VIDEO OF ORTHOPAEDIC TECHNIQUE

Surgical Technique for Subtrochanteric Fracture of Femur

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A 56-year-old woman had fell over herself 4 h prior to her presentation to our hospital. The diagnosis was a subtrochanteric fracture of the right femur (AO-32-A3). The patient was placed in a supine position was set up on a fracture traction table after general anesthesia. The right leg was placed in abduction while the left leg was positioned so that there was flexion of the knee and hip joint. The C-arm was placed on the left side. The surgical field was sterilized and draped. Deformity and external rotation are always present for this type of fracture, so the first step was to place a joystick in the proximal fragment to correct the external rotation. Then the perfect entry point could be defined by K wire. After inserting guide wire into the canal dreaming was followed. An appropriate nail was selected and inserted. The distal tip of the nail should be located in the cancellous bone. Before inserting the proximal lag screws into the femoral head, the external rotation of the proximal fragment must be corrected by the joystick. The traction was loosened and the distal fragment was pushed towards the proximal side so that the gap between the fragments disappeared. The affected leg was maintained in perfect alignment. Meanwhile, the distal locking screws were inserted using the free hand perfect circle technique.

Key words: Femur; Intramedullary nail; Subtrochanteric fracture

Introduction

Subtrochanteric fracture of the femur, which is usually caused by a high-energy injury, is common in clinics. The subtrochanteric portion of the femur is the stress concentration of the leg because of the group of surrounding muscles. When fracture occurs in the subtrochanteric portion of the femur, a displacement will be frequently found; especially external rotation of the proximal segment is often present. Conservative treatment for this kind of fracture cannot provide good reduction, so malalignment usually occurs. Thus, internal fixation is advocated by most surgeons[1–6]. Many methods of internal fixation, including plate-screw systems and intramedullary nails, are used for this kind of fracture. However, intramedullary nail is in fashion.

There are many advantages of managing a femoral subtrochanteric fracture using an intramedullary nail, including that closed indirect reduction and fixation can be achieved through a minimally invasive technique. As a result, the damage to the fracture site can be minimized, which is of benefit to the fracture healing, and the risk of failure of internal fixation will be reduced[2,7–9]. Furthermore, an intramedullary nail can provide much more stability than a plate-screw system in terms of biomechanics[6,10]. Patients can move relatively early following surgery and complications may be reduced, including pneumonia, urinary infection, and deep vein thrombosis[1,6,10,11].

The purpose of this investigation is to explain femoral subtrochanteric fracture surgical techniques and to provide useful suggestions for carrying out these procedures, such as the use of a joystick and finger, which can help provide good reduction and alignment with a perfect entry point in a neutral position during surgery when a closed reduction and intramedullary nail fixation are performed.

Case Presentation

A 56-year-old woman had fell over herself 4 h prior to her presentation to our hospital. A shortened deformity, swelling and tenderness in the proximal portion of the right thigh were found on physical examination. Plain X-ray images of the anteroposterior (AP) and lateral views revealed a subtrochanteric fracture of the right femoral shaft and the fracture line was transverse. In AP view, the proximal segment was displaced in external rotation and adduction.

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Meanwhile, the distal segment was displaced superiorly. In lateral view, the proximal fragment was displaced anteriorly. In other words, the hip was flexed. The distal fragment was displaced posteriorly. The diagnosis was a right femoral subtrochanteric fracture (AO-32-A3, Evans 2).

Surgical Technique

The patient's case history was assessed and physical examination was undertaken in the emergency room. Laboratory indexes of this patient were all in the normal range. Right tibial tubercle traction was performed and sustained for 3 days up to surgery. The anteroposterior and lateral X-ray images of the right proximal femur after traction were reevaluated to assess the displacement.

After induction of general anesthesia, the patient was placed on a fracture traction table. The patient was placed in a supine position and the right leg in abduction; the trunk was tilted towards the left side. The left leg was kept in flexion. The shape between the trunk and the right leg was like the figure "V". The C-arm was placed on the left side and the monitor was positioned on the caudal side. The space on the right side was free. The surgical field was sterilized and draped. For this kind of fracture, deformity and external rotation is always present, so the first step was to place a joystick in the proximal fragment to correct the external rotation[12]. The joystick should be located on the lateral and posterior side. Traction was performed and a neutral position of the proximal fragment could be achieved using the joystick. When the fluoroscopy showed that the proximal fragment was in a neutral position, the perfect entry point could be defined.

In AP view, around 2–4 cm proximal to the superior tip of the greater trochanter, the skin was stabbed and the K wire was inserted towards to the perfect entry point. The placement of the K wire was checked by AP and lateral view. The entry point was opened using a cannulated drill. A finger-aid was inserted to help reducing the fracture. After inserting a guide wire along with the finger-aid into the canal dreaming was followed. An appropriate nail was chosen and inserted. The distal tip of the nail was located in the cancellous bone. Before inserting the guide K wire into the femoral head, the external rotation of the proximal fragment was corrected using the joystick. Then the proximal lag screws were inserted into the femoral head.

The traction was loosened and the distal fragment was pushed towards the proximal side. As a result, the gap between the fragments disappeared and compression between the fragments was achieved. The affected leg was maintained in perfect alignment. Meanwhile, the distal locking screws were inserted using the free hand perfect circle technique. The alignment, reduction, and implants were checked again by fluoroscopy. The incisions were closed following irrigation. The whole procedure took 30 min. The total blood loss was approximately 30 mL. Partial weight-bearing exercise was encouraged at the second day after the operation. The patient was then followed up clinically until her complete recovery.

Discussion

Intramedullary nailing is the most commonly used procedure to treat femoral subtrochanteric fractures. The use of conventional proximal femoral plates does not provide stable fixation, which can lead to complications such as deformity and nonunion and destruction of blood supply. There is general consensus that intramedullary devices are more appropriate than extramedullary devices for these unstable fractures. However, malreduction can result in failure regardless of whether a plate or a nail was used. The risk of complications such as abduction deformity, splitting of proximal fragment, and nonunion correlate with the lack of good reduction, especially the perfect entry point. To achieve a successful outcome and minimize the risk of complications, the key point is to master the surgical techniques, and to respect the principles of biological osteosynthesis following the concept of minimally invasive surgery.

Highlights and Pitfalls

1. For femoral subtrochanteric fractures, the proximal fragment is always anteriorly and laterally displaced in external rotation. If the proximal fragment cannot be maintained in a neutral position, the perfect entry point cannot be achieved and a poor result cannot be avoided. A joystick can be used to control the placement of the proximal fragment. Therefore, the perfect entry point can be identified. This is a critical step.
2. The finger-aid is applied before inserting the guide wire. This is not only to control the proximal fragment but also to control the pathway of the guide wire in the canal. The tip of the guide wire must reach down to the cancellous bone.
3. Remember to correct the deformity of external rotation by joystick before inserting the lag screws into the proximal fragment. Otherwise, deformity of external rotation of the leg will occur.
4. Before inserting the distal locking screws, the traction is loosened. Then the distal fragment is pushed towards the proximal side so that compression between the fragments is achieved. The alignment of the affected leg is checked by fluoroscopy until satisfactory alignment is achieved. Finally, the distal locking screws are inserted using the free hand perfect circle technique.

Video Image

Additional video images may be found in the online version of this article. Visit http://onlinelibrary.wiley.com/doi/10.1111/os.12291/suppinfo.

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