

Good results using angular stable locking system with distal tibia fracture nail osteosynthesis

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ABSTRACT

Objectives: The treatment of unstable tibia fractures has always been challenging. In recent years the treatment of choice has been intramedullary nailing. Intramedullary nails have been shown to have a risk of non-union and the need for secondary procedures is substantial. Studies has shown that angular stable locking screws has the ability of achieving higher stability and increased bone healing. The study describes the results of tibial nailing with angular stable locking screws in patients with tibia fractures. **Methods:** Designed as a prospective case series with inclusion from accident and emergency department at a level 1 trauma center, recruiting a consecutive cohort of all skeletally mature patients with tibia fracture in the distal half of the crus where intramedullary nail was indicated and osteosynthesis with a Tibia Expert Nail supplemented with the Angular Stable Locking System was performed. Main outcome measurement was bone healing. **Results:** Fifty-one patients were included and eligible for one-year follow-up and all fractures healed in an average of 4.8 months, though two patients had secondary procedures performed to facilitate healing, and two patients healed in valgus malunion, 6° and 18° respectively. **Conclusions:** The osteosynthesis method showed a high rate of healing and a low rate of complications.

KEY WORDS: Traumatology, tibia, nail, osteosynthesis, angular-stable

INTRODUCTION

The treatment of unstable tibia fractures has always been challenging. In recent years the treatment of choice has been intramedullary nailing, due to the advantage of good mechanical stability, short time to union and little soft tissue damage resulting in a shorter period of disability,[1] though several studies also showed excellent results using open reduction and internal fixation with angular stable plates or external fixation[2-5] often supplemented with fibula fixation. [6]. Intramedullary nails have been shown to have a risk of non-union and as well as the need for secondary procedures is substantial, furthermore there is a risk of varus, valgus and antecurvation malalignment above the acceptable five degrees and chronic anterior knee pain.[7, 8] Intramedullary nails were originally designed for diaphyseal tibia fractures, but advances in nail design and nail-locking opportunities, has widened the indications for its use to also include distal and proximal metaphyseal and intraarticular fractures, despite of the risk of poor mechanical stability due to several small or large fragments, the trumpet-like widening of the metaphyse, thinning of the distal cortex and little nail-cortex contact. [9] In order to increase stability in these distal fractures, the nail is typically locked with screws, but minor differences in the diameter of the screw hole and screw diameter still compromise stability.[10] Therefore a system with distal angular stable interlocking screws encased with a sleeve has

been developed. This has the potential benefit of increasing stability using fewer screws and avoiding supplemental fibula fixation resulting in less soft-tissue damage.[11-13], though never shown in a randomized setting[14], there are several studies indicating that angular stable locking screws has the potential ability of achieving higher stability and increased bone healing, reducing the risk of mal- or non-union, malalignment and loss of reduction[15-17].

MATERIALS AND METHODS

In a 18-month period (2012-2013) a consecutive cohort of all skeletally mature patients with tibia fracture in the distal half of the crus where intramedullary nail was indicated, received a Tibia Expert Nail (Synthes, Zuchwil, Switzerland), and was supplemented with the Angular Stable Locking System(ASLS) (Synthes, Zuchwil, Switzerland) in the nails distal locking holes. All patients were operated by a specialist in orthopedic traumatology or an orthopedic resident supervised by a specialist in orthopedic traumatology with special attention to the anatomical reduction of the fracture and placement of the screws. Screws were set as the operator preferred. Postoperatively all patients were mobilized with movement in knee and ankle joint, as well as allowed individualized weightbearing. Patients were followed every six weeks until healing, and all patients were seen at a one year follow-up. Healing was defined as callus in 3 of 4 cortices

on a standard crus x-ray. Malunion was defined as more than 5° of malalignment in either axis on a standard crus x-ray. Complications, shortening and clinically relevant malrotation, and reoperations were recorded as well. Fractures were classified according to the AO/OTA classification system.[18]

RESULTS

Fifty-one patients were included and eligible for one-year follow-up. Thirty-one were male and twenty were female with a mean age of 48 years (17-71). Fractures were classified according to AO/OTA classification system and showed the following distribution: 42a:20, 42b:10, 43a:18, 43b:3. The mean antero-posterior postoperative axis were 1.2° (SD:2.6) and mean side postoperative axis were 1.1° (SD:3.2). Mean distance from tip of nail to talocrural joint was 11.7mm (SD:12.4), and averagely 2.5 ASLS screws were used per patient. All fractures healed in an average of 4.8 months. Two had valgus malunion, respectively 6° and 18°. Four patients were re-operated, one received implant removal because of anterior knee pain, one patient was dynamized due to delayed healing, one patient had bone defect and received autologous bone grafting and one patient had implant removal after bone healing due to suspicion of infection which was not confirmed.

DISCUSSION

With the Tibia Expert nail combined with ASLS we have shown 96.1 % healing rate in patients with tibia fractures in the distal half of the crus. Two patients required reoperation to facilitate healing and 100% healing rate was achieved after 4.8 months averagely. Two patients healed with malunion, including one patient with 18° valgus malunion which we regarded as a major complication. We found no obvious cause for the secondary loss of reduction, but it is similar to other authors results and a known complication.[14] Furthermore we used 2.5 ASLS screws per patient thus potentially minimizing the risk of perioperative nerve and vessel damage, as well as reducing operation time. The number of screws, the position of screws and the combination of regular locking screws and ASLS screws has in recent literature been debated, but no clear conclusion has yet arrived.[13] We also defined healing as callus in 3 of 4 cortices on a standard crus x-ray. We choose this standard as this is the regular postoperative follow-up procedure in our clinic, and we only use supplemental CT on special indications, as for example delayed healing etc. We acknowledge the fact that radiological healing does not always correspond to the patients experience of healing,[14] but it is nevertheless a prerequisite for the patients experience of healing. Our limitations in this study is that we have a small patient cohort in a non-randomized design and perspectives for further research are therefore a randomized study based on a sample size calculated patient cohort using

validated outcome measures, in order to achieve a higher level of evidence than described in this study. More studies are also needed in order to describe the correct indication, position and use of ASLS screws in regard to fracture classification and in potential combination with regular locking screws as well of the economic impact of using ASLS screws. In conclusion we found that this system showed a high rate of healing and a low rate of complications.

CONFLICTS OF INTEREST:

The authors declare that they have no conflict of interest.

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