Medial Condyle Fractures of the Tibia

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Medial condyle fractures of the tibia are typically a result of varus force with axial loading. Most of these fractures are due to high-energy trauma and are associated with significant proportion of concomitant ligament and nerve injuries leading to a poor clinical outcome (1,2). In addition, the incidence of limb threatening vascular injury is highest in medial condyle fractures among all proximal tibial fractures (3).

We have observed that at in our level 1 trauma center only approximately 7 % of all proximal tibial fractures are isolated medial condyle fractures indicating a rather rare fracture pattern. The suggested reasons for the lower incidence as compared to lateral condyle fractures are the denser bone structure of the medial condyle and the physiological valgus alignment of the lower limb. There is only scant literature available regarding isolated medial condyle fractures.

Aim

The aim of this study was to present a concise summary of the currently available literature regarding the classification, treatment, and associated injuries related to medial condyle tibial fractures.

Fracture classifications

The most commonly used fracture classifications on proximal tibial fractures are Schatzker (4) and AO/OTA (5) classifications. In Schatzker classification, the isolated medial condyle fracture is designated as type IV. The classification also subdivides split fractures (type IV A) and comminuted fractures with articular depression (type IV B). The AO/OTA classification divides medial condyle fractures according to whether the fracture has articular depression and/or split or if the fracture line extends obliquely across the intercondylar eminence. The subtypes in AO/OTA classification are B1.2 (pure medial split), B1.3 (oblique medial split), B2.3 (medial depression), B3.2 (pure medial split-depression) and B3.3 (oblique split-depression). Although the AO/OTA classification is more descriptive, it is rarely used clinically due to its complexity.

Other classifications have also been proposed. Wahlquist et al. (6) suggested that medial condyle fractures should be categorized to three types according the localization of the fracture line in relation to the intercondylar eminence. The rationale for this classification is that in their clinical study of 28 patients with medial condyle fractures, the extent of concomitant soft-tissue injuries correlated with localization of the primary fracture line.

The aforementioned classifications do not include a posterior shearing fracture (Moore type I), which is commonly seen in fracture-dislocations (2). This fracture type accounts 37% of all tibial plateau fracture-dislocations. It is morphologically a coronal split fracture and it is associated with a high incidence of neurovascular injuries due to inherent joint instability.

Indications for operative treatment

According to AO principles, medial condyle fractures of the tibia should always be treated operatively unless the fracture is completely non-displaced (7). If treated non-operatively, there is high risk for varus malunion. Clinical series on operatively treated medial condyle fractures are limited. Brunner et al. (8) treated five patients with medial condyle fractures with buttress plate fixation. Four of these patients had less then 2 mm and one patient 3 mm step of articular surface in radiographs. All these patients had satisfactory functional and clinical outcome with mean Lysholm Score 81 points and average SF-36 being 82 points.

Conservative treatment of medial condyle fractures has consistently shown inferior clinical results. Delamarter and Hohl (9) showed that there is a significantly higher incidence of redisplacement in medial condyle fractures (20%) as compared to lateral condyle fractures (8%) following a cast brace treatment. Honkonen et al. (10) found in their study that even minor varus malunion leads to unsatisfactory functional and clinical outcome. These results are corroborated by a study of 95 patients with proximal tibial fractures, including 8 medial condyle fractures, treated either with ORIF or conservatively (11). Two of the eight patients with medial condyle fracture were treated with cast immobilisation and both had unsatisfactory results.

Operative technique

The most commonly used surgical approach is a posteromedial approach, which also allows access to the posteromedial fragment in Moore type I fracture variants. In addition, several posterior approaches have been described and these are applicable especially in fractures located purely posteromedially (12–16). The most anatomical of these is probably the direct dorsal approach first described by Galla and Lobbenhoffer (12,13). This approach does not involve a dissection of the neurovascular bundle and allows better visualization of the posteromedial surface while patient lies in the prone position. The posteromedial fragment is reduced by axial traction with the knee in extension. When using this approach, the possible articular impression of the posterior lateral condyle is reduced through the fracture line.

Following reduction, the fracture is fixed with a plate using additional screws if needed. In some fracture patterns, a screw fixation alone can be used. A posterior buttress plate to neutralize the axial forces in tibial plateau and to prevent redisplacement is highly advocated in posterior shearing fractures.

Associated injuries

Wahlquist et al. (6) showed that the incidence of associated injuries is higher when fracture line is more laterally based compared with medial locations. In their A-type fracture (fracture line medial to intercondylar eminence) one out of seven patients (14 %) had compartment syndrome. In addition one patient had an ACL rupture and a medial meniscal tear. In B-type fractures (fracture line within intercondylar eminence) four out of twelve patients (33%) had compartment syndrome and one patient had an ACL avulsion and a medial meniscal tear. In C-type fractures (fracture line lateral to intercondylar eminence) six out of nine patients (67%) had compartment syndrome. In addition, one patient had an anterior tibial artery injury requiring vascular surgery intervention and peroneal nerve injury was observed in one patient.

Conclusion

Based on the current literature, isolated medial condyle fractures of the tibia should be treated operatively with open reduction and internal fixation unless the fracture is truly non-displaced.

Extension of the fracture line lateral to the intercondylar eminence should be considered a red flag for significant associated injuries such as compartment syndrome or neurovascular injury.

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