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Original Article

Comparative study on three surgical techniques for intra-articular calcaneal fractures: open reduction with internal fixation using a plate, external fixation and minimally invasive surgery☆

Missa Takasaka, Cintia Kelly Bittar, Fernando Saddi Mennucci, Carlos Augusto de Mattos, José Luís Amim Zabeu*

Hospital e Maternidade Celso Pierro, Pontifícia Universidade Católica de Campinas (PUC-Campinas), Campinas, SP, Brazil

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ABSTRACT

Objective: To evaluate, compare and identify the surgical technique with best results for treating intra-articular calcaneal fractures, taking into account postoperative outcomes, complications and scoring in the Aofas questionnaire.

Methods: This was a retrospective study on 54 patients with fractures of the calcaneus who underwent surgery between 2002 and 2012 by means of the following techniques: (1) open reduction with extended L-shaped lateral incision and fixation with double-H plate of 3.5 mm; (2) open reduction with minimal incision lateral approach and percutaneous fixation with wires and screws; and (3) open reduction with minimal incision lateral approach and fixation with adjustable monoplanar external fixator.

Results: Patients treated using a lateral approach, with fixation using a plate had a mean Aofas score of 76 points; those treated through a minimal incision lateral approach with screw and wire fixation had a mean score of 71 points; and those treated through a minimal incision lateral approach with an external fixator had a mean score of 75 points. The three surgical techniques were shown to be effective for treating intra-articular calcaneal fractures, without any evidence that any of the techniques being superior.

Conclusion: Intra-articular calcaneal fractures are complex and their treatment should be individualized based on patient characteristics, type of fracture and the surgeon's experience with the surgical technique chosen.

☆ Study conducted at the Service of Orthopedy and Traumatology, Hospital e Maternidade Celso Pierro, Pontifícia Universidade Católica de Campinas (PUC-Campinas), Campinas, SP, Brazil.

* *Corresponding author*.
E-mail: fmenucci@msn.com (F.S. Mennucci).

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Estudo comparativo entre três técnicas cirúrgicas para fraturas intra-articulares de calcâneo: redução aberta e fixação interna com placa, fixação externa e minimamente invasiva

Palavras-chave:
Calcâneo/lesões
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RESUMO

Objetivo: Avaliar, comparar e identificar a técnica cirúrgica com melhor resultado para o tratamento de fraturas intra-articulares do calcâneo, levando em consideração evolução pós-operatória, complicações e pontuação no questionário Aofas.
Métodos: Estudo retrospectivo de 54 pacientes com fraturas de calcâneo operados entre e 2002 e 2012 com as técnicas 1) redução aberta com incisão lateral alargada em "L" e fixação com placa duplo "H" de 3,5 mm, 2) redução aberta por incisão lateral econômica e fixação percutânea com fios e parafusos e 3) redução aberta por incisão lateral econômica e fixação com fixador externo monoplanar regulável.
Resultados: Pacientes tratados pela via de acesso lateral e fixação com placa tiveram média de 76 pontos na escala Aofas, em pacientes tratados pela via de acesso lateral econômica e fixação com fios e parafuso a média foi de 71 e nos pacientes tratados com via de acesso lateral e fixador externo foi de 75 pontos. As três técnicas cirúrgicas demostraram-se efetivas no tratamento da fratura intra-articular do calcâneo, sem evidência de superioridade de uma técnica sobre as demais.
Conclusão: : A fratura intra-articular do calcâneo é uma fratura complexa e seu tratamento deve ser individualizado, baseado nas características do paciente, no tipo de fratura e na experiência do cirurgião com a técnica operatória escolhida.

Introduction

Calcaneal fractures correspond to approximately 1% to 2% of all the fractures of the human body and constitute nearly 60% of tarsal bones fractures. They generally follow high-energy axial traumas, such as fall from height or motor accidents.

According to the current literature, 60% to 75% of these fractures are considered to be displaced and intra-articular,[1–3] which evidences the difficulty of the treatment. They can cause great disability due to pain and chronic stiffness, in addition to hindfoot deformities. These fractures are characterized clinically by poor functional results due to their complexity.

Approximately 80% to 90% of the calcaneal fractures happen in males between 21 and 40 years, mostly in industrial workers. Several authors[4–7] have reported that the rehabilitation of these fractures can take from nine months to several years, which implicates great economic burden on society.

Since the early 1980s, the treatment of choice for displaced and intra-articular calcaneal fractures was open reduction with internal fixation; however, soft tissue complications, such as surgical dehiscence and infection, can occur in up to 30% of the patients.[8–10]

In an attempt to reduce complication rates, new surgical techniques emerged, such as minimally invasive incision and percutaneous fixation, which cause less injury to the tissues and reduce the incidence of soft tissue complications.[10,11]

Despite the modern surgical techniques and the considerable number of studies in the literature,[11–13] calcaneal fractures and their best treatment method remain an enigma for orthopedic surgeons.

This study aimed to assess, compare, and identify the surgical technique with the best clinical functional result in the treatment of displaced and intra-articular calcaneous fracture, including (1) open reduction with extended L-shaped lateral incision and fixation with 3.5-mm double-H plate; (2) open reduction with minimal incision lateral approach and percutaneous fixation with wires and screws; and (3) open reduction with minimal incision lateral approach and fixation with adjustable monoplanar external fixator.

Material and methods

The study protocol was approved by the Research Ethics Committee under No. 064/11.

This was a retrospective study that analyzed the medical charts of 54 patients with 60 calcaneal fractures, operated on between 2002 and 2012, in an university hospital in Campinas, SP, Brazil, by a single orthopedic surgeon (foot-and-ankle specialist). The inclusion criteria comprised skeletally mature individuals with deviated intra-articular calcaneal fractures classified as Sanders type II and III, who were operated on with one of the following surgical techniques:

1. Conventional lateral surgical access plus fixation with a 3.5-mm implant: incision between the fibula and calcaneus tendon beginning above the lateral malleolus, extended around and posterior to the malleolus toward the base of the V metatarsal. The sural nerve is identified and protected. The calcaneofibular ligament is detached from its calcaneous insertion and, along with the dislocated