
2.1

Muscles Surrounding the Hip

The hip joint is completely surrounded by muscles. The functions of the muscles can be inferred on the basis of their paths. The points of origin and attachment of the muscles surrounding the hip are illustrated in Figs. 2.1 and 2.2 (ventral view), in Figs. 2.3 and 2.4 (dorsal view) and 2.5 (lateral view). These drawings also show the attachment of the articular capsule of the hip joint and the position of the epiphyseal cartilage. The reflected head of the rectus femoris muscle is attached to the ventral capsule of the hip joint cranially.

Considering the anatomy of the hip joint for surgical purposes, it is important to differentiate between the superficial muscles and the deep muscles. The superficial muscles at the height of the hip joint consist of the sartorius muscle in a ventral position; lateral to this is the tensor fasciae latae muscle inserting into the fascia of the iliotibial tract, into which the gluteus maximus muscle leads dorsally. This is shown in the sectional drawing in Fig. 2.6.

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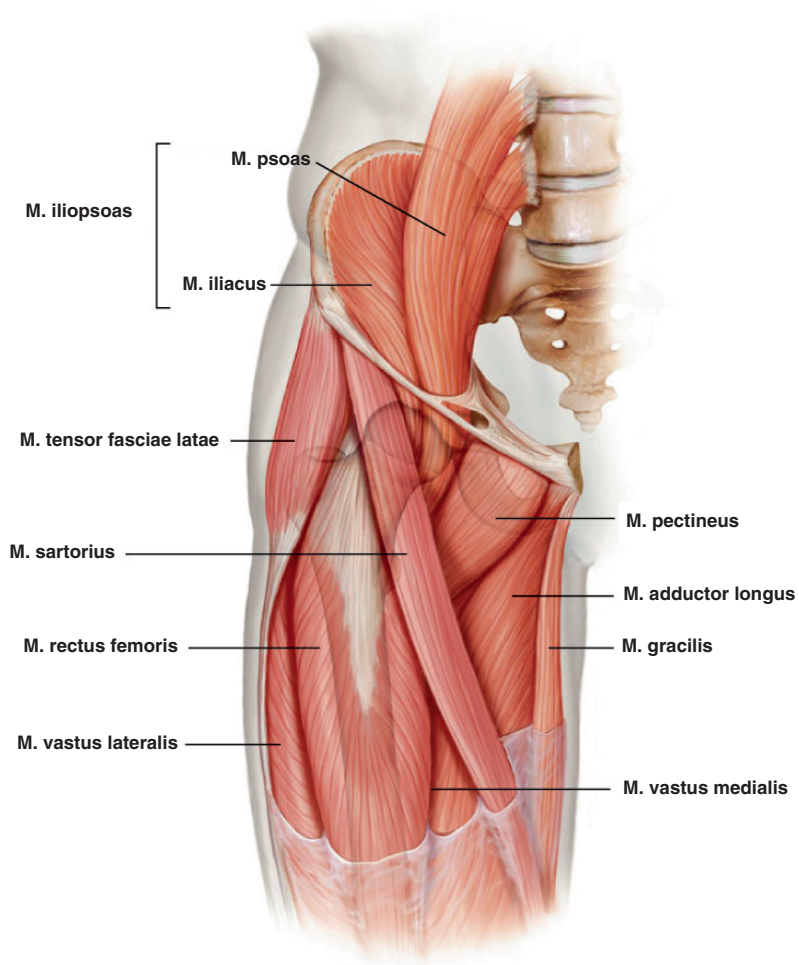


Fig. 2.1 Superficial layer of the muscles – ventral aspect of the hip joint

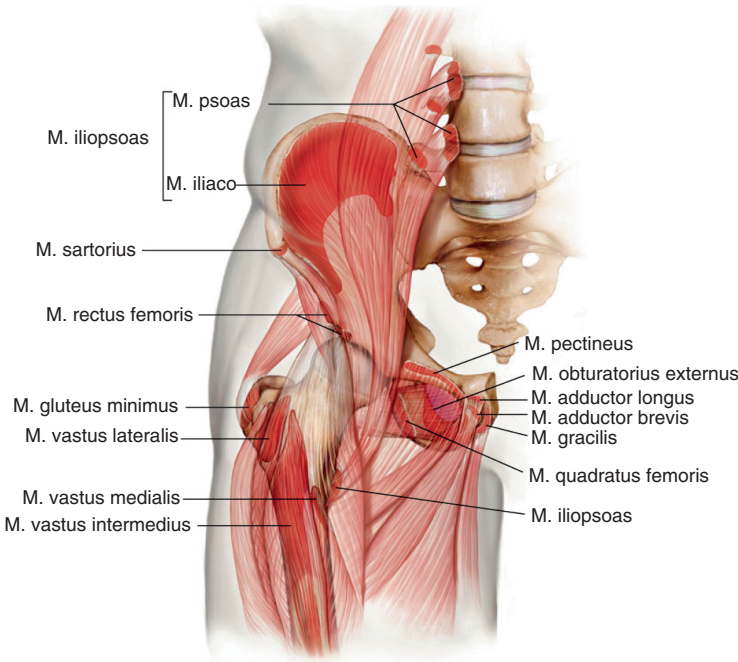


Fig. 2.2 Deep layer of the muscles – ventral aspect of the hip joint

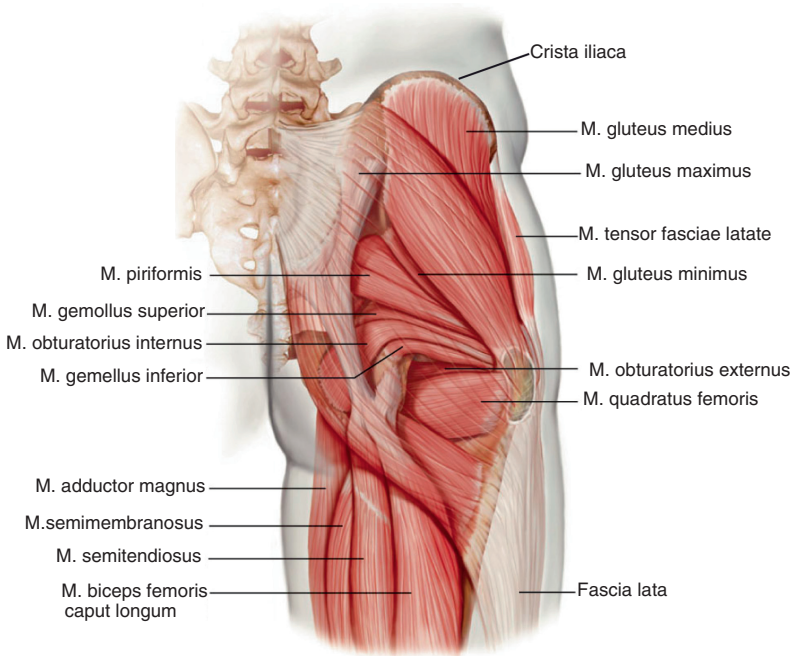


Fig. 2.3 Superficial layer of the muscles – dorsal aspect of the hip joint

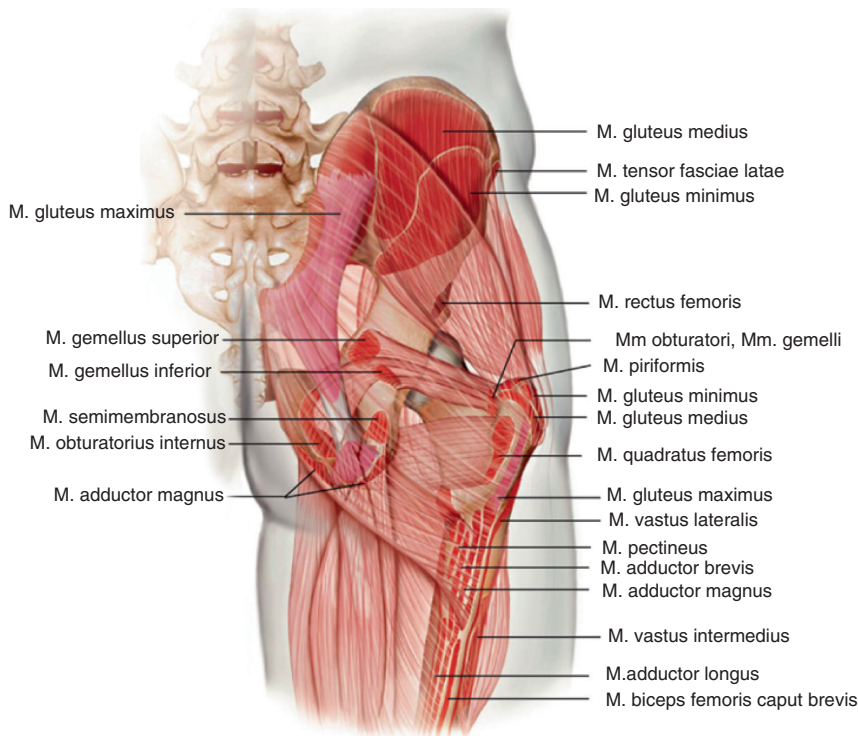


Fig. 2.4 Deep layer of the muscles – dorsal aspect of the hip joint

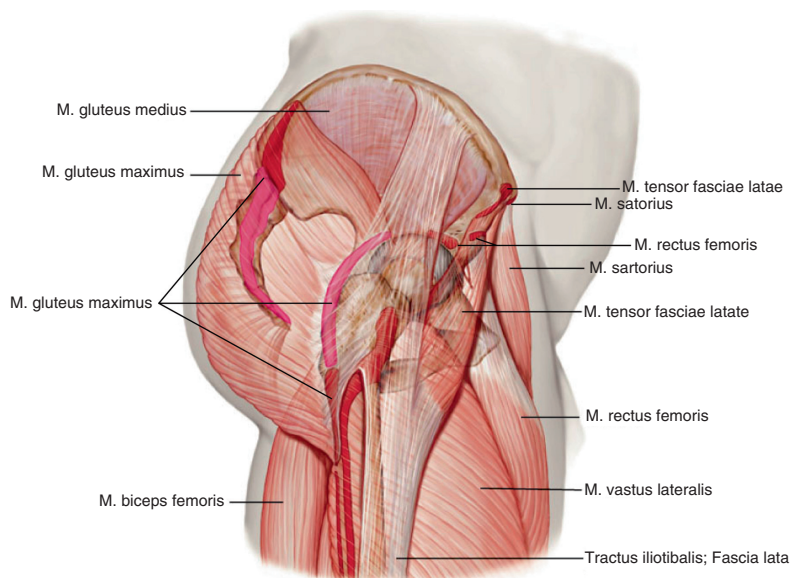


Fig. 2.5 Muscles and fasciae – lateral aspect of the hip joint

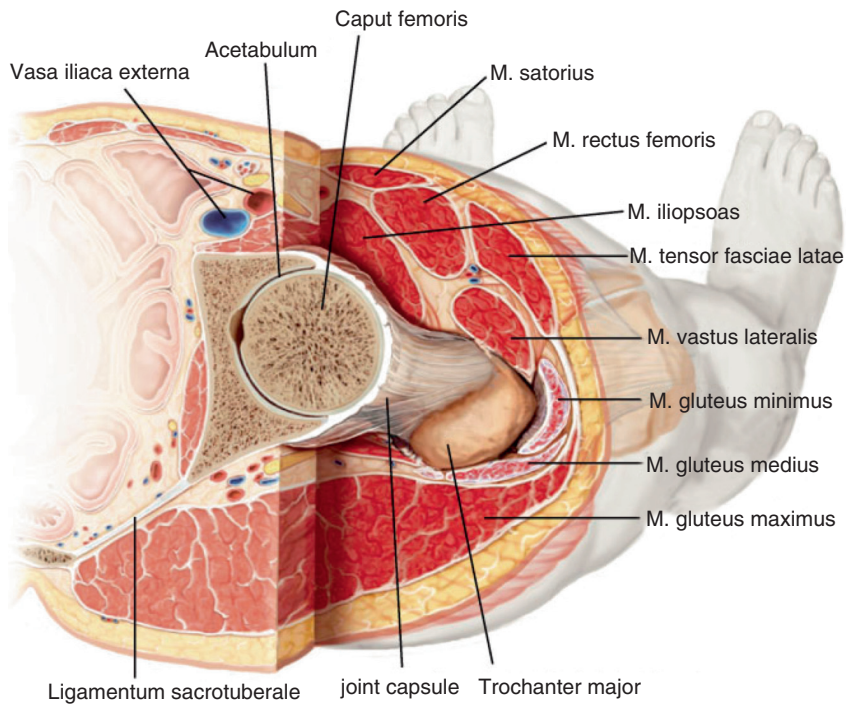


Fig. 2.6 Soft tissues around the hip joint

2.2

Nerves in the Anatomical Vicinity of the Hip Joint

The nerves running in the anatomical vicinity of the hip joint are decisive with regard to the surgical approaches to the joint. It is possible to reach the hip joint safely only if they are not endangered. With specific reference to treatment of trauma, preparatory exposure of the nerves is important for lowering the risk of iatrogenic damage.

Five nerves are of significance when exposing the hip joint for surgery. These are the femoral nerve, the lateral cutaneous nerve of the thigh, the superior and inferior gluteal nerves and lastly, the sciatic nerve, which is the largest nerve in the human body.

2.3

Femoral Nerve (Fig. 2.7)

Origin: The femoral nerve originates in the lumbosacral plexus, made up of the first to fourth lumbar segments.

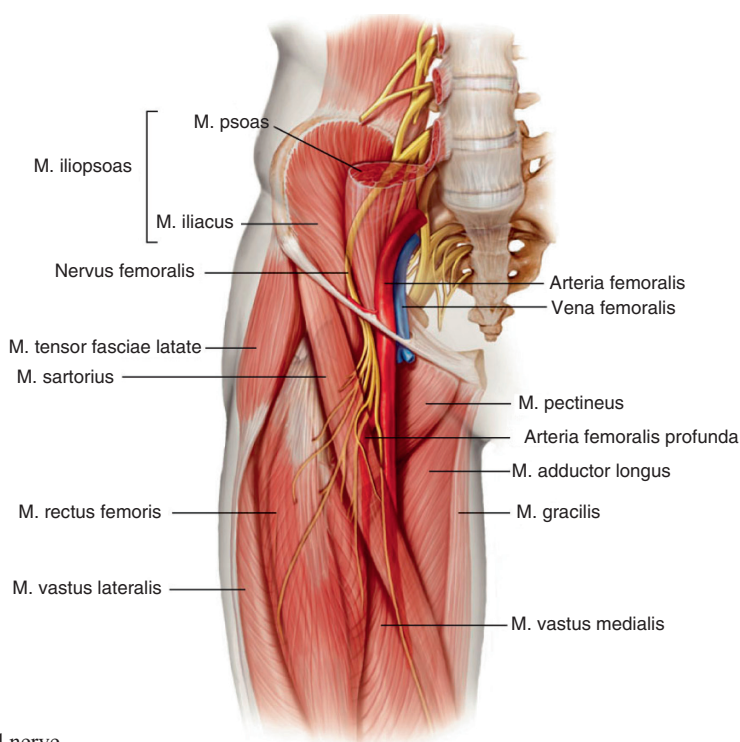


Fig. 2.7 Femoral nerve

Path: The femoral nerve is located laterally to the femoral vein and femoral artery. It runs down along the iliacus muscle beneath the inguinal ligament.

Innervation: The femoral nerve innervates the psoas major and minor muscles, the iliacus muscle, the quadriceps femoris muscle, the sartorius muscle and the pectineus muscle.

Risks: Due to its location ventral to the anterior edge of the acetabulum, this nerve is at risk of pressure-related damage when exposing the joint because of the position of the retractor on the anterior edge of the acetabulum. Direct injury is also possible if, by mistake, entry is made ventral to the psoas muscle. Preparation of this nerve is important for avoiding damage, in particular, when using the ilioinguinal approach. Caudal enlargement of the anterior approach to the hip joint leads to injury of the nerve branches leading into the sartorius and quadriceps femoris muscles.

2.4

Lateral Cutaneous Nerve of the Thigh (Fig. 2.8)

Origin: The lateral cutaneous nerve of the thigh is a purely sensorial branch of the lumbar plexus arising from the second and third lumbar segments.

Path and innervation: The lateral cutaneous nerve of the thigh runs along the iliacus muscle, directly medial to the superior iliac spine and beneath the inguinal ligament, after which it separates into several branches that lead out over the sartorius muscle and through the fasciae, and then branch out further in order to provide the sensory function of the skin of the lateral thigh.

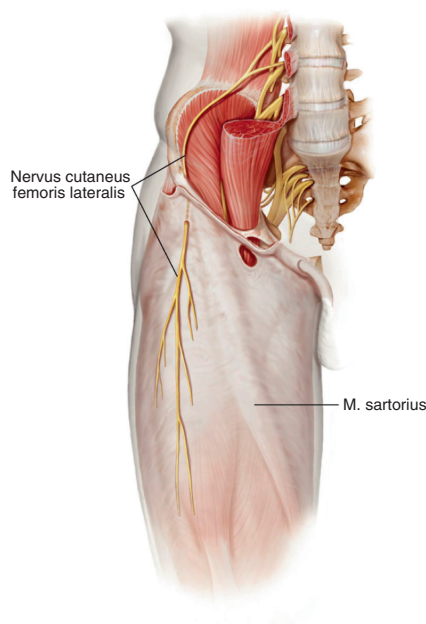


Fig. 2.8 Lateral cutaneous femoral nerve

Risks: With the anterior approach to the hip joint, the nerve is in the immediate anatomical vicinity. In the event of swelling in the hip joint region, in particular, following the trauma of surgery, a direct nerve compression syndrome can occur below the inguinal ligament in the form of paraesthetic meralgia. With the anterior approach to the hip joint, lateralisation of the skin incision by about 2 cm away from the anterior superior iliac spine can considerably reduce the risk of damaging this nerve.

2.5

Superior and Inferior Gluteal Nerves (Fig. 2.9)

Origin: The superior gluteal nerve is a nerve of the lumbosacral plexus arising from the first lumbar vertebra and leading as far as the sacrum.

Path: Together with the artery and vein of the same name, this nerve runs through the suprapiriform foramen, that is, that part of the ischiatic foramen above the piriformis muscle.

Innervation: The superior gluteal nerve consists almost exclusively of motor nerve fibres and innervates the gluteus medius and minimus muscles as well as parts of the tensor fasciae latae muscle.

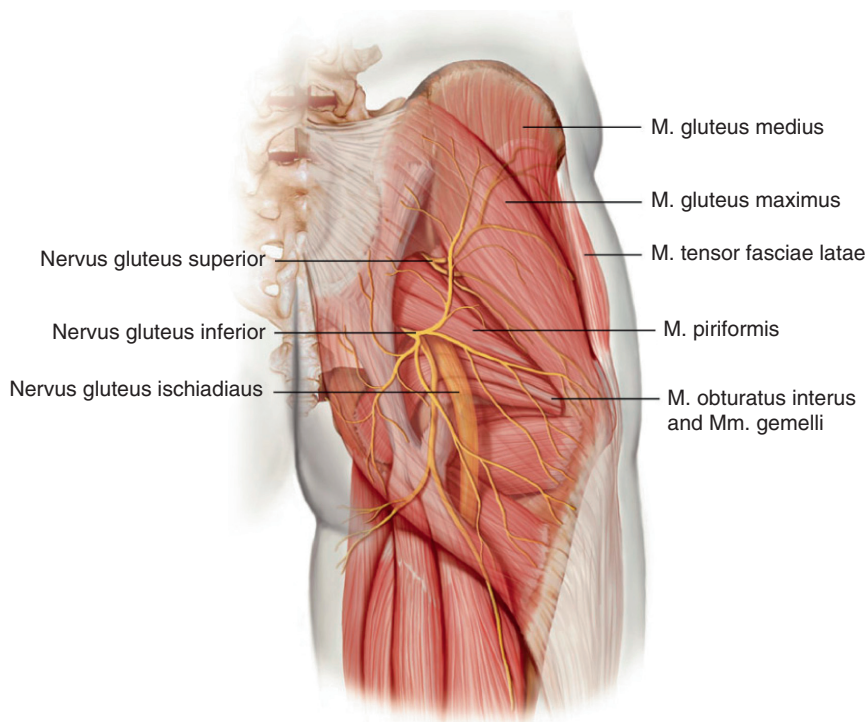


Fig. 2.9 Gluteal nerves

Risks: Dissection of the gluteus minimus or medius muscles leads to damage to single peripheral branches. There is also a risk of indirect damage due to pressure caused by the retractor. Incorrectly carried out intramuscular injections in the buttock, too, can cause iatrogenic damage to this nerve.

The inferior gluteal nerve also arises from the lumbosacral plexus, leading out from nerve endings L5–S2.

Path: Together with the blood vessels of the same name, the sciatic nerve and the posterior cutaneous nerve of the thigh, the pudendal nerve and internal pudendal artery, this nerve runs through the so-called infrapiriform foramen, that is, that part of the ischiatic foramen located caudally to the piriformis muscle.

Innervation: The inferior gluteal nerve contains almost exclusively motor nerve fibres and innervates the gluteus maximus muscle.

Risks: This nerve can be damaged by intramuscular injections in the buttock carried out incorrectly. With the transmuscular approach, single nerve fibres serving the peripheral areas are potentially endangered.

2.6

Sciatic Nerve (Fig. 2.10)

The sciatic nerve arises in the lumbosacral plexus, originating from L4 to S5. It runs through the infrapiriform foramen, that is, the part of the sciatic foramen situated below the piriformis muscle. In the region of the hip joint, it lies dorsally against the obturator

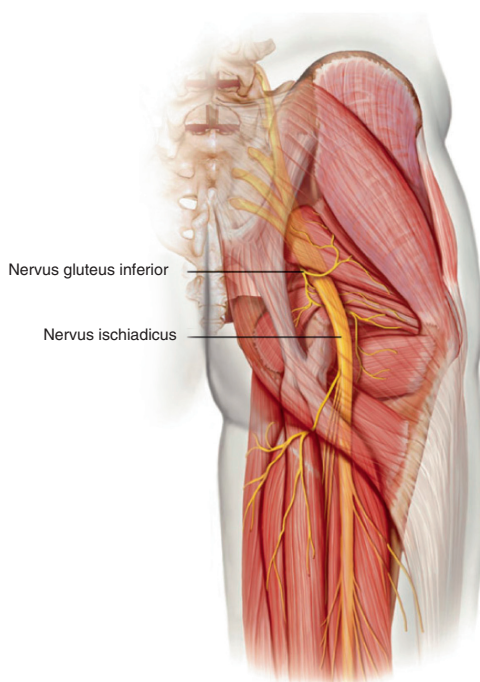


Fig. 2.10 Sciatic nerve

internus muscle and the quadratus femoris muscle. Below the hip joint, it branches out into the common peroneal nerve and the tibial nerve.

Innervation: The sciatic nerve supplies most of the thigh muscles: the gemelli, the quadratus femoris, the obturator internus, the biceps femoris, the semitendinosus and the semimembranosus. If this nerve is damaged, motor and sensory damage to the lower leg and to the foot region will also result.

Risks: Neuroparalysis is a frequent occurrence associated with fractures of the pelvis or the femur or dislocations of the sacroiliac joint. Iatrogenic damage to this nerve can be caused by intramuscular injections and also by pressure caused by the retractor, in particular, when the posterior or posterolateral approaches to the hip are used.

The hip joint can be reached by means of several different approaches (Fig. 2.11). The nerves and blood vessels surrounding the hip joint, in particular, condition the choice of possible approaches. Almost all surgeons favour an approach based on their own training and experience and on their interpretation of published results. Particular diseases and also the use of the various different implants and instruments may often be associated advantageously with specific approaches. All approaches to the hip joint have many years of history behind them. In recent years, interest in small “minimally invasive” approaches has rapidly increased. All these minimised approaches are based on the previously known approaches. Many are named after several different authors. Any comparison between different approaches is difficult, for a number of reasons. For example, no standard terminology has been developed up to now for classing the various different techniques. Accordingly,

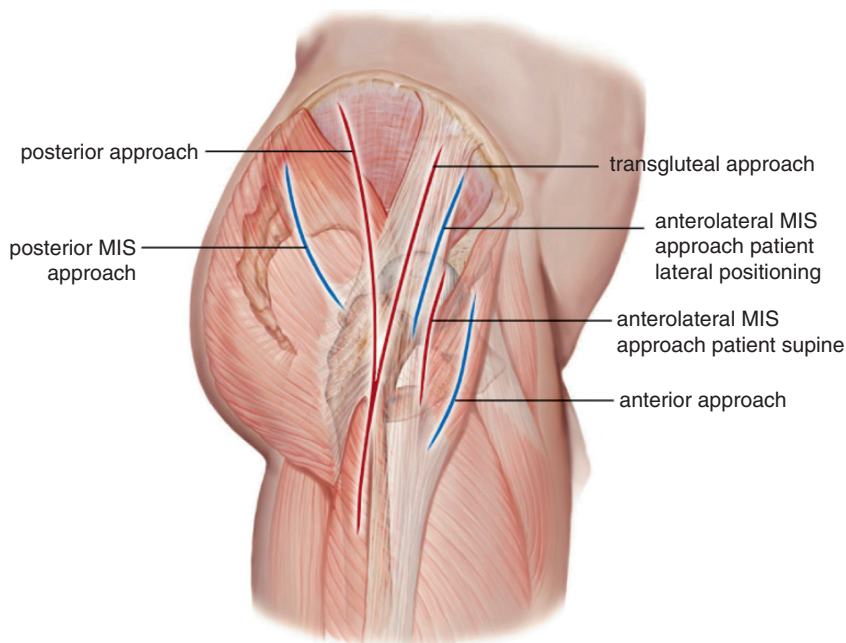


Fig. 2.11 Skin incisions for THR surgery

there is no precise linguistic usage. Expressions such as transgluteal, direct lateral or anterolateral are used by many surgeons and also by authors to indicate both different and the same procedures. Published descriptions are often short and accompanied by very few illustrations or none at all. The surgical anatomy of the hip joint is not univocally described in the orthopaedic literature. What is more, the approaches also differ in terms of skin incision and of management of the superficial and deep muscles as well as the articular capsule.

An anatomical classification is therefore helpful. To make the following table easier to understand, the best-known authors are indicated with the anatomical nomenclature. Therefore see also the references.

Anatomical definition	Anatomical description	Classical authors	MIS authors
Posterior	Splitting of gluteus maximus muscle	Moore, Osborne, Kocher Langenbeck “Southern approach”	Wenz, Sculco, Roth, Nakamura
Posterolateral	Between gluteus maximus muscle and fasciae latae	Henry, Marcy and Fletcher	Goldstein
Transgluteal	Splitting of gluteus medius muscle	Bauer, Hardinge, Learmonth	Berger, Higuchi
Transtrochanteric	Trochanteric osteotomy	Ollier, Vidal, Digastrique, Courpied	Ganz
Anterolateral	Between gluteus medius muscle and tensor fasciae latae muscle	Watson Jones, McKee Farrar	Röttinger, Jerosch, Pfeil
Anterior	Between tensor fasciae latae muscle and sartorius muscle	Smith-Peterson, Hüter, Judet	Lesur, Keggi, Matta, Rachbauer
Medial	Medial approach with separation of adductor longus muscle	Ludloff, Thomas and Benecke	
Two-incision	Two ways to the joint		Irving, Berger Wetzel

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