

Well-Leg Positioning on a Fracture Table: Using a Pillow Sling

Jesse E. Bible, MD, and Hassan R. Mir, MD

Abstract

Although rare, acute compartment syndrome remains a well-reported complication of the lithotomy position. The avoidable nature of this potentially devastating complication has led many surgeons to forgo this well-leg setup when using the fracture table, and instead place the uninjured limb into a scissored position.

In this report, we describe a safe and efficient technique for positioning the well leg in a scissored position on the fracture table using a pillow and a self-adherent compression bandage.

With this positioning method for the uninjured limb, an optimal amount of relaxed hip and knee extension, and limb adduction to midline along the table's support bar, is reliably achieved to permit lateral fluoroscopic imaging of the injured limb without overlap of the well leg or interference with C-arm positioning.

The development of acute compartment syndrome in lower legs placed in the lithotomy position is a rare complication reported within various surgical subspecialties, including general surgery, gynecology, and urology.¹⁻⁵ Although it is reported in arthroscopic knee cases, the more frequent occurrence in orthopedics, based on available case reports, appears to involve the well (uninjured or contralateral) leg placed in the hemilithotomy position on the fracture table.⁶⁻⁹

Prior studies have found significantly elevated lower leg compartment pressures in legs placed in the lithotomy position. Chase and colleagues¹⁰ measured the anterior compartment pressures in 16 limbs placed in the lithotomy position. They found minor elevations after initial lithotomy positioning, but gradual increases over time, with an average elevation to 30 mm Hg and maximum of 70 mm Hg. Similarly, Meyer and colleagues¹¹ recorded the lower leg pres-

ures in 8 healthy volunteers positioned on a fracture table. Changing from the supine position to the lithotomy position significantly increased the intramuscular pressure in the anterior compartment (from 11.6 to 19.4 mm Hg) and in the lateral compartment (from 13.0 to 25.8 mm Hg).

Along with increased intramuscular pressures, local hypotension occurs in lower legs placed in the lithotomy position. Mean diastolic blood pressure in the ankle was 63.9 mm Hg in the leg placed in the supine position as opposed to 34.6 mm Hg in the same leg placed in the lithotomy position.¹⁰ This finding is not unexpected, given that local arteriolar pressure decreases by 0.78 mm Hg for every 1.0 cm of elevation.¹²⁻¹⁴ Furthermore, some "kinking" of either femoral vessels at the hip or popliteal vessels at the knee may also occur.¹⁵

For prevention of these problems, the well leg can be placed in a position of slight hip extension and full knee

extension on the fracture table—the so-called scissored position. This position is commonly achieved with an additional traction boot and support bar connected to the well leg. However, this additional setup can make positioning the C-arm machine difficult; there is obstruction by the additional support bars and the leg itself. In addition, the uninjured extremity may be placed into positions that cause unnecessarily high stresses across the joints and can potentially lead to iatrogenic injury and pain.

Risk of fracture in the well leg results from the C-arm machine abutting the well leg when swinging through to obtain a lateral image. This problem is overcome by securing the well leg to the fracture table's longitudinal support bar using a pillow sling, thereby reducing the risks of compartment syndrome, allowing the uninjured limb to be in a relaxed position, and allowing good fluoroscopic images to easily be obtained. This brief report is an introduction to this positioning method.

Surgical Technique

The patient is intubated and anesthetized on the hospital bed before being transferred to the fracture table. On the fracture table, the operative leg is placed in a boot traction device in the standard fashion. The perineal post is then inserted, and the patient is pulled caudally on the bed so that the post is appropriately positioned for countertraction.

With an assistant holding the well leg, the distal flat-top table extension is removed. With a calf or foot sequential compression device still in place, a pillow enclosed in a pillowcase is wrapped around the lower leg

Authors' Disclosure Statement: The authors report no actual or potential conflict of interest in relation to this article.



Figure 1. Pillow being wrapped around lower leg in U-shaped fashion.

and ankle in a U-shaped fashion using the longitudinal length of the pillow (Figure 1). The pillow-wrapped leg is then placed against the side (not the

top) of the table's support bar and secured in place using a 6-in self-adherent compression bandage (eg, Coban; 3M, St. Paul, Minnesota), wrapped circumferentially around both the pillow and the support post (Figures 2A, 2B). Although an Ace wrap may be more readily accessible, we have found it to slowly loosen and/or migrate, thus potentially changing the leg position throughout the case.

As shown in Figure 3, the C-arm machine can then be positioned in an oblique fashion relative to the bed with an unobstructed view of the hip. The C-arm can also be repositioned perpendicular to the injured limb, and unobstructed images can be obtained of the entire length of the femur. This quick and efficient setup of the well leg allows for an optimal amount of relaxed hip and knee extension, and limb adduction to midline along the table's support bar, to permit lateral fluoroscopic imaging of the injured limb without overlap of the well leg or interference with C-arm positioning.

Results

For more than 2 years, Dr. Mir has used the pillow-sling technique for placement of the well leg in the scissored position on the fracture table in all patients. Between September 2010 and January 2013, he applied the technique 93 times, with the procedures listed as follows with their Current Procedural Terminology (CPT) codes: 14 cases of percutaneous fixation of femoral neck fracture (CPT 27235), 8 cases of treatment of intertrochanteric or subtrochanteric fracture with plate/screw type implant (CPT 27244), 34 cases of treatment of intertrochanteric or subtrochanteric fracture with intramedullary implant (CPT 27245), and 37 cases of treatment of femoral shaft fracture with intramedullary implant (CPT 27506).

With respect to compartment syndrome, there were no intraoperative or postoperative complications. Furthermore, no patients complained of pain in the well leg immediately after surgery or at subsequent follow-ups. No difficulty was encountered with intraoperative C-arm imaging of the injured limb at the



Figure 2. (A) Lateral and (B) overhead views of uninjured leg in pillow-sling and secured to fracture table support bar using 6-in self-adherent bandage.



Figure 3. (A) C-arm setup. (B) Easy clearance of well-leg and unobstructed view of hip.

hip or along the length of the femur in the lateral or anteroposterior planes. The well leg did not have to be repositioned in any cases to achieve adequate imaging of the hip and femur.

Discussion

Although rare, acute compartment syndrome remains a potential yet avoidable complication of the lithotomy position. Some surgeons avoid this setup of the well leg on the fracture table and instead use a scissored position for the uninjured limb.

In this report, we presented a safe and efficient technique for placing the well leg in a scissored position on the fracture table using a pillow and a self-adherent compression bandage. We did not compare the pillow-sling with other well-leg positioning techniques but instead described a reproducible technique that we have used effectively and successfully, even with multiple morbidly obese patients who met the weight limits for the fracture table.

In addition, even with consistent use of this pillow-sling technique at our high-volume trauma center, there have been no complications, such as compartment syndrome, well-leg pain, or difficulty in intraoperative imaging of the injured limb. The pillow-sling is a

safe and expedient alternative technique for well-leg positioning on the fracture table, and it can be easily reproduced by other surgeons.

Dr. Bible is Chief Resident, and Dr. Mir is Assistant Professor of Orthopaedics and Rehabilitation, Vanderbilt Orthopaedic Institute, Vanderbilt University School of Medicine, Nashville, Tennessee.

Address correspondence to: Jesse E. Bible, MD, Vanderbilt Orthopaedic Institute, Medical Center East, South Tower, Suite 4200, 1215 21st Ave S, Nashville, TN 37232-8774 (tel, 615-936-0112; fax, 615-936-0117; e-mail, jesse.bible@vanderbilt.edu).

Am J Orthop. 2014;43(12):571-573. Copyright Frontline Medical Communications Inc. 2014. All rights reserved.

References

1. Leff RG, Shapiro SR. Lower extremity complications of the lithotomy position: prevention and management. *J Urol.* 1979;122(1):138-139.
2. Lydon JC, Spielman FJ. Bilateral compartment syndrome following prolonged surgery in the lithotomy position. *Anesthesiology.* 1984;60(3):236-238.
3. Kubiak R, Wilcox DT, Spitz L, Kiely EM. Neurovascular morbidity from the lithotomy position. *J Pediatr Surg.* 1998;33(12):1808-1810.
4. Cohen SA, Hurt WG. Compartment syndrome associated with lithotomy position and intermittent compression stockings. *Obstet Gynecol.* 2001;97(5 pt 2):832-833.
5. Moses TA, Kreder KJ, Thrasher JB. Compartment syndrome: an unusual complication of the lithotomy position. *Urology.* 1994;43(5):746-747.
6. Chung JH, Ahn KR, Park JH, et al. Lower leg compartment syndrome following prolonged orthopedic surgery in the lithotomy position –A case report–. *Korean J Anesthesiol.* 2010;59(suppl):S49-S52.
7. Tan V, Pepe MD, Glaser DL, Seldes RM, Heppenstall RB, Esterhai JL Jr. Well-leg compartment pressures during hemilithotomy position for fracture fixation. *J Orthop Trauma.* 2000;14(3):157-161.
8. Anglen J, Banovetz J. Compartment syndrome in the well leg resulting from fracture-table positioning. *Clin Orthop.* 1994;(301):239-242.
9. Mathews PV, Perry JJ, Murray PC. Compartment syndrome of the well leg as a result of the hemilithotomy position: a report of two cases and review of literature. *J Orthop Trauma.* 2001;15(8):580-583.
10. Chase J, Harford F, Pinzur MS, Zussman M. Intraoperative lower extremity compartment pressures in lithotomy-positioned patients. *Dis Colon Rectum.* 2000;43(5):678-680.
11. Meyer RS, White KK, Smith JM, Groppo ER, Mubarak SJ, Hargens AR. Intramuscular and blood pressures in legs positioned in the hemilithotomy position: clarification of risk factors for well-leg acute compartment syndrome. *J Bone Joint Surg Am.* 2002;84(10):1829-1835.
12. Enderby GE. Postural ischaemia and blood pressure. *Lancet.* 1954;266(6804):185-187.
13. Matsen FA 3rd, Mayo KA, Krugmire RB Jr, Sheridan GW, Kraft GH. A model compartmental syndrome in man with particular reference to the quantification of nerve function. *J Bone Joint Surg Am.* 1977;59(5):648-653.
14. Peters P, Baker SR, Leopold PW, Taub NA, Burnand KG. Compartment syndrome following prolonged pelvic surgery. *Br J Surg.* 1994;81(8):1128-1131.
15. Gershuni DH, Yaru NC, Hargens AR, Lieber RL, O'Hara RC, Akeson WH. Ankle and knee position as a factor modifying intracompartmental pressure in the human leg. *J Bone Joint Surg Am.* 1984;66(9):1415-1420.

This paper will be judged for the Resident Writer's Award.
