Mid-Term Results of Operative Treatment of Navicular Fractures and a New Navicular Fracture Classification

Foot & Ankle Category: Trauma

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Introduction
Talar navicular body fractures are uncommon fractures. Formerly recommended treatment often was nonoperative, while nowadays open reduction and fixation is advocated. Some authors also propose primary arthrodesis in case of grossly destroyed articular surfaces. Two classification systems representing the mechanism of injury are described. A new classification system is introduced that allows better prediction of long-term outcome.

Methods
A review of records from 1997 through 2009 yielded 57 patients having sustained a navicular fracture. Twenty-four fulfilled the inclusion criteria and were followed until March 2011. There were 14 men and 10 women with an average age of 44 years (range 17-61). Average follow up was 67.5 month (range 11-157). Clinical outcome was measured by the AOFAS midfoot score, VAS Hannover Questionnaire. Radiologically osteoarthritic changes of the TN und naviculocuneiforme (NC) joints were graded according to Kellgren-Lawrence and Meary’s angle was measured. According to the new classification navicular avulsion fractures of the proximal dorsal lip or the tuberosity were classified as type Ia and Ib and sagittal split fractures of the body as type II. Type III navicular fractures were separated in fractures with TN luxation and lateral plantar fragmentation (type IIIa) or multiple fragmentation of the proximal navicular joint surface (type IIIb).

Results
The mechanism of injury was a fall in 16 patients, a motor-vehicle accident in three, a motorcycle accident in three and a crush injury in two. Concomitant fractures of the foot comprised 8 cuboid fractures, 7 fractures of the talar head and 5 fractures of anterior calcaneal process. Associated lesions included injuries of the ipsilateral limb in four patients and multiple-system injuries in one. All patients were treated operatively by open reduction and internal fixation. In two cases primary arthrodesis (one TNC, one NC) was performed. 13 additional procedures were necessary (5 primary closed reduction and K-wire pinning of what?, 6 hardware removal, one TN arthrodesis, one corrective osteotomy) Overall results showed an AOFAS Score of 84.4 and a VAS Hannover Questionnaire Score of 75.5. Spearman’s coefficients showed significant correlation of the clinical outcome with TN mobility (-0.44, p= 0.016), with TN arthrosis (-0.53, p=0.004), and with ST mobility (-0.53, p=0.004). Using the new classification 4 patients had type I fractures, 6 patients type II fractures, 5 type IIIa and 9 type IIIb fractures. In contrast to Sangeorzan’s classification the proposed new classification showed significant correlation of the fracture type and AOFAS Score (-0.016, p=0.470 vs -0.39, p=0.030), of fracture type and Hannover Score (-0.14, p=0.253 vs. -0.36, p=0.041), and of fracture type and osteoarthritis of TN joint (0.39, p=0.029 vs. 0.53, p=0.004)
Conclusion
At mid-term follow-up, open reduction and internal fixation of navicular fractures lead to appropriate clinical outcome but is closely related to the severity of the initial fracture comminution. A new classification with close correlation to clinical and radiological outcome.