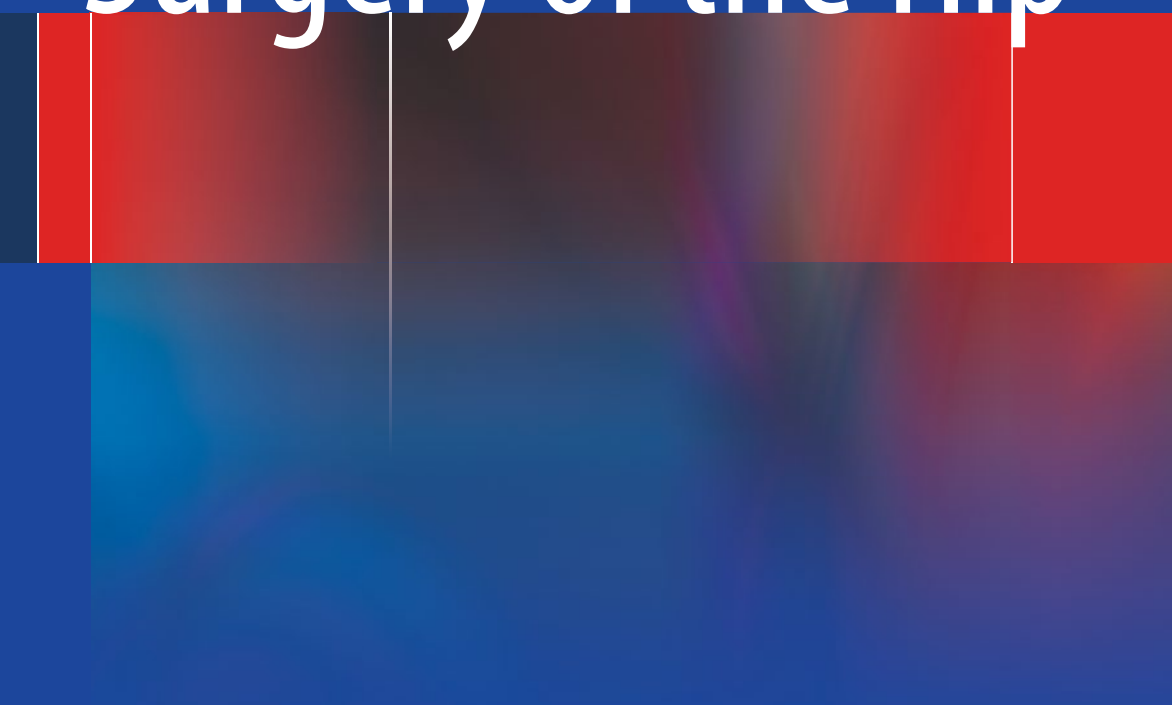
Dominique G. Poitout
Henri Judet *Editors*

Mini-Invasive Surgery of the Hip



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Chapter 1
Minimally Invasive Anterior Approach for Total Hip Replacement

Thierry Siguier, Marc Siguier, and Bertrand Brumpt

Abstract The minimally invasive anterior approach using intermuscular planes allows a surgical approach to the hip and implantation of a total hip prosthesis with no muscle, tendon, or trochanteric section, even partially. This is not offered by any other surgical approach. Preserving the abductors and gluteal muscles with an approach that is distant to them avoids the risk of limp attributable to insufficiency of the gluteus medius. The minimally invasive anterior approach for THR is a safe and reproducible technique providing low morbidity and fast postoperative recovery.

Introduction

The most widely used approaches for total hip replacements (THRs) are the posterior, transtrochanteric, direct lateral, and anterolateral approaches. Few publications describe the use of the anterior approach to do partial hip replacements or THRs [10, 11, 14]. In France, Judet and Judet [10] used Hueter's anterior approach since 1947 to implant neck replacements. They continued to use the anterior approach for THRs and spread the use of an approach derived from Hueter's approach, which removed the insertion of the tensor fasciae latae on the anterior iliac crest over 1–2 cm, sectioned the reflected tendon of the rectus femoris, and cut the piriformis muscle [11]. Since 1993 we have been using a minimally invasive anterior approach derived from this modified Hueter's approach. It allows for implantation of a total hip prosthesis with a 5- to 10-cm incision and no muscle or tendon section. It appeared to us that it was not necessary to perform any muscular or tendon section to obtain a good exposure. Postoperative rehabilitation is therefore simplified; the lack of muscular section allows quick indolence authorizing walking without

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crutches. Furthermore a short skin incision (usually 6–8 cm) is sufficient in most cases, as long as during the procedure it is aided by the "hints and tricks" elaborated over a 17-year experience. This operative procedure, established by Marc Siguier and Bertrand Brumpt a long time before hip mini invasive surgery was in vogue, has systematically been used since June 1993. A large continuous series of 1,037 primary total hip replacements performed following this procedure between June 1993 and June 2000 has been reviewed retrospectively and published [23].

Anterior Approach and Hip Anatomy

The choice of an anterior approach for hip prosthetic surgery is anatomically logical. The anterior situation of the hip and the natural anteversion of the acetabulum and upper femur present them facing the surgeon for a patient in the supine position.

If seen from behind, the organization of muscular masses around the posterior part of the hip makes it in fact a deep articulation. This is because of the presence of the buttock muscles and the external rotators recovering the capsular plan. When considering the front part of the hip, the disposition of muscular masses allows for an intermuscular approach.

As reported by Lowell and Aufranc about [15] the Smith Petersen's approach, anterior approach "passes through an internervous line, the muscles medially being innervated by the femoral nerve and upper lumbar roots, those laterally being supplied by the superior gluteal nerve." The anterior approach is away from the sciatic nerve and the superior gluteal nerve.

Surgical Technique

The procedure we describe is reproducible and can be used for all patients with classic cases of osteoarthritis of the hip in which there is no previous surgical history. This technique has been used without navigation or an image intensifier.

Patient Positioning

The patient is always positioned in the dorsal decubitus position on a Judet's orthopedic table allowing traction, external and internal rotation, and lowering of the inferior limb foot to the ground during the procedure (Fig. 1.1a–c).

The sacrum rests on a scooped out pelvic support. This pelvic support stabilizes the pelvis and also allows for an efficient transmission of the orthopedic table's traction forces.

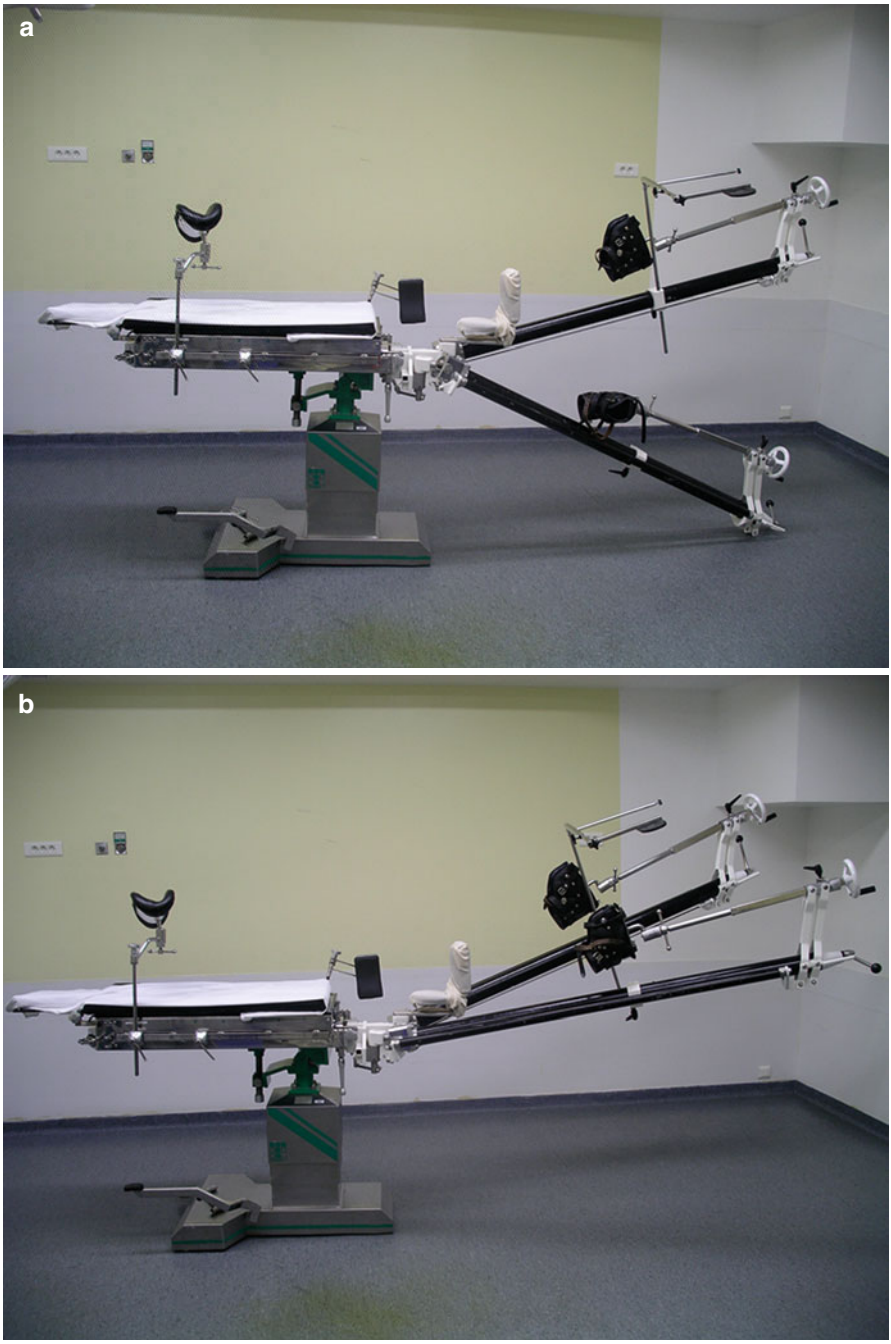

Fig. 1.1 (**a**–**c**) Judet's orthopedic table allowing a stable position of the pelvis and of the operated lower limb in the desired position

Fig. 1.1 (continued)

Iliac counterpressure on the opposite side helps to stabilize the pelvis regardless of the position of the limb being treated.

The opposite upper limb rests on a support, with the extended elbow. The operating side upper limb is positioned in front of the patient's chest, with a flexed forearm, in a way so as not to interfere with the surgeon's and first assistant's liberty of movements. Installation must be checked by the surgeon.

Two assistants help with surgery, but it can be done with just one assistant. The first assistant is positioned on the left of the surgeon for surgery on a right hip and on the right of the surgeon for surgery on a left hip. The second assistant is positioned opposite the surgeon. The operative field must expose the iliac crest in its anterior half and the anteroexternal surface of the thigh over approximately 20 cm.

For didactic purposes, the approach to the hip will be described in three planes.

Plane 1

The skin is incised parallel to an imaginary line joining the anterosuperior iliac spine to the head of the fibula. The incision is made approximately 2 cm behind this line (Fig. 1.2). The length of the skin incision ranges from 6 to 8 cm for a patient with normal body weight and can be increased in size if it does not provide sufficient comfort during surgery, particularly in obese or very muscular patients. It is rare to need an incision more than 10 cm long. With reference to the apex of the greater trochanter, which can be identified easily by palpation, the incision is made 2/3 above the apex and 1/3 below the apex (on the line described previously), that is, in

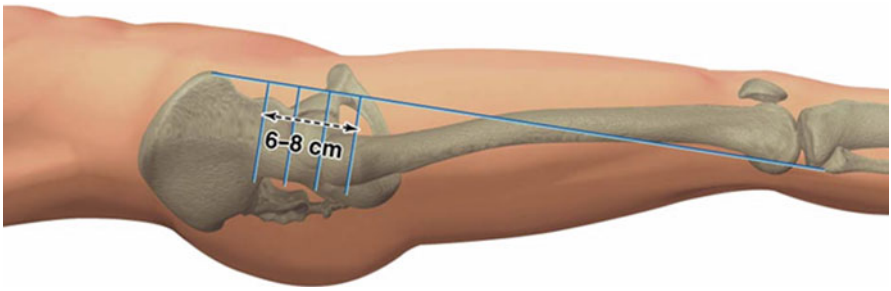

Fig. 1.2 The skin incision is positioned in reference to the apex of the greater trochanter and 2 cm behind an imaginary line joining the anterosuperior iliac spin to the head of the fibula

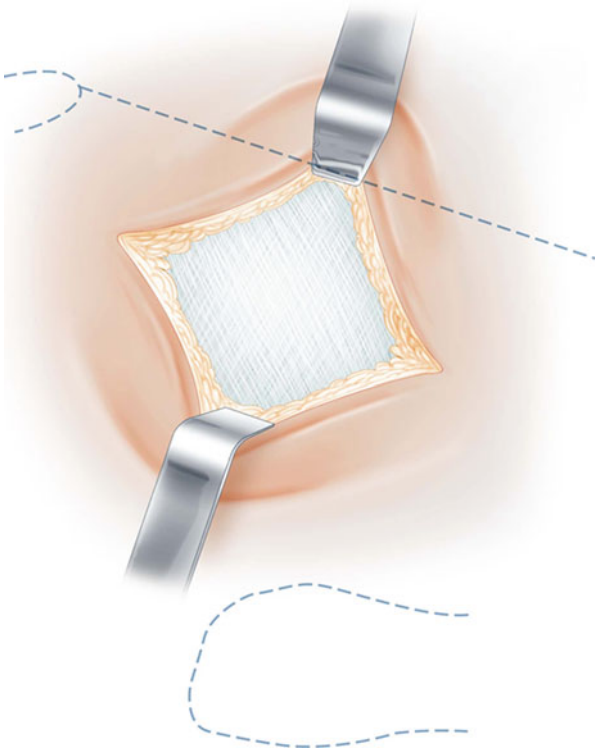

Fig. 1.3 The skin and fat tissue are incised to the superficial aponeurosis of the tensor fasciae latae

front of the greater trochanter (Fig. 1.3). After incising the subcutaneous fat and hemostasis, a buttonhole incision is made along the direction of the incision on the superficial aponeurosis of the tensor fasciae latae on the part which is most mobile on palpation. The correct location of the buttonhole incision is confirmed by the appearance of the muscle fibers, which are characterized because of their oblique path from above downward and from front to back (Fig. 1.4). The incision of the superficial aponeurosis of the tensor fasciae latae then is to be continued over the

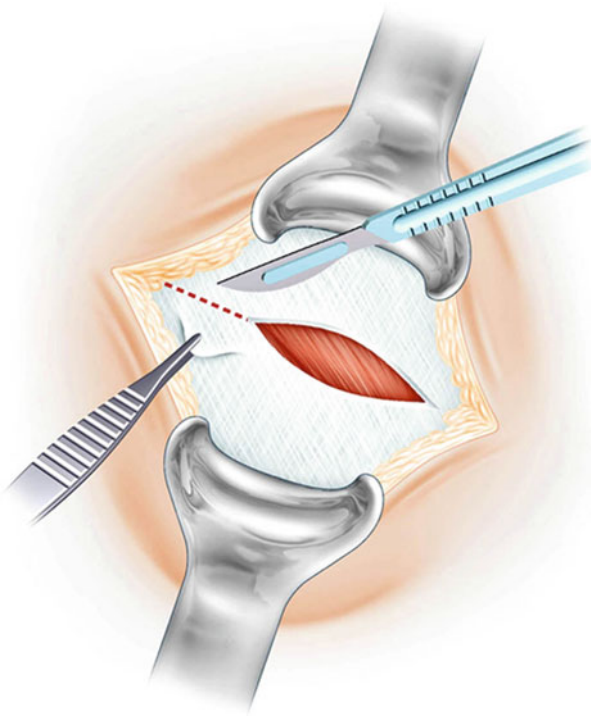

Fig. 1.4 A buttonhole incision is made on the superficial aponeurosis of the tensor fasciae latae along the direction of the incision

entire length of the skin incision and beyond, sliding the superior and inferior angles of the incision upward and then downward successively using a small retractor. The internal edge of the superficial aponeurosis of the tensor fasciae latae then is grasped with dissecting forceps and raised with a firm hand to allow a rasp to release the entire tensor fasciae latae from its aponeurosis over its anterointerior side (Fig. 1.5). A retractor held by the first assistant then is used to displace the tensor fasciae latae muscle laterally, and another retractor held by the second assistant is used to displace the sartorius muscle medially. Correctly balanced retraction then will allow the second plane to be exposed perfectly.

Plane 2: Innominate Aponeurosis and Anterior Circumflex Vessels

This plane is located immediately on the deeper surface of the tensor fasciae latae that is pulled aside by the first assistant. The innominate aponeurosis may be more or less thick. The anterior circumflex vessels, which are visible beneath this aponeurosis, must be identified to tie them off or coagulate them. The presence of one or two "sentinel" veins emerging at the superficial surface of the deep innominate aponeurosis helps identify the bundle of circumflex vessels which vary in number, volume, and location among patients. After these have been controlled (Fig. 1.6),

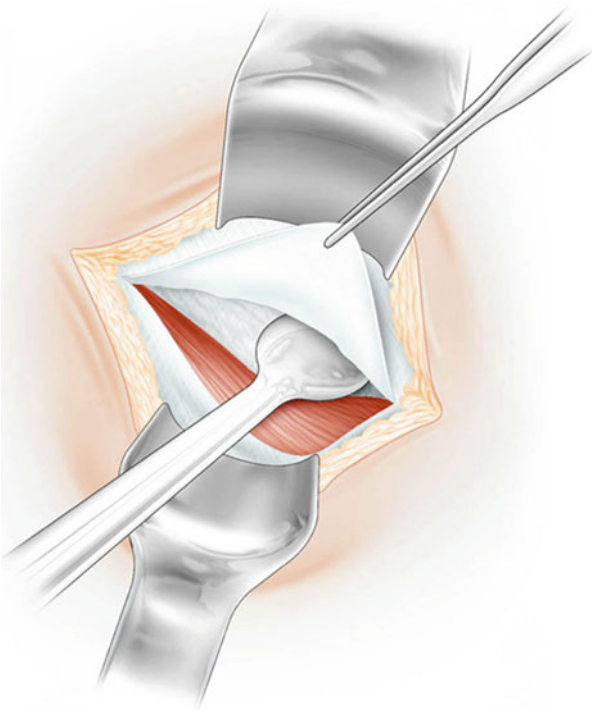

Fig. 1.5 The tensor fasciae latae muscle is released from its superficial aponeurosis after completely incising it

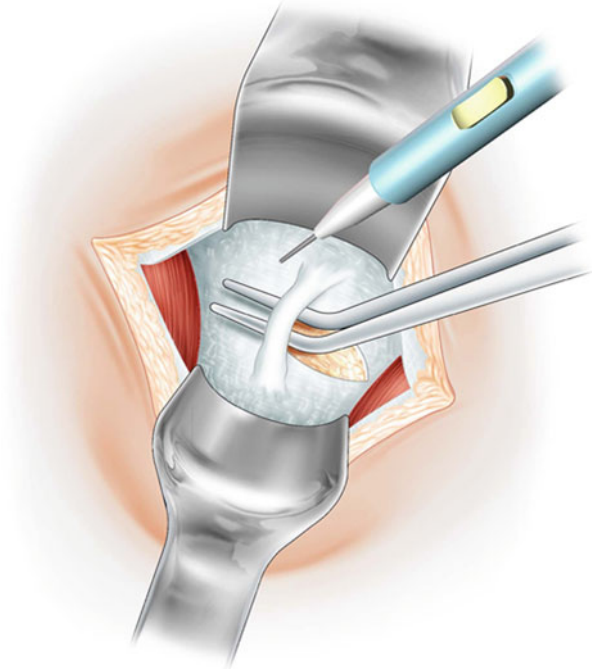

Fig. 1.6 The innominate aponeurosis and the anterior circumflex vessels are correctly exposed between the posterior retractor removing the tensor fasciae latae muscle and the anterior retractor removing the anterior rectus femoris muscle. The anterior circumflex vessels are ligated or coagulated

complete incision of the innominate aponeurosis may be done easily over the entire length of the incision. The incision begins upward at the level of the reflected tendon of the rectus femoris, which is preserved. Below, the aponeurosis becomes thinner and disappears. Complete incision of the innominate aponeurosis reveals a fatty space leading to the third plane.

Plane 3: Anterior Capsular Plane

The fatty tissue located beneath the innominate aponeurosis is incised from the top downward and from the outside inward to identify (without damaging) the aponeurosis of the iliacus muscle, which covers the anterior surface of the joint capsule to a greater or lesser extent depending on the patient. As soon as the external edge of the iliacus muscle has been identified, the thin perimysium which surrounds it is incised, and a first pointed retractor, held by the second assistant, is slid to the inferior surface of the neck of the femur, preserving the attachment of the iliacus muscle to the anterior joint capsule as much as possible. In its upper part, slightly beneath the reflected tendon of the anterior rectus, the external edge of the iliacus muscle is pulled upward with dissecting forceps, and a small white avascular space—the attachment of the direct tendon of the anterior rectus femoris onto the joint capsule—then can be dissected. A second pointed retractor, also held by the second assistant, is slid into this space. This then pulls aside the iliacus and rectus femoris muscles pressing on the anterior wall of the acetabulum. The retractor must be level with the anterior capsule and its insertion onto the anterior wall, beneath the two muscles described previously and not in the body of the muscle, to avoid the risk of damaging the femoral nerve with the pointed tip. Tilting the retractor exposes the inferior part of the anterior aspect of the joint capsule, sparing the area of attachment between the iliacus muscle and the anterior surface of the capsule. A third pointed retractor, held by the first assistant, will slide easily to the superior edge of the neck of the femur, between gluteus minimus and capsule, to clearly expose the anterior surface of the neck. The exposure can be improved even more: the first assistant who still has one free hand can pull aside the internal edge of the tensor, outward, with an American retractor (Fig. 1.7). The full surgical approach to the hip then is complete.

The methods of exposure and details that allow a total replacement to be done comfortably using this minimally invasive approach will be described.

Anterior Capsulectomy or Anterior Capsulotomy

Whether anterior capsulectomy is done with conventional or diathermal scalpel, a small lip must be fashioned on the anterior edge of the acetabulum. An internal flap which remains adherent to the deep surface of the iliacus muscle and protects it also must be made. This capsulectomy approximates 40 % of the surface of the whole capsule (Fig. 1.8).

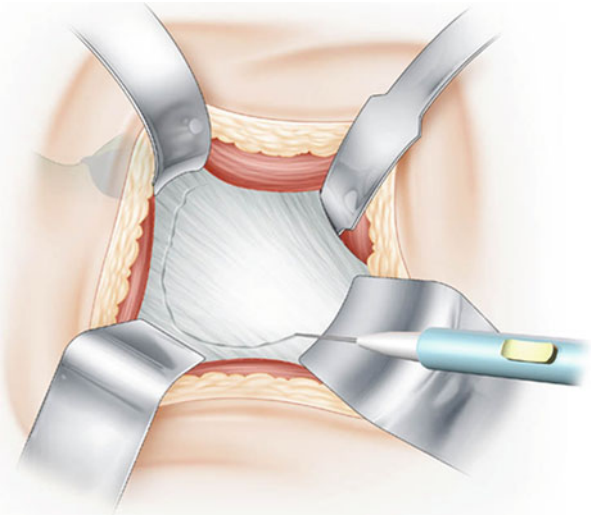

Fig. 1.7 The exposed anterior capsule of the hip and the anterior capsulectomy are shown. The anterior retractor pulls aside the iliacus and rectus femoris muscles. The inferior retractor is slid to the inferior surface of the neck of the femur. The superior retractor is slid to the superior surface of the neck of the femur

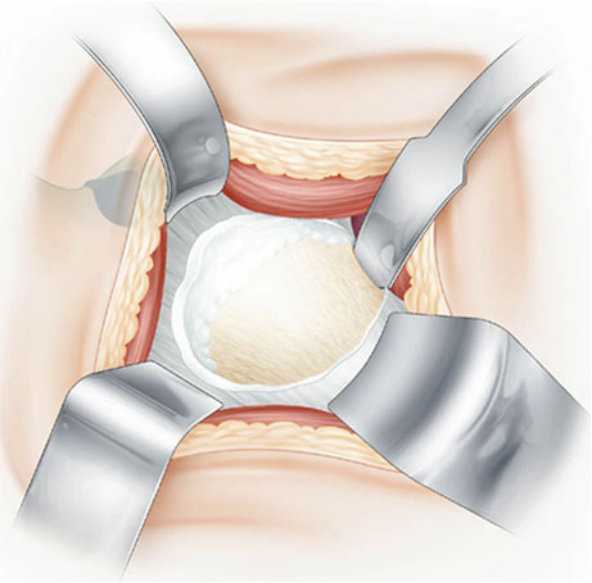

Fig. 1.8 The femoral head and neck are exposed after the partial anterior capsulectomy. The portion of excised anterior capsule is shown in the dissecting forceps

The anterior capsulectomy can be deliberately chosen by the surgeon. However, the capsulectomy must be performed in case of preoperative stiffness in extension, important stiffness, or in case of a planned shortening correction.

An anterior capsulotomy with a capsular repair at the end of the procedure can be done in all other cases. The capsulotomy will then be performed in a U-form with a superior acetabular hinge (Fig. 1.9). The exposure is made easier by the positioning of the curve retractor under the capsular flap, in contact with the anterior acetabulum's wall. This capsular flap protects the anterior muscles from the retractor.