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Positioning a Patient with a Leg Amputation Stump on the Orthopedic Table

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Abstract

Introduction: Patients with lower-limb amputation presenting with an ipsilateral femoral neck fracture for which conservative surgical management is indicated pose a challenge in positioning on the orthopedic table. We describe a simple technique to overcome this difficulty. **Case Report**: A 39-year-old female presented with a Garden type I femoral neck fracture. Osteosynthesis using a dynamic hip screw (DHS) was indicated. The history of leg amputation made positioning on the orthopedic table complex. The patient was placed in the supine position, with the contralateral limb supported in a gynecological holder. Transcondylar femoral traction using a Steinmann pin allowed mobilization of the affected limb and facilitated the procedure under fluoroscopic guidance. **Conclusion**: Head-preserving internal fixation of proximal femoral fractures in amputee patients represents a real challenge, particularly regarding positioning on the orthopedic table.

Keywords

Lower-Limb Amputee, DHS Osteosynthesis, Transcondylar Traction, Orthopedic Table

1. Introduction

Femoral neck fractures are a common reason for consultation in trauma surgery [1]. Currently, the Dynamic Hip Screw (DHS) is considered the standard implant for the fixation of extracapsular fractures of the proximal femur [2]. This technique requires positioning the patient on a fracture table, with the foot secured in a traction boot to facilitate fracture reduction through traction and rotational maneuvers.

In patients with a below-knee amputation who sustain an ipsilateral fracture,

patient positioning is more challenging because of the absence of the foot and part of the lower leg. We describe a simple technique to overcome this difficulty and provide an overview of other available techniques.

2. Case Presentation

A 39-year-old woman was admitted to the trauma emergency department with a closed injury to the left hip. The injury resulted from a fall onto her left side while disembarking from a bus following its sudden acceleration.

Prior to the injury, the patient was independently ambulatory using a lower-limb prosthesis and was able to perform all activities of daily living. The residual limb measured 7 cm distal to the tibial tuberosity. The overlying skin was of good quality, and the surrounding soft tissues provided adequate coverage of the underlying bone. Radiographic evaluation revealed a left femoral neck fracture classified as Garden type I. Following multidisciplinary case discussion, internal fixation with a Dynamic Hip Screw (DHS) was indicated.

The patient had undergone an ipsilateral transtibial amputation 26 years earlier. The main technical challenge was patient positioning on the fracture table.

The patient was positioned supine on a fracture table using the standard technique. The contralateral limb was placed in a gynecological leg holder. Femoral transcondylar traction was established using a 2.5-mm Steinmann pin inserted from the medial to the lateral side to minimize the risk of injury to the popliteal neurovascular bundle. The pin was placed approximately two fingerbreadths proximal to the patella and 5 cm posterior to its anterior plane. It was then connected to the traction apparatus via a Böhler stirrup and a traction cord, allowing controlled mobilization and positioning of the operative limb (**Figure 1**).

Figure 1. Patient positioning on the fracture table using transcondylar skeletal traction.

A fluoroscopic image intensifier was positioned to obtain anteroposterior and lateral views of the affected hip (**Figure 2**). Fluoroscopic assessment demonstrated an impacted femoral neck fracture in coxa valga alignment, allowing implantation of a 135˚ two-hole DHS with a 90-mm lag screw without the need for preliminary reduction maneuvers.

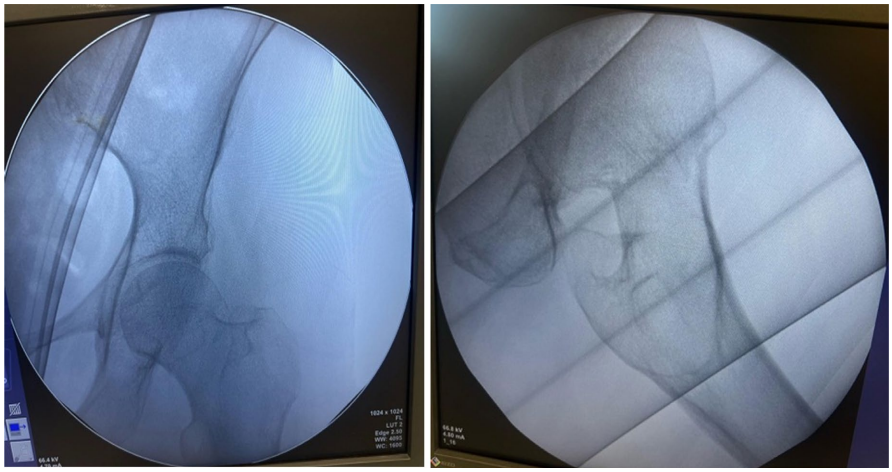

Figure 2. Intraoperative anteroposterior and lateral fluoroscopic views.

The patient was mobilized on the first postoperative day using a pair of crutches with non-weight-bearing ambulation. Local wound care was performed every three days at both the surgical incision and the pin insertion sites. Prosthetic fitting was initiated on postoperative day 45, and full weight-bearing was permitted from postoperative day 90. Postoperative radiographs confirmed satisfactory fracture reduction and stable fixation (**Figure 3**). At the 6-month follow-up, the patient had regained her pre-injury level of function. Radiographs demonstrated complete fracture union with the fixation construct maintained in an appropriate position (**Figure 4**).

3. Discussion

The management of stable femoral neck fractures is most commonly based on joint-preserving surgical treatment, primarily through internal fixation using a dynamic hip screw (DHS) rather than multiple cannulated screw fixation [3].

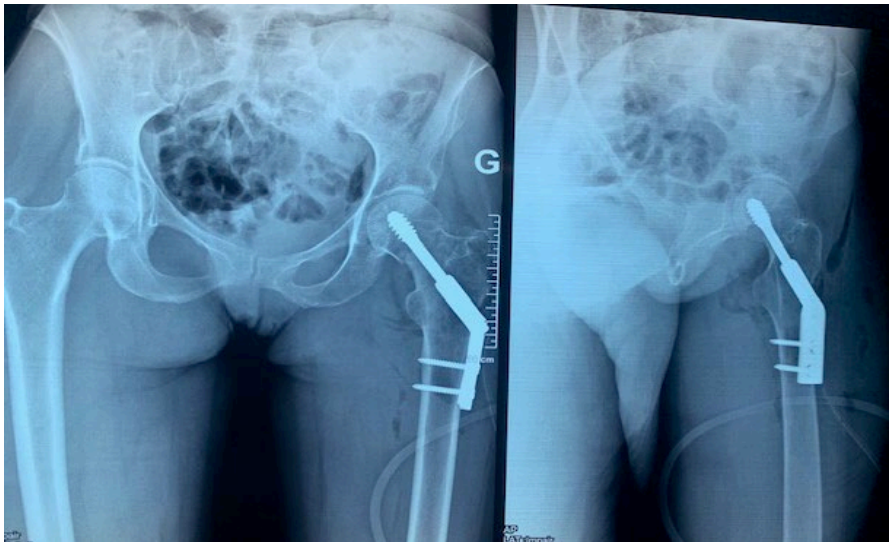

Figure 3. Postoperative anteroposterior and lateral radiographs of the hip.

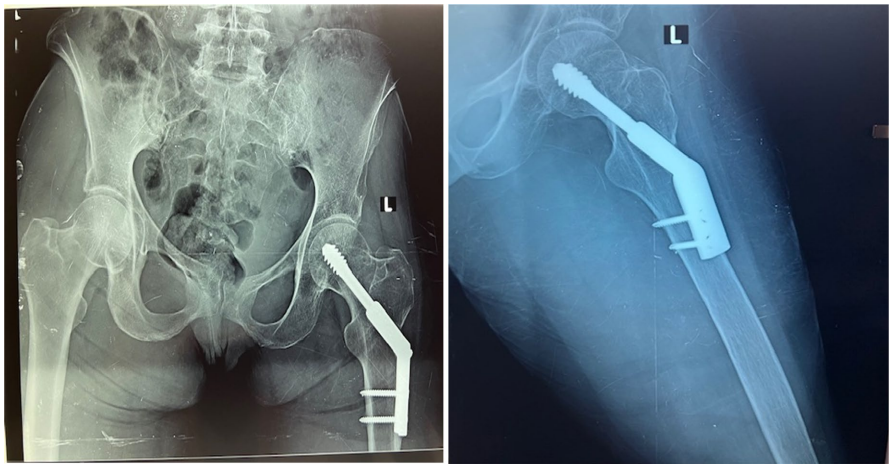

Figure 4. Radiographic assessment following fracture union.

This technique requires positioning the patient on a fracture table and the use of fluoroscopic imaging for intraoperative guidance.

In patients with partial lower-limb amputation, positioning on a fracture table is more challenging and requires specific technical modifications. In the present case, the use of a transcondylar Steinmann pin connected to the traction apparatus by a linking cord proved sufficient. This technique is particularly suitable for non-displaced fractures that do not require preliminary reduction maneuvers. Its primary purpose is to stabilize the limb and facilitate fluoroscopic imaging, thereby ensuring optimal placement of the lag screw in both anteroposterior and lateral views.

Transtuberosity skeletal traction may also be considered and offers comparable advantages in this setting.

Anjum and McNicholas reported a case of a femoral neck fracture in a 22-year-old patient with a lower-limb amputation. The authors applied skin traction to the residual limb using an elastic bandage while the patient was positioned on a fracture table. The traction assembly was connected to the traction apparatus to maintain adequate traction and facilitate fracture reduction [4]. However, this technique should be avoided in elderly patients because of the increased risk of skin injury related to tissue fragility and atrophy.

In elderly patients, in the presence of advanced osteoporosis, bilateral lower-limb amputation, or when substantial traction forces are required, alternative technical approaches should be considered.

In cases of bilateral transtibial amputation, the limb may be positioned on a radiolucent leg support, while the contralateral hip is maintained in abduction to allow unobstructed fluoroscopic access. Traction and rotational control can then be provided manually by a surgical assistant [5].

Another option is to fit the patient's prosthesis onto the residual limb and secure the prosthetic foot within the traction boot of the fracture table. In this setting, a radiolucent support should be placed beneath the limb as a safety measure. However, these techniques are suitable only for minimally displaced or nondis-

placed fractures and are not appropriate when substantial fracture reduction maneuvers are required [5].

In cases of bilateral transfemoral amputation, Aqil proposed positioning the patient supine on a radiolucent operating table in accordance with the standard procedure. The residual limb on the uninjured side is firmly secured in a gutter support and positioned in abduction and flexion, thereby allowing optimal access for the fluoroscopic C-arm. The residual limb on the fractured side is placed on the thigh support of the fracture table without the application of traction. The use of the radiolucent support provides unobstructed access for the image intensifier and enables satisfactory visualization of the hip in both anteroposterior (AP) and lateral projections (**Figure 2** and **Figure 3**) [6].

In the presence of a displaced fracture requiring greater traction forces, another technique consists of shortening the traction arm and reversing the traction boot to accommodate the flexed knee and the residual limb. In this configuration, the flexed knee and residual limb functionally simulate the foot and ankle, allowing effective traction to be applied to the affected limb, as described by Al-Harthy *et al.* [7]. A standard traction boot should be used, and the residual limb should measure at least 12 cm in length (measured distal to the tibial tuberosity). In patients with a long residual limb, the tongue of the traction boot may be folded back to facilitate proper fitting [5].

Gamulin also described a technique involving the application of an external fixator to the distal femur, which is then connected to the traction table [8]. Although this method provides satisfactory traction and limb stability, it has several drawbacks, including increased intraoperative complexity for positioning and adjustment, as well as additional cost. Furthermore, the use of external fixation is associated with a higher risk of complications, including soft-tissue injury to the residual limb, pin-tract infections [9], and avulsion fractures, particularly in patients with osteoporotic bone.

4. Conclusion

Head-preserving surgical management of proximal femoral fractures in patients with lower-limb amputation remains technically challenging, particularly with regard to patient positioning on the fracture table.

The various techniques described enable the surgical strategy to be tailored to the specific anatomical constraints of these patients, thereby facilitating satisfactory fracture reduction and stable internal fixation. The ultimate goal is to achieve fracture union in appropriate alignment while promoting recovery to the patient's pre-injury level of function.

Author Contributions

Study conception and manuscript preparation, Sow Mayoro; manuscript review and editing, Diop Malick, Dembélé Badara, Daffé Mohamed, and Sané André Daniel.

Written informed consent for publication was obtained from the patient.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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