Lateral Femoral Line: A Technique for Easy Insertion of Newer Femoral Reconstruction Nails

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The lateral femoral line technique identifies the correct femoral entry portal for the insertion of second-generation femoral reconstruction nails.

The newer second generation reconstruction nails, such as the proximal femoral nail (Synthes-Stratec, Oberdorf, Switzerland), Russell-Taylor Delta nail (Smith & Nephew Inc, Memphis, Tenn) and gamma nail (Stryker Corp, Kalamazoo, Mich), produce satisfactory results clinically and biomechanically in the treatment of unstable proximal femoral fractures. The key to smooth progression of the surgery is in making the appropriate skin incision and femoral entry portal.

The entry portal for these nails is at or slightly lateral to the tip of the greater trochanter. An inappropriate incision makes it difficult to identify the entry portal site. This could potentially increase the surgical time, as the image intensifier would have to be put through a series of maneuvers from anteroposterior (AP) to lateral views and vice versa to ensure the femoral entry portal is at the correct site. An inappropriate entry point in the proximal femur could also damage the hip abductor mechanism. As the femur has an anterior bow, the incision for the femoral entry portal should be sited in line with the proximal femoral shaft inclination, which takes the entry point into the posterior half of the greater trochanter.

Experienced trauma surgeons are able to “eyeball” the correct femoral entry portal using the appropriate skin incision for the femoral entry portal.
incision. The lateral femoral line technique was designed to identify the appropriate site of incision and entry portal (tip of the greater trochanter) for these nails.

**TECHNIQUE**

**Study Sample**

Between January 2000 and December 2001, the lateral femoral line technique was used in 39 patients who underwent femoral fixation with the proximal femoral nail (Synthes-Stratec). Sixteen patients had proximal femoral fractures and 23 patients had femoral metastases. Fractures involving the intertrochanteric region and subtrochanteric fractures were excluded, as open reduction was required. In patients with femoral metastases, the most common source of primary lesion was prostatic carcinoma followed by breast carcinoma.

**Surgical Technique**

All surgeries were performed under general anesthesia. Patients were placed supine on a fracture table with the affected leg slightly adducted, resting in a foot holder. The contralateral leg was flexed, abducted, and externally rotated at the hip and flexed at the knee. The C-arm of the image intensifier was positioned to allow visualization of the proximal femur in both AP and lateral planes. The thigh on the affected side was prepared with an aqueous iodine-based solution from the iliac crest to the distal knee and covered with vertical transparent drapes.

As the femur has an anterior bow, the incision for the femoral entry portal should be sited in line with the proximal femoral shaft inclination.

The tip of the greater trochanter in the AP plane was identified using the image intensifier and line A was drawn on the upper thigh anteriorly, connecting the tip of the greater trochanter and the center of the femoral head (Figure 1). This line was extended across the lateral aspect of the thigh by placing a long guide wire so that it lay along the middle of the femoral canal (Figure 3). The lateral femoral line was then extended proximally above the greater trochanter. The intersection of these two lines identified the tip of the greater trochanter in both coronal and transverse planes.

A 5-cm incision was made along the lateral femoral line for the entry portal starting approximately 8-10 cm proximal to the junction of line A and the lateral femoral line (Figure 4). An incision along the lateral femoral line ensured that the tip of the greater trochanter was in line with the incision. After careful dissection of the soft tissues, a 2.8-mm threaded Kirschner wire was inserted at the tip of the greater trochanter, as identified by the intersection of line A and the lateral femoral line under image intensifier control in the AP plane. The guide wire was inserted in the direction of the lateral femoral line. If line A and the lateral femoral line were drawn correctly, the guide wire would be in line with the long axis of the femur (Figure 5). The number of attempts required to successfully pass the guide wire was noted. The standard nailing procedure was then performed.

**RESULTS**

The incisions for the femoral entry portal using the lateral femoral line technique were aligned with the axis of the proximal femoral shaft in...
all patients. The appropriate entry portal was made within the first two attempts. Extension of the initial incision, which was approximately 5 cm, was not necessary (Figure 6).

**DISCUSSION**

Ebraheim et al. have shown that the tip of the greater trochanter is an acceptable entry portal in reconstructive nailing when the femoral neck is involved in a pathological process but care must be taken to drive the nail distally. It has also been shown that reaming through the piriformis fossa weakens the femoral neck and increases the potential for fracture. Exact location of the entry portal in the sagittal plane is essential, and this can be identified on lateral views with an image intensifier. In an obese patient, it is not always possible to make the incision for the entry portal in line with the long axis of the femur. The skin incision for the femoral entry portal for any intramedullary nail fixation should be approximately 8-10 cm proximal to the greater trochanter tip.

When the incision for the entry portal along the lateral aspect of the thigh is not in line with the long axis of the femur, surgical time may be prolonged as the guide wire will have to be maneuvered in a direction different to the long axis of the femur to reach the tip of the trochanter (Figure 7). The image intensifier also may need to be rotated from AP to lateral and vice versa before a satisfactory entry portal is made. By using the lateral femoral line tech-

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At 3-month follow-up, no incidence of hip abductor weakness was noted. In the study sample, 18 of 39 patients were obese. In these patients, the location of the greater trochanter could not be identified with any certainty by palpating the lateral aspect of the thigh.

Figure 4: Incision along the lateral femoral line. Figure 5: Direction of the guide wire when introducing it into the tip of the greater trochanter.
nique these difficulties are avoided.

Although we have not compared the number of times it takes to make the entry portal by the lateral femoral line technique with the usual trial and error method, we have found that the appropriate femoral entry portal was made within two attempts by using the lateral femoral line technique.

By using the lateral femoral line technique identification of the entry portal site was easier for two reasons. First, the incision was in line with the tip of the trochanter. Second, due to the anterior convexity of the femoral shaft, the direction of the entry portal should be inclined upwards. Hence, aligning the guide wire along the lateral femoral line when making the entry portal ensures the appropriate inclination of the entry guide with respect to the long axis of the proximal femoral shaft.

As the lateral femoral line technique makes it easier for percutaneous insertion of a femoral nail, it will be of use especially to the resident orthopedic surgeon in the early part of training. When the femoral entry portal is made without difficulty, it reduces the stress on the surgeon and gives the surgeon more time to concentrate on other aspects of the surgery.

**REFERENCES**


