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Calcaneal Articular Fractures Treated With Nail Calcanail: About 20 Cases

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Abstract Original Research Article

Fractures of the calcaneus are serious fractures due to their frequent functional impact on plantar static and walking. They occur most often during a fall reception from a high place and, as a result, may be associated with other fractures (spine, pelvis, contralateral calcaneus, etc.). The calcaneus fractures may be classified as parcel fractures and thalamic fractures with isolated or associated depression and separation.

Keywords: Calcaneus, articular fracture, nail calcanail.

INTRODUCTION

Fractures of the calcaneus are serious fractures due to their frequent functional impact on plantar static and walking. They occur most often during a fall reception from a high place and, therefore, may be associated with other fractures (spine, pelvis, contralateral calcaneus, etc.).

The fractures of the calcaneus can be classified into parcel fractures and thalamic fractures involving, alone or in combination, depression and separation.

METHODS

This is a retrospective study of a series of 20 calcaneal articular fractures treated and monitored in the orthopedic surgery department of the Avicenne University Hospital of Rabat between 1 January 2014 and 1 January 2019 with an average follow-up of 24 months All our patients benefitted from a standard radio face, profile (Figure-1) and retro tibial incidence (Figure-2) and scanner of the back foot (Figure-3). The classification of Duparc [1] has been used for its pedagogical value allowing a better understanding of the anatomo-pathology of thalamic fractures of the calcaneus. The procedure was performed under general or locoregional anesthesia, the duration of the intervention was on average 120 minutes under general anesthesia. lateraldecubitus installation (Figure-4). Technique: We have developed a posterior intra-osseous approach to make an intra-focal reduction of these fractures; the installation by the same way first of a locked nail simplifies and makes reliable the osteosynthesis. This posterior approach and the reduction technique minimize the surgical aggression and the operative follow-up. The decisive advantages of this technique are the following: the realization of an intra-bone drilling in the axis of the trabeculae of the calcaneus allowing the reduction and the collection of a cylindrical graft the intra-focal reduction of the displaced articular fragments facilitated by the use of a Caspar-type talocaneal distractor, the placement of a locked nail with self-stable screws under the reduced articular surface and maintained at the right height the establishment of spongy graft promoting bone consolidation through the windows of implant, the possibility of performing a talocalcaneal arthrodesis by the same route first and with the same instrumentation if the joint damage justifies it. All our patients benefited from internal osteosynthesis by nail calcanal with scopic-controlled bone grafting followed by immobilization by plaster cast during 45 to 60 days. Béquillage without support analgesic treatment and lovénox during all the duration of immobilization and monitoring platelets twice a week.

RESULTS

There were 15 men and 5 women, mean age 42 years (range 21 to 61 years). The right side was reached 11 times, the left side 8 times. The fracture was bilateral in one patient. The etiologies are dominated by road accidents (22 cases or 75%) and falls (7 cases or 25%)

with 2 cases of voluntary defenestration in a psychiatric context (3 fractures). Associated lesions of the musculoskeletal system were observed in six patients (two femur fractures, one contralateral tibial puncture fracture, one ipsilateral slope fracture, two lumbar fractures, one sacral fracture, two wrist fractures). According to the classification of DUPARC and CAFFINIERE [1], fractures were type III of Duparc in 50% of cases (10 patients), types IV in 37.9% (6 patients) and type V in 13.9% of cases (4 patients). The thalamic depression was of vertical type in 8 cases, horizontal in 6 cases and mixed in 10 cases. Osteosynthesis was performed between the 4th and 7th days post-traumatic with a nail calcanal (Figure-5). We used a cortico-cancellous graft of support in all our patients. All patients were reviewed with a mean follow-up of 2 years (12-60 months). The functional results were analyzed according to the quotation of Kitaoka *et al.*, [2] which takes into account 3 parameters: pain, function and alignment of the hind foot. Thus, the result was considered excellent, when the overall score was between 95 and 100, good when it was between 80 and 94, average when it was between 50 and 79, and bad when it was under 50. Evaluation of anatomical findings was done on ankle and ankle radios under load and an ascending retro-tibial impact. We have selected the quotation of Babin *et al.*, [3] based on the BÖHLER angle measurement and the anatomical result was considered very good when the BÖHLER angle was greater than or equal to 25°, good when it was between 20° and 25°, fair when it was was between 10° and 20° and bad when it was less than 10°. According to the rating of Kitaoka, the average score was 74. The functional results were excellent in 16% of cases, good in 56% of cases, average in 25% of cases and bad in 3% of cases (repeated by a double arthrodesis). The resumption of work was on average 4.6 months with the same capacity in 10 patients (34%), two patients had a clear physical decrease. The axis of the hind foot was normal for 83% and a valgus flat foot was found in 17% of the cases. Talo-calcaneal osteoarthritis (Figure-3) appeared in 4 cases at the last follow-up, of which one case was resumed by subtalar arthrodesis. . Anatomically, the result was very good in 24% of cases, good in 8% of cases, average in 28% of cases and bad in 40% of cases. The average Böhler angle at last recoil was 13° (0° to 35°). The study of the difference between the Böhler angle calculated immediately postoperatively and at the last follow-up showed a secondary loss of the initial thalamic surface recovery that averaged 3° (0° to 5°). This secondary subsidence concerned only 48% of patients. We noted a case of superficial infection that has evolved well under antibiotherapy and local care. A patient case of algodystrophy who favorably evolved under medical treatment and reeducation. Finally, at the last follow-up, we noted a case of poorly tolerated subtalar osteoarthritis that required a double arthrodesis.

Fig-1: Fracture type III of the calcaneum

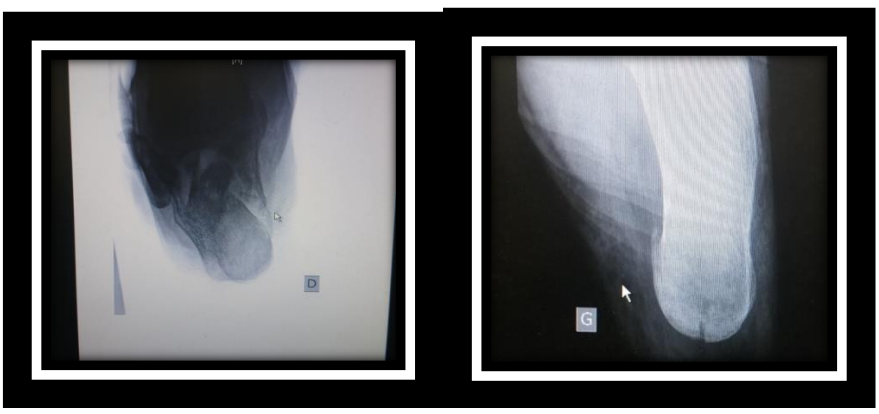

Fig-2: Retro-tibial incidence showing presence and absence of valgus calcanen

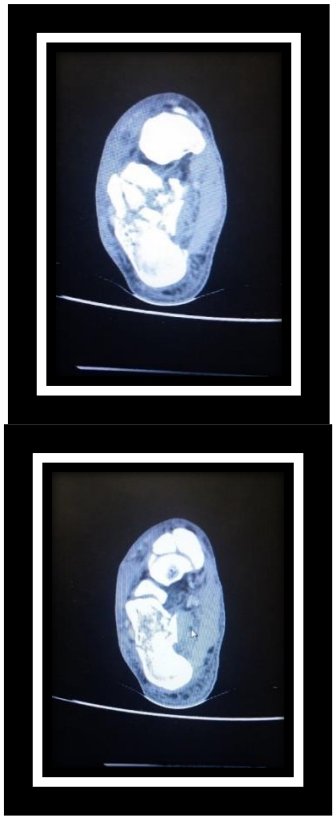

Fig-3: Comminuted fracture with plantar cortex breaking (type 4 and 5)

Fig-4: Lateral decubitus installation

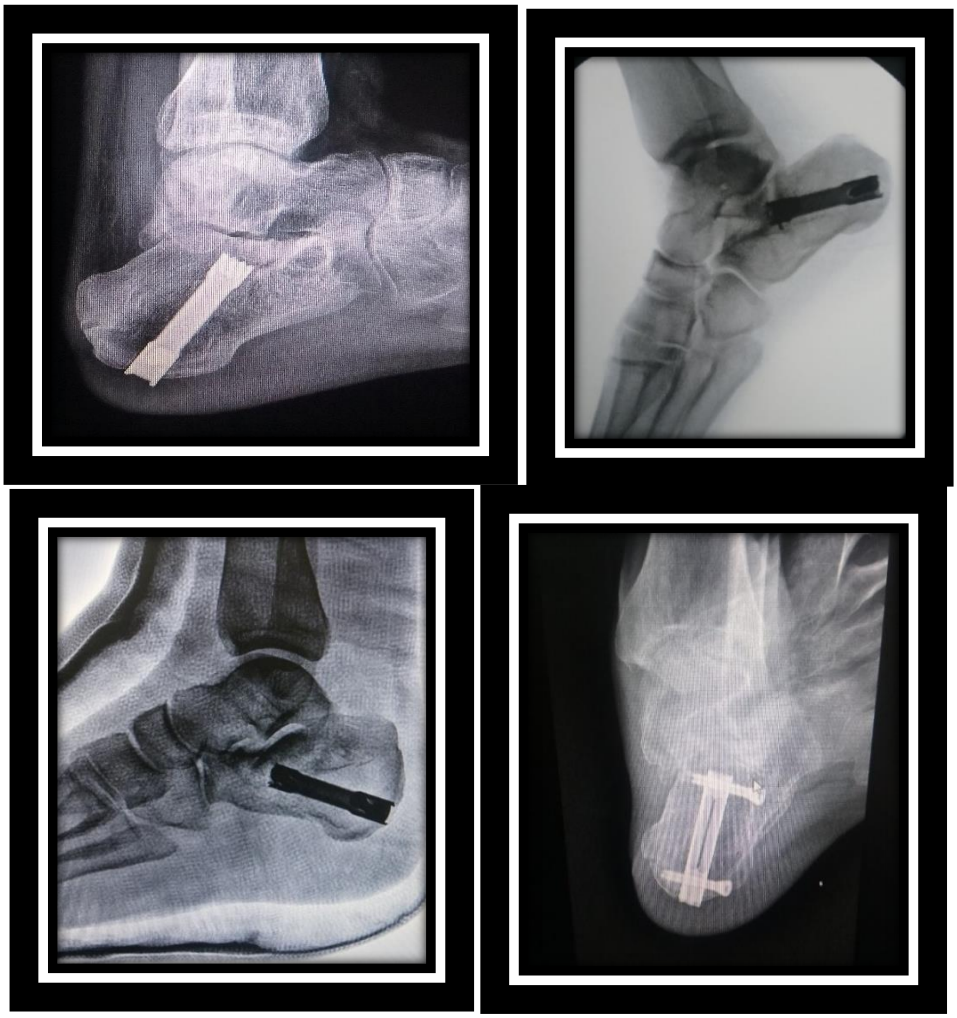

Fig-5: Postoperative radiography-osteosynthesis by nail calcanail

DISCUSSION

Since the first descriptions of these thalamic fractures, their treatment remains controversial [4, 5]. In 1931, Böhler [6] described the method of reduction by a pull pin followed by immobilization by plaster. In 1913, Leriche recommended osteosynthesis by plate and screw [7]. These recommendations were supported by Palmer [8]. In recent years, thanks to a better analysis of pathological lesions and the establishment of technical bases for the reduction and osteosynthesis of calcaneal articular fractures in the open air, many authors have reported satisfactory results after surgical treatment: Buckley and Meek [8], Crosby and Fitzgibbons [9] and Parmar [10]. This treatment is currently part of the therapeutic arsenal of articular fractures of the calcaneus. The analysis of the comparative series, surgical treatment versus functional treatment of calcaneal articular fractures, has shown that surgical treatment can lead to comparable results, even superior to functional treatment [11, 12]. Parma *et al.*, [13] published in 1993 the first randomized comparative study of 31 functionally treated patients and 25 surgically treated patients. With a mean follow-up of 23 months, functional outcomes were excellent and good in 65% of non-operated patients and 64% of operated patients. Buckley and Meek [14] published the results of a randomized comparative study of 36 patients, of whom 17 were functionally treated and 19 were surgically treated. With an average follow-up of 5 years, the functional results were good and very good in 69% of the cases for the first group and in 65% of the cases for the second group. The authors found, however, that surgically well-reduced patients performed better than the others and concluded that surgery was superior if there was certainty of a perfect reduction. Crosby and Fitzgibbons [15] achieved 100% good and very good results for the operated group and 20% for the nonoperated group. For these authors, in the event of any displaced fracture, surgical treatment is required. Thus, we agree with most authors that the treatment of displaced articular fractures of the calcaneus must be surgical. The risk of skin necrosis and infection, major drawbacks of this treatment, can be significantly reduced by certain rules: before the intervention, care must be taken to reduce edema and inflammatory phenomena by the elevation of the limb, icing and the administration of an anti-inflammatory

treatment. The intervention must be decided upon resolution of inflammatory phenomena around the 7th day, the skin incision must be lateralized near the Achilles tendon. Acute angles should be avoided, dissection should be limited and the upper flap should be raised from the periosteum with the fibular tendons and the sural nerve. The closure of the incision must be done without tension in two planes under drainage. Postoperatively, the limb should be kept elevated for a few days. Compressive dressings should be avoided. The removal of the threads must be done at the 3rd week. Respecting these rules, our cutaneous and septic complications were rare and without serious impact on the final result, compared to the Stephenson series where the cutaneous necrosis rate was of the order of 21% [16]. This posterior approach and the reduction technique minimize the surgical aggression and the operative follow-up.The decisive advantages of this technique are:- the completion of an intraosseous drilling in the axis of the trabeculae of calcaneus allowing the reduction and the collection of a cylindrical graft; The intrafocal reduction of displaced articular fragments facilitated by the use of a talocalcaneal distractor of the Caspar type;- the establishment of a locked nail with self-supporting screws under the reduced articular surface and maintained at the correct height;- The establishment of spongy graft promoting bone consolidation through the windows of the implant- the possibility of performing a talocalcaneal arthrodesis by the same route first and with the same instrumentation if the articular damage justifies it.

CONCLUSION

It is a minimally invasive solution for joint fractures and avoids the dilapidated lateral approach wich remains the cause of two common problems: first-line healing disorders and conflict with fibular tendons.

Conflicts of Interest: The authors do not declare any conflict of interest.

Contributions of the Authors

Ouissaden El Mehdi carried out the collection of patient files, the writing of a file of exploitation of the files, the follow-up of the patients and the writing of the article. All authors have read and approved the final version of the manuscript.

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