Trauma Case Reports 29 (2020) 100348

Contents lists available at ScienceDirect

Trauma Case Reports

journal homepage: www.elsevier.com/locate/tcr

Case Report

Customised proximal femoral nail in treatment of intertrochanteric fracture with ipsilateral femoral shaft malunion: A case report

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ARTICLE INFO

Keywords:
Intertrochanteric fractures
Customised nail
PFN
Fragility fractures
Malunited shaft femur
Stress riser

ABSTRACT

Peritrochanteric fractures are the most common fragility fractures for which patient are admitted in hospital and often require surgical interventions. With increasing life expectancy and early age of presentation, revision surgeries are increasing due to re-trauma, implant failure, infections etc.

Here we present the case of a 65 years female, with inter trochanteric fracture femur right side with ipsilateral malunited proximal femur fracture, which was managed with customised proximal femoral nail.

This case exemplifies the need for novel techniques and implants in our armamentarium to deal with such unusual fractures in elderly population.

Introduction

Osteoporosis is a major health problem in the elderly and frequently leads to fragility fracture, the most debilitating of them being fractures around hip. The demographics of world populations are set to change, with more elderly living in developing countries, and it has been estimated that by 2050 half of hip fractures will occur in Asia [1,2].

Here we present the case of a 65 years female, with inter trochanteric fracture femur right side with ipsilateral malunited proximal femur fracture, which was managed with customised proximal femoral nail.

Case

A 65 years female, presented to the emergency department of our hospital with history of slip and fall in bathroom. Patient complained of severe pain around right hip and inability to bear weight since trauma. Patient was managed as per ATLS protocol. After primary survey, local examination of right hip revealed swelling and ecchymosis. On palpation, tenderness was present, passive movement of hip joint was painful and distal pulsations were palpable.

Patient revealed about previous trauma (RTA 15 years back) which was managed conservatively. Radiographs revealed intertrochanteric fracture (AO/OTA 31A1.2) [3] with malunited femoral shaft fracture at proximal–mid junction (Figs. 1 and 2).

Patient was admitted with skin traction. Patient and her family members were explained the need for surgery and both informed and written consent was taken.

Pre operative planning focused on various available options, including DHS and intramedullary device. However, the shortest cephalomedullary nail available in our hospital was of 170 mm, which would not been possible to negotiate through the malunited

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https://doi.org/10.1016/j.tcr.2020.100348
Accepted 27 July 2020
Available online 29 July 2020

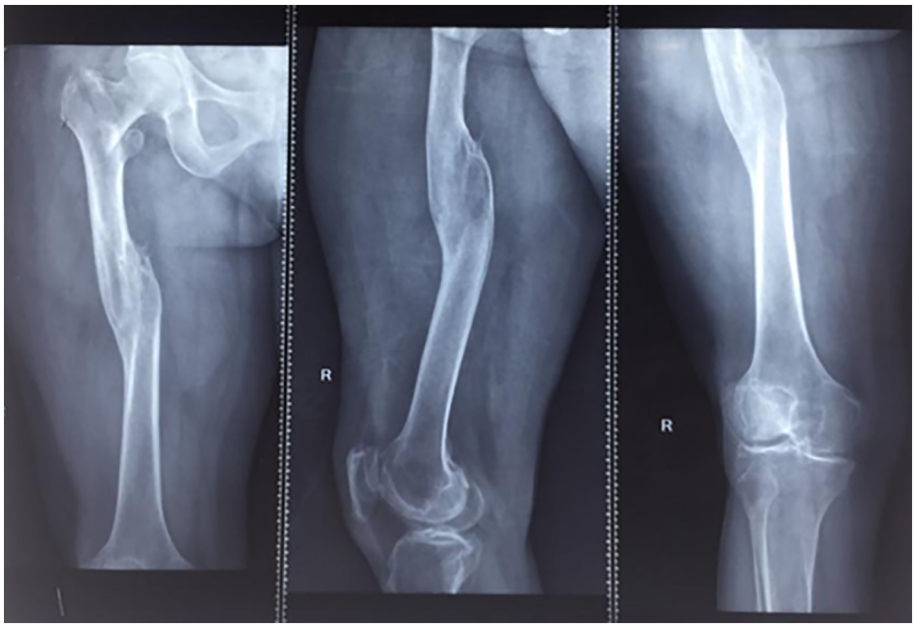

Fig. 1. Pre operative radiograph showing inter trochanteric fracture (AO/OTA 31A1.2) and malunited femur.

Fig. 2. Pre operative radiograph showing inter-trochanteric fracture (AO/OTA 31A1.2) and malunited femur.

portion of femur. So a customised nail for the patient was made by cutting the distal portion of nail after measurement in radiograph.

The length from tip to greater trochanter to the malunited site was measured over plain radiograph and nail was cut just shy of that length pre operatively.

Patient was treated by closed reduction internal fixation with customised PFNA2. Hospital stay was uneventful. Patient was discharged on advice for partial weight bearing with walker support. Sutures were removed after 2 weeks (Figs. 3 and 4).

After 3 months follow up patient was asymptomatic, walking comfortably with the help of stick. Radiographs showing signs of union, proper positioning of implant and no radiological changes at the tip of implant abutting over the malunited portion.

Fig. 3. Post operative AP radiograph with customised PFNA2 showing proper reduction and implant positioning.

Fig. 4. Post operative lateral radiograph with customised PFNA2 showing proper reduction and implant positioning.

Discussion

Majority of the patients with trochanteric fractures belong to geriatric age group with many medical comorbidities like diabetes, hypertension, osteoporosis, Parkinson's disease etc. Therefore it is of paramount importance that the index surgery be well executed following principles of fixation and biomechanics to reduce chances of revision surgery.

Surgical treatment has become the preferred treatment option due to the benefits of early mobilisation. Since the past decade,

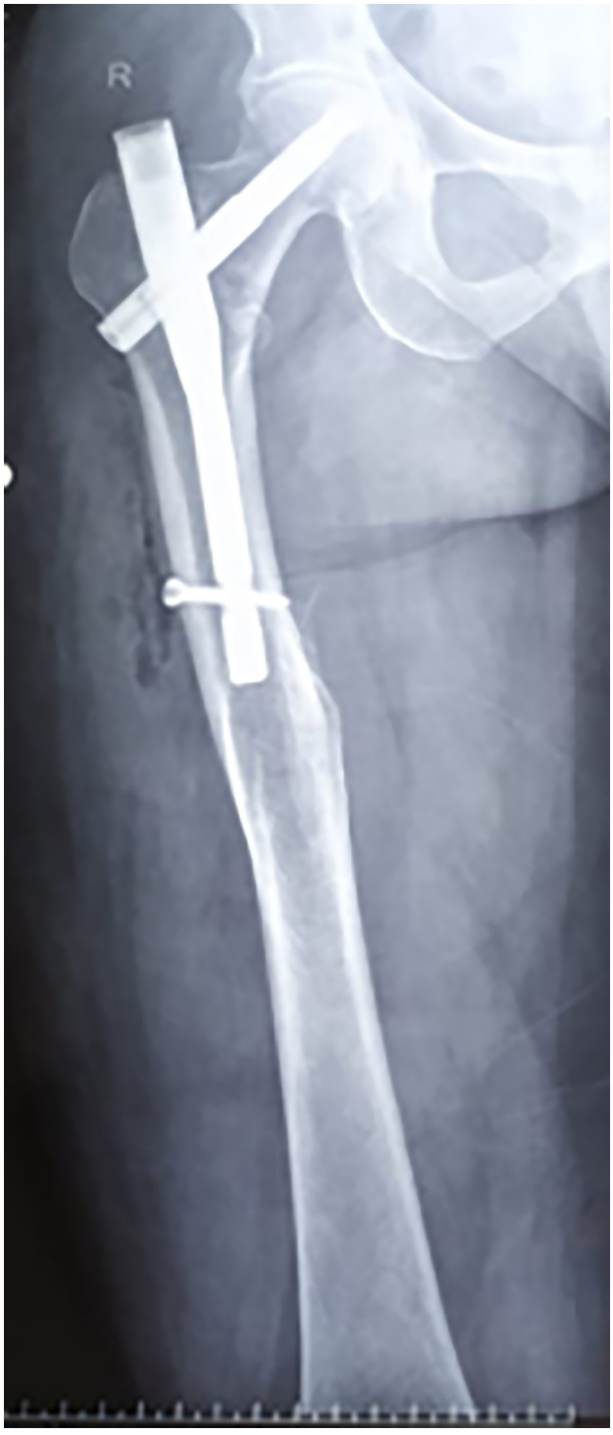

Fig. 5. Full length AP view of femur.

intramedullary device has become the preferred implant of choice even for stable fractures. But with the increasing number of cases, more complications like screw cut out, Z and reverse Z effect and peri implant fracture rates have also increased and the causes of failure better understood [4–6]. In a study by Şemmi Koyuncu et al. rate of revision procedures from mechanical failures is 9.2% [7].

Most of the literature focuses on arthroplasty after malunited femoral shaft and neck fractures [8]. After going through the available literature, we found no such cases where intramedullary device was customised and used for fixation (Fig. 5).

The increased use of intramedullary nailing in the management of trochanteric fractures is associated with its biomechanical advantages and minimal invasiveness. As the preference for intramedullary nailing has increased, complications associated with

distal locking have emerged. Stress concentrations lead to thigh pain and erosion of the femoral cortex, and the subsequent tip-effect results in femoral fractures during minimal force at the tip of the nail [9,10]. Other authors have described femoral cortical hypertrophy as a result of stress concentration leading to a risk for femoral fracture [11–13].

Considering the superior biomechanics of an intra medullary device over extramedullary implant and the stress riser created by the load bearing device below the distal screw, we chose a customised proximal femoral nail. Even the nail bears the risk of peri implant fracture albeit lesser than a dynamic hip screw.

This case highlights the challenges faced in an apparently simple fracture made complex due to the previous trauma and novel ways to manage them with available implants.

We would also like to raise the question of how short a nail is acceptable for proximal femoral fractures? And what would have our options been had this been an intracapsular neck fracture requiring hemiarthroplasty? Had this malunited fracture been even a centimetre proximal we would have been in a difficult situation as the nail have to be cut even shorter, may be compromising the distal locking and hence the overall biomechanical stability of the construct. The only other option left apart from accepting the risks of plating in such cases would have been to create a new distal lock proximally in the nail and lock it free hand as the aiming device cannot be used, making the process even more cumbersome. Some authors have reported good results with use of unlocked short nails [14,15], however these results have not been reproduced by others, and hence cannot be used as a reliable method. The proximal femoral nail has evolved from the standard 250 mm version to the short 200 mm and now the ultrashort 170 mm nails and in this case after customising the nail, it was 160 mm! Just how short a nail can be acceptable is still open to debate as no biomechanical studies have answered our question of what should be the minimum acceptable nail length. Promising results have been reported in using the short metaphyseal stems [16] (lesser than 120 mm stems) in total hip arthroplasties. However, can that be an inspiration for shorter custom implants to be used in such complex scenarios is yet to be seen.

Author CRediT roles

Siddharth Dubey - Conceptualisation; Data curation
R Dinesh Iyer - Methodology; Writing - original draft
Md Quamar Azam - Review and editing
Bhaskar Sarkar - Supervision.

Funding

The authors received no funding/grant from any external agencies.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee (Institute ethics committee vide letter no. AIIMS(R)-ethics/1995) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Consent to participate

Written and informed consent were taken from the patient and his family members for using his individual and clinical data for publication and research purposes.

Availability of data and materials

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

Declaration of competing interest

The authors declare that they have no conflict of interest.

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