

A Motor Sparing Knee Block For Knee Surgery

Anatomical considerations

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Introduction

Femoral and sciatic nerve block provide superior pain relief for total knee arthroplasty (TKA), but cause motor weakness, which may delay mobilisation and cause postoperative falls.

Motor sparing alternatives are being investigated.

We describe the anatomy of the nerve supply to the knee for a new concept for a motor sparing knee (MSK) block.

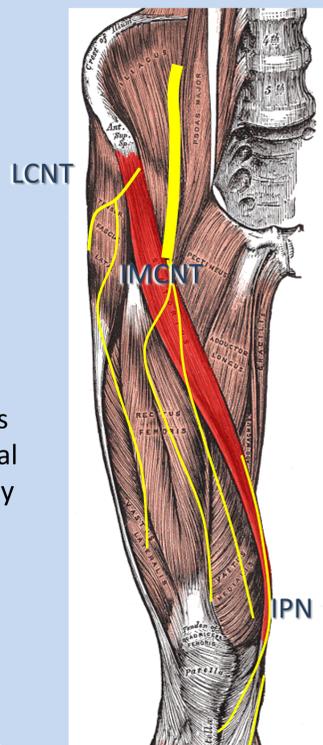
Anatomy

Cutaneous nerves to the knee:

- **Lateral Cut Nerve of Thigh (LCNT)** after passing over SM is identified on US between SM and Tensor Fascia Latae (TFL) and supplies the anterolateral aspect of the thigh (Pic 1-4).

- **Intermediate Cut Nerve of Thigh (IMCNT)** branches off the femoral nerve in the distal part of the femoral triangle, passes over Sartorius Muscle (SM) to supply the anteromedial aspect of the thigh (Pic1)

- **Infrapatellar Nerve (IPN)** has a variable origin, passes over or through SM and runs obliquely and distal to the patella to supply skin anteromedial below the knee

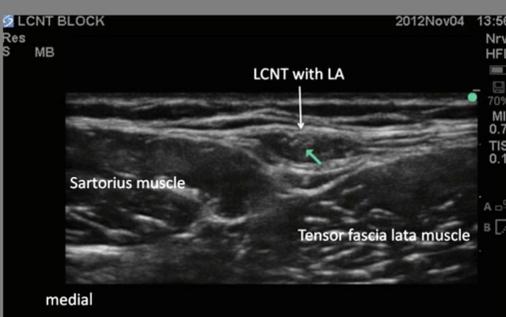


Pic 2: cut.nerves of thigh
Not shown is the medial cut nerve

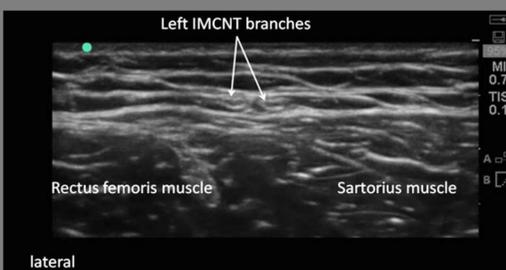
Pic 1a: LCNT and IMCNT territory with US transducer position and injection points.

Pic 1b: infrapatellar nerve territory

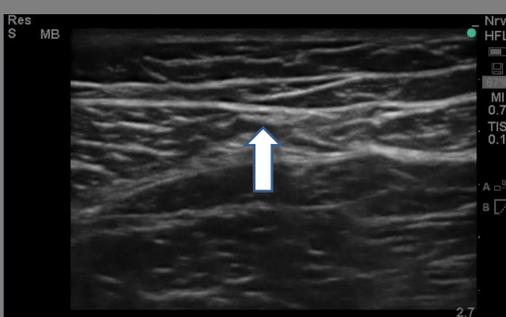
Cutaneous Nerve Territories:



Pic 3: right LCNT deep to fascia lata between Sartorius and TFL Muscles



Pic 4: IMCNT passing over Sartorius Muscle



Pic 5: Infrapatellar Nerve between Sartorius (left) and Gracilis Muscle

Nerve supply to the knee joint:

- **5 genicular nerves** which accompany the arterial supply to the joint, located at the 4 corners of the knee and medially at joint level. Those are formed by Sciatic, Common Fibular, Obturator and Femoral Nerves. Main locations are superomedial, superolateral and inferomedial for the knee joint

- **Vastus Medialis motor nerve** continuing to medial capsule (Pic)

- Obturator Nerve (posterior division) branches traverse the adductor canal to the popliteal fossa (variable)

- Further branches arise from the Tibial Nerve to supply the posterior capsule.



Pic : medial aspect of thigh showing motor branch to vastus medialis muscle and its continuation to the knee capsule at the medial epicondyle, Infrapatellar Nerve (x) in a variation of penetrating sartorius muscle, separate from saphenous nerve (s)



Pic : US transducer placed longitudinal at transition between femoral shaft and epicondyle The genicular nerves are located deep to vastus medialis / lateralis muscle within a genicular vascular network. Local anaesthetic is seen here lifting the muscle off the periosteum

Discussion

- The nerve supply to the knee is complex and variable. Advancing US technology in experienced hands however allows easy identification of cutaneous nerves (LCNT and IMCNT).
- Because of its variation, the IPN is most reliably blocked within the adductor canal at midhigh level. This also affects the branch to Vastus Medialis Muscle which may cause a minor degree of motor weakness.
- Genicular nerve locations are identifiable by bony landmarks.
- A full block therefore requires 3 injections for cutaneous nerves and 3 to main genicular nerves (4 if posterior capsule is to be affected).

Conclusion

It may be possible using the knowledge of the detailed knee supply to achieve a motor sparing knee block. This requires a multi injection approach and advanced US skills.

Ref

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