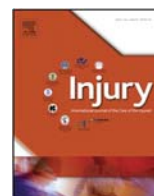




Contents lists available at ScienceDirect

Injury

journal homepage: [www.elsevier.com/locate/Injury](http://www.elsevier.com/locate/Injury)

## Predictive variables of open reduction in intertrochanteric fracture nailing: a report of 210 cases

Verónica Jiménez Díaz\*, Alfonso Carlos Prada Cañizares, Ismael Auñón Martín, Miguel Aroca Peinado, Pedro Caba Doussoux

Department of Orthopaedic and Trauma Surgery, Hospital Universitario 12 de Octubre, Madrid, Spain

### KEY WORDS

Intertrochanteric fracture  
Unstable  
Elderly  
Reduction  
Open approach  
Fixation  
Predictive variables  
Proximal femoral nail

### ABSTRACT

**Background:** Factors that impede closed reduction in intertrochanteric fractures remain unknown. This study was designed with the aim of establishing radiological variables that can predict an open reduction when nailing those type of fractures.

**Materials and methods:** Observational prospective study carried out between March 2013 and March 2015. Patients of both gender who suffered an intertrochanteric fracture, and who were surgically treated by intramedullary nailing (PFN-A), were included. Patients were evaluated by means of a questionnaire designed in 12 de Octubre Trauma department. Radiological parameters assessed preoperatively, after fracture reduction in the traction table, and after fixation were: calcar, lateral wall and posterior buttress integrity or disruption; lesser trochanter location, varus or valgus deformities, and flexion or extension of the proximal fragment.

**Results:** Association between open reduction and the following types of fractures was statistically significant ( $p < 0.001$ ): subtypes A2.3, A3.2 and A3.3 of AO classification and subtypes IV and V of Evans classification. There were four radiological parameters associated with the need for open reduction: disruption of lateral wall ( $p < 0.0000$ ), posterior wall fracture ( $p < 0.001$ ), calcar ( $p < 0.004$ ) and malalignment in the axial view ( $p < 0.001$ ).

**Conclusions:** Open reduction seems to be necessary for complex fracture patterns such as A2.3, A3.2 and A3.3 types of AO/OTA classification, as well as types IV and V of Evans classification. There are four major radiological parameters that can predict the need of approaching the fracture site: posterior buttress, calcar disruption, lateral wall disruption and proximal fragment flexion. The development of high quality evidence regarding this topic is necessary due to the vast impact that open reduction can have on elderly patients.

© 2016 Elsevier Ltd. All rights reserved.

### Introduction

Proximal femoral fractures are a significant concern in our actual aging society and their incidence is ever increasing particularly amongst women, over the past ten-years [1,2]. In Spain the incidence of hip fractures amongst elderly population is 500 cases per 100,000 people per year. Approximately 90% of hip fractures occur in patients aged 65 years or over, whilst 74% are women [3]. Mortality of hip fractures has been estimated to be 30% during the first year. Furthermore, hips fractures are also associated with a significant decrease in autonomy and quality life [4,5]; males, elderly and patients with comorbidity have higher risk of mortality and impairment of function [6–8].

Approximately a half of the osteoporotic fractures of the proximal femur involve the intertrochanteric region [9]. Several devices have been developed for fixation of intertrochanteric fractures, with the main options including intramedullary nails and sliding hip screw systems. In the last two decades, the surgical treatment of intertrochanteric fractures has shown a continuing trend towards the increased use of intramedullary nails, however, for unstable fracture patterns the best treatment remains controversial [10,11]. Approximately 30% of hip fracture surgeries require revision [4,11]; Nonetheless, with this increasing number of fractures and subsequent increase in surgical procedures, the law of probability states that there will be a greater number of failures and the rate of revision surgeries will be higher.

Due to the high impact of those fractures in the quality life of patients, achieving early union with reduce risk of complications must be a high priority of orthopedic surgeons. An accurate reduction and stable fixation of intertrochanteric fractures is the first step for accomplishing this goal, however in some situations this can be a challenge for surgeons, who must deal with severe osteoporotic bones

\* Corresponding author at: Department of Orthopaedic and Trauma Surgery, 7th floor, Hospital Universitario 12 de Octubre, Av. Córdoba s/n, 20041, Madrid, Spain. Tel.: +34652475728; fax: +34913908127.

E-mail address: [veronica.jimenez.diaz@gmail.com](mailto:veronica.jimenez.diaz@gmail.com) (V. J. Díaz).

or really unstable fracture patterns. There are several factors that influence surgery results, affecting stability of the bone-implant assembly. These include quality of the bone, fracture pattern, quality of the reduction achieved, design of the device selected, and position of the implant within the bone [11]. By achieving an anatomical reduction and choosing a suitable device for each fracture pattern, orthopaedic surgeons can improve final outcomes and limit patient morbidity and mortality rates.

Intramedullary nailing for intertrochanteric fractures has a low rate of failure, ranging from 0.6% to 3.6%. [12] Several scientific researches have provided tips and tricks in peri- and intraoperative management of these fractures, with the most famous by Haidukewych [11], that aim so to helping surgeons minimize rates of failure. The main reason is that elderly patients probably are not able to endure a revision surgery. Lack of reduction impact failure rates post intramedullary nailing. When closed reduction is not achieved, an open reduction of the fracture site is necessary, thus increasing the risk of morbidity in elderly patients.

Currently, factors that impede a closed reduction remain unknown. To date no studies have been conducted on this topic. This study was designed with the aim of establishing radiological variables that can predict the success of an open reduction when nailing intertrochanteric fractures.

## Material and methods

An observational prospective study was carried out at Hospital Universitario 12 de Octubre during a 24 months period, between March 2013 to March 2015. Our inclusion criteria consisted of: patients of both genders of any age who suffered an intertrochanteric fracture after any type of mechanism of injury, and who were surgically treated by intramedullary nailing (PFN-A, Synthes, Switzerland), and followed up in our centre.

Patients who suffered other types of hip and femoral fractures, such as intracapsular fractures, subtrochanteric fractures or diaphyseal fractures were excluded of this study. Patients treated with other surgical techniques such as dynamic hip screw and patients with the initial diagnosis of intertrochanteric fracture who were transferred to other centres for treatment or follow-up were also excluded.

All patients included in the study were evaluated by a written questionnaire designed in our department. The questionnaire consisted of six sections including: epidemiological data (collected in the first section), classification of fractures by the AO and Evans systems (assessed in the second section). Surgeons preoperatively evaluated fractures (collected in the third section); questions about fracture stability, reduction handling and the possibility of carry out a closed or open reduction were answered. All the radiographic parameters, which were evaluated such as potential factors of open reduction, were collected in the fourth section. Surgical data, such as closed or open reductions, complications during surgery were collected in the fifth section. Follow-up data and long-term complications were collected in

the last section. The minimum follow-up of all patients included in this study was six months, measuring clinical and radiological parameters every three months at outpatient clinics.

The radiological parameters that may impede closed reduction, evaluated in this study were calcar, lateral wall and posterior buttress integrity or disruption; lesser trochanter location: attached to the proximal fragment, to the distal fragment or free. Varus or valgus deformities, evaluated by the cervical-diaphyseal angle, and flexion or extension of the proximal fragment were also assessed. All parameters were assessed preoperatively, after reduction of fracture in the traction table and after fixation with intramedullary nailing. Anatomical reduction was defined as continuity of calcar and posterior buttress as well as lateral wall, without varus-valgus deformity or flexion-extension of the proximal fragment. The surgical team for all procedures consisted of a consultant and a junior or senior registrar; each of them could be the main surgeon depending on the decision of the consultant. For open reduction, the selected procedure was a mini open approach to the fracture side, assisting fracture reduction by gently placing of a Homman retractor on the anterior cortex of femoral neck. Criteria for carry out an open reduction were the lack of reduction in anteroposterior or axial views after closed reduction attempts on the traction table.

Postoperative follow-up was performed at the outpatient clinics. Patients were reviewed at one month, three months, six months and twelve months after surgery; Clinical data such as autonomy, weight-bearing, pain or infection, and radiological data were collected in every interview. Outcomes were assessed by the two main investigators.

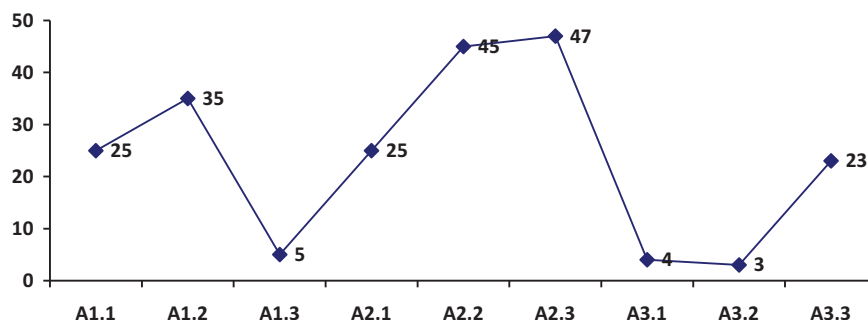
## Statistical analysis

Descriptive statistical analysis of all variables included in this study was performed. To study associations between open reduction and different variables such as fracture types and X-ray parameters the Pearson  $\chi^2$ -Statistical Test and Fisher Statistical Test were used. P-values of <0.05 were considered statistically significant. Software used for analysis was STATA/SE 10.0.

## Results

During 24 months the data of 210 patients who had intramedullary nailing intervention using PFN-A (Synthes, Switzerland) was collected. There were 163 females (78%) and 74 males (22%), with an average age of 83 years (SD 8.19). Regarding laterality, distribution of fractures was the same for both lower limbs (50%). In 207 cases (98%) the mechanism of injury was a fall from standing height. In three cases, the mechanism of injury was pedestrian hits by car. Results of fracture distribution classification systems are shown in Graphics 1 and 2.

The following results were obtained in preoperative assessment: 66% of fractures had calcar disruption, 44% had lateral wall disruption and 48% had posterior wall disruption. In 52% cases the lesser trochanter was a free fragment isolated from the proximal femur;



Graphic 1. Fracture distribution according to AO classification.

Download English Version:

<https://daneshyari.com/en/article/5653028>

Download Persian Version:

<https://daneshyari.com/article/5653028>

[Daneshyari.com](https://daneshyari.com)