The Application of the Landstuhl Frame for Air Evacuation of Patients with Femur Fractures

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The use of traction to transport patients with femur fractures is well accepted. This paper describes step-by-step the construction of a traction device suitable for use on military aircraft. This "Landstuhl frame" is easily constructed using materials readily available. It is quick and effective for the transportation of patients with lower extremity fractures.

The use of traction to transport patients with femur fractures is not new. DeChauliac and co-workers suggested skin traction for thigh fractures in the 1500s. This concept has been modified over the centuries by Buck (1861), to the Tobruck splint used in World War II, and to the Hare traction splint used by many emergency medical technicians throughout Europe and the United States.[1,2]

Currently, the Hare traction splint is the main form of traction used in military air evacuation. We recommend against its use for long missions because of the potential for traction injuries to the sciatic nerve. We hypothesize that these injuries are caused by the length of flight time required (12 hours from Kenya to Germany) and/or malpositioning/shifting of the splint during flight. In addition to potential injury, the Hare traction splint is uncomfortable for patients.

For these reasons, we believe that skeletal traction is the method of choice when transporting patients with femoral fractures long distances to definitive care. However, providing skeletal traction on military aircraft (C-9, C-130, and C-141) has proven challenging. Until now, the three common methods of providing skeletal traction for military air evacuation have been the NATO traction device, the Stryker frame with the Collins traction unit, and rubber tubing that was doubled or tripled to provide enough "weight."

The NATO traction device cannot generate adequate distraction force to reduce the fracture or provide patient comfort. The Stryker frame with the Collins traction unit provides adequate distraction force, but the patient ends up hanging halfway off the side of the litter because the overhead bar is in the center of the bed. Finally, any other contraption that is assembled at the last moment involves too much time and unnecessary searching about for materials and has the potential to fail during transport.

To answer these problems, we have devised a Zimmer traction frame on a NATO litter that is suitable for flight and provides improved patient comfort. The materials needed for this traction frame are: (1) one 27-inch Zimmer traction bar; (2) two 7-inch traction bars with single clamps; (3) two Zimmer cross clamps; (4) one Zimmer pulley; (5) one Steimen pin bow or Kirschner wire tractor; (6) a 2-foot-long bungie cord; (7) one "S" hook; (8) one Collins traction unit; and (9) one NATO litter.

The traction frame is assembled as follows:

(1) Attach the single-clamp traction bars to the end of the NATO litter (Fig. 1).
(2) Use the two cross clamps to attach the plain bar to the single-clamp bars (the height of the bar will be adjustable) (Fig. 2).
(3) Place the pulley on the plain bar in direct line with the fractured leg.
(4) Tie the bungie cord to the Collins traction unit and feed the rest of the cord through the pulley (Fig. 3).
(5) Select the proper traction bow for your patient (Steimen pin bow or Kirschner wire tractor) and attach it to the Collins unit with the "S" hook.
(6) Pull the extra cord that you fed through the pulley to obtain the desired amount of poundage you require for traction.
(7) Double or triple the bungie cord through the pulley and Collins traction unit.
(8) Tie the rest of the cord off and tape it to ensure that the clamp does not come loose.

The pulley may be loosened and rotated counterclockwise (looking from patient's left side) during flight to compensate for the patient moving on the litter. Also, a rolled egg crate secured by a litter strap and placed under the patient's buttocks will help minimize patient displacement as a result of the traction unit.

We feel that the "Landsthul frame" is a practical and readily accessible solution to the need for mobile traction. Its construction is easy, it is highly mobile, and it provides patient comfort during transport. Figures 4 and 5 show the actual device used for a double femur fracture.

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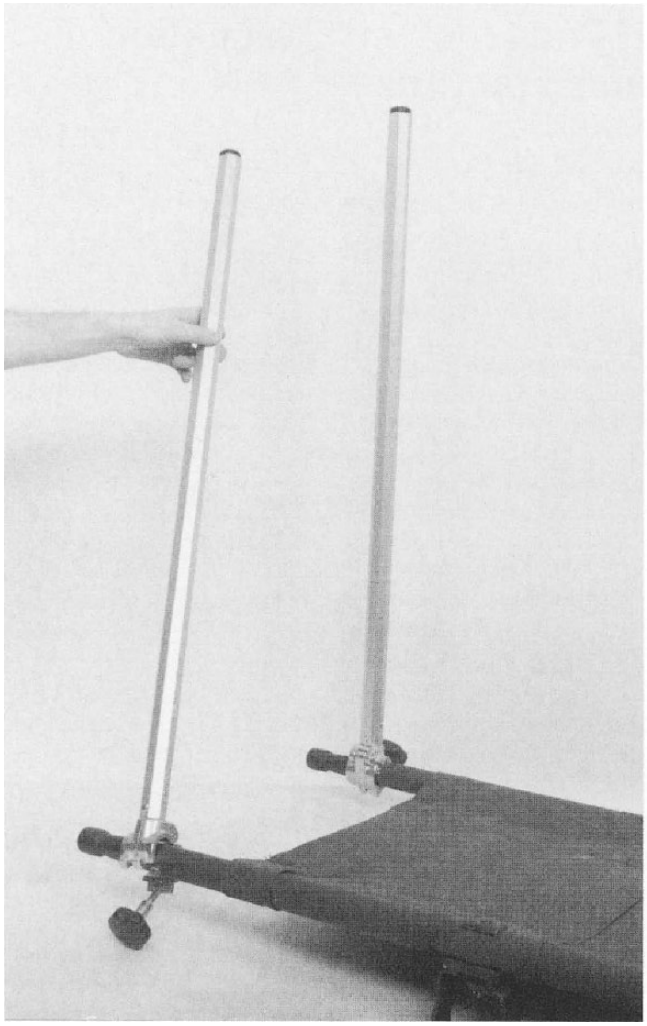

Fig. 1. Traction bars are attached to the NATO litter.

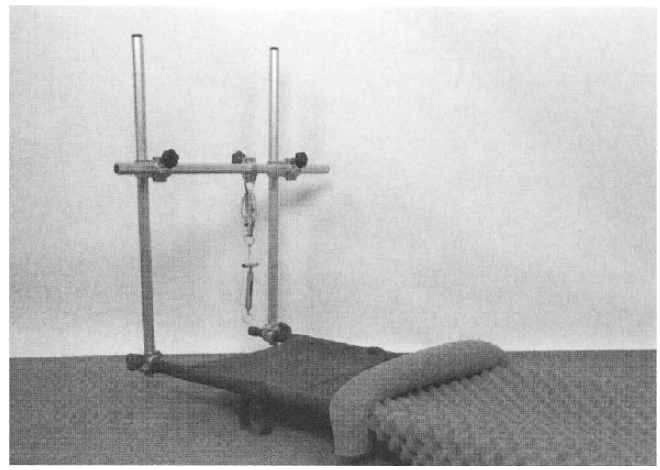

Fig. 3. The bungie cord is attached to the Collins traction unit.

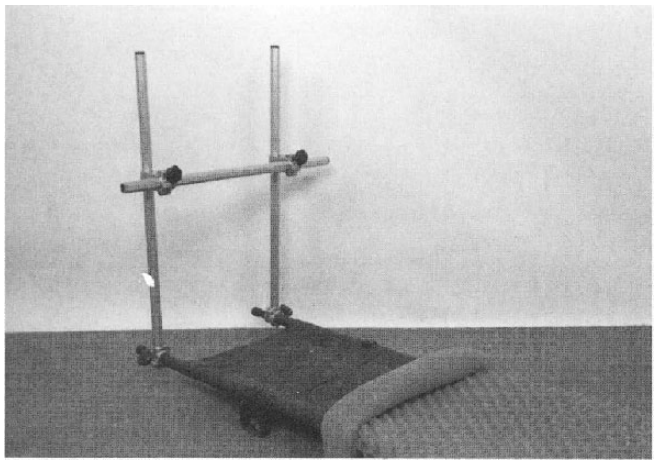

Fig. 2. Cross clamps are used to attach the plain bar to the single-clamp bars.

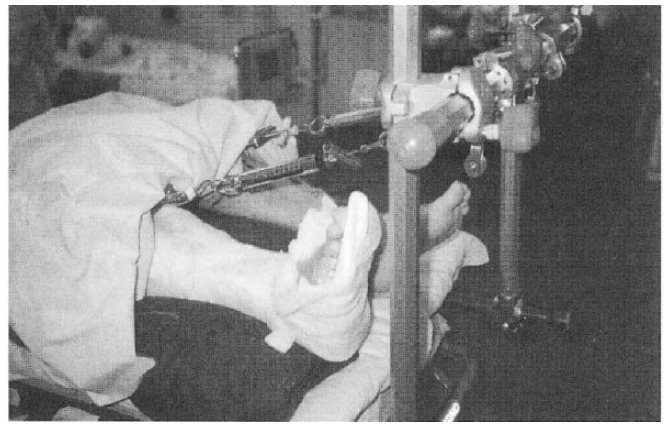

Fig. 4. The Landstuhl frame in use during transport of a patient with a double femur fracture.

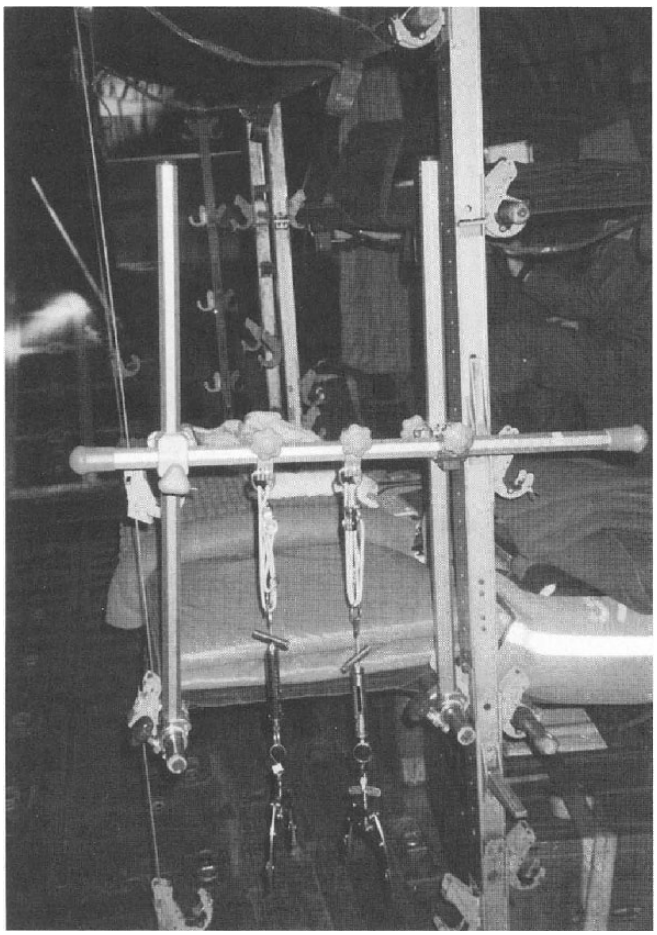

Fig. 5. The finished device.

References

1. Bowen TE, Bellamy RF, editors: Emergency War Surgery: First United States Revision. NATO Handbook, pp. 160–3. Washington, DC, U.S. Government Printing Office, 1988.
2. Grant HD, Murray RH, Bergeron JD, O'Keefe MF, Limmer D, editors: Brady Emergency Care, Ed. 5, pp. 268–83. Englewood Cliffs, NJ, Prentice Hall, 1995.