

# PARASACRAL NERVE BLOCK

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Sciatic nerve block is typically used in combination with a femoral nerve block for lower limb surgery. Recently described parasacral approach to the sciatic nerve is a true sacral plexus block and injection of local anesthetic occurs in a fascial plane around the branches of the entire sacral plexus before the sciatic nerve is formed (above the piriformis muscle).[1] In addition to the single-shot technique, this approach is especially well suited for continuous infusion of local anesthetic.[2]

## ANATOMY

The sacral plexus is formed by the lumbosacral trunk and the ventral rami of the first, second, third sacral nerves. The nerves forming the sacral plexus converge towards the greater sciatic notch and unite to form a large band located on the posterior wall of the pelvic cavity, in front of the piriformis muscle. Hypogastric vessels, the ureter and the sigmoid colon are located in front of the plexus. Of note, gluteal vessels follow the same course as the sacral nerves [3], but in an anterior plane. The sacral plexus lies dorsally on the piriformis and ventrally on the fascia of this muscle. This fascia contributes to form the pelvic aponeurosis or fascia. This fascia, fibrous and resistant, is fixed medially on the anterior sacral foramina, where the sacral nerves emerge. Through this fascia, the sacral plexus lies near the rectum. Laterally, the sacral plexus lies close to the greater sciatic foramen sandwiched by the obturator internus muscle. The sacral plexus runs in a fascial plane limited by the pelvic fascia ventrally, the piriformis dorsally and medially and laterally by the obturator internus muscle. Hypogastric vessels are located near sacral plexus as well as the superior gluteal artery which passes between the lumbosacral trunk and the first sacral nerve. The inferior gluteal vessels run between the second and the third sacral nerves. The other important arteries are the lateral superior and inferior sacral arteries, the ischial arteries and the pudendal artery (Figure 1).

Collateral and terminal branches of the sacral plexus:

- Ventral collateral branches of the sacral plexus are the nerve to the obturator internus muscle, the haemorrhoidal nerve, the pudendal nerve and nerves to the various pelvic structures. All these nerves form the pudendal plexus (ventral branch of S4, anastomized with the S2 and S3 branches of the sacral plexus). These nerves supply pelvic and perineal organs.
- Dorsal collateral branches are the inferior and superior gluteal nerves, the nerves to the piriformis, gemelli and quadratus femoris muscles.
- A single terminal branch.

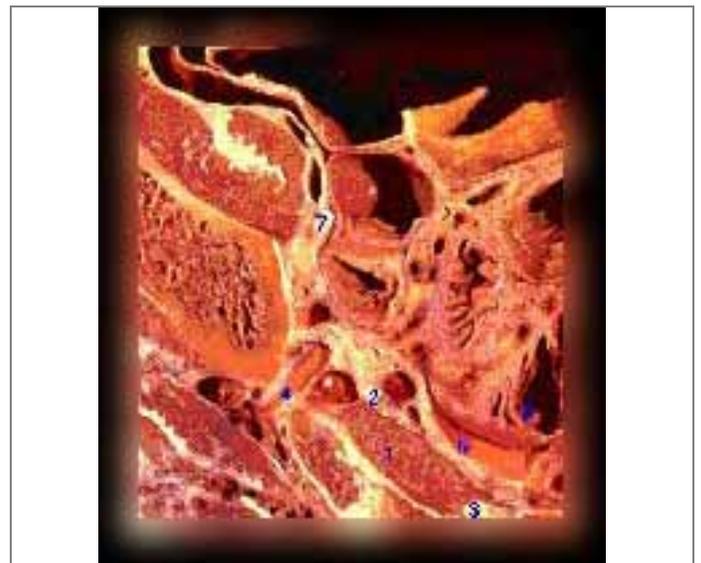


Figure 1

The sacral plexus innervates the skin of the medial part of the gluteal and posterior aspects of the thigh. It also innervates the hip joint and proximal muscles of the thigh. More caudally, the plexus extends as the sciatic nerve.

## EQUIPMENT

- Single injection: insulated needle for nerve stimulation, 100mm.
- Several kits for catheter insertion are currently commercially available. An ideal set should include an insulated needle with a short bevel, a cannula for catheter insertion, a catheter, an electrical wire connection and an antibacterial filter. The needle should be at least 90mm long. We typically use Contiplex D 110TM.
- Two syringes with local anesthetics are prepared: 3 mL of lidocaine for local anesthesia of the skin and 20 mL ropivacaine 0.75%.
- Para-sacral block is best performed preoperatively after light sedation.

## PATIENT POSITIONING

The patient is positioned in a lateral decubitus position, similar to the position required for the classical, posterior approach to sciatic block with the side to be blocked up. The dependant limb should be straightened at the knee and hip, and the limb to be blocked should be flexed at both hip and knee (Figure 2).

## SURFACE LANDMARKS

Surface landmarks are follows: A line is drawn between the posterior superior iliac spine (PSIS) and the lowest point of the ischial tuberosity (IT). Both of these points are usually easily identified. The needle insertion point lies three fingers breadth inferior to the PSIS on this line (6cm). This point is just below the posterior inferior iliac spine, which usually cannot be palpated (Figure 3).

## NEEDLE ORIENTATION

The needle is connected to a nerve stimulator. For a single shot, the needle is directed perpendicular to the skin in all planes and strictly horizontal. It is important not to direct the needle medially (Figure 4A). With a continuous block technique, the puncture site is the same; however, the needle is directed 10° more caudally to facilitate insertion of the catheter (Figures 4B and 4C).

## NERVE STIMULATION

The nerve stimulator is initially set at 2 mA intensity and plantar flexion of the foot or toes (tibial division of the sciatic nerve) or dorsiflexion/eversion of the foot or toes (peroneal division of the sciatic nerve) are



Figure 2

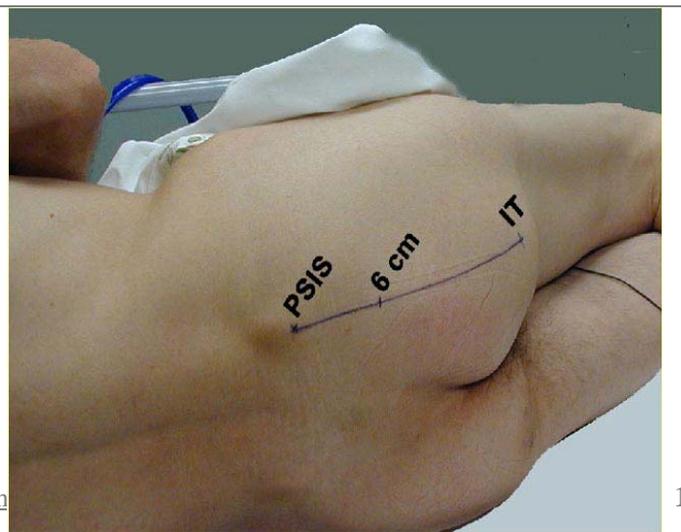


Figure 3



Figures 4 A-C

sought. The stimulating current is then reduced in order to obtain this response at 0.5 mA. The mean depth of

needle insertion at which the response is obtained is 7 cm.

Upon injection of the first ml of local anesthetic the motor response disappears. The injection is completed with repeated negative blood aspiration tests and verbal contact with the patient is kept throughout. A volume of 15 to 20 mL local anesthetic is sufficient. Multiple stimulation technique is not necessary with this approach because all 3 branches of the sciatic nerve (tibial, common peroneal and posterior cutaneous nerve of the thigh) emerge together above the piriformis muscle.

The catheter is then inserted some 2cm beyond the needle tip. Deeper insertion of the catheter should be avoided in order prevent misplacement of the catheter below the piriformis. Indeed, if the catheter is inserted too far along the sciatic nerve, the posterior cutaneous nerve of the thigh may not be blocked as this nerve leaves the sciatic trunk above the piriformis muscle.

We prefer to tunnel the catheter below the skin for 4 to 5 cm in order to move its emergence underneath the skin at a clean area. The catheter is then fixed, an antibacterial filter is connected and a test dose is administered (Figure 5).



Figure 5

## NERVE STIMULATION TIPS

The correct motor responses are extension or flexion of the foot or toes.

- A proximal response (hip or thigh) may be a result of muscular contraction of the piriformis (too caudal and superficial puncture), or of the

obturator internus muscle (too lateral puncture) and should not be accepted.

- Obturator nerve stimulation (adduction of the thigh) is due to an excessively deep and medial puncture. This nerve runs in front of the parasacral plexus, in the same fascia plane.
- Contraction of the gluteal muscles indicates too superficial needle placement.
- In case of bone contact (sacral or iliac bone, near the sacroiliac joint, at the top of the greater sciatic notch), the needle should be re-directed more caudally on the line drawn. The needle tip should be no more than 20 mm deeper than the skin-bone contact with proper needle placement.

## EXTENSION OF THE PARASACRAL BLOCK

The advantage of this block is the ability to achieve anesthesia of all three branches of the sciatic nerve (tibial, common peroneal and posterior cutaneous nerve of the thigh) through a single injection of local anesthetic [4]. Additionally, the superior and inferior gluteal branches as well as the branch to the quadratus femoris are also blocked.

Of note, with a "three in one" block, the obturator nerve is often spared. Thus, combining the parasacral block with the "3-in-1" block should result in anesthesia of the entire lower extremity. Finally, extension of the local anesthetic to pudendal plexus (especially to the pudendal nerve) can occur in up to 80% of the patients. One theoretical drawback of the approach is the possibility of urinary retention due to the proximity of the pelvic splanchnic nerves (inferior hypogastric plexus).

## LOCAL ANESTHETICS

In our orthopaedic and traumatology unit, Hautepierre Hospital, Strasbourg, France we use the following protocol when performing the parasacral approach:

- lidocaine or mepivacaine for short procedures
- ropivacaine for longer procedures or postoperative pain management
- The concentrations and volumes are adjusted according to whether this block is used in

combination with a lumbar plexus block or a saphenous block.

When the parasacral approach is used alone we use 20 mL 0.75% ropivacaine as a bolus and patient controlled administration of ropivacaine 0.2% 5mL/kg/h, bolus 5mL, with a lock-out time of 45 minutes.

When the parasacral block is combined with a lumbar plexus block (posterior or anterior approach) we usually mix ropivacaine 0.75% with lidocaine 2% (epinephrine 1/200000) in a 3/1 proportion. The volumes injected for the lumbar plexus are 20 mL with the parasacral, 20 to 30 mL for the lumbar plexus depending on the weight of the patient.

When lumbar and parasacral catheters are used simultaneously, the administration schedule is the same for both blocks. However, it is essential that the patient understands well the location of the pain in the two territories.

Before using the catheter, we confirm the location of the catheters on a radiograph. A typical picture resembles a spindle with a lateral-caudal orientation and crossing the sciatic notch (**Figure 6**).

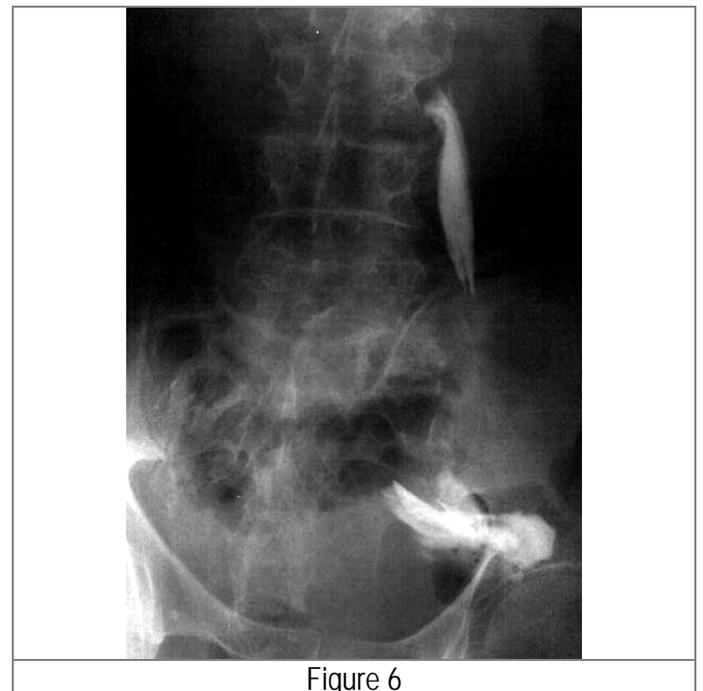


Figure 6

## INDICATIONS

### SURGERY

Common indications for use of parasacral sciatic nerve block for surgery include knee, leg and foot surgery, or as a supplement to femoral nerve block.

#### PAIN MANAGEMENT

Postoperative pain management after knee, leg or foot surgery.

The facility of insertion of a catheter in the space formed by the pelvic fascia medially, piriformis muscle dorsally, obturator internus laterally allows a good prolonged analgesia in the surgery of the lower limb.

The continuous parasacral sciatic block is indicated in the proximal surgery, where the posterior

- cutaneous nerve of the thigh is concerned:
- carcinologic surgery of the lower limb
- thigh or leg amputation
- popliteal fossa surgery (tumors, cysts...)
- total knee arthroplasty

Other indications are prolonged ankle, leg or foot surgery with a thigh tourniquet (serious trauma or microsurgery): in these indications the catheter technique is not only beneficial for the pain but by the prolonged sympathetic block as well.

## CONTRAINDICATIONS

- Contraindications are similar to those with other peripheral blocks: infection at the puncture point, coagulation disorders and neurological defects in the territories of the block
- sacral decubitus
- lack of patients cooperation
- inability to assume the lateral decubitus position.

## CONCLUSION

The parasacral approach to sciatic block is a technique well suited for anesthesia of the lower limb. It results in a high success rate and possibly less discomfort during the procedure than the posterior approach to the sciatic nerve block. Additionally, the extension of the block could be better than that of other approaches. When combined with a lumbar plexus block, this technique can be used to anesthetize the entire lower limb, including the posterior aspect of the knee. Finally, the open fascial plane facilitates insertion of an indwelling catheter for continuous infusion of local anesthetics.

## REFERENCES

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