

Closed Femoral Nailing in Lateral Decubitus Position without a Fracture Table: A Preliminary Report of Fifteen Patients

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Background: The use of a fracture table is standard for closed intramedullary nailing of femoral fractures. Instead of a fracture table, some clinicians have successfully performed this operation in the supine position via manual traction. Here, we present our experience performing this operation in the lateral decubitus position without a fracture table.

Methods: From December 2001 to November 2002, we consecutively performed closed intramedullary femoral nailing in 15 patients with low comminuted femoral shaft fractures in the lateral decubitus position without a fracture table. We used manual or joystick traction to approximate the fracture fragments and introduced a guide pin. A reaming procedure was done with serial reamers of increasing diameters to reduce the fracture fragments. Then, the nail was inserted along the guide pin.

Results: Six femora underwent Küntscher nailing and nine femora underwent interlocking nailing. Nine procedures were completed via joystick traction and six were completed via manual traction only. All fifteen procedures were completed without any changes in the other operative methods. The mean operation time was 55 minutes for Küntscher nailing and 118.3 minutes for interlocking nailing. The average union time was 5.8 months with 100% union.

Conclusions: For low comminuted femoral shaft fractures, using manual or joystick traction in the lateral decubitus position without a fracture table is an alternative in closed femoral intramedullary nailing.

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Key words: femoral shaft fracture, intramedullary nailing, fracture table, manual traction.

Closed intramedullary nailing has become the standard treatment for femoral shaft fractures.⁽¹⁻⁴⁾ The use of a fracture table is standard for intramedullary nailing of femoral fractures.⁽¹⁾ This operation is usually performed with the aid of a fracture table and the patient is prepared in the lateral or supine position on the fracture table after skeletal

traction is exerted on the distal femur.⁽⁵⁾ McFerran and Johnson⁽¹⁾ and Baumgaertel et al.⁽⁶⁾ used distractors instead of a fracture table to reduce fractures when performing this operation. Karpos et al.,⁽⁷⁾ Sirkin et al.⁽⁴⁾ and Wolinsky et al.^(8,9) used only manual traction instead of a fracture table or distractors and performed the operation without difficulty. For

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the manual traction method, surgeons prepare patients in the supine position on elongated radiolucent tables with the hips elevated about 30 degrees. We present our experience in closed intramedullary femoral nailing with the patient in the lateral decubitus position without the use of a fracture table.

METHODS

Patient data

From December 2001 to November 2002, 15 consecutive patients (4 females and 11 males) with closed, low communicated femoral shaft fractures were included in this prospective study (Table 1). According to the Winquist-Hanson classification,⁽¹⁰⁾ 6 patients had type 0, 4 had type 1, and 5 had type 2 fractures. The mean patient age was 36.1 (range, 14-71) years. The mean body weight was 60.3 (48-73) kg. The mean body height was 165.3 (152-180) cm. Patient injuries were due to motorcycle accidents in six, motor vehicle accidents in four, falls from a height in two, falls on the ground in two, and blunt trauma in one. The fracture locations were in the proximal femur in 3 patients, at the junction of the proximal and middle portions in 3, in the middle portion in 8, and at the junction of the middle and distal portions in 1.

Surgical technique

Surgery was performed within 24 hours of trauma, as suggested by Wolinsky et al.⁽⁸⁾ When the patients were diagnosed with femoral shaft fracture in the emergency department, the operations were performed as soon as possible if no contraindications such as associated head injury, thoracoabdominal injury or unstable hemodynamic conditions were noted. The mean time between patient presentation and surgery was 7.6 (range, 2-14) hours.

Table 1. Patient Data

Male / Female	11/4
Mean age (year)	36.1 (14-71)
Mean body weight (Kg)	60.3 (48-73)
Mean body height (cm)	165.3 (152-180)
Winquist-Hansen Classification	
Type 0	6
Type 1	4
Type 2	5

Under general anesthesia, the patients were prepared in the lateral decubitus position as near as possible to the distal end of the operating table to avoid hindrance from the table seat during fluoroscopic examination. The fluoroscope was placed in front of the patient (Fig. 1).

The operative procedure is shown and briefly described in Figure. 2. The entry point of the intramedullary nail was created in the piriformis fossa via the open method. The proximal femoral fragment was reamed to adequate size to create some space to simplify the guide insertion (Fig. 2B). Fracture site approximation was achieved by distal fragment traction using either the joystick method^(11,12) with the half pin of the external fixator on the distal femoral fragment, or by simple manual traction. We would try to insert the guide pin from the proximal to the distal femoral medullary canal by simple manual traction. If we could not insert the pin within 15 minutes, the joystick method was used for guide pin insertion. The half pin of the external fixator was set in the distal fragment 5 to 10 cm distal to the fracture site using a 5-mm stab wound in the lateral thigh (Fig. 2C). After guiding the proximal fragment to the distal femur, we removed the joystick (Fig. 2D) and inserted the guide pin into the distal fragment (Fig. 2E). Then we performed reaming with serial flexible reamers of increasing diameters

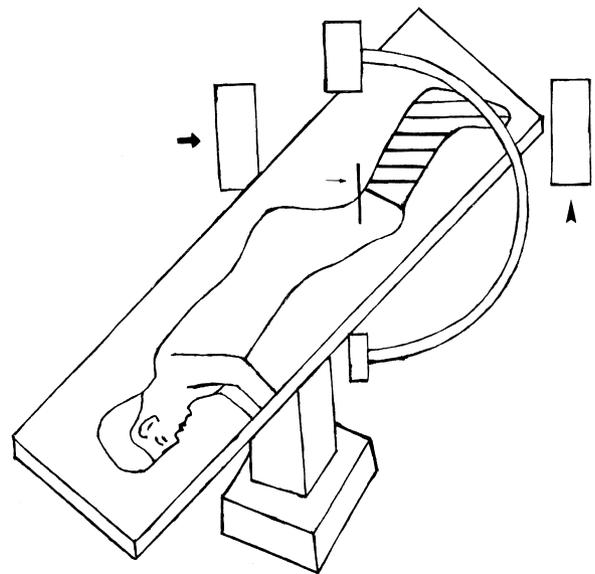


Fig. 1 Patient preparation.

while an assistant kept the leg in in-line traction. (Fig. 2F). The selected nail was 1 mm smaller in diameter than the last reamer (i.e. over-reaming 1 mm). While the assistant kept the injured leg in traction, we inserted a Küntscher nail for type 0 fractures or an interlocking nail for type 1 and 2 fractures along the guide pin (Fig. 2G). When performing a static interlocking nailing, the proximal locking screw was set with the aid of a jig and the distal locking screws were set by free hand with the aid of the fluoroscope.⁽¹³⁾ The distal locking screws were set while the patient's knees and lower legs were kept parallel with towels. The operative procedure was fluoroscopically monitored in the mediolateral view.

Operation time was defined as the time interval between skin incision and wound closure.

Patients began isometric quadriceps-setting and straight leg raising exercises on the first day after surgery. From the second postoperative day, they were encouraged to walk using crutches. Weight-bearing was allowed on the injured limb as tolerated by the patient.

Follow-up

Patients were discharged when wound conditions were stable. Patients were instructed in partial weight-bearing crutch ambulation. They had regular follow-up clinical evaluations and roentgenographic examinations to record healing status, alignment (including varus, valgus, anterior or posterior angulations), leg length discrepancy (comparing the distance from the anterior superior ischial spine to the medial malleolus in both legs) and any complications. Union was determined by serial radiographs and defined as callus bridging the fracture site.

RESULTS

All 15 operations were completed without difficulty. The mean time for follow-up was 18.3 (8-30) months. The clinical results are shown in Table 2. From skin incision to wound closure, the mean operation times were 55 (40-60) minutes for Küntscher nailing and 118.3 (95-150) minutes for interlocking nailing. The mean blood loss was 150 (50-300) ml. Nine distal femoral fragments were reduced to the proximal femur via joystick traction, while 6 were reduced via manual traction only. Six femora underwent Küntscher nailing and 9 femora underwent

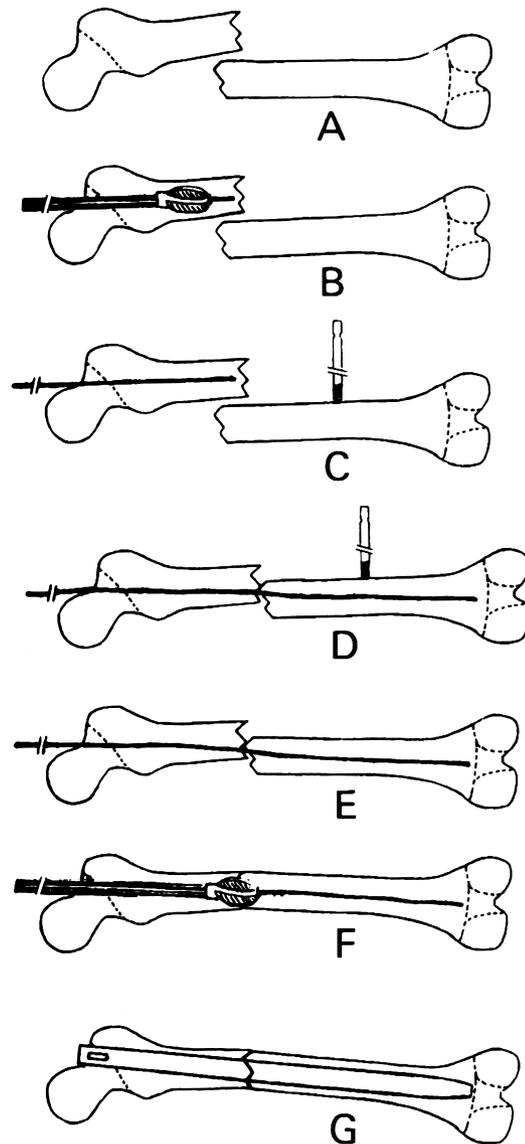


Fig. 2 (A) A simple femoral shaft fracture. (B) Preparation of the nail inlet and reaming dilatation for inserting the guide pin into the distal femoral medullary canal. (C) Set on joystick (D) Approximation of the fracture ends by joystick traction and passage of the guide pin. (E) Removal of the joystick. (F) Reaming reduction. (G) Insertion of the nail.

interlocking nailing. The Küntscher nail diameters and lengths were 10-12 mm and 360-400 mm respectively. The interlocking nail diameters and lengths were 9-12 mm and 340-380 mm respectively.

The union rate was 100% (15/15). The mean union time for the 6 patients who underwent

Table 2. Results

	Küntscher nailing	Interlocking nailing
Number of patients	6	9
Operative time (minutes)	55 (40-60)	118.3 (95-150)
Manual traction	2	4
Joystick traction	4	5
Nail diameter (mm)		
9		2
10	1	3
11	3	3
12	2	1
Nail length (mm)		
340		2
360	1	1
380	4	6
400	1	
Limb-length discrepancy (> 1 cm)	0	0
Varus or valgus (> or < 5°)	0	0
Posterior angulation (> or < 10°)	1	0
Anterior angulation (> or < 10°)	0	0
Union rate	100% (6/6)	100% (9/9)
Union time (months)	6 (5 - 7)	5.7 (5 - 8)

Küntscher nailing was 6 (5-7) months. The mean union time for the 9 patients who underwent interlocking nailing was 5.7 (5-8) months. The overall mean union time was 5.8 (5-8) months. There was no

valgus or varus deformity greater than 5 degrees. There was no leg length discrepancy greater than 1 cm. One patient who underwent Küntscher nailing had a posterior angulation of 12 degrees because of the small nail diameter compared with the medullary canal.

There was one intraoperative complication that increased the comminution severity from type 0 to type 2, necessitating changing the Küntscher nail to an interlocking nail (Fig. 3). No immediate or delayed wound infections developed. One patient had a bent Küntscher nail and underwent nail exchange (Fig. 4). One patient had one distal screw back-out. None of these minor complications influenced the healing process.

DISCUSSION

Although, closed femoral intramedullary nailing on the fracture table has become the most popular method for treatment of femoral shaft fractures, it can lead to complications including pudendal, sciatic and femoral nerve palsy, perineal sloughs, well leg compartment syndromes, and crush syndromes.⁽¹⁴⁻²⁰⁾

If closed intramedullary femoral nailing could be done without using a fracture table, these complications could be avoided. Distractors have been used to reduce fractures and perform closed in-

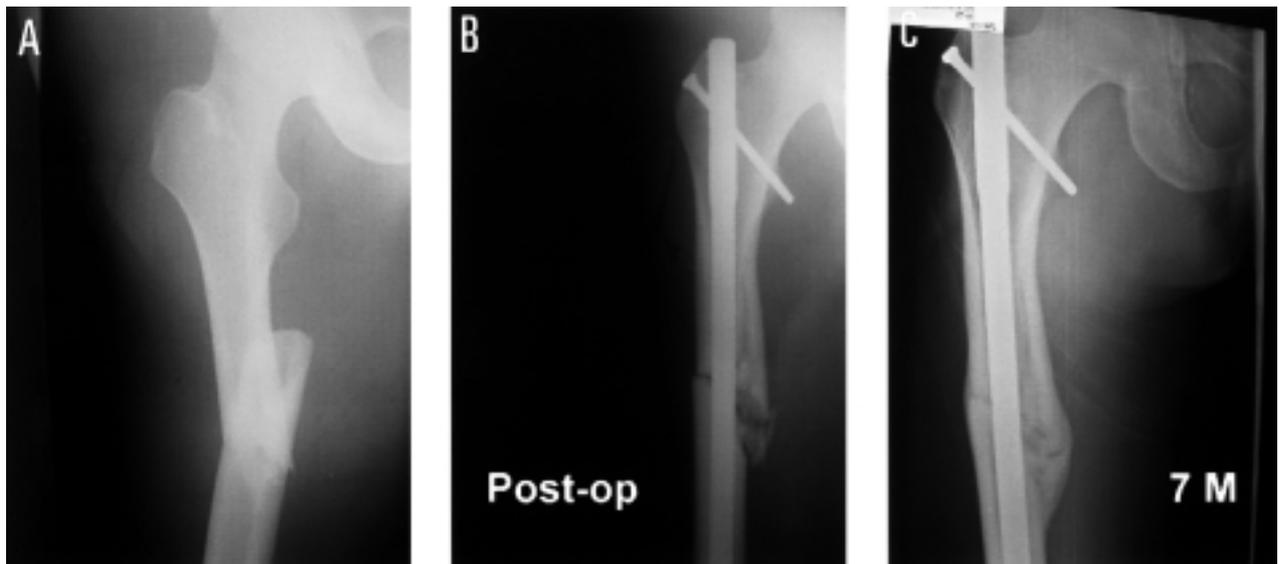


Fig. 3 (A) Preoperative radiograph of a Winquist-Hansen type 0 fracture. (B) The fracture comminution became Winquist-Hansen type 2 intraoperatively. (C) The fracture healed 7 months later after interlocking nail fixation.

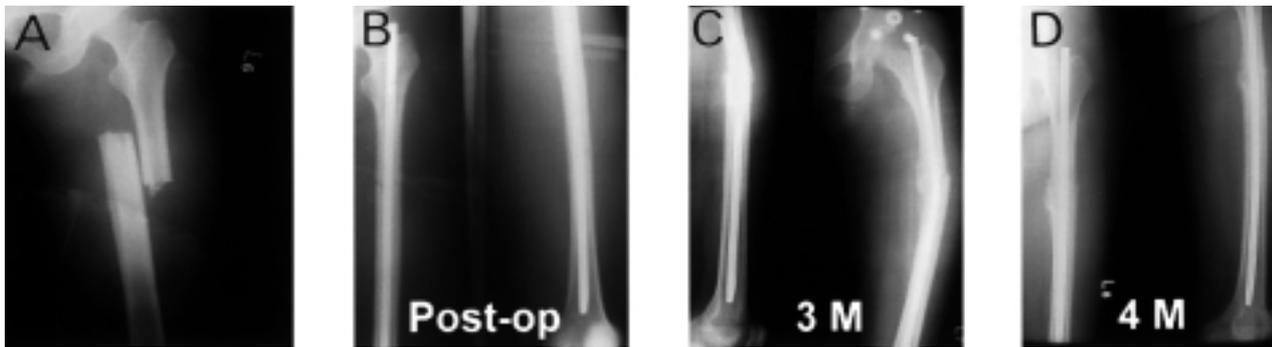


Fig. 4 (A) Preoperative radiograph of a Winquist-Hansen type 0 fracture. (B) Postoperative radiograph. (C) The Kuntscher nail is bent 3 months after surgery. We exchanged the nail immediately. (D) Healing callus formation.

intramedullary femoral nailing instead of traction with a fracture table.^(1,6) Manual traction to reduce fractures and perform closed intramedullary femoral nailing can also be done successfully.^(4,7,8,9) Using an extra-long radiolucent table, Karpos et al. prepared patients in a supine position with a rolled sheet placed under the sacrum and lower lumbar spine.⁽⁷⁾ Using a 65-inch radiolucent C-arm extension attached to the operating table, Sirkin et al. prepared patients in the supine position with a rolled sheet underneath the ipsilateral trunk to elevate the hip 30 to 45 degrees.⁽⁴⁾ Using a radiolucent operating room table with a radiolucent extension, Wolinsky et al. prepared patients in a supine position with a roll placed beneath the ipsilateral buttock so that the affected hip was elevated at least 30 degrees.⁽⁸⁾ These authors all placed the patients in the supine position to perform closed intramedullary femoral nailing. We proved the feasibility of the lateral decubitus position without a fracture table for this procedure. Under designed serial procedures, we completed closed intramedullary femoral nailing procedures without difficulty.

According to the literature, the mean operative time for femoral interlocking nailing in the supine position without a fracture table is 107 ± 36 minutes.⁽⁹⁾ The mean operative time was 118.3 minutes for interlocking nailing in this series. Although, our operative time was longer during the study, it will shorten as clinicians become more familiar with the operative techniques. Wolinsky et al. revealed that the further along the learning curve they progressed, the shorter the nailing time became.⁽⁸⁾

There are some advantages in performing closed

intramedullary nailing with patients in the lateral decubitus position without a fracture table. Complications associated with the use of a fracture table can be avoided. The position preparation is easy -- the patient is simply placed in the lateral decubitus position near the distal end of the operative table. It is easier to access the nail inlet on the piriformis fossa in the lateral decubitus position. Satisfactory results can be expected if the principles of closed reduction and nailing are followed.

There are also some disadvantages to this procedure. It is more difficult to check the alignment in the coronal plane (anteroposterior view) due to rotation limitations of the fluoroscope. This means that distal femoral fractures are more likely to be fixed in more varus or valgus positions due to the wide intramedullary canal in the distal femur. Hence, we needed an assistant to keep traction on the leg when we introduced the guide pin, reamed the medullary canal and inserted the nail. Although we had no experience on patients with highly comminuted femoral shaft fractures (Winquist-Hansen type 3 or 4), we believe that these fracture types are not absolutely contraindicated. Finally, it is better if this technique is used as soon as possible after injury. Karpos et al.⁽⁷⁾ suggested that this technique (manual traction) should not be used if treatment is delayed more than 48 hours postinjury. However we feel that if the surgery must be delayed, adequate skeletal traction to maintain femoral length and assurance of adequate fracture end distraction are necessary before surgery.

In conclusion, using manual traction or joystick traction with patients in the lateral decubitus position

without the use of a fracture table to perform closed femoral intramedullary nailing appears to be an alternative for low comminuted femoral shaft fractures.

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在不用骨折手術床之下以側躺姿勢進行之封閉式股骨 內釘固定手術：15個病人的初步報告

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- 背景：** 利用骨折手術床進行封閉式股骨骨髓內釘固定手術，是目前治療股骨骨折的標準方式。有些作者則並未利用骨折手術床，可以在病人平躺的手術姿勢下，利用人力牽引，完成封閉式股骨骨髓內釘固定手術。在此我們則提出在不用骨折手術床之下，讓病人在側躺的姿勢之下進行這種手術的經驗。
- 方法：** 從2001年12月到2002年11月，我們接連對15個低粉碎性股骨骨折的病人，以不利用骨折手術床，並且在側躺的手術姿勢下完成封閉式股骨骨髓內釘固定手術。我們利用人力牽引或搖桿牽引以使骨折兩端靠近，然後將骨內釘導引穿到遠端，再以逐漸增大的鑽孔過程達成復位，之後置入骨髓內釘以完成手術。
- 結果：** 其中有6支股骨骨折接受 Küntscher 氏骨髓內釘固定，而有9支股骨骨折接受鎖定式骨髓內釘固定。9個手術是利用搖桿牽引來完成手術，6個手術以人力牽引來完成手術。這15個手術的進行，都不需改變為其它手術方式來進行。Küntscher 氏骨髓內釘固定手術的平均手術時間為55分鐘，而鎖定式骨髓內釘固定手術的平均手術時間為118.3分鐘。平均癒合的時間是5.8個月。癒合率為100%。
- 結論：** 對於低粉碎性的股骨骨折，不用骨折手術床，在側躺的手術姿勢下，以人力牽引或搖桿牽引完成封閉式股骨骨髓內釘固定手術，也是達成封閉式股骨骨髓內釘固定手術的另一種手術方式的選擇。
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關鍵字： 股骨骨折，骨髓內釘固定，骨折手術床，人力牽引。

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