific for tibial plateau fractures and therefore the most commonly used classification system for these fractures.

1.1. Conservative therapy

Although conservative treatment of knee joint fractures is a valid alternative to surgical treatment, it should be reserved for cases where surgery is not recommended or

possible, i.e., in cases of severe closed soft tissue damage or excessive perioperative risks, e.g., cardiopulmonary decompensation.⁴

1.2. Joint reconstruction by osteosynthesis

For the reconstruction of a fracture at or around the knee joint, various procedures and fixation devices can be used. In extensive comminuted fractures of the proximal tibia and distal femur, a two-stage procedure is recommended, especially in cases with severe soft tissue damage. The fracture should be stabilized temporarily by an external fixator. Subsequently, the fracture morphology must be analyzed by computed tomography or magnetic resonance imaging in order to select the appropriate internal fixation device and to define the surgical strategy. After reduction of swelling and soft tissue consolidation, the reconstruction of the fracture is most often performed by internal fixation using precontoured periarticular locking plates. In simple intraarticular fractures, a watertight reconstruction of the joint surface is the goal. However, in comminuted fractures it is more important to achieve fracture healing and to reconstruct the (metaphyseal) bone stock for a later joint replacement (Figure 1).

Complications following high-energy fractures of the tibia plateau are avoided by strict adherence to the principles and techniques of gentle tissue handling and limited incisions. The complications can be divided into early (i.e.,

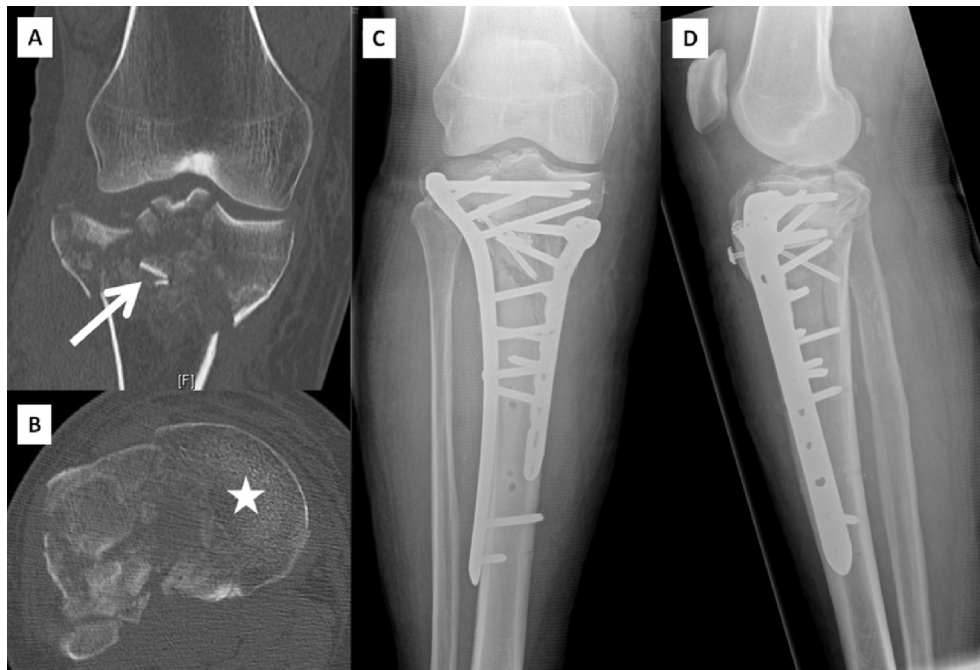


Figure 1 Severely comminuted fracture of the tibial plateau (Schatzker Type VI; AO-Mueller Type 41-C3). Note the displaced die punch fragments of the lateral articular surface (arrow in A). The main fragment is located anteromedially (star in B). The reconstruction was performed by using a double plate fixation (C and D). In the first step, the main fragment (anteromedial) was fixed with a locking plate that is normally used for high tibial open wedge osteotomies (Tomofix). In the second step, the displaced articular fragments were elevated and the articular surface was reconstructed. The remaining bone defect was filled with bone substitute (Calcibone). In the third step, a lateral periarticular locking plate was attached as usual. Finally, the tibial tuberosity was fixed with two cannulated screws.

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