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# Chiari Pelvic Osteotomy for Advanced Osteoarthritis in Patients with Hip Dysplasia

## Surgical Technique

BY HIROSHI ITO, MD, TAKEO MATSUNO, MD, AND AKIO MINAMI, MD

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### INTRODUCTION

The treatment of severe osteoarthritis due to hip dysplasia in younger and more physically active patients is controversial. Total hip arthroplasty in young patients is best avoided, if possible, because of its limited durability. The pelvic reconstructive osteotomy is one joint-preserving procedure, the objective of which is to provide good osseous femoral head coverage. Chiari described a medial displacement pelvic osteotomy for the treatment of subluxation of the hip<sup>1</sup>. In the present report, we describe the technique of Chiari pelvic osteotomy, performed through an Ollier lateral U approach<sup>2,3</sup> along with a trochanteric osteotomy, for the treatment of advanced osteoarthritis in dysplastic hips.

### SURGICAL TECHNIQUE

The patient is placed in the lateral decubitus position with the extremity draped free on the table. No traction table or any other distraction device is used. Intraoperative fluoroscopy or radiography is used to confirm the appropriate osteotomy line. The skin incision (Fig. 1) begins at the anterior superior iliac spine and is curved downward and posteriorly for a distance of 2 cm, distal to the base of the greater trochanter, and then is curved up-

### ABSTRACT

#### BACKGROUND:

It is not clear whether a Chiari pelvic osteotomy performed for the treatment of advanced osteoarthritis can delay the need for total hip arthroplasty. We present the mid-term results of the Chiari pelvic osteotomy performed for the treatment of Tönnis grade-3 osteoarthritis (large cysts, severe narrowing of the joint space, or severe deformity or necrosis of the head with extensive osteophyte formation), with a particular focus on whether this procedure can delay the need for total hip arthroplasty.

#### METHODS:

We followed thirty-two hips in thirty-one patients with Tönnis grade-3 osteoarthritis who had refused total hip arthroplasty and had been treated with a Chiari pelvic osteotomy. The mean age at the time of surgery was 35.2 years. The mean duration of follow-up was 11.2 years, at which time clinical evaluation with the Harris hip score and radiographic evaluation were performed.

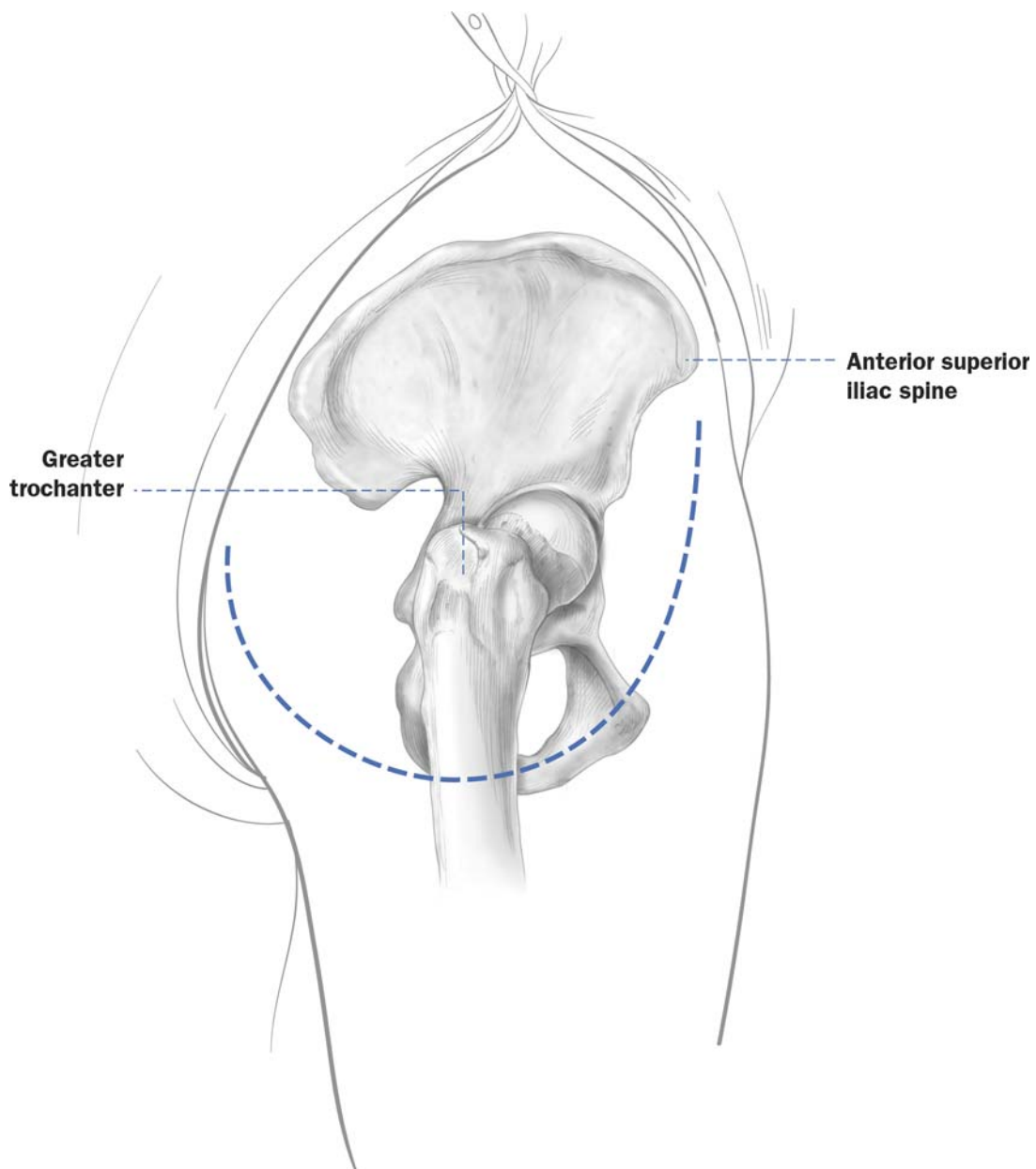
#### RESULTS:

The average Harris hip score improved from 52 points preoperatively to 77 points at the time of follow-up; the average pain score improved from 20 to 31 points. Three hips with a hip score of <70 points required total

*continued*

**ABSTRACT** | continued

hip arthroplasty. With a hip score of <70 points as the end point, the cumulative rate of survival at ten years was 72%. The clinical outcome was significantly influenced by the preoperative center-edge angle ( $p = 0.004$ ), the preoperative acetabular head index ( $p = 0.039$ ), achievement of the appropriate osteotomy level ( $p = 0.011$ ), and superior migration ( $p = 0.009$ ) and lateral migration ( $p = 0.026$ ) of the femoral head.

*continued***FIG. 1**

The skin incision of the Ollier lateral U approach to the hip joint.

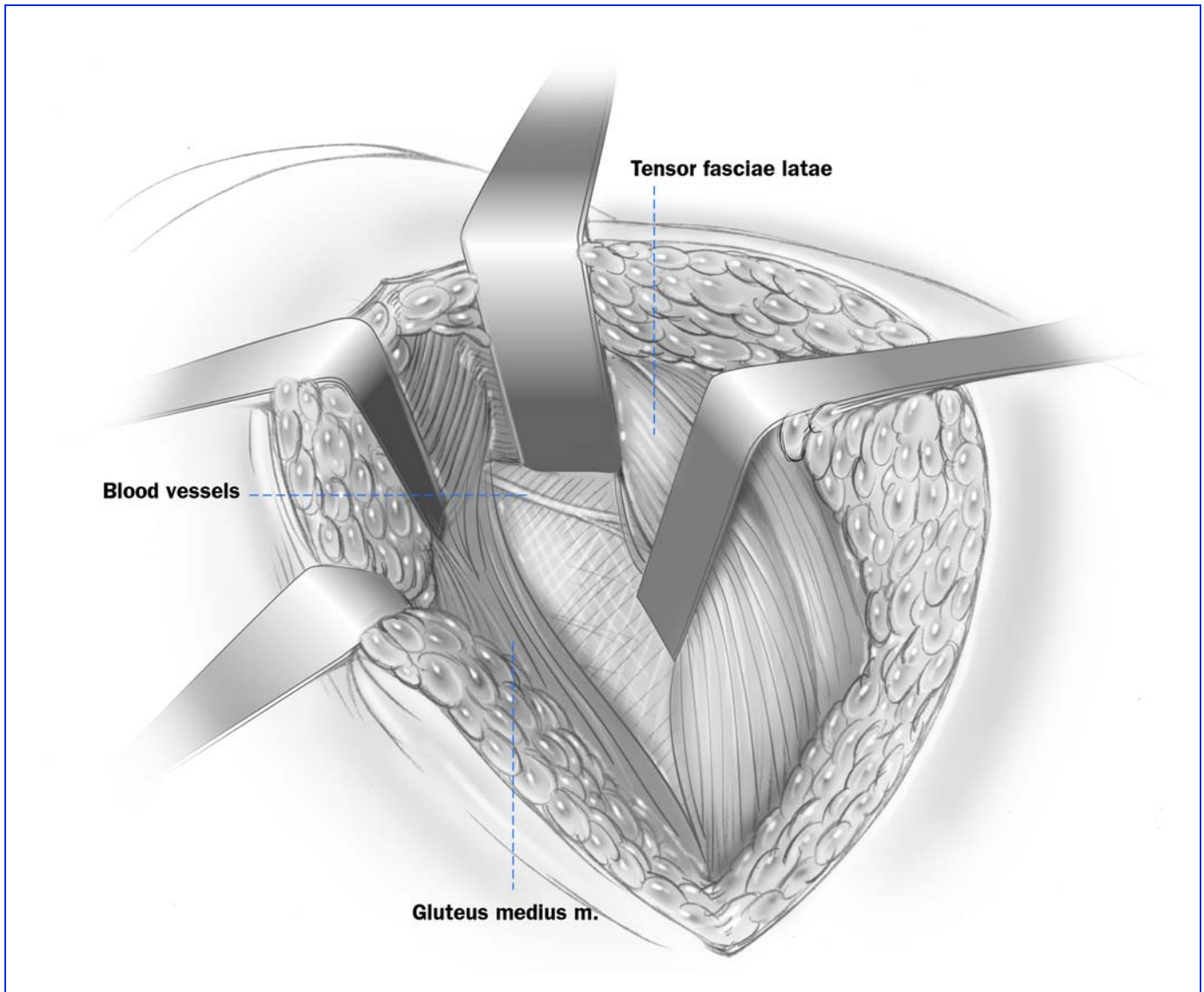


FIG. 2

The anterior dissection is carried out by separating the tensor fasciae latae anteriorly and the gluteus medius posteriorly, continuing distally to the greater trochanter.

ward and back to the posterior superior iliac spine. The exposure is developed by incising the gluteal fascia in the same line on the skin incision. The anterior interval (Fig. 2) between the tensor fasciae latae and the gluteus medius is identified and dissection is carried out by separating the tensor fascia latae anteriorly and the gluteus medius

## ABSTRACT | continued

### CONCLUSIONS:

Although the clinical results were inferior to those of total hip arthroplasty, Chiari pelvic osteotomy may be an option for young patients with advanced osteoarthritis who prefer a joint-conserving procedure to total hip arthroplasty and accept a clinical outcome that is predicted to be less optimal than that of total hip arthroplasty. Moderate dysplasia and moderate subluxation without complete obliteration of the joint space and a preoperative center-edge angle of at least 10° are desirable selection criteria.

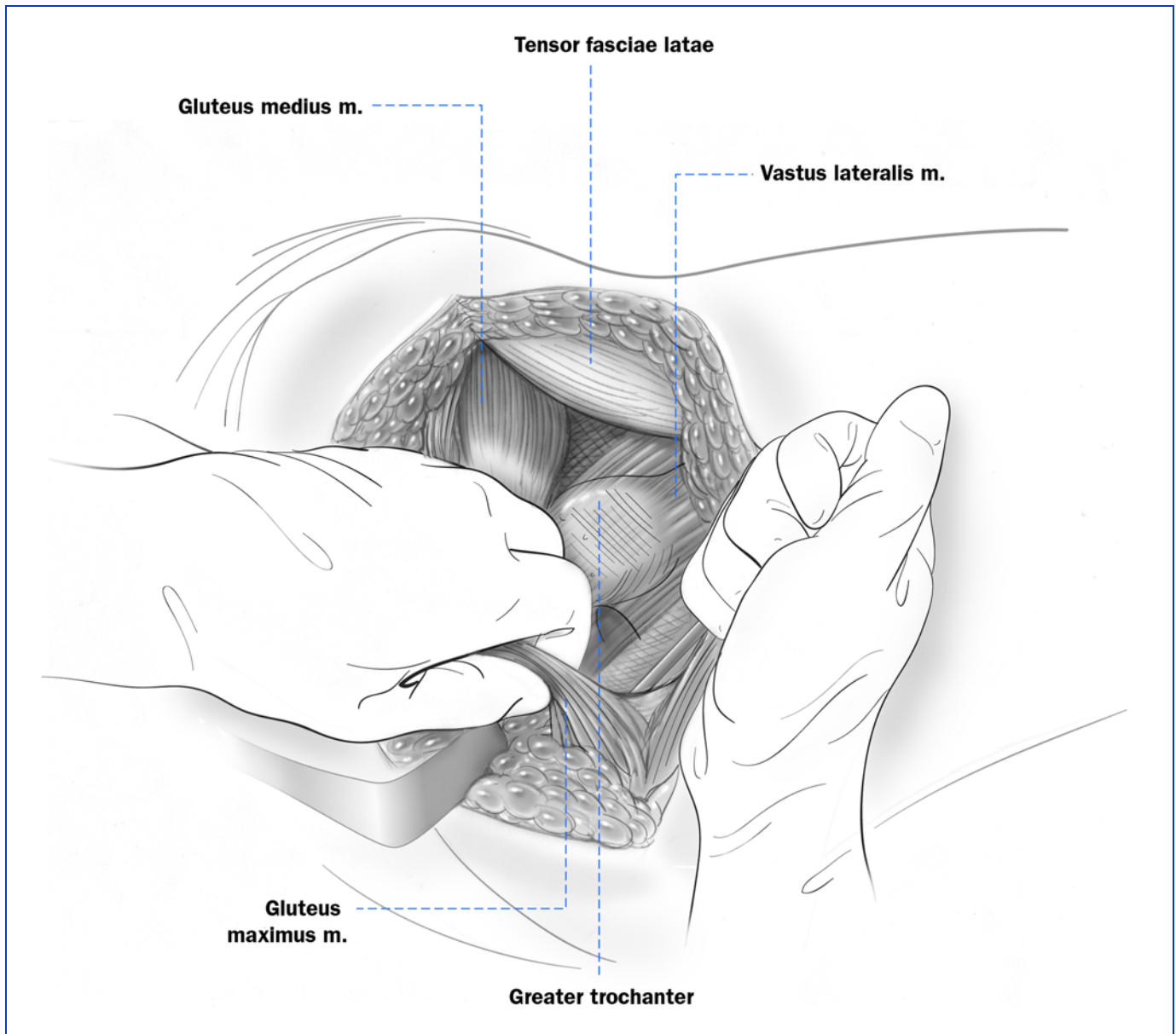


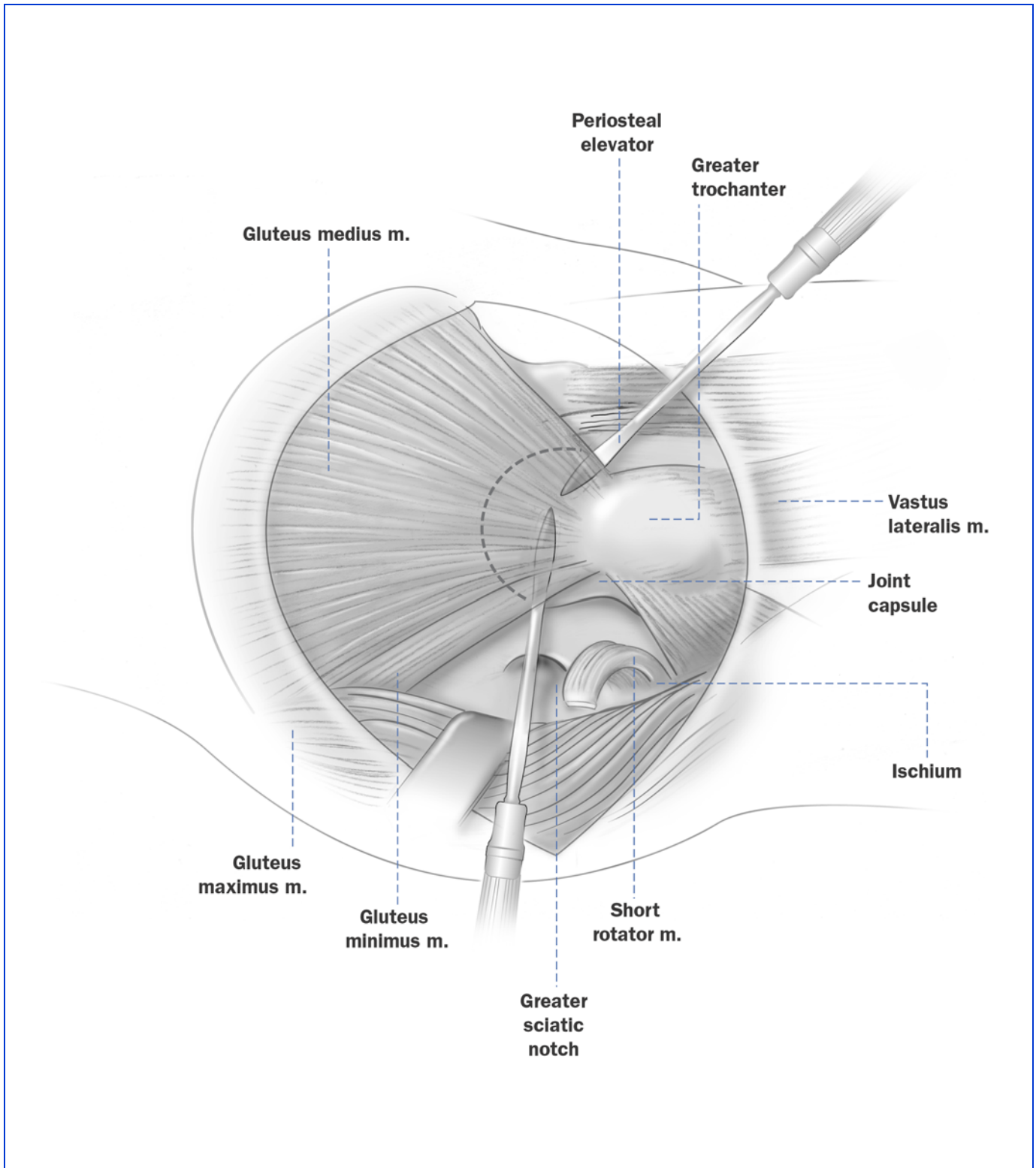
FIG. 3

The posterior dissection is carried out by blunt splitting of the fibers of the gluteus maximus.

posteriorly, continuing distally to the greater trochanter. Blood vessels in this interval are coagulated. A posterior dissection is carried out by blunt digital splitting of the fibers of the gluteus maximus at the level of the underlying posterior border of the gluteus medius muscle

(Fig. 3). The short external rotator muscles are identified with the hip placed in internal rotation. The piriformis, obturator internus, and gemelli are incised at their insertions, and then the anterior and posterior borders of the gluteus medius with the underlying gluteus

minimus can be clearly visualized with and defined by the periosteal elevators placed beneath them (Fig. 4). After the osteotomy line is marked, the greater trochanter is osteotomized obliquely at its base, with care being taken to avoid injury to the femoral neck and to pre-

**FIG. 4**

The anterior and posterior borders of the gluteus medius with the underlying gluteus minimus are clearly visualized with and defined by the periosteal elevators placed beneath them.



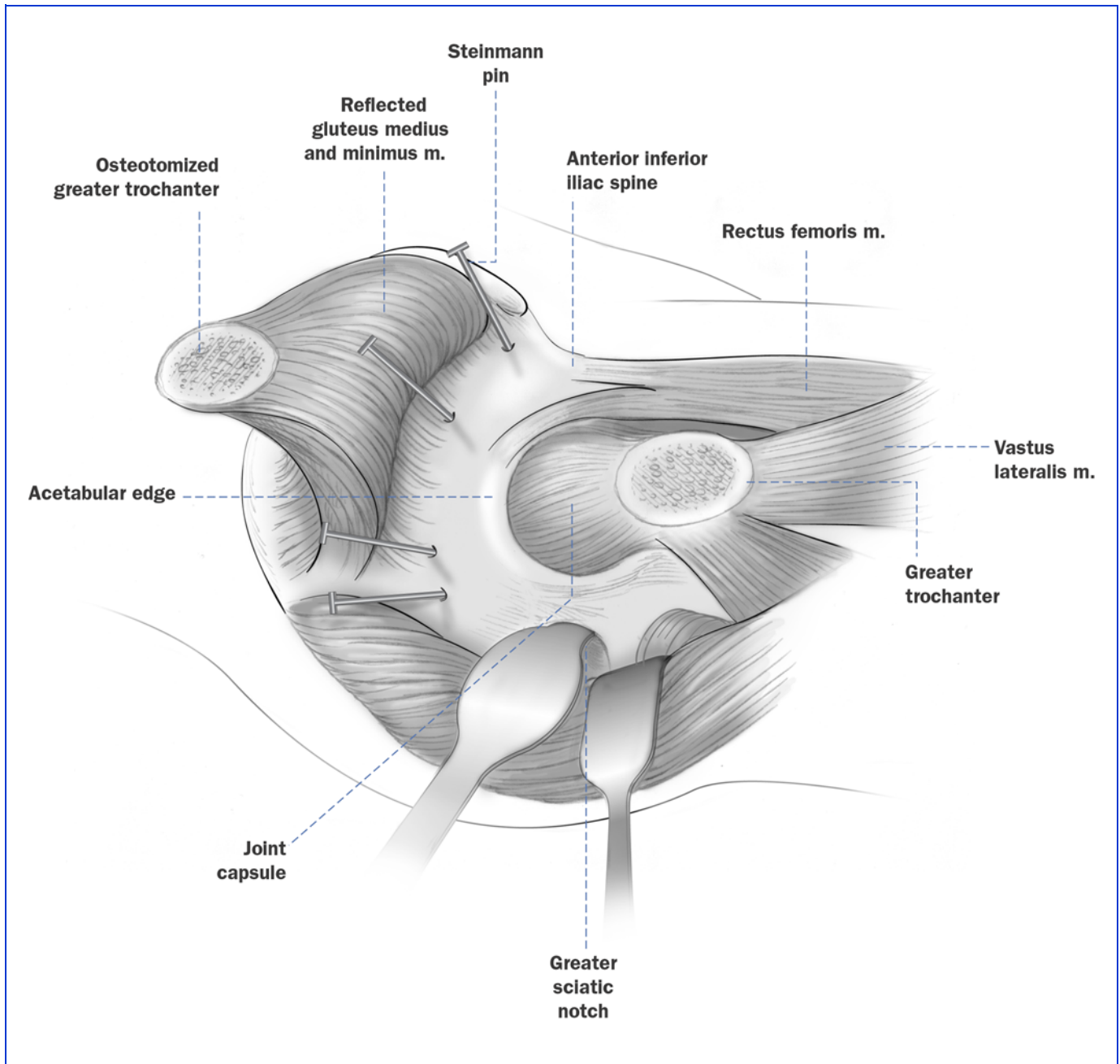


FIG. 5

The greater trochanter with its tendinous insertion of the gluteus medius and minimus is retracted proximally to expose the lateral surface of the ilium.

serve the insertion of the gluteus medius and minimus muscles. The greater trochanter with its tendinous insertion is then retracted proximally to expose the entire joint capsule

(Fig. 5). The reflected head of the rectus femoris is then incised at its insertion. The lateral surface of the ilium extending from the anterior inferior iliac spine to the greater

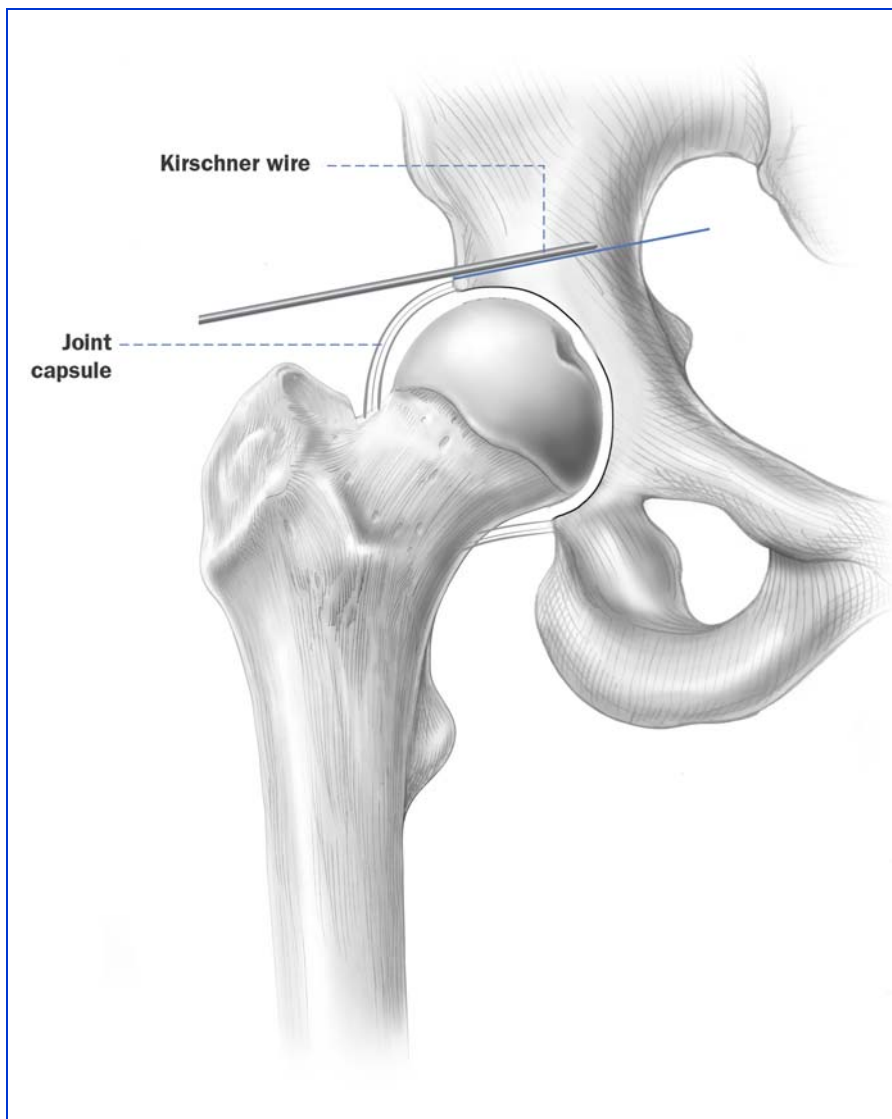
sciatic notch as well as the entire superior joint capsule is exposed with use of several Steinmann pins (Fig. 5).

With use of fluoroscopy, a 2-mm-diameter Kirschner wire



is inserted just tangential to the superior joint capsule as a guide for the osteotomy (Fig. 6). The dome-shaped osteotomy line is then drawn with use of electrocautery (Fig. 7). This line should run just proximal to the capsular attachments. The angle of inclination for the osteotomy line should be  $10^{\circ}$  or  $20^{\circ}$  upward in relation to the transverse plane

of the body. The dome-shaped osteotomy is performed with use of a reciprocating power saw (Fig. 8). After the osteotomy is completed, the distal osseous fragment is manually displaced medially and slightly posteriorly to improve lateral and anterior femoral head coverage (Fig. 9). Two 2-mm-diameter Kirschner wires are then in-



**FIG. 6**

A 2-mm-diameter Kirschner wire is inserted just tangential to the superior joint capsule as a guide for the osteotomy.

## CRITICAL CONCEPTS

### INDICATIONS:

The performance of a Chiari pelvic osteotomy for the treatment of advanced osteoarthritis due to hip dysplasia should be limited to patients with an age of less than fifty years who refuse total hip arthroplasty after having received preoperative information that a future revision arthroplasty is likely and who accept a clinical outcome that is predicted to be less favorable than that of total hip arthroplasty. The patient should also understand that clinical functional improvement requires several months after surgery.

### CONTRAINDICATIONS:

Radiographic evidence of severe dysplasia and subluxation with a preoperative center-edge angle of less than  $-10^{\circ}$  or complete obliteration of the joint space are contraindications to this procedure. Patients who are unwilling to accept a clinical outcome that is inferior to that of total hip arthroplasty also are not candidates for this procedure.

### PITFALLS:

The osteotomy level is one of the important factors influencing the outcome. The level of the osteotomy is considered to be appropriate when placed between 0 and 10 mm from the superior osseous margin of the acetabulum<sup>4</sup>. Intraoperative use of fluoroscopy or radiographs is recommended. Chiari emphasized that the risks of the osteotomy are more pronounced when it is performed at too low a level because the proximal osteotomized fragment presses excessively on the joint capsule,

*continued*

**CRITICAL CONCEPTS** | continued

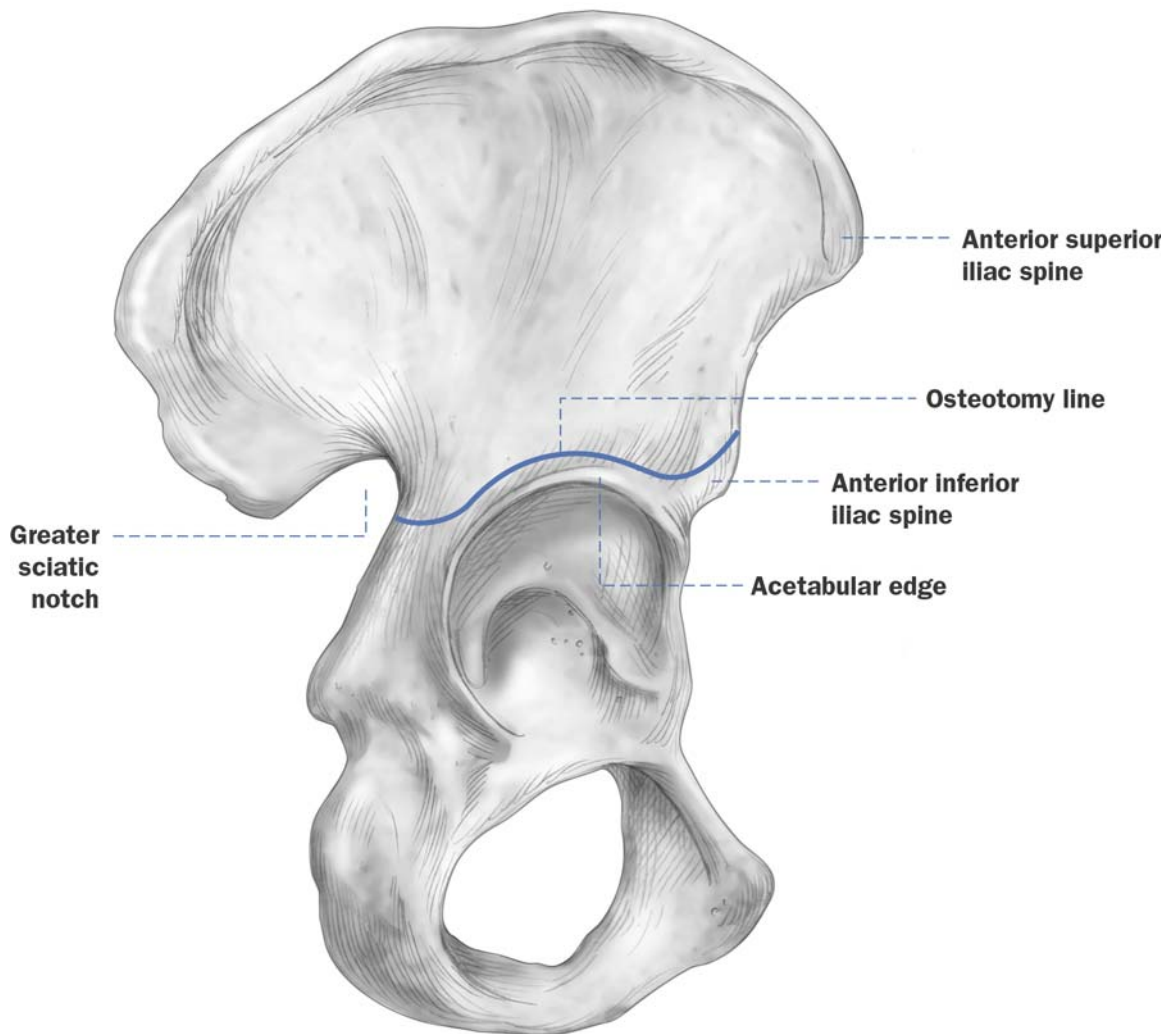
resulting in a poor outcome<sup>1</sup>. Efforts should be made to avoid an excessively low or high osteotomy.

Sufficient displacement of the fragment for the improvement in femoral head coverage is technically important. This also provides good acetabular bone stock for subsequent total hip arthroplasty. A postoperative center-edge angle of 30° to 35°, which usually requires 1.5 to 2.5 cm of medial displacement of the distal fragment, is ideal for femoral head coverage.

If the preoperative position of the greater trochanter is high-riding, distal advancement of the trochanter to an anatomically normal position is performed. Ideally, the proximal end of the greater trochanter should be at the same level as the center of the femoral head.

Preoperative education of the patient regarding the possibility of limited functional improvement is necessary.

*continued*



**FIG. 7**

The dome-shaped osteotomy line is drawn.

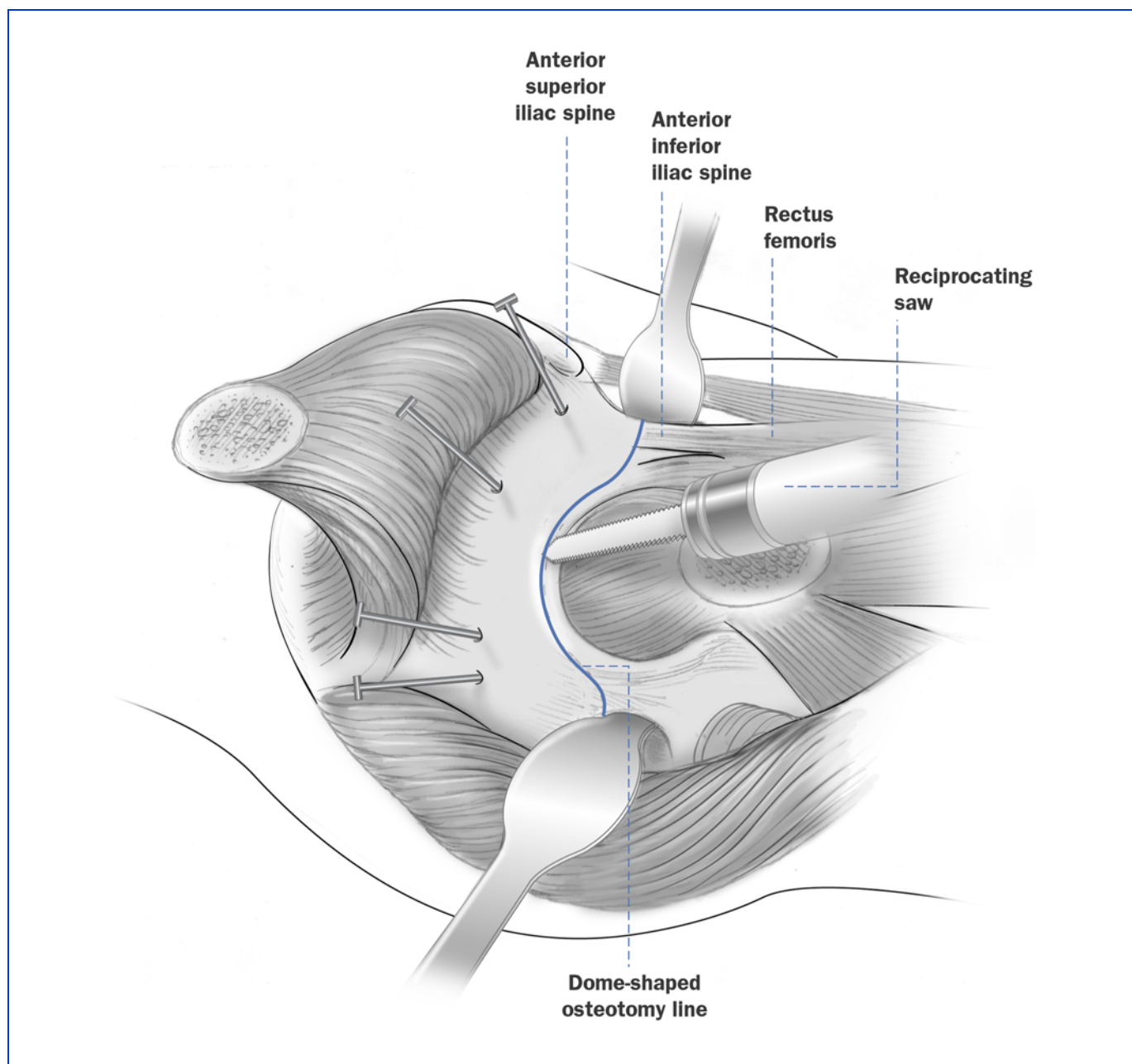


FIG. 8

The dome-shaped osteotomy is performed with use of a reciprocating power saw.

serted from the proximal part of the ilium into the ischium distally to fix the fragment in position. Two or three cancellous screws are then inserted to reattach the osteotomized greater trochanter (Fig. 10). The greater

trochanter is advanced distally by 1 to 2.5 cm if it is high-riding preoperatively. In hips in which a femoral valgus osteotomy is performed simultaneously, a cable system is used for fixation of the greater trochanter. A final

check of the improvement of femoral head coverage and the appropriate position of the greater trochanter is performed fluoroscopically. The reflected head of the rectus femoris is sutured to the straight head.

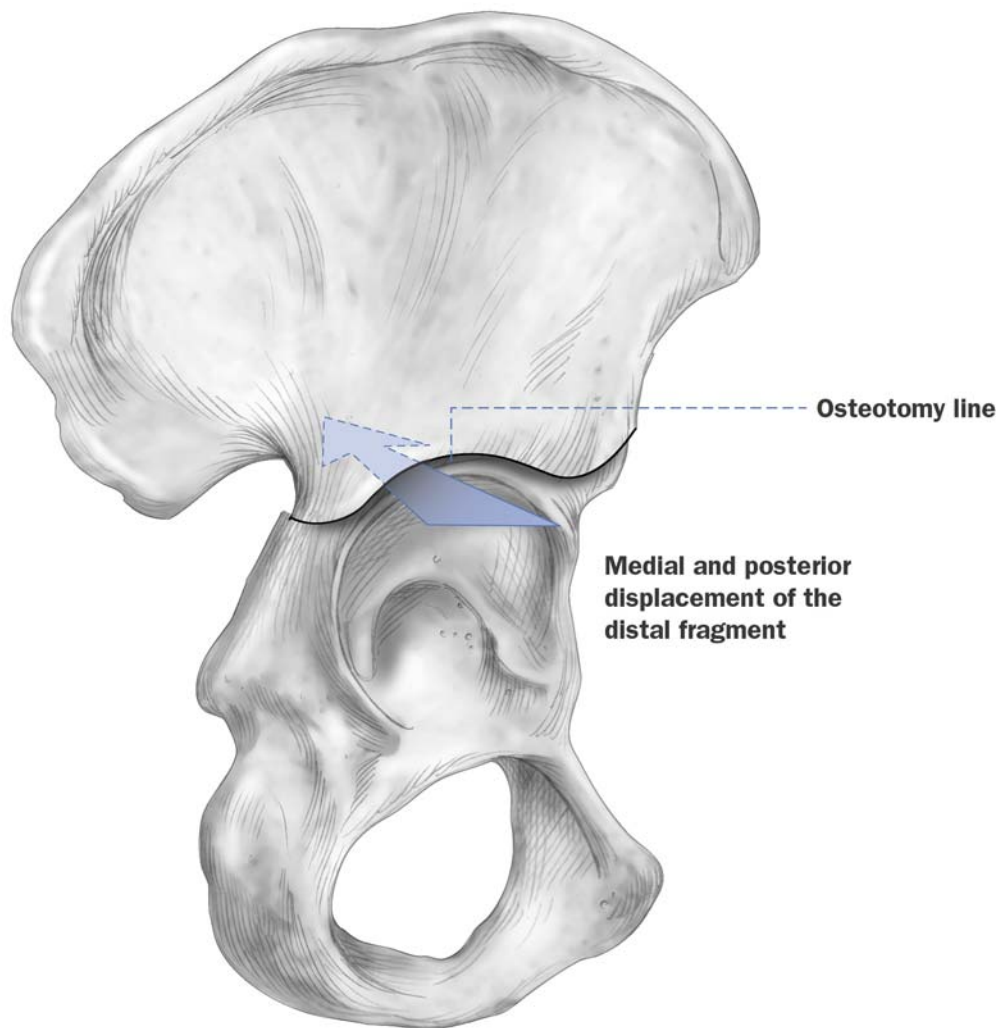
One 3-mm suction drain is inserted, and the wound is closed in layers.

A femoral valgus osteotomy is performed if the femoral head is distorted and preoperative radiographs show good congruity between the femoral head and the acetabulum with the hip in an adducted position. The femoral osteotomy is per-

formed through a lateral approach in which the incision is enlarged by adding a distal extension from the base of the greater trochanter, parallel to the femur, for a distance of 6 to 8 cm. The femoral shaft is exposed by detaching the vastus lateralis, and the osteotomy cut is performed with a power saw. A laterally based triangular

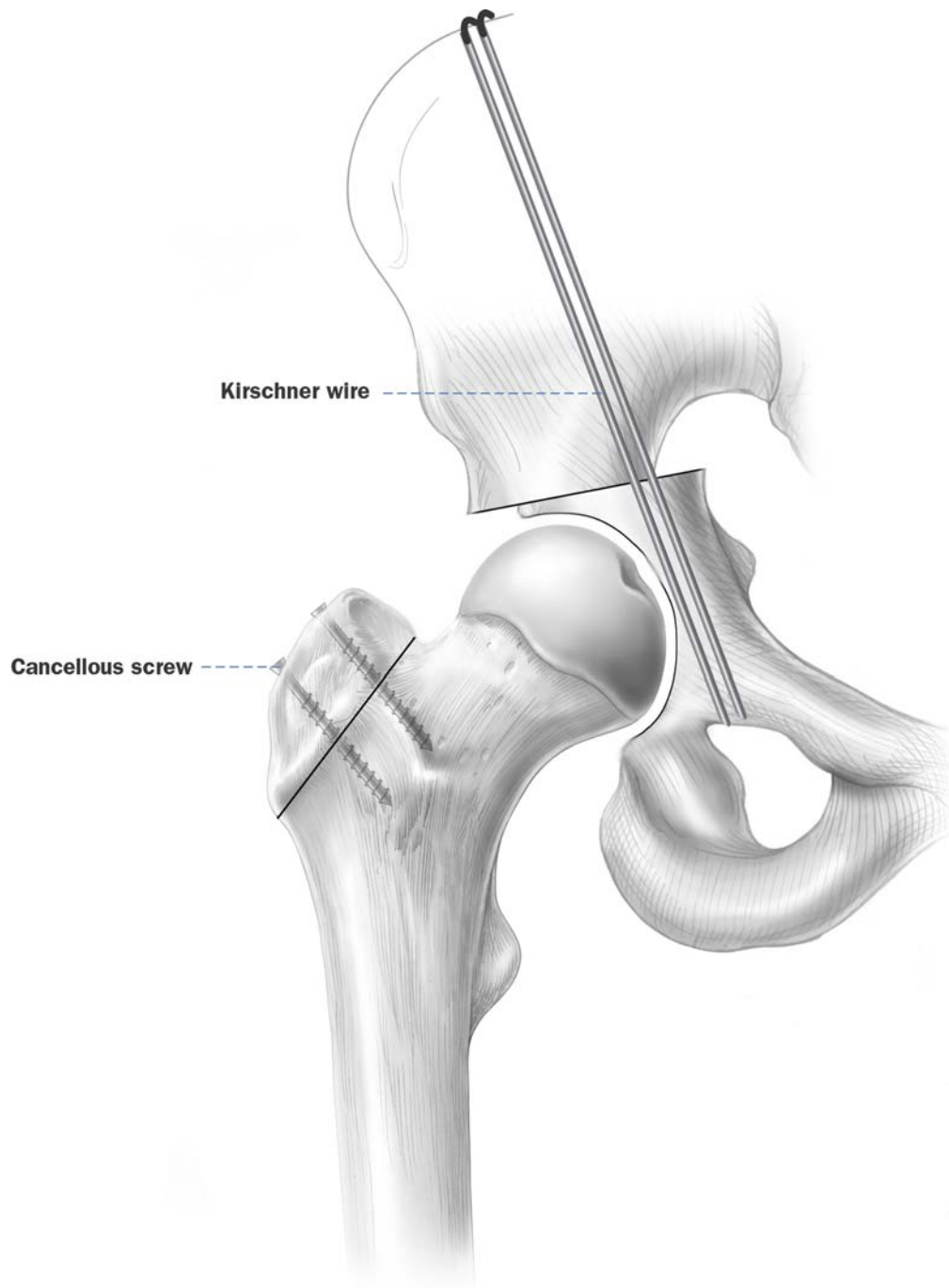
wedge is removed, and a 110° to 130°-angle plate is used for fixation (Fig. 11).

Postoperative traction or cast immobilization is not used. After two weeks of bed rest, the patient is allowed to use a wheelchair, and non-weight-bearing walking is allowed as tolerated. Partial weight-bearing is begun four



**FIG. 9**

Displacement of the distal fragment is performed by pushing it medially and slightly posteriorly.

**FIG. 10**

Two 2-mm-diameter Kirschner wires are inserted from the proximal part of the ilium into the distal part of the ischium. Two or three cancellous screws are used to reattach the osteotomized greater trochanter.

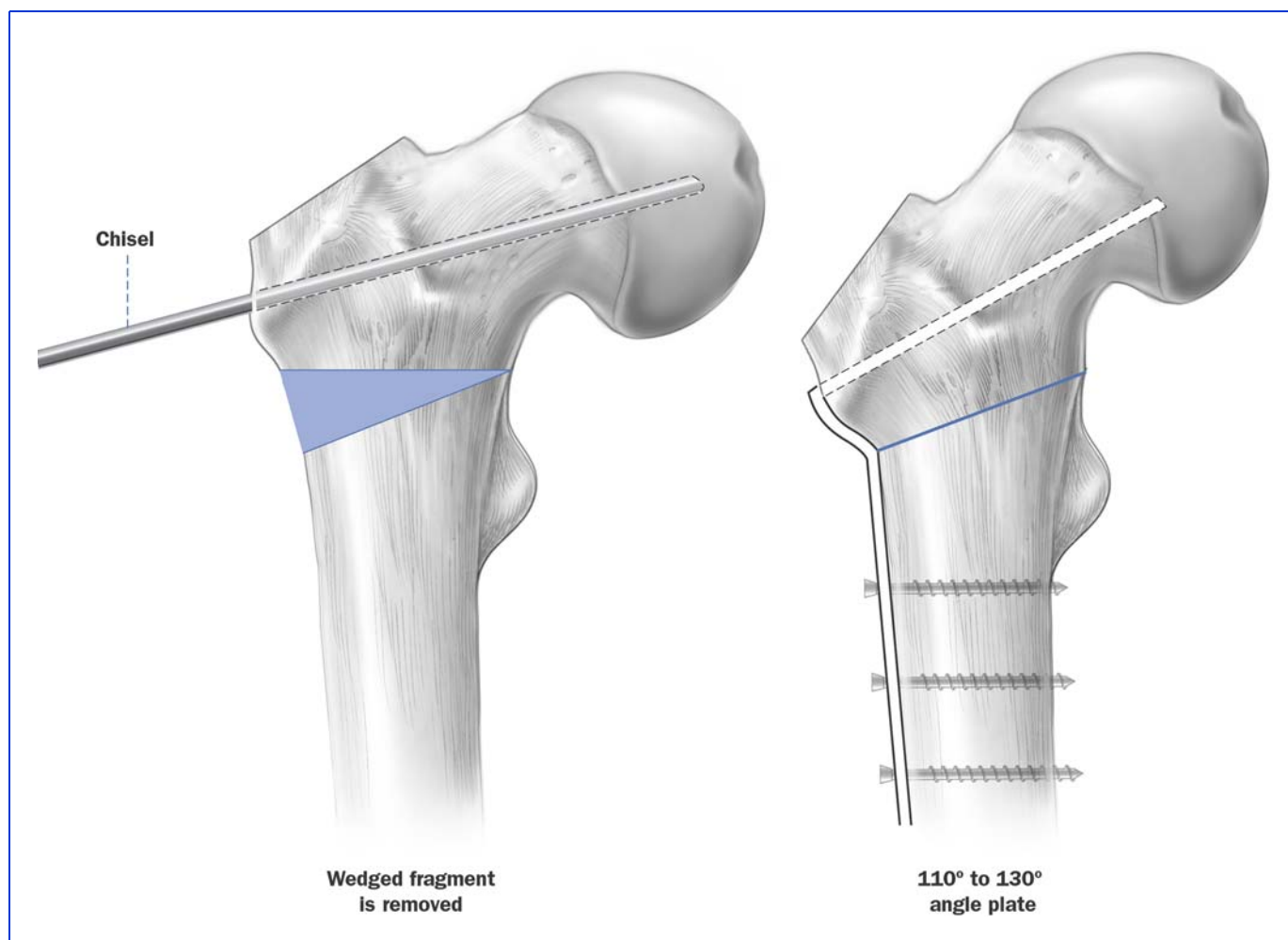


FIG. 11

Femoral valgus osteotomy. A laterally based triangular wedge is removed, and a 110° to 130°-angle plate is used for fixation.

## CRITICAL CONCEPTS | continued

### AUTHOR UPDATE:

In the original study, the osteotomized greater trochanter was reattached with use of two or three metallic screws. Since January 2004, we have used bioresorbable cancellous screws made of forged composites of hydroxyapatite particles and polylactic acid (Super-Fixsorb; Takiron, Osaka, Japan)<sup>5</sup>. Bioabsorbable screws offer several advantages compared with metallic screws. There is no need to remove the implant, problems associated with migration of the screws can be avoided, and gradual stress transfer to the bone may permit more complete bone-remodeling. However, poly-L-lactide screws carry a risk of fracture when used to reattach the osteotomized greater trochanter<sup>6</sup>. These screws have a threaded diameter of 6.5 mm, a core diameter of 4.0 mm, an unthreaded diameter of 4.5 mm, and a length of 35 to 70 mm. A screw-hole is made to penetrate the medial femoral cortex with use of a 4.4-mm-diameter drill-bit and is tapped to a threaded diameter of 6.6 mm. The screw is inserted with use of a screwdriver so that it penetrates the medial cortex. All screws have been inserted with a washer to increase interfragmental compression. Three screws are routinely used. Thus far, good bone union has been obtained within three to six months postoperatively in all hips without displacement of the greater trochanteric fragment.



to six weeks after surgery when a pelvic osteotomy alone has been performed and at eight weeks when combined pelvic and femoral osteotomies have been performed. Full weight-bearing is started ten to twelve weeks postoperatively. The two Kirschner wires are removed six weeks postoperatively with the patient under local anesthesia.

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