

Surgical versus conservative management of fifth metatarsal fractures in adults

A protocol of retrospective study

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Abstract

Background: At present, the treatment of base fractures of the fifth metatarsal, especially the area I fractures, is still a controversial topic. The objective of our work was to assess the radiological and clinical outcomes of displaced avulsion fractures of the fifth metatarsal base after treated with conservative treatment or intramedullary screw.

Methods: All of the fifth metatarsal fractures patients underwent surgery by the senior authors in our hospital from January 2017 to December 2019 were reviewed. Institutional Review Board in the Subsidiary Hospital of Guizhou Medical University approved this study. Patients with the following conditions can be included:

- (1) the displaced avulsion fracture of fifth metatarsal base;
- (2) aged 18 to 40 years;
- (3) a completed medical history;
- (4) the patients were followed up for at least 6 months.

Patients with the following conditions will be excluded: follow-up less than 6 months; open fracture; pathological fracture; osteoporotic fracture; patients have the history of ankle or foot surgery. Radiographs were taken at 1, 3, 6 and 12 months in outpatient follow-up. The following outcomes were assessed in the follow-up: functional outcomes, the score of patient satisfaction, as well as the motion range, and complications. All the statistical analyses were implemented via applying the software of SPSS Version 12 (SPSS Inc, Chicago, IL).

Results: We hypothesized that there was no remarkable difference between two groups in the outcomes after operation.

Trial registration: This study protocol was registered in Research Registry (researchregistry6024).

Abbreviations: AOFAS = American Orthopaedic Foot and Ankle Score, FFI = Foot Function Index, VAS = visual analog scale.

Keywords: conservative treatment, fifth metatarsal fractures, protocol, retrospective, surgical management

1. Introduction

The fifth metatarsal fractures is one of the most familiar metatarsal fractures, with 6.7 fractures reported for every 10,000

people.^[1,2] The fracture of the proximal fifth metatarsal is not only owing to the direct injuries in this area, but also to the inverted injuries with plantar flexion. These fractures can lead to serious incidence rate, especially in athletes, the time of competition is obviously shortened, and refracture, sometimes it cannot resume sport.^[3–5]

Generally speaking, the treatment of the fracture of the base of the fifth metatarsal is performed by non-surgical or surgical measures. Surgical procedures usually involve the bicortical screw or intramedullary internal fixation approaches.^[6–8] However, the non-surgical approach is to use the immobilization cast to promote the weight-bearing passive healing. At present, the treatment of base fractures of the fifth metatarsal, especially the area I fractures, is still a controversial topic.^[9–13] Some investigations have indicated that the conservative treatment may not yield the best long-term effects for athletic patients with displaced avulsion fracture of base zone I of the fifth metatarsal, leading to the delayed healing and resumption of activity.^[14–16] Furthermore, some literatures suggest the application of non-surgical intervention to promote rehabilitation. Studies have indicated that the application of non-surgical interventions can avoid surgery-related discomfort and the complications, which is a cost-effective method.^[17–20]

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The authors have no conflicts of interest to disclose.

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

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The objective of our work was to assess the radiological and clinical outcomes of displaced avulsion fractures of the fifth metatarsal base after treated with conservative treatment or intramedullary screw. We hypothesized that there was no remarkable difference between two groups in the outcomes after operation.

2. Materials and methods

2.1. Patients

Patients with the following conditions can be included:

- (1) the displaced avulsion fracture of fifth metatarsal base;
- (2) aged 18 to 40 years;
- (3) a completed medical history;
- (4) the patients were followed up for at least 6 months.

Patients with the following conditions will be excluded: follow-up less than 6 months; open fracture; pathological fracture; osteoporotic fracture; patients have the history of ankle or foot surgery.

2.2. Study design

All of the fifth metatarsal fractures patients underwent surgery by the senior authors in our hospital from January 2017 to December 2019 were reviewed. Institutional Review Board in the Subsidiary Hospital of Guizhou Medical University approved this study (20201742). This study was registered in the research registry (researchregistry6024). This work was implemented and then reported on the basis of the requirement of strengthening the reporting of observational studies in epidemiology checklist (Table 1).

2.3. Surgery and conservative technique

Each patient received a standard general anesthesia regimen and was placed on the radiologic operating table with supine position. This surgery was assisted through utilizing the tourniquet. And an approximately 3 cm longitudinal skin incision was made at the distal base of fifth metatarsal bone. After determining the lateral zone of aponeurosis and peroneus brevis, the periosteum was raised slightly to expose fracture. The reduction forceps are conducted by utilizing the fracture reduction. The screw drill was inserted through fracture site to determine the length of screw and the intramedullary purchase. The cannulated screw guide pin of 3 mm was inserted between the peroneus brevis tendon and the plantar aponeurosis lateral band.

In the conservative group, the patients were immobilized in the neutral position through using the plaster. The short leg plaster

was utilized for 2 weeks, afterwards, before the weight bearing, the tubular plaster was applied for the next two weeks to four weeks. During immobilization, the hip joints and knee should be encouraged to exercise moderately to avoid lower extremity musculoskeletal atrophy and venous thrombosis. Moderate movements of the knee and hip were encouraged to avoid venous thrombosis and musculoskeletal atrophy of lower extremity during immobilization.

2.4. Postoperative rehabilitation

The passive and active flexion and extension of distinct ankle joints were carried out on the second day after operation. The patient was weight-free in the first 2 weeks and the incision was allowed to heal. As long as the sutures are removed at 2 weeks, the patient can bear the weight that the fracture boot can bear. At the same time, they can use swimming pool and land bike to gradually increase the resistance training for four weeks, and allow the complete weight-bearing at six weeks. All patients were asymptomatic in clinical and X-ray showed that after healing, they could resume complete activity.

2.5. Outcomes

Radiographs were taken at 1, 3, 6, and 12 months in outpatient follow-up. The examination of radiographs was conducted for the displacement of plate, implant failure, or signs of fracture healing. The following outcomes were assessed in the follow-up: functional outcomes, the score of patient satisfaction, as well as the motion range, and complications. The functional outcomes included Visual Analog Scale (VAS), Foot Function Index (FFI), as well as the American Orthopedic Foot and Ankle Score (AOFAS). Postoperative complications included infection, non-union or delayed union, stiffness, refracture, and internal fixation loosening.

AOFAS is composed of 4 scoring systems, each of which containing two parts, in which the first part is subjective and it should be addressed via patient; the second part is objective and needs the clinical examination. In accordance with the affected anatomical area, the most relevant score should be given. This 4 scoring system included an examination of the alignment of anatomical joint. However, in these 4 systems, function item is divided into different and a variety of subitems. The total score is 100. The higher the obtained score, the better the patient's condition.

The FFI is composed of 23 items and is divided into 3 subscales: movement restriction, disability, and pain. The answers to each question ranges from 0 point (difficulty or no pain) to 10 point (so difficult help is needed or the most pain imaginable). The intensity of pain is assessed with the 100-mm horizontal VAS, where 0 mm was no pain and 100 mm was the extreme pain, and the level was compare between the groups.

2.6. Statistical analysis

The Student's unpaired *t* test and Chi-squared test were respectively applied to compare the qualitative outcomes and qualitative variables between the 2 groups. When the value of *P* was less than .05, it can be considered as significant in statistical. Power analysis was also carried out to determine if no remarkable differences were observed due to the small sample size. All the

Table 1

Patient baseline demographics.

Demographics	Group A	Group B	P value
Number of patients			
Age at surgery			
Female sex			
BMI			
ASA score			
Follow-up			

ASA=American Society of Anesthesiologists, BMI=body mass index.

statistical analyses were implemented via applying the software of SPSS Version 12 (SPSS Inc, Chicago, IL).

3. Discussion

Owing to the special vascular system at the fifth metatarsal base, the fracture management is a challenging approach for orthopedics. It has been indicated in the literature that watershed-region at the fifth metatarsal base greatly reduces the success rate of fracture healing, particularly in the absence of surgical intervention. Therefore, in the past few decades, the application of surgical intervention in the treatment of fifth metatarsal base fractures has increased significantly. The application of invasive interventions is mainly welcome owing to they offer the rigid fixation of fracture surface while maintaining a retrograde blood supply to areas with insufficient blood vessels. The objective of our work was to assess the radiological and clinical outcomes of displaced avulsion fractures of the fifth metatarsal base after treated with conservative treatment or intramedullary screw. We hypothesized that there was no remarkable difference between two groups in the outcomes after operation.

Author contributions

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