# Abstract

Calcaneal fractures are common injuries that prevent patients from getting on with their normal life for a long time. They are usually caused by axial forces leading to impaction of the talus into the calcaneus. Falls and jumps from heights are the most common causes. These fractures also occur bilaterally.

We used open reduction and internal fixation with a calcaneal LCP for the treatment of 98 patients with 114 calcaneal fractures in our department from August 2005 till December 2011. Bilateral fractures of the calcaneus occurred in 16 patients - 2 women and 14 men.

On the day of injury plain radiographs of the calcaneus in lateral and axial projection were taken. Computed tomography was performed in all operated patients in sagittal, transversal and coronal planes. On the basis of CT findings the fractures were classified as Sanders types I - IV. Patients with type II and III fractures were indicated for surgical ORIF treatment.

The results were evaluated using the Rowe score.

The aim of the experimental work was to assess the biomechanical strength of the calcaneus without fracture and to compare it with the strength of the calcaneus after the osteosynthesis with an angular stable plate alone or in combination with filling of the calcaneal defect with injectable self-hardening hydroxyapatite cement. Comparison of the mechanical strengths of both types of osteosyntheses was also the aim of our work. We performed this experiment in 6 cadaveric specimens of the calcaneus and mathematical models.

The most frequent mechanism of injury was fall or jump from a height (81 patients). 16 patients were diagnosed with bilateral calcaneal fracture.

An excellent Rowe score of the osteosynthesis without augmentation was achieved in 33 patients (33.7%). These patients are virtually without any subjective complaints and restrictions in their daily lives. Good results were achieved in 38 patients (38.8%), satisfactory results in 19 patients (19.4%) and poor results in 8 patients (8.2%). Injured patients who underwent the calcaneal osteosynthesis with augmentation achieved excellent results in 6 cases (30%), satisfactory results in 7 cases (35%), good results in 5 cases (25%) and poor results in 2 cases (10%). In unilateral injuries the results were excellent in 28 cases (34.1%) and good in 35 cases (42.7%). Satisfactory results were achieved

in 15 patients (18.3%) and poor results in 4 patients (4.9%). As for patients with bilateral fractures the results were excellent in three cases (18.7%) and good in four cases (25%). The results were satisfactory in five patients (31.3 %) and poor in 4 patients (25 %).

The Sanders classification based on CT examination is used as an indication scheme in our department. Type II and III fractures are indicated for surgical ORIF treatment. We prefer the calcaneal LCP and an extended lateral approach. This allows us perfect visualisation of the fracture, thorough reduction of the subtalar and calcaneocuboid joints and stable internal fixation.

We did not detect any statistically significant difference in the incidence of complications in patients with calcaneal bone defect filled with any material peroperatively, compared to patients left without filling.

Our clinical results were confirmed by the theoretical part where we subjected calcaneus without fracture, fractured calcaneus after osteosynthesis with angular stable plate alone and with a splint with bone cement augmentation to a pressure test. The healthy bone was the strongest; the strength of the heel was not significantly different in the two types of osteosynthesis.

The surgical treatment of displaced intra-articular fractures using open reduction from the extended lateral approach and internal fixation with the calcaneal LCP achieves good results. CT examination is necessary for the diagnosis, fracture classification and indication for surgical treatment. Proper timing of the operation is essential. An urgent surgical intervention is necessary in open fractures or in fractures associated with severe soft tissue damage. Peroperative filling of the defect in the calcaneus body, which appears after reduction of fragment of the rear articular surface of the heel, does not achieve better results in either fracture treatment or in the possibility of faster weight-bearing of the affected limb. We therefore assume this filling not to be necessary.