

# On the Treatment of Tibial Fractures using the Ilizarov Fixator

Akademisk avhandling

som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien vid Göteborgs Universitet kommer att offentligens försvaras i Sahlgrenska aula, Sahlgrenska Universitetssjukhuset/Sahlgrenska  
Torsdagen den 18 september 2014, kl 13.00

av  
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Avhandlingen baseras på följande delarbeten:

- I. **Ilizarov external fixation or locked intramedullary nailing for treatment in diaphyseal tibial fractures – a randomized prospective study of 58 consecutive patients.**  
Ramos T, Karlsson J, Eriksson BI, Nistor L.  
*Arch Orthop Trauma Surg* 2014; 134 (6): 793-802.
- II. **The Ilizarov external fixator – a useful alternative for the treatment of proximal tibial fractures – a prospective observational study of 30 consecutive patients.**  
Ramos T, Ekholm C, Eriksson BI, Karlsson J, Nistor L.  
*BMC Musculoskelet Disord*. 2013; 14 (1): 11.
- III. **Treatment of distal tibial fractures with the Ilizarov external fixator –a prospective observational study in 39 consecutive patients.**  
Ramos T, Karlsson J, Eriksson BI, Nistor L.  
*BMC Musculoskelet Disord*. 2013; 14 (1): 30.
- IV. **Gait analysis with insoles in different types of tibial fractures treated with Ilizarov external fixator.**  
Ramos T, Hjältman K, Reetz T, Tranberg R, Nistor L.  
*Manuscript*.

Göteborg 2014



UNIVERSITY OF GOTHENBURG

# On the Treatment of Tibial Fractures using the Ilizarov Fixator

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Gothenburg, Sweden 2014

## Abstract

The aim of this thesis was to analyse the results of the Ilizarov method in patients with different types of tibial fracture and compare them with conventional methods, in terms of primary union, complication rates, post-operative function, quality of life, and how the patients' gait was affected during rehabilitation. Fifty-eight patients with isolated diaphyseal fractures (Study I) were randomised to treatment with either the Ilizarov method (IL) or locked intramedullary nailing (IM). Thirty consecutive patients with isolated proximal metaphyseal fractures (Study II – 11 classified as Schatzker type I-IV and 19 as Schatzker type V-VI) and 39 consecutive patients with isolated distal metaphyseal fractures (Study III – 21 extra-articular and 18 intra-articular) were treated prospectively using the IL. The follow-ups included clinical investigations, roentgen assessments, self-appraisals (VAS Pain and VAS Satisfaction, NHP and EQ-5D). In Studies II and III, we also used specific questionnaires: the KOOS and FAOS respectively. In Study IV, 85 patients from the earlier studies were included in a gait analysis study, using the medilogic® insole pressure technique.

In Study I, in the IL and IM groups, nine and two patients respectively had open fractures. Twelve patients sustained major complications, four in the IL group and eight in the IM group ( $p=0.107$ ). In the IL group, two patients developed pseudarthrosis and two malunion. In the IM group, two patients developed compartment syndrome, one had a deep infection, one hardware failure, one delayed union, one pseudarthrosis and two had a malunion. Superficial pin-site infections were observed in 16 patients in the IL group. The fractures were radiographically healed at an average of 12 weeks in both groups. At the one-year follow-up, there were differences in pain (VAS) and satisfaction (VAS) scores in favour of the IL treatment ( $p=0.03$  and  $p=0.02$  respectively). There were no differences between the groups with regard to range of motion (ROM) in the knee and ankle joints. Local tenderness and pain, mainly anterior knee pain, were registered in 19 patients in the IM group and one patient in the IL group at the one-year follow-up ( $p<0.001$ ). In Study II, 25 of the 30 patients achieved a ROM in the knee exceeding 10-100°. The patients with Schatzker type I-IV fracture had a shorter operating time and hospital stay, as well as better knee flexion, and the self-appraisal indicated that they tolerated the treatment better than those with Schatzker type V-VI fracture. In Study III, one patient had a deep infection and developed a residual deformity. Another patient with residual deformity underwent re-operation. Even if the radiological results were "poor" in five patients, the overall self-appraisal showed satisfactory results in 36 of the 39 patients. In Study IV, there was an improvement in all the gait parameters as the fractures healed. There were differences in recovery between the patients with Schatzker type I-IV and type V-VI fractures, corresponding to the severity of the fracture. In the diaphyseal fractures, there were no statistically significant differences between the IL and IM groups. Gait analysis demonstrated that step length and walking speed were more clearly correlated to increasing time after operation, compared with weight-bearing, i.e. load. To summarise, the Ilizarov method produced a good, satisfactory clinical outcome with a low complication rate and is at least as good as internal fixation. This technique should therefore be considered as a valid alternative and can be useful as the primary and definitive treatment of patients with all types of tibial fracture.

**Keywords:** tibial fracture, external fixation, intramedullary nail, randomised study, load, gait analysis, VAS, NHP, EQ-5D

**ISBN:** 978-91-628-9068-1

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