CASE REPORT

Neck of femur fracture fixation in a bilateral amputee: an uncommon condition requiring an improvised fracture table positioning technique

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SUMMARY

While neck of femur fractures are common it is rare to see this injury in a bilateral leg amputee. Special consideration needs to be given to the management of these patients. We report the case of a 58-year-old man with bilateral leg amputation who presented to the emergency department with left hip pain following a fall. A fracture of the left neck of femur with extension into the femoral shaft was diagnosed. Internal fixation was planned with a dynamic hip screw. Standard fracture table setup, which allows for traction of the fractured limb and positioning of the contralateral limb such that anteroposterior and lateral X-rays can be obtained, was not possible in this case due to the amputations. We highlight considerations that need to be made in positioning a bilateral amputee for neck of femur fracture fixation and also highlight an improvised technique that can be utilised by other surgeons.

BACKGROUND

Fractures of the neck of femur are common. They are, however, rarely seen in patients who have undergone amputations of their legs. In fracture configurations that are suitable for internal fixation the outcome is affected by patient-related factors, fracture configuration, fracture reduction and position of the implant.¹⁻⁶ The setup, of patients in theatre, is a vital part of achieving satisfactory results in some of these parameters. The setup should enable adequate reduction of the fracture through traction and manipulation of the limb and also ensure satisfactory imaging of the fracture and fixation can be obtained during the procedure. Non-amputee patients undergoing internal fixation of neck of femur fractures are usually positioned supine on a fracture table with the fractured side placed in a foot boot and traction applied to assist with reduction. The contralateral leg is placed in a stirrup and the hip flexed and abducted or the foot is placed in a boot and the hip extended. In the situation of an amputee this setup is not possible and therefore requires special consideration. We report the case of a bilateral leg amputee who required internal fixation of neck of femur fracture. We describe the issues we faced in positioning the patient in theatre and the improvised setup method we utilised in this case. This report will serve as a reference to other surgeons encountering similar scenarios and assist them in planning and preparing for surgery.

CASE PRESENTATION

A 58-year-old patient presented to the emergency department at our institution with symptoms of left hip pain following a mechanical fall. The patient had undergone bilateral leg amputation, with an above-knee amputation on the left and a below-knee amputation on the right, for complications of peripheral vascular disease secondary to insulin dependent diabetes mellitus several years earlier. They were usually mobile with bilateral prostheses and at the time of the fall the left-sided prosthesis jarred into the patients left groin. Initial radiographs of the pelvis and left femur did not reveal an obvious fracture (figures 1 and 2). Examination findings however raised a high index of suspicion of a fracture and therefore the patient was admitted and underwent an MRI scan of the left hip and femur. The MRI scan revealed a fracture line extending from the lateral aspect of the subcapital region of the left femoral neck through the inter-trochanteric region and into the upper femoral shaft (figures 3 and 4). The patient was offered internal fixation of the fracture using a dynamic hip screw (DHS) with a long plate. Following informed consent the patient agreed to the procedure.

TREATMENT

The positioning of the patient for surgery was considered and discussed prior to surgery, as the standard setup in our institution, using a traction boot on the fracture side and a stirrup on the contralateral side would not be suitable for this case. It was planned that a Steinmann Pin would be placed in the distal femur of the fractured side to provide traction and rotational control. With the limb attached to traction the table base could be removed and enable full anteroposterior and lateral imaging of the femur, which was deemed necessary as a DHS with a long shaft plate was to be applied. To enable access for the fluoroscopy machine it was planned that the below-knee stump of the contralateral limb would be placed and secured into a stirrup with the hip flexed and abducted.

Under spinal anaesthesia the patient was placed supine on the fracture table in theatre. A Steinmann Pin was placed into the distal femur, as planned, under aseptic conditions. The Steinmann Pin was attached to a traction bow (figure 5). The patient was positioned against the perineal post and an attempt was made to attach the traction bow to the clamp on to the traction arm. It was however found that even with the longest traction bow and

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Figure 1 Pelvis X-ray with no obvious fractures.

Figure 2 Lateral X-ray of left hip.

Figure 3 MRI reveals intracapsular fracture of left neck of femur.

Figure 4 Extension of fracture into left femoral shaft is demonstrated on MRI.

Figure 5 Steinmann Pin attached to traction bow.

the shortest traction arm they were approximately six inches short of connecting. Consideration was given to connecting the traction bow to the traction arm clamp using some rope but this was felt to be unsuitable, as this would not provide rotational control. The theatre staff obtained all the available clamps and an improvised extension was built onto the traction arm, which

enabled a connection to be made (figures 6–8). This was assessed and found to be able to provide satisfactory traction and rotational control.

Attention then turned to the contralateral side. This leg required positioning to allow the fluoroscopy machine to obtain anteroposterior and lateral images of the surgical side. The

Figure 6 Improved extension of traction arm using clamps.

Figure 7 Traction bow attached to clamps on traction arm.

Figure 8 Intraoperative image shows leg with Steinmann Pin and traction hoop supported by attachments to traction arm.

stump was placed into a standard stirrup with the hip flexed and abducted. In the absence of a foot and calf, which usually rests securely in the contours of the stirrup and is easily secured with straps, it was felt the limb was liable to displace from the stirrup during surgery. Slick tape was therefore placed around the base of the stirrup and onto the thigh. The stirrup straps and crepe bandage were applied over the top, to ensure the leg would not become dislodged (figure 9).

The fluoroscopy apparatus was positioned and satisfactory imaging of the operative site could be obtained. The fracture was well reduced and therefore surgery proceeded with internal fixation with a DHS with an eight-hole plate (figures 10 and 11). Following surgery the Steinmann Pin was removed and pin tract dressings applied.

DISCUSSION

Neck of femur fractures are common but are not frequently seen in patients who have had lower limb amputations.^{7 8} Special challenges are presented in the operative management of amputee patients who require internal fixation of their fractures.

The positioning of a patient with a neck of femur fracture undergoing internal fixation, from a surgeon's perspective, needs to allow traction with rotational control of the fractured side and enable adequate fluoroscopic imaging of the operative site to be obtained.

Ordinarily a fracture table, with the fractured side in a boot attached to a traction arm and the contralateral limb either secured in a stirrup with the hip flexed and abducted or the foot secured in a boot with the hip extended, is used to aid reduction of the fracture and allow anteroposterior and lateral fluoroscopy images to be obtained of the surgical site. This standard positioning is not an option in a bilateral amputee and therefore an alternative technique is required.

Several methods of supporting the fractured limb on the traction table have been described in patients with below-knee amputations. The limb can simply be rested on a radiolucent thigh support or the patient's prosthesis can be applied to the stump and the foot of the prosthesis secured into the traction boot.⁹ While these techniques allow, according to the authors, for adequate imaging they do not permit traction or manipulation of the limb and therefore reduction by indirect means. A third technique uses an inverted traction boot to secure the below-knee stump with the knee flexed.¹⁰ This technique does permit manipulation of the limb but is only suitable in below-knee amputees.

There is one report of the internal fixation of an intertrochanteric fracture in a patient with bilateral above-knee amputations in the literature. The authors used a radiolucent thigh support on the surgical side and a gutter support for the contralateral side.¹¹ While this technique permitted adequate imaging for the authors it does not provide rotational control.

Figure 9 Stump of contralateral below-knee amputation secured into stirrup with sleek and crepe bandage.

Figure 10 Anteroposterior fluoroscopy images.

Figure 11 Lateral fluoroscopy images.

The methods described above were not deemed suitable in the case we report. The fracture in this case was undisplaced and therefore did not require manipulation; rotational control of the limb was however desired to ensure correct placement of the long shaft plate. It was also felt that imaging of the femoral head and the whole plate in both anteroposterior and lateral planes would be inadequate and obstructed by a thigh support.

Concerns are raised by other authors that the use of skeletal traction is associated with risks of infection and cutting out of the pin, particularly in amputees, due to the relative avascularity of the limb and high incidence of osteoporosis.^{9 10} We acknowledge this is the case but felt on balance a femoral Steinmann Pin would provide the best setup for a satisfactory surgical outcome.

Following insertion of the Steinmann Pin, however, we found that the traction bow would not reach the traction arm clamp even with the longest bow and shortest traction arm available. We considered using rope to connect the bow to the clamp but this would not have given us the rotational control we desired. We therefore obtained all of the available clamps and improvised an extension to the traction arm. Fortunately there was not a significant delay in the initiation of surgery given the patient was already under spinal anaesthetic.

This case reports an undescribed technique for the positioning of an above-knee amputee for internal fixation of a femoral neck fracture that can be utilised by other surgeons. This technique

enables traction to be applied and rotational control of the surgical limb, which previously described techniques fail to achieve. This case also highlights the need for a thorough individualised assessment of theatre setup for unusual cases. While this should be carried out, as far as possible, in advance we recommend a final evaluation or 'trial run' prior to the initiation of anaesthesia. We suggest the patient is placed on a trolley adjacent to the fracture table with the perineum aligned with the position of the perineal post in order that a direct visual assessment of the length of the traction apparatus can be made.

Contributors AJB and CB were involved in the clinical care of the patient described in this case report and were involved in the writing and editing of the manuscript.

Competing interests None.

Patient consent Obtained.

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Learning points

- An individualised assessment of amputees presenting with neck of femur fractures is required to plan surgical setup.
- We recommend a 'trial run' of the setup prior to initiation of anaesthesia.
- Intraoperative traction with rotational control can be applied to the limb of an above-knee amputee using a Steinmann Pin and traction bow.
- Care must be taken when using a Steinmann Pin in amputees as their bone may be osteoporotic and due to poor vascular supply the risks of infection higher.

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