

## Case Report

# Management of intertrochanteric fracture in a bilateral below knee amputee

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### ABSTRACT

Intertrochanteric fracture in a patient with bilateral below knee amputation is rare and the management is challenging. The major difficulty is in applying optimal amount of traction for reduction of the fracture due to absence of foot. We present the case of an elderly female with bilateral below knee amputation presenting with a minimally displaced right intertrochanteric fracture. The patient was managed using reverse boot technique for applying traction, obtaining reduction and fixed with right proximal femoral nail. The patient was able to return to her pre-injury mobility status on the third postoperative day. We highlight a method of traction application using this simple modification of the fracture table so that adequate amount of traction can be applied safely.

**Keywords:** Below knee amputee, Reverse boot traction, Intertrochanteric fracture

### INTRODUCTION

Hip fractures are a common source of morbidity and mortality worldwide.<sup>1</sup> These kinds of fractures are rare in below knee amputees. It is rarer in a bilateral below knee amputee. Management of intertrochanteric fractures is traditionally done by closed reduction and internal fixation with a dynamic hip screw or an intramedullary device using a fracture table. The foot is usually secured to a boot on the fracture table to achieve adequate traction and rotational alignment of the fracture. This is followed by internal fixation. However, this becomes a task in a below knee amputee due to the absence of foot. We elaborate the steps of applying reverse boot traction in below knee amputees. This method is easy, takes less time and involves the use of standard equipment.<sup>2</sup>

### CASE REPORT

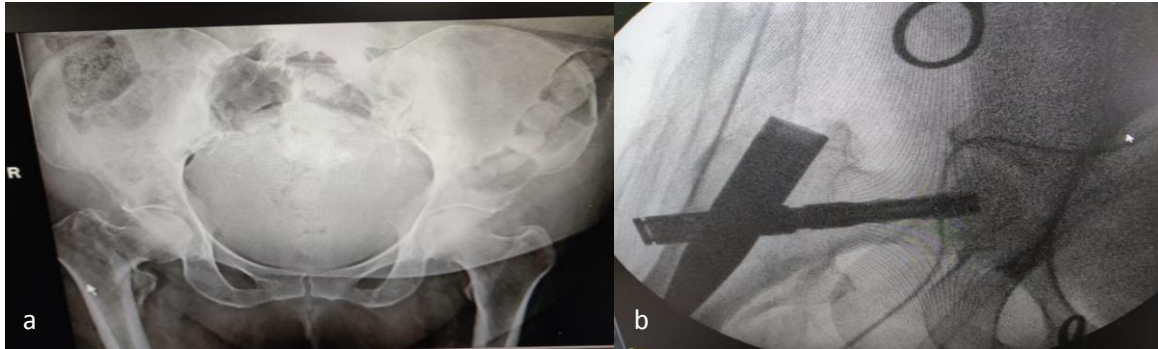
A 66 year old lady presented to the Emergency Department in our institution with history of fall during

transfer from wheelchair to couch. She does not use any prosthesis and used a wheelchair for mobility. She complained of pain in the right hip. She had undergone bilateral below knee amputation due to complications of peripheral vascular disease. The radiographs of the pelvis revealed a minimally displaced right intertrochanteric fracture (Figure 1a). Reverse boot traction (RBT) was applied. Under spinal anaesthesia, the fracture was reduced by closed manipulation. A proximal femoral nailing was performed (Figure 1b).

Steps of reverse boot traction application are: Step 1: pre-operative preparation which includes assessment for breaches in skin and bony prominences, measurement of the stump length below the knee joint line and range of movement of knee joint. Step 2: the patient is positioned on the fracture table. The opposite limb is slightly abducted and firmly secured (Figure 2a). Step 3: the foot holder boot is brought closer to the below knee stump (Figure 2b). The knee is flexed to 90 degrees. Step 4: the foot holder boot is reversed (Figure 2c). A trial fit is

done. Step 5: the bony prominences were protected (Figure 2d) and a well-padded compression bandage is applied to the stump (Figure 2e). Step 6: the reverse boot

is strapped on (Figure 2f). Step 7: the entire unit is secured with crepe bandage and adhesive strapping (Figure 2g).



**Figure 1: (a) Pre-operative X-ray, (b) Intra operative image intensifier picture.**



**Figure 2: Steps of RBT application. (a) Step 1- position of the patient on the fracture table. The opposite limb is firmly secured. (b) Step 2- the foot holder is brought closer to the stump. (c) Step 3- the knee is flexed to 90 degrees. The foot holder boot is reversed. (d) Step 4- the bony prominences are protected. (e) Step 5- well-padded compression bandage is applied to the stump with knee joint in 90 degrees. (f) Step 6- the reverse boot is strapped on. (g) Step 7- the entire unit is secured with crepe bandage and adhesive strapping.**

The postoperative period was uneventful. The patient returned to pre injury mobilization status on the third post-operative day.

## DISCUSSION

Fractures of the trochanter are common worldwide. Fracture of the residual limb in a below knee amputee is rare and rarer in bilateral below knee amputees. Special consideration should be given to these patients. The standard use of a fracture table is not possible as foot is conspicuously absent. The correct positioning of the patient on the fracture table is required for the successful reduction and operative fixation of the fracture.<sup>3</sup> There have been several techniques described in the past for such patients. In our case the reverse boot traction method to accommodate the flexed knee and stump was suitable.<sup>2,4</sup> As each fracture is unique, the various described techniques must be weighed appropriately according to advantages and disadvantages before a decision is made. We discuss the methods currently available in the literature and describe steps of RBT application in detail.

First method describes the use of a Steinmann pin in the fractured limb to provide skeletal traction with hoop or external fixator attached to the fracture table.<sup>5</sup> This method provides sufficient traction and rotation control. It can be used for displaced hip fracture, short BK stump, and in above knee amputees as well.<sup>6</sup> This technique is invasive and has risk for pin tract infection. This technique is better avoided in situations where the risk of infection is higher, like peripheral vascular disease, diabetes mellitus, intravenous drug abuse.<sup>2,7</sup> It is also associated with injury to soft tissue of the stump, chronic scar discomfort and an increased risk for pull out due to osteoporotic bones of the stump.<sup>8</sup>

The second method elaborates the use of skin traction, which facilitates positioning of the limb utilizing adhesive fabric tape.<sup>9</sup> The reduction manipulation and maintenance of fracture reduction were difficult in this method.<sup>3</sup> It may be easily unravelled once a significant amount of traction is applied.<sup>5</sup> These limitations may be overcome by the application of the tape in a "Figure of 8" manner and have been used in displaced comminuted fractures successfully.<sup>9</sup> An important consideration to be made with application of skin traction is the risk of injury to skin during the procedure and difficulty in use of prosthesis after the surgery. Surgeons must carefully assess the skin around the knee joint and the stump as any fragile skin could be broken down by the elastic adhesive tape.

Next method is the use of manual traction by an assistant for achieving the adequate reduction.<sup>10</sup> This technique does not allow the maintenance of adequate traction throughout the length of the surgery.

Another method that has been described is using the patient's prosthesis to secure the limb onto the traction boot of the fracture table.<sup>10</sup> The manual and prosthesis methods are not of much use in displaced intertrochanteric fractures.

The final method described is flexed knee RBT technique. It is a simple alternative to those mentioned above. Adequate amount of traction is easily achieved with this technique. There is accurate control of reduction in all planes for which patella could be used as a guide.<sup>4</sup> The risk for skin injury and infection is reduced. Effectiveness of this technique depends on the length of the distal stump and stump length of 12 cm or more (inferior to knee joint line) is ideal. However shorter stumps have been accommodated with additional bandaging around the stump and boot. In patients with a longer stump, the boot tongue may be everted for the stump to protrude.<sup>2</sup> In patients with a small frame and short femur, difficulty can be overcome by the use of a paediatric boot.<sup>9</sup> The knee must ideally flexed to 90 degrees for attachment to the boot. However, the inverted boot can be angled to suit the stump in patient with contractures.<sup>2</sup> This technique can be used in displaced and comminuted fractures. It allows the comfortable use of fluoroscopy imaging intra operatively. These patients were discharged earlier and started ambulating faster with their prosthesis than in those positioned with skeletal traction.<sup>11</sup>

This technique may obscure the distal femur and reduce the working surgical field. The reverse boot does not allow for access to the insertion site of the interlocking screw.<sup>9,12</sup> Hence, in cases where a long intramedullary nail is mandated, another technique of positioning the patient should be used. This technique is not suitable for use in the management of hip fractures in above knee amputees.<sup>6</sup>

## CONCLUSION

RBT for intertrochanteric fractures in patients with below knee amputation is a simple and non-invasive method. It utilizes the standardized equipment with no additional requirements. It provides adequate traction along with rotational realignment for closed manipulation of the fracture. It can be used for small or short stumps with minimal adjustments in the boot. Minor alterations in the boot can be made to suit stumps with contractures as well. The postoperative recovery time is short and rehabilitation is painless. The patient's return to pre injury mobility status is quicker.

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