Subtrochanteric Fractures: One Case Reports of Terrible Treatment

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Abstract

Background: Deforming muscle forces make treatment of subtrochanteric fractures challenging. Choice of fixation method, meticulous preoperative planning, master the surgical techniques, respect the principles of biological osteosynthesis for subtrochanteric fractures are critical to reduce nonunion and reoperation rates.

Case presentation: We present a clinical case who underwent sever years of treatment with five operations. It was a tragedy for the man and his family, as well as for surgeons. We hope this case has the potential to improve the cognition of subtrochanteric fractures for orthopedics surgeons, especially beginners and juniors.

Conclusion: Choice of fixation method, meticulous preoperative planning, master the surgical techniques, respect the principles of biological osteosynthesis and concept of minimally invasive surgery for subtrochanteric fractures ars critical to reduce nonunion and reoperation rates.

Background

Subtrochanteric fracture occurs within 5 centimeter of the distal end of the trochanter.¹Because a growing prevalence of osteoporosis and motor vehicle accidents, the number of subtrochanteric fractures is increasing worldwide.²The subtrochanteric region has certain anatomical and biomechanical features that can make fractures in this region difficult to treat. Under the trochanter is the area where the cancellous bone between the trochanters moves to the cortex of the femoral shaft, which is the place where the stress conduction is highly concentrated. The inner side is compressive stress and the outer side is tensile. Conservative treatment for this fracture cannot provide good reduction, so malalignment usually occurs. ³Thus, internal fixation is advocated by most Surgeons⁴. Intramedullary nail has many advantages of managing a femoral subtrochanteric fracture such as small skin incisions, central fixation, closed indirect reduction can be achieved through minimally invasive techniques.⁴

If one didn't respect the principles of biological osteosynthesis, master the surgical techniques, follow the concept of minimally invasive surgery, it would be painful and serious for the patient. We presented one clinical case, the patient underwent sever years of treatment with five operations. The lesson was profound and worth rethinking thoroughly.

Case Presentation

The patient was a 30 year old men. He fell from a height of three meters, causing a shortened deformity, swelling in the proximal portion of the left thigh. Plain X-ray image viewed revealed a subtrochanteric fracture of the left femoral and the line was spiral type[Fig1]. He had no significant past medical history and presented in stable condition and had no wounds. The local surgeons from a basic hospital performed with a short proximal femoral nail antirotation for closed reduction and internal fixation on

traction table.[Fig2a,b]However, the reduction was inappropriate. Forty days after surgery, the patient fell slightly in the bathroom. He had suffered from episode of periprosthetic fracture of the femur.[Fig2c,d] An open reduction was performed by the same surgeons operated on him last time. They decided to use a sawtooth-arm internal embracing fixator which was made of Nickel-Titanium shape memory alloy and consisted of three components: body, arms and sawteeth.It was quite strange.[Fig3a,b] Over the following three years, the x-rays performed at that time showed the non union. Internal fixation was broken thirty-eight months after the initial surgery. [Fig3c]After removed the broken plate and corrected axes and length of the femur, the surgeons performed with a bridge combined internal fixation system. [Fig4a,b]We never saw this system before. Just as one expected this internal fixation system was broken sixty-five months after the initial surgery. [Fig4c,d]This time the case was treated with a long proximal femoral nail antirotation. Meanwhile, the gap between the fragments were freshened and massive cancellous bone from left iliac bone was implanted.[Fig5a,b]Follow up x-rays and clinical examination showed nonunion of the fracture persisted.[Fig5c,d]Eighty months after the initial surgery, the patient was completely disappointed. He left the local hospital where he had four operations and came to our department. The only lucky thing for him was that there was no infection from the beginning to the end. Because rotational at the fracture site, locking compression plate was used to fix the nonunion and autogenous right iliac bone graft was given. [Fig6a,b]Four months after ORIF, X-ray showed signs of fracture healing. [Fig6c,d]By this time he was 37 years old.

Discussion And Conclusions

Compared with femoral shaft fractures and intertrochanteric fracture, subtrochanteric femur fractures present significant treatment challenges.¹ Failure to appreciate the complexities of this injury may lead to serious consequences like this case. Increased understandings of biomechanical characteristics of the subtrochanteric fracture and comprehensions of the implant materials can reduce the incidence of complications.⁵

The lesson of this case was worth summarizing. In the first operation, the quality of reduction was dissatisfied. Furthermore, it was a short femoral nail which was lack of mechanical advantages that was chosen by surgeons. The choice of the appropriate implant to be critical for fixation of subtrochanteric femur fractures. The appearance of intramedullary nail provides the basis for closed reduction or minimally invasive open reduction.⁶ A long femoral nail is the first choice for subtrochanteric fractures which has become a consensus.^{3,4,7}

In the second and third operations, anatomical open reduction could disturb the biological composition of the fracture environment.Due to extensive incision, the blood supply was destroyed. Failures again were inevitable. The core concept of fracture healing is the balance between the stability of fixation and the blood supply of bone. ⁸ Units biomechanical and biological aspects were the “diamond concept”.⁸ Open reduction may disturb the biological composition of the fracture environment. Although the advantage is represented by anatomical reduction, open reduction internal fixation techniques in this fracture is not

necessary. Proximal femoral locking plates are associated with a high complication rate⁹. Plates have an eccentric location relative to the mechanical axis of the femur, making them biomechanically inferior to nails in bending.⁹ Some minimal invasive techniques could help the surgeon achieve satisfactory reduction in Subtrochanteric fractures.^{3,4,7}

By the fourth operation, the biological advantage was gone. Different from the treatment of fresh fracture, when replacing the internal fixation, it should be taken into account that the long intramedullary nail not be as relatively stable fixation. The strain at the fracture end had exceeded the requirements for relatively stable internal fixation, which had become absolutely unstable. Despite advances in surgical techniques, alternatives to fracture fixation and assistive means of healing, femoral nonunion continues to be a significant clinical problem. It's a horrible complication that greatly prolongs rehabilitation and introduces risk of other complications.^{5,10} The prevention of nonunion should be emphasized. Half cases of nonunion are caused by improper selection or use of internal fixation.¹¹ Reduction quality is the critical factor to prevent nonunion in treatment of subtrochanteric fracture with intramedullary nail.¹²

We judged that the reason why nonunion was that medullary cavity here was relatively wide. This patient was a atrophic, unstable fracture end with rotation, ischemic nonunion. With the retention of PFNA, the patient was healed by the freshening of the broken end, bone grafting, auxiliary steel plate at the last operation. For the treatment of nonunion after failed nailing, augmentative plate fixation which is applied to the fracture site to provide a rigid fixation can be an ideal choose.¹³ It healed in an average of six months, with no complications were reported.¹⁴

It was a tragedy for the man and his family, as well as for previous surgeons. The case had the potential to improve the cognition of subtrochanteric fractures for surgeons, especially beginners and juniors.

Choice of fixation method, meticulous preoperative planning, master the surgical techniques, respect the principles of biological osteosynthesis and concept of minimally invasive surgery for subtrochanteric fractures are critical to reduce nonunion and reoperation rates.

Declarations

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Authors' contributions

XZD is the first author and HT is the corresponding author. XZD, HZ, DKT,JF performed the operation and substantially contributed to the drafting and revision of the manuscript. All authors revised the manuscript. All authors read and approved the final manuscript.

Availability of data and materials

Data associated with this study are retained at a central repository at the Orthopaedic Department, Changhai hospital Affiliated to the Navy Military Medical University. If there are any questions, please contact the corresponding author.

Ethics approval and consent to participate

Not applicable

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

Competing interest

No potential conflict of interest relevant to this article was reported.

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Figures

Figure 1

Plain X-ray images revealed a subtrochanteric fracture.

Figure 2

2a,2b In the first operation, surgeons performed with a short proximal femoral nail. 2c,2d The patient fell forty days after surgery.

Figure 3

3a,b In the second operation, a sawtooth-arm internal embracing fixator was used. 3c It was broken thirty-eight months after the initial surgery.

Figure 4

4a,b In the third operation, a bridge combined internal fixation system was performed. 4c,d It was broken sixty-five months after the initial surgery.

Figure 5

5a,b In the fourth operation, the case was treated with a long proximal femoral nail antirotation 5c,d The nonunion of the fracture was persisted.

Figure 6

6a,b Locking compression plate was used to fix the nonunion. 6c,d X-ray showed signs of fracture healing.