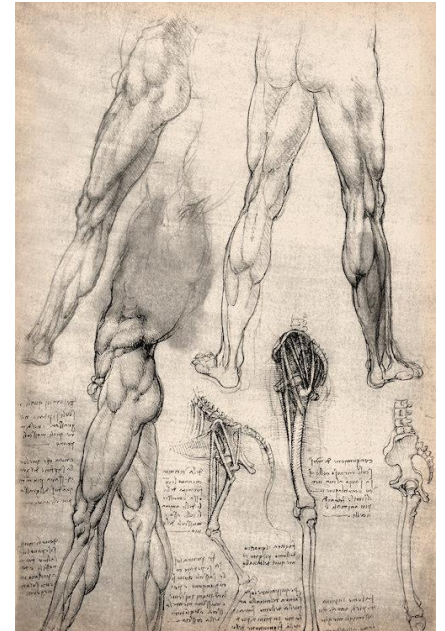


THE GLUTEAL REGION

The gluteal region lies posterolateral to the bony pelvis and proximal end of the femur. It is made of large & small skeletal muscles, with nerves & blood vessels in between. Muscles in the region mainly abduct, extend, and laterally rotate the hip joint.

The gluteal region communicates with the pelvic cavity and perineum through the greater and lesser sciatic foramina, respectively. Inferiorly, it is continuous with the posterior thigh. So, there are:

- Structures pass from the pelvic cavity to the gluteal region via the greater sciatic foramen,
- Structures pass from the gluteal region to the perineum via the lesser sciatic foramen,
- Structures pass from the gluteal region to the back of the thigh directly.



Surface Anatomy of the Gluteal Region:

The gluteal region extends from the iliac crest superiorly to the gluteal fold inferiorly, & from the midline posteriorly to the anterior border of tensor fasciae latae muscle anteriorly (represented by a line from the anterior superior iliac spine to the greater trochanter). The bony parts palpable in the gluteal region are:

- The iliac crest & the posterior superior iliac spine,
- The back of the sacrum & coccyx,
- The greater trochanter,
- The ischial tuberosity.

Intramuscular injection: the gluteal muscles are good site for IM injection. When doing that, the gluteal region should be divided into 4 quadrants, by a vertical line passing from the highest point in the iliac crest to the level of the ischial tuberosity, & a horizontal line at the midpoint of the vertical line. The sciatic nerve lies always in the lower medial quadrant, so to avoid injuring it during the injection, the needle must be injected in the upper lateral quadrant.

The Sacral Plexus

The sacral plexus is lower part of the lumbosacral plexus, it mainly supplies the skin & muscles of the gluteal region, back of the thigh & leg, & the sole of the foot. See the figures of the sacral plexus & note the following:

- The plexus is formed by the "ventral rami" of the 5 sacral spinal nerves, accompanied by the lumbosacral trunk (L4 & L5) which descends from the lumbar plexus.
- The small S5 spinal nerve joins the one coccygeal spinal nerve (Co) to form the anococcygeal nerve.
- The ventral rami forming the plexus divide into anterior & posterior "divisions". Nerves emerging from the plexus are derived from the anterior divisions, the posterior divisions, or both.
- The nerves of the lower limb are formed in the pelvic cavity, & enter the gluteal region through the greater sciatic foramen (all of them).
- The sacral plexus also gives nerves supplying structures in the pelvis & perineum, these nerves don't enter the gluteal region (except the pudendal nerve)
- The pudendal nerve is the nerve of the perineum, it enters the gluteal region via the greater sciatic foramen, then enters the perineum via the lesser sciatic foramen.
- The sciatic nerve is the largest nerve in the body. It consists of 2 parts: the tibial nerve medially (derived from the anterior divisions) & the common peroneal nerve laterally (derived from the posterior divisions). The 2 nerves are surrounded by a common sheath, with the tibial nerve slightly larger than the common peroneal.

Origin	Nerve	RV	Motor supply	Cutaneous supply
Ventral rami	Nerves to piriformis	L5 – S2	Piriformis	
	Perforating cutaneous nerve	S2 – S3		Skin over medial aspect of gluteal fold

Posterior divisions	Superior gluteal	L4 – S1	Gluteus medius, gluteus minimus, & tensor fasciae latae	
	Inferior gluteal	L5 – S2	Gluteus maximus	
Anterior divisions	Nerve to quadratus femoris	L4 – S1	Quadratus femoris and gemellus inferior	
	Nerve to obturator internus	L5 – S2	obturator internus and gemellus superior	
Both divisions	Posterior cutaneous nerve of thigh	S1 – S3		Gluteal fold, upper medial aspect of thigh and adjacent perineum, posterior aspects of thigh and upper leg
	Sciatic	L4 – S3	All muscles in the posterior compartment of thigh, part of adductor magnus, all muscles in the leg and foot	Lateral side of leg, all of the foot except the medial side

Cutaneous Innervation of the Gluteal Region

The skin of the gluteal region is supplied by the following nerves:

- Lateral cutaneous branches of subcostal nerve (T12) & iliohypogastric nerve (L1): the skin over tensor fasciae latae,
- Posterior rami of L1, 2, 3 (the superior clunial nerves): the upper & central parts of the buttock,
- Posterior rami of S1, 2, 3 (the medial clunial nerves): the medial part of the buttock,
- Perforating cutaneous nerve & branches from the posterior cutaneous nerve of thigh (the inferior clunial nerves): the lower part of the buttock.
- The coccygeal nerve (Co): the skin around the anus.

Muscles of the Gluteal Region

The gluteal region contains 2 groups of muscles:

1. Superficial group: larger muscles including (from posterior to anterior): gluteus maximus, medius, & minimus muscles & tensor fasciae latae.
2. Deep group: smaller muscles including (from superior to inferior): piriformis, gemellus superior, obturator internus, gemellus inferior, & quadratus femoris muscles.

Gluteus maximus, which is one of the largest & strongest muscles of the body, is the most superficial one. Deep to it are all of the other muscles, nerves & blood vessels of the region. Note the following:

- See the table for the attachments, nerve supply & action of each muscle.
- Gluteus maximus acts mainly to extend the thigh on the hip joint. This action is mandatory in walking, running, & standing up from sitting position.
- Gluteus medius & minimus abduct the thigh on the hip joint, & stabilizes the pelvis during walking (when the other leg is off the ground). Weakness in these muscles causes the pelvis to "swing" during walking (positive Trendelenburg's sign)
- Tensor fasciae latae is inserted into the iliotibial tract. It stabilizes the knee in extension and, together with the gluteus maximus muscle via the tract, stabilizes the hip joint by holding the head of the femur in the acetabulum.
- Deep to gluteus maximus, piriformis muscle is the main landmark of the region. Piriformis muscle emerges from the greater sciatic foramen, almost filling it, to be inserted into the superior border of the greater trochanter. It leaves small gaps above & below it, through which other structures enter the gluteal region.
- Obturator internus muscle originates from the inner surface of the obturator membrane & the bone around it. It emerges from the lesser sciatic foramen to be inserted into Medial side of greater trochanter, with the 2 small gemellus muscles above & below its tendon.
- Quadratus femoris muscle is placed horizontally. Its lower border marks the boundary between the gluteal region & the back of the thigh.

Nerves, Vessels, & Relations

The nerves of the gluteal region were mentioned above as the terminal branches of the sacral plexus. The gluteal region is supplied by 2 arteries: the superior & inferior gluteal arteries, which originate from the internal iliac artery in the pelvic cavity. Note the following:

- The superior gluteal artery & nerve enter the gluteal region via the greater sciatic foramen above the piriformis muscle. The artery divides into a superficial & a deep branch. The superficial branch runs between gluteus maximus & minimus muscles, supplying the upper part of gluteus maximus, while the deep branch ramifies & runs between gluteus medius & minimus muscles, supplying them & tensor fasciae latae muscle. In addition, this branch supplies the hip joint, & anastomoses with the inferior gluteal, medial & lateral circumflex femoral arteries. The superior gluteal nerve follows the same course of the deep branch of the artery.
- The inferior gluteal artery & nerve enter the gluteal region via the greater sciatic foramen below the piriformis muscle. The nerve runs (superficial to the sciatic nerve) & supplies gluteus maximus muscle only. The artery supplies gluteus maximus & the remaining muscles, anastomoses with the superior gluteal artery, sends a twig to the sciatic nerve, & sends a descending branch to participate in the cruciate arterial anastomosis posterior to the neck of femur.
- The sciatic nerve emerges beneath the piriformis muscle, as a large "flattened" structure, runs inferolaterally to enter the back of the thigh, midway between the ischial tuberosity & the greater trochanter. In the gluteal region, the sciatic nerve runs on gemellus superior, obturator internus, gemellus inferior, & quadratus femoris muscles respectively, supplying none of them.
- The posterior cutaneous nerve of thigh emerges below the piriformis also, & runs along the medial border of the sciatic nerve to the back of the thigh. In the gluteal region, it gives 2-3 branches (the inferior clunial nerves) that pass around the inferior border of gluteus maximus muscle to supply the skin over the gluteal fold. A perineal branch passes medially to supply the skin of the scrotum or labia majora in the perineum.
- Nerve to quadratus femoris enters the gluteal region through the greater sciatic foramen inferior to the piriformis muscle. It runs deep to the sciatic nerve, obturator internus & gemellus muscles to supply quadratus femoris & gemellus inferior muscles.
- The nerve to the obturator internus enters the gluteal region through the greater sciatic foramen inferior to the piriformis muscle. It supplies the gemellus superior and then passes over the ischial spine and through the lesser sciatic foramen to innervate the obturator internus muscle.
- Pudendal nerve & internal pudendal artery: these 2 structures do not supply the gluteal region, they are the neurovascular bundle of the perineum. They enter the gluteal region via the greater sciatic foramen to run on the sacrospinous ligament, & immediately enter the perineum via the lesser sciatic foramen, with the artery lateral to the nerve.
- Perforating cutaneous nerve: a small branch of the sacral plexus that does not enter the gluteal region via the greater sciatic foramen. Instead, it directly pierces the sacrotuberous ligament to loop around the inferior border of gluteus maximus muscle supplying the skin over its medial side.
- So, from lateral to medial, the structures emerging inferior to piriformis muscles are:
 - Sciatic nerve (with the inferior gluteal nerve & vessels superficial to it, & the nerve to quadratus femoris deep to it),
 - Posterior cutaneous nerve of thigh,
 - Nerve to obturator internus,
 - Internal pudendal vessels,
 - Pudendal nerve,
 - Perforating cutaneous nerve.

- **Veins:** Inferior and superior gluteal veins follow the inferior and superior gluteal arteries into the pelvis where they join the pelvic plexus of veins. Peripherally, the veins anastomose with superficial gluteal veins, which ultimately drain anteriorly into the femoral vein.
- **Lymphatics:** Deep lymphatic vessels of the gluteal region accompany the blood vessels into the pelvic cavity and connect with internal iliac nodes. Superficial lymphatics drain into the superficial inguinal nodes on the anterior aspect of the thigh.

THE POSTERIOR COMPARTMENT OF THE THIGH

This is the region that extends from the lower border of quadratus femoris muscle to the popliteal fossa (the back of the knee). It consists of 3 muscles, with important neurovascular structures deep to them. Superficially, the posterior compartment is covered by the fascia lata, which sends 2 intermuscular septa medial & lateral to the compartment to separate it from the medial & anterior compartments of the thigh respectively. These septa are attached to the linea aspera of the femur. Note the following:

- **Muscles:** 3 long powerful muscles constitute the compartment: semimembranosus & semitendinosus (medially), & biceps femoris -long & short heads- (laterally). See the table for the attachments, nerve supply & action of each muscle.
- Biceps femoris muscle has 2 heads: long & short.
- Semitendinosus muscle lies superficial to the larger semimembranosus muscle.
- **Nerves:** the sciatic nerve enters the posterior compartment by passing deep to the long head of biceps femoris. It runs on adductor magnus muscle (separated from it by the intermuscular septum) to enter the popliteal fossa from its top. Within the sheath of the sciatic nerve, the tibial part lies medially & the common peroneal part lies laterally. The tibial part supplies all of the 3 muscles, except the short head of biceps, which is supplied by the common peroneal part. The division of the 2 parts occurs at a variable level in the back of the thigh, usually between the middle 1/3rd & lower 1/3rd of the thigh.
- The posterior cutaneous nerve of thigh enters the back of the thigh together with the sciatic nerve, & then it pierces the fascia lata to the skin, supplying the posterior aspects of the thigh, knee, & upper part of the leg.
- **Blood vessels:** the posterior compartment of the thigh is supplied by a number of arteries that reach the compartment from the gluteal region & the anterior compartment of the thigh:
 - A descending branch from the inferior gluteal artery enters the region beneath the gluteus maximus muscle.
 - The medial circumflex femoral artery (branch from the profunda femoris artery) enters the region through the gap between quadratus femoris & adductor magnus muscles.
 - The transverse branch of the lateral circumflex femoral artery (branch from the profunda femoris artery) enters the region by passing around the lateral surface of the upper femur.
 - These 3 arteries anastomose in the uppermost part of the posterior compartment, & are joined by an ascending branch from the first perforating artery (see below), to form the "cruciate anastomosis" around the hip, & supply the surrounding structures in the region.
 - The profunda femoris artery (in the medial compartment of thigh) gives 4 perforating branches, that perforate adductor magnus muscle near its attachment to the femur, to enter the posterior compartment. These 4 arteries anastomose with each other, & give many branched supplying all of the surrounding structures, including the sciatic nerve.
 - **Veins:** Deep veins generally follow the arteries and have similar names.
 - Superficial veins & lymphatic drainage of the back of thigh will be considered separately for the whole lower limb.

END