State of the Art Safety Standards in RA
THE EUROPEAN SOCIETY OF REGIONAL ANAESTHESIA & PAIN THERAPY

European Society of Regional Anaesthesia & Pain Therapy
ESRA ITALIA

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ESRA MEETING
ANNUAL UPDATE

1 day, 1 programme, 3 cities

ROMA, 13 APRILE 2024

Responsabili scientifici:
Mario Bosco
Fabio Costa
Fabrizio Fattorini

SESSIONE 3
IL GINOCCHIO: PRIMA, DURANTE E DOPO

Tecniche anestesiologiche

R. Perna

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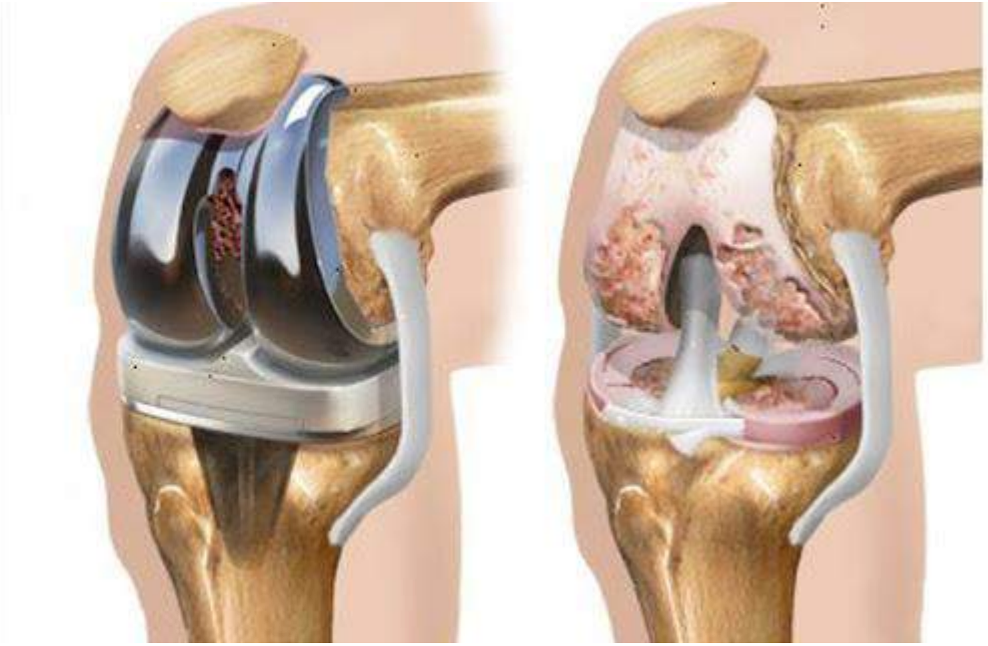
Dichiarazione sul Conflitto di Interessi

Il sottoscritto ***Raffaele PERNA***
in qualità di: relatore dell'evento

«IL GINOCCHIO: PRIMA, DURANTE E DOPO
Tecniche anestesiologiche

ai sensi dell'art. 3.3 sul Conflitto di Interessi, pag. 18,19 dell'Accordo Stato-Regione del 19 aprile 2012,

Dichiara che negli ultimi due anni NON ha avuto rapporti anche di finanziamento con soggetti portatori di interessi commerciali in campo sanitario



L'artroplastica totale del ginocchio (TKA) è un metodo ampiamente utilizzato per il trattamento dell'osteoartrosi allo stadio terminale e di altre condizioni invalidanti del ginocchio e si prevede che la sua domanda aumenterà fino a superare 1 milione di procedure entro il 2030 negli Stati Uniti

__Price AJ, Alvand A, Troelsen A, et al.__ Knee replacement. Lancet. 2018;392: 1672-1682.
__Siddiqi A, Warren JA, McLaughlin J, et al.__ Demographic, Comorbidity, and Episode-of-Care Differences in Primary Total Knee Arthroplasty. J Bone Joint Surg [Am]. 2021;103-A:227-234.

Tra i cambiamenti nella pratica clinica nell'ultimo decennio, abbiamo assistito ad una ***costante diminuzione della durata della degenza ospedaliera (LOS) e ad uno spostamento verso la chirurgia ambulatoriale***.

Siddiqi A, Warren JA, McLaughlin J, et al. Demographic, Comorbidity, and Episode-of-Care Differences in Primary Total Knee Arthroplasty. *J Bone Joint Surg [Am]*. 2021;103-A:227-234.
4. C leveland Clinic OME Arthroplasty Group. Understanding the main predictors of length of stay after total hip arthroplasty: patient-related or procedure-related risk factors? *J Arthroplasty*. 2021;36:1663-1670.e4

Uno degli aspetti che continua a richiedere miglioramenti è ***l'incidenza relativamente elevata di dolore severo postoperatorio***, che varia dal 10 al 36%, che produce insoddisfazione tra i pazienti dopo TKA e un aumento dell'utilizzo dell'ospedale.

K im DH, Pearson-Chauhan KM, McCarthy RJ, Buvanendran A. Predictive Factors for Developing Chronic Pain After Total Knee Arthroplasty. *J Arthroplasty*. 2018;33: 3372-3378.
7. E lmallah RK, Chughtai M, Khlopas A, et al. Pain Control in Total Knee Arthroplasty. *J Knee Surg*. 2018;31:504-513.

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INNERVAZIONE DEL GINOCCHIO:

Anteriore e Posteriore

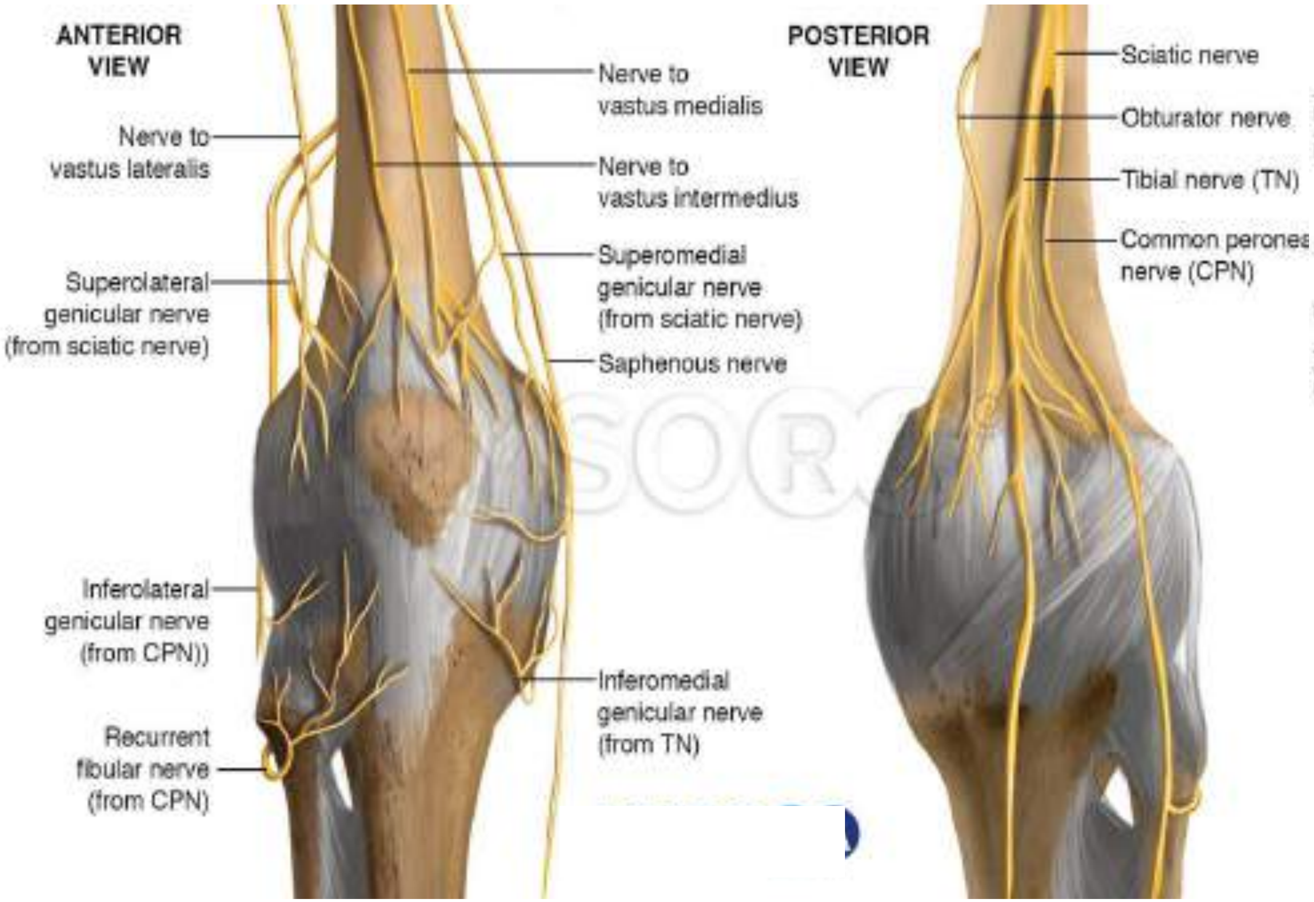

Table 1. Sensory Innervation of the Knee

Compartment	Nerves	Considerations	Joint Supply	Cutaneous Supply
Anterior	Femoral nerve	Crosses behind the inguinal ligament and lateral to the femoral artery and provides branches to innervate each muscular component of the quadriceps muscle (Vastus Medialis, intermedious and lateralis branches)	The vastus medialis to the medial collateral ligament, The vastus lateralis branches end at the quadriceps tendon without innervating the capsule of the knee	The vastus medialis to the superomedial aspect, The vastus intermedius to the anterosuperior aspect of the knee
	Common fibular nerve	Provides articular (genicular) branches to knee, lateral superior, lateral inferior, recurrent.	Inferolateral capsule of the knee joint, proximal tibiofibular joint	Lateral aspect of the knee
	Saphenous nerve	Cutaneous branch of the Femoral nerve Runs into the adductor canal	Infrapatellar Branch Descending Branch Antero inferior capsule of knee joint	Medial and inferior aspect of the knee
Posterior	Tibial nerve	Branch of the Sciatic nerve, provides the posterior articular nerve.	Articular (genicular) branches to knee medial superior, medial inferior, middle and capsular branches	Medial portion of the capsule, retinaculum, collateral ligaments of knee joint proximal and distal tibiofibular joint
	Obturator nerve	Originates two main branches: anterior and posterior	Posterior branch to joint capsule, cruciate ligaments and synovial membrane	Anterior branch to medial aspect and mid-thigh
Plexuses	**Contributors to the plexus**		**Sensory innervation**	
Peripatellar	Femoral nerve: medial, intermediate, lateral femoral cutaneous nerves Saphenous nerve: infrapatellar branch Retinacular nerves: medial (terminal branch of nerve to vastus medius), lateral (direct branch of sciatic nerve) Nerve to vastus intermedius		Skin anterior, superior, inferior, medial and lateral to patella; retinacula; collateral ligaments and capsule of knee joint	
Subsartorial	Saphenous nerve: Infrapatellar branch Obturator nerve: anterior division Medial femoral cutaneous nerve Nerve to vastus medius		Cutaneous to medial side of knee, retinaculum, collateral ligaments and capsule of knee joint	
Popliteal	Tibial nerve Sciatic nerve Obturator nerve		Retinaculum, anterior and posterior cruciate ligaments, collateral ligaments and capsule of knee joint	

Adapted from Pulsed radiofrequency of the composite nerve supply to the knee joint as a new technique for relieving osteoarthritic pain: a preliminary report. Pain Physician.2014;17(6):493-506.

APPROCCI

ANESTESIA

A. Generale
A. Neurassiale
A. Locoregionale

ANALGESIA

A. Locoregionale
A. Neurassiale

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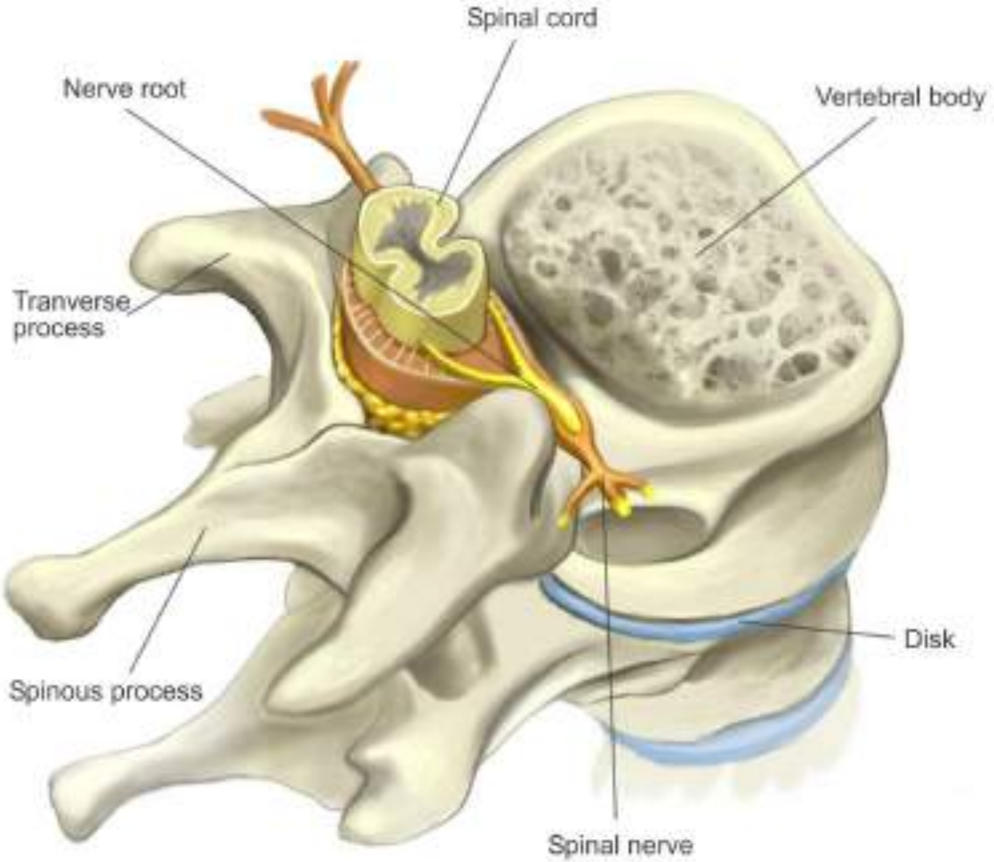
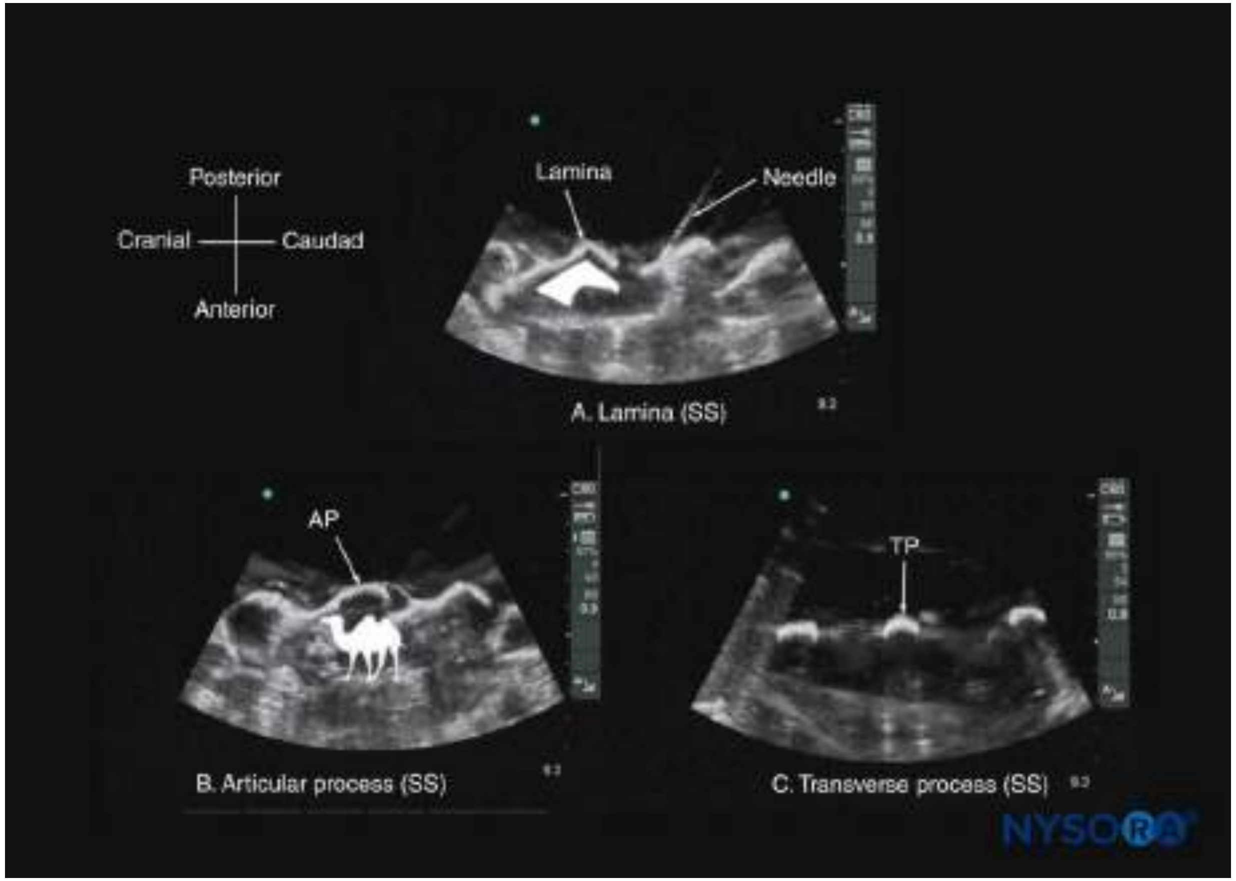
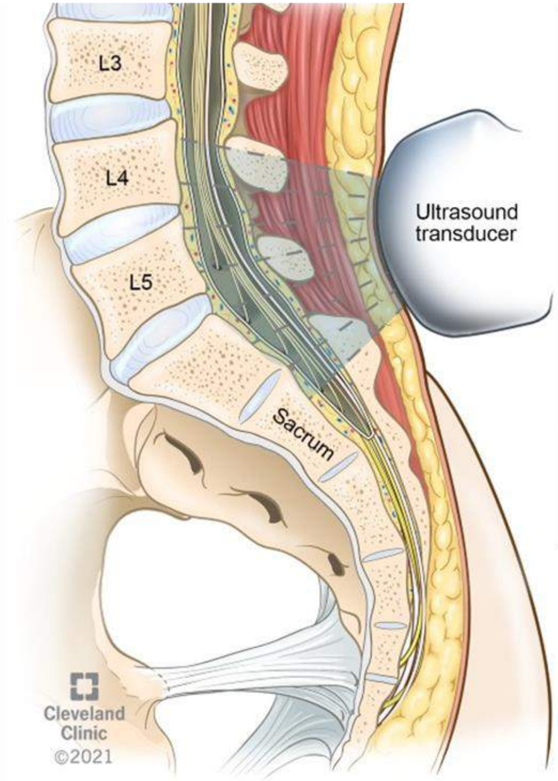


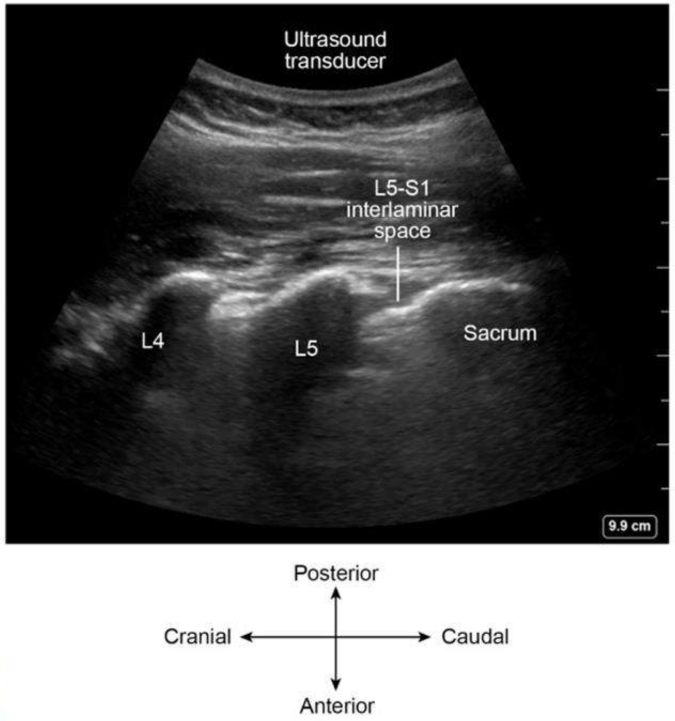
A. Subaracnoidea e Peridurale

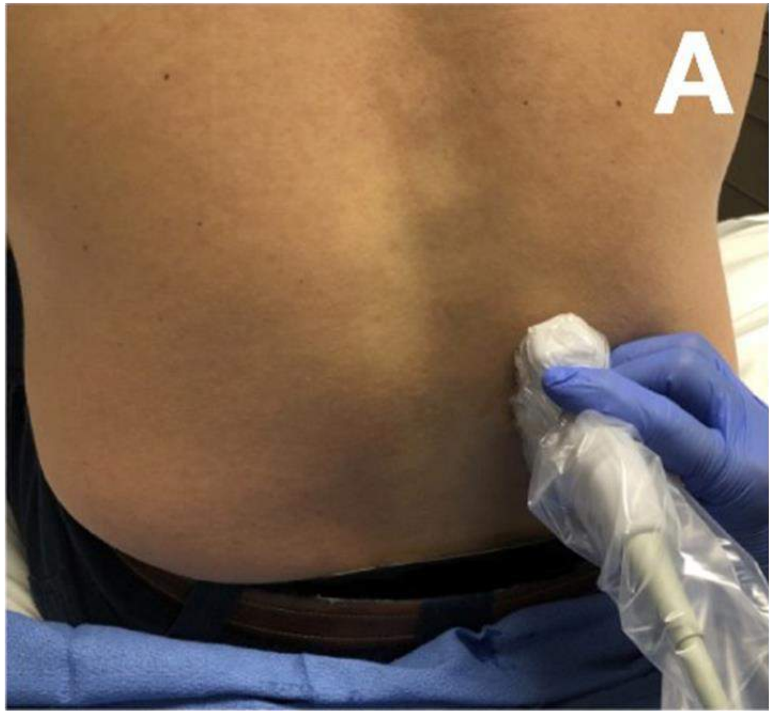
Neuraxial Ultrasound



Scansione parasagittale dei processi trasversi

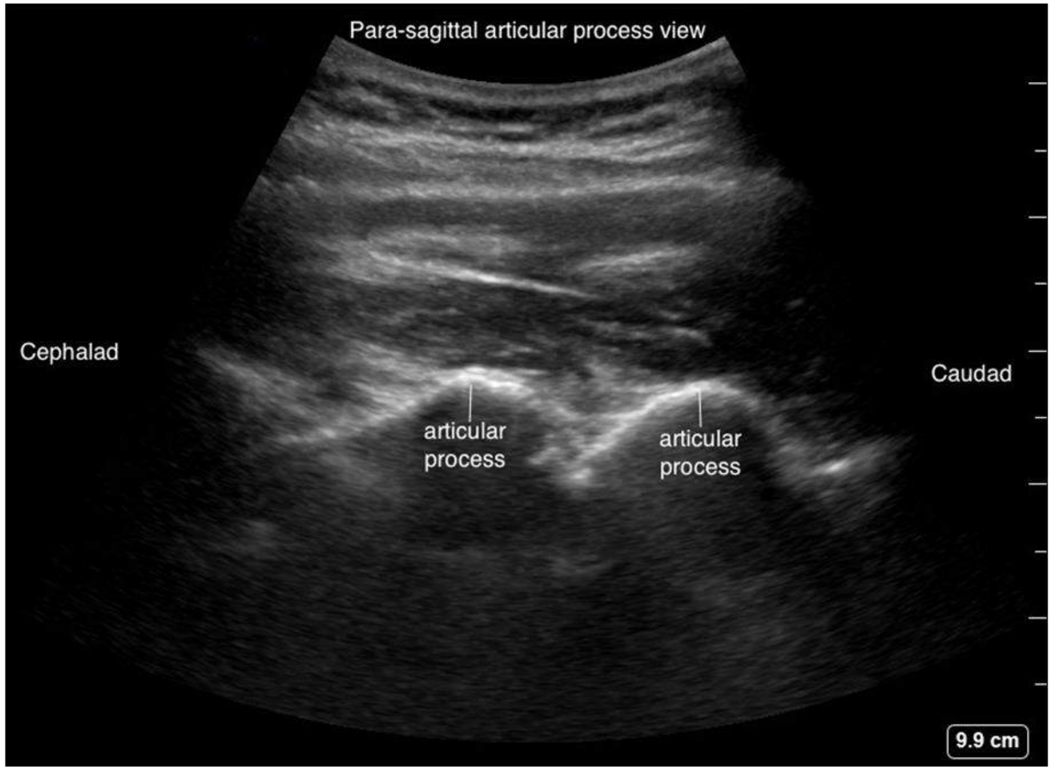


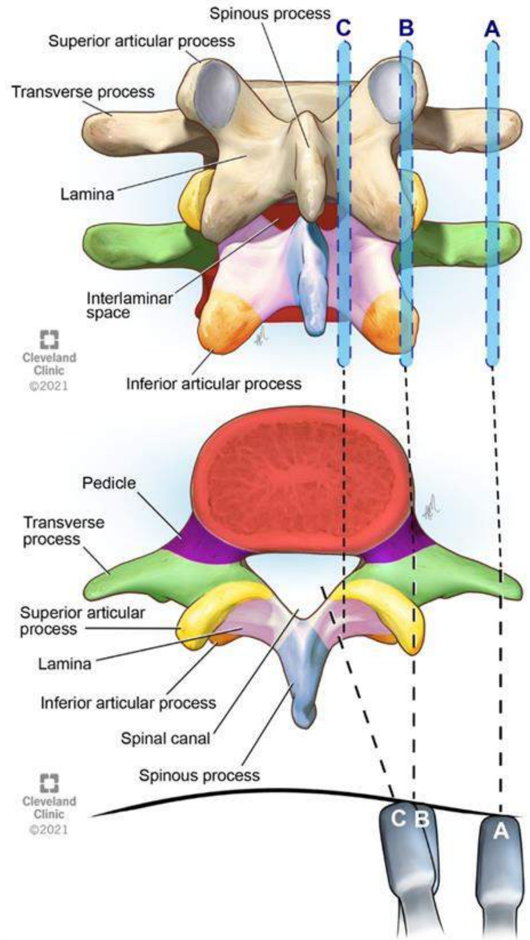




Gli US possono essere utilizzati identificare l'esatto livello vertebrale utilizzando la tecnica di scansione parasagittale. Posizionare la sonda sul sacro per identificare l'osso sacrale (piatto), il processo trasverso di L5 e lo spazio intervertebrale L5–S1. Far scorrere il trasduttore cranialmente per identificare gli altri spazi

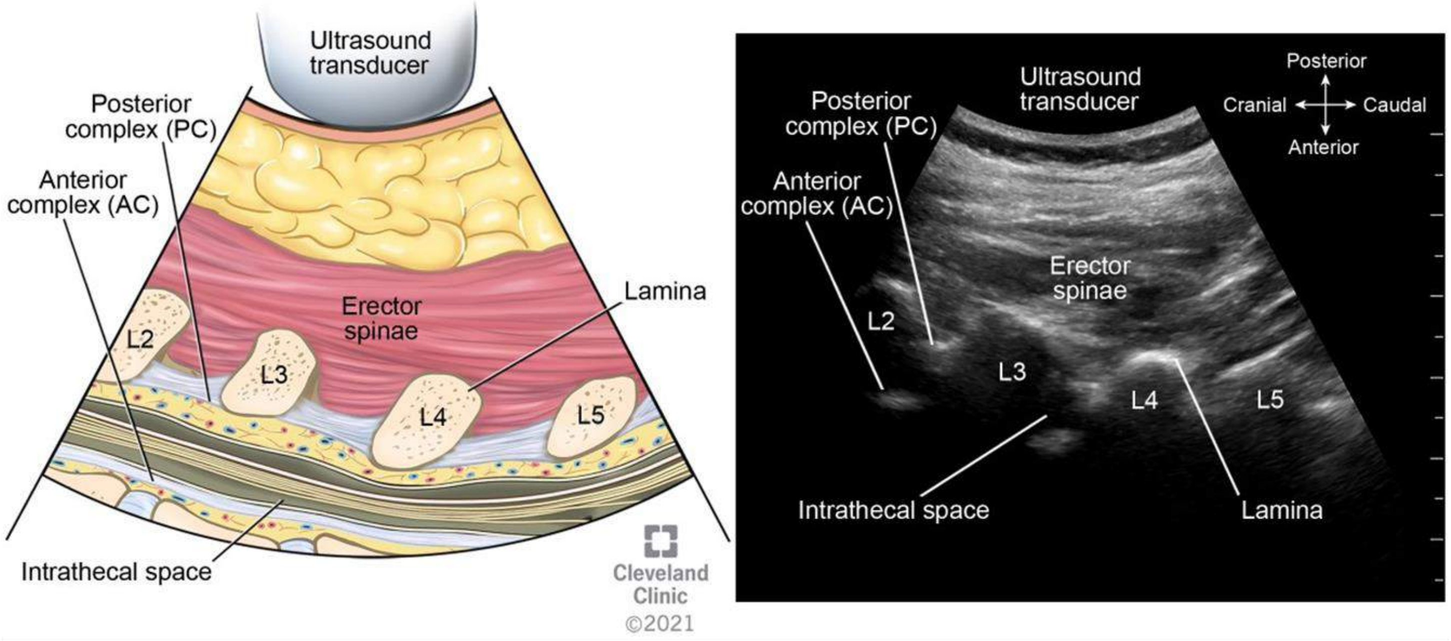
Scansione parasagittale dei processi articolari

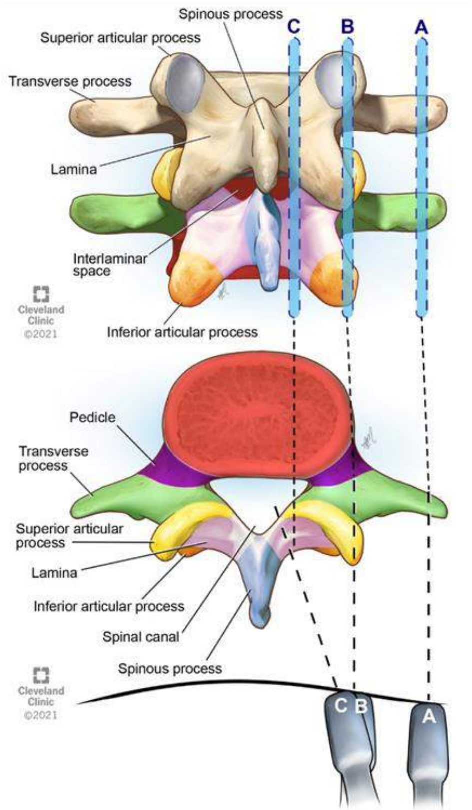




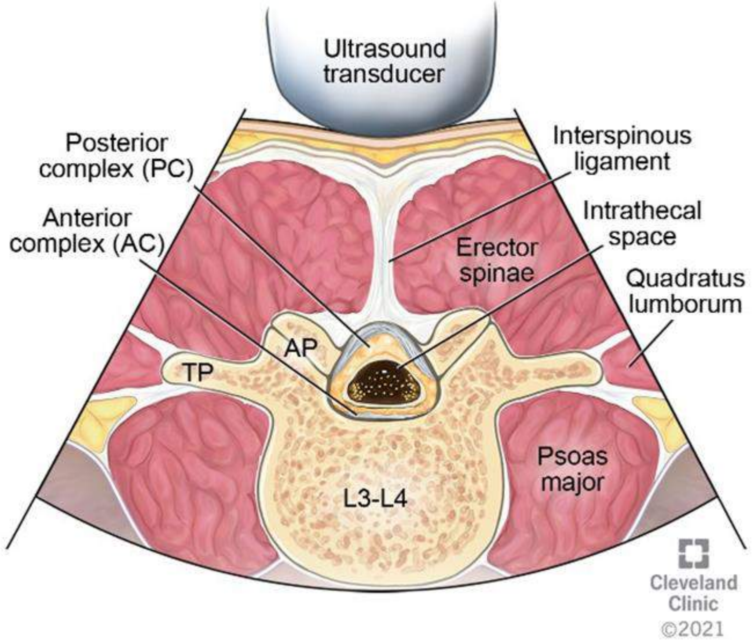
Partendo dalla scansione parasagittale dei processi trasversi, far scorrere il trasduttore medialmente finché non si evidenzia una linea iperecogena continua bianca a forma di gobbe. Le gobbe sono le ombre acustiche dei processi articolari ("segno della gobba di cammello«). Le strutture neuroassiali sono difficili da vedere in questa prospettiva perché le strutture ossee sono continue e non consentono segnali ultrasonici oltre i processi articolari

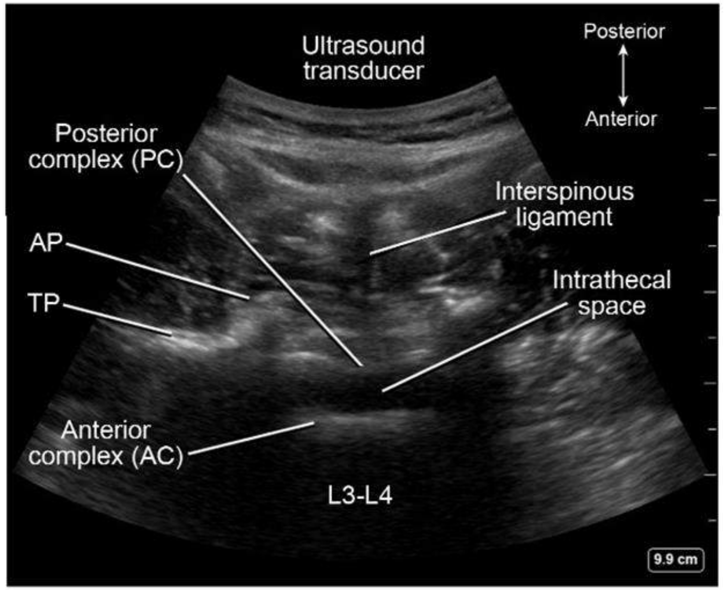
Scansione parasagittale interlaminare

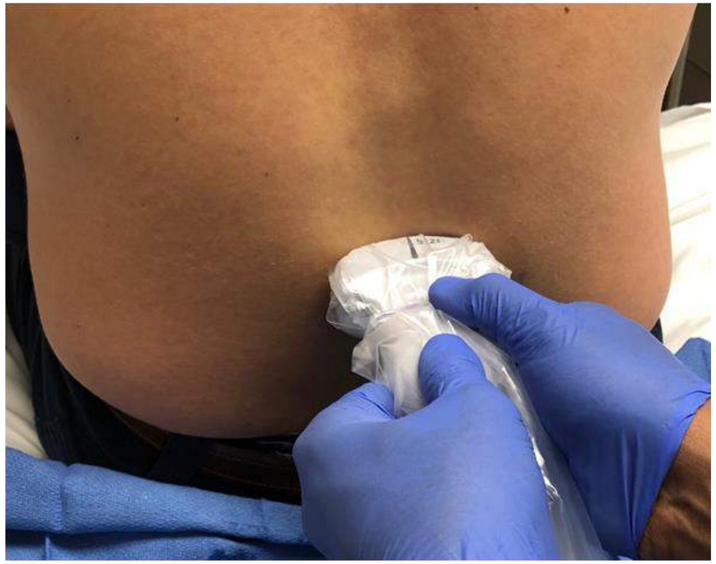




Partendo dalla scansione parasagittale dei processi articolari parasagittale, inclinare il trasduttore medialmente verso il piano sagittale mediano e portare in vista la lamina. Le lamine iperecogene inclinate delle vertebre lombari adiacenti formano un’immagine a dente di sega o a testa di cavallo. Gli spazi rappresentano gli spazi interlaminari attraverso i quali possono essere visualizzati PC e AC. Questa è la visione più importante nella scansione sagittale per identificare gli interspazi. Questa finestra è utile anche per identificare gli spazi più brevettati per un approccio paramediano a una procedura neuroassiale







Una volta identificati e contrassegnati gli interspazi utilizzando l’approccio parasagittale obliquo, ruotare la sonda di 90 gradi e centrarla sulla linea mediana per identificare il processo spinoso. Questa è la finestra acustica più importante per l'identificazione della linea mediana e degli spazi interspinosi tra i processi spinosi consecutivi (specie nei pazienti obesi)

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BJA

British Journal of Anaesthesia, 123 (3): 269–287 (2019)

doi: 10.1016/j.bja.2019.05.042
Advance Access Publication Date: 24 July 2019
Review Article

CLINICAL PRACTICE

Anaesthetic care of patients undergoing primary hip and knee arthroplasty: consensus recommendations from the International Consensus on Anaesthesia-Related Outcomes after Surgery group (ICAROS) based on a systematic review and meta-analysis

Stavros G. Memtsoudis[1,2,*], Crispiana Cozowicz[1,2], Janis Bekeris[1,2], Dace Bekere[1], Jiabin Liu[1], Ellen M. Soffin[1], Edward R. Mariano[3], Rebecca L. Johnson[4], Mary J. Hargett[1], Bradley H. Lee[1], Pamela Wendel[1], Mark Brouillette[1], George Go[1], Sang J. Kim[1], Lila Baaklini[1], Douglas Wetmore[1], Genewoo Hong[1], Rie Goto[5], Bridget Jivanelli[5], Eriphyli Argyra[6], Michael J. Barrington[7], Alain Borgeat[8], Jose De Andres[9,10], Nabil M. Elkassabany[11], Philippe E. Gautier[12], Peter Gerner[2], Alejandro Gonzalez Della Valle[1], Enrique Goytizolo[1], Paul Kessler[13], Sandra L. Kopp[4], Patricia Lavand'Homme[14], Catherine H. MacLean[15], Carlos B. Mantilla[4], Daniel MacIsaac[16], Alexander McLawhorn[17], Joseph M. Neal[18], Michael Parks[17], Javad Parvizi[19], Lukas Pichler[2], Jashvant Poeran[20], Lazaros A. Poultsides[21], Brian D. Sites[22], Otto Stundner[2], Eric C. Sun[23], Eugene R. Viscusi[24], Effrossyni G. Votta-Velis[25], Christopher L. Wu[1], Jacques T. Ya Deau[1] and Nigel E. Sharrock[1]

Conclusions: Recommendation: primary neuraxial anaesthesia is preferred for knee arthroplasty, given several positive postoperative outcome benefits; evidence level: low, weak recommendation. Recommendation: neuraxial anaesthesia is recommended for hip arthroplasty given associated outcome benefits; evidence level: moderate-low, strong recommendation. Based on current evidence, the consensus group recommends neuraxial over general anaesthesia for hip/knee arthroplasty.

KJA
Korean Journal of Anesthesiology

Review Article

The role of regional analgesia in personalized postoperative pain management

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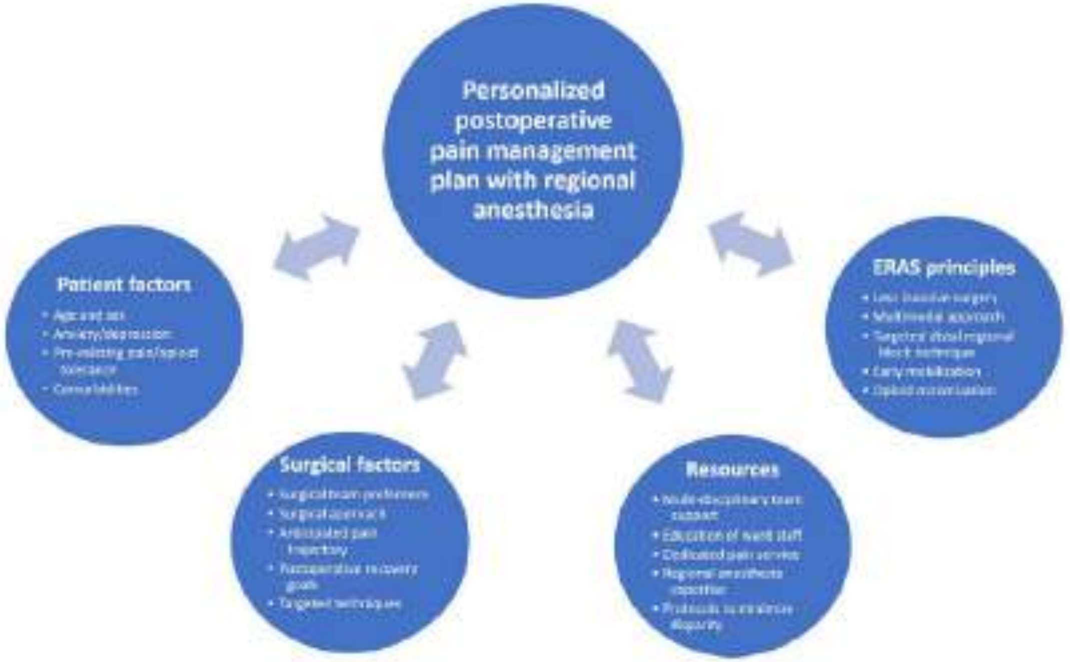


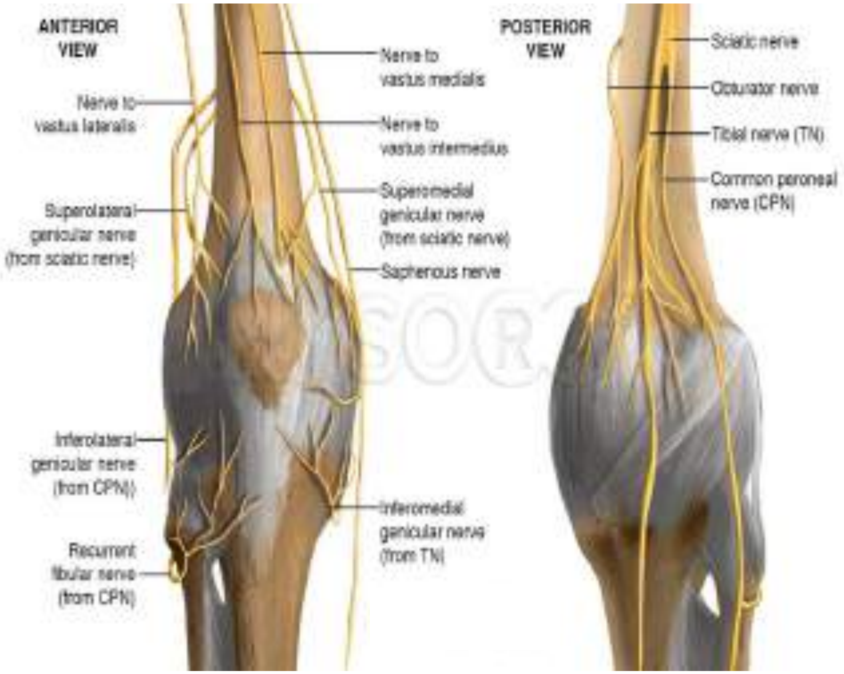
Fig. 2. Formulation of a personalized postoperative pain management plan incorporating regional anesthesia. ERAS: enhanced recovery after surgery.

Pain management plays a fundamental role in enhanced recovery after surgery pathways. The concept of multimodal analgesia in providing a balanced and effective approach to perioperative pain management is widely accepted and practiced, with regional anesthesia playing a pivotal role. Nerve block techniques can be utilized to achieve the goals of enhanced recovery, whether it be the resolution of ileus or time to mobilization. However, the recent expansion in the number and types of nerve block approaches can be daunting for general anesthesiologists. Which is the most appropriate regional technique to choose, and what skills and infrastructure are required for its implementation? A multidisciplinary team-based approach for defining the goals is essential, based on each patient's needs, and incorporating patient, surgical, and social factors. This review provides a framework for a personalized approach to postoperative pain management with an emphasis on regional anesthesia techniques.

Table 2. Regional Analgesia for TKA

Analgesic Procedure	Advantages	Disadvantages	Contraindications
Intrathecal analgesia	• Relatively easy technique • Bilateral analgesic effect for bilateral TKA	• Effect in sympathetic innervation (urinary retention and hypotension) • Respiratory depression related to intrathecal opioid use • Pruritus • Unnecessary bilateral block • Risk of infection and nerve damage • Delays mobilization	• Elevated intracranial pressure • Infection on the injection site • Risk of hypotension (hypovolemia) • Thrombocytopenia or coagulopathy
Femoral nerve block	• Easy access with or without ultrasound guidance • Excellent analgesia • Good predictable course of catheter with ultrasound guidance	• Delays mobilization • High risk of falls	• Patient inability to positioning • Allergy to LAs • Preexisting coagulopathies (endogenous or iatrogenic)
Sciatic nerve block (posterior)	• Analgesia on the posterior aspect of the knee • Adjuvant effect on anterior compartment blocks	• Relatively deep block • Requires prone/ semiprone position • Delays mobilization	• Active infection on the injection site • If no USG guidance, anatomic anomalies
Adductor canal block (ACB)	• Allows early mobilization and recovery time • Continuous technique provides the highest analgesic effect[73] • Higher opioid-sparing effect than LAI[78,79] • Easy ultrasound guide access[68]	• Tunneling is required in some cases	• affecting physical • landmarks identification • Pre-existing neuropathies affecting the distribution of the block
iPACK	• Adjuvant analgesic effect on ACB • Analgesia on the posterior aspect of the knee • Minimal impact on mobilization	• Limited to single shot technique • Short analgesic effect • Risk of foot drop	
Local anesthetic infiltration (LAI)	• Easy intraoperative administration • Adjuvant analgesic effect • Minimal impact on mobilization	• Increased risk of toxicity[101] • Short analgesic effect • Risk of infections with intraarticular catheter	
Genicular nerve block	• No risk of toxicity (no LA use)	• Requires Fluoroscopic and trained staff • USG guidance still in investigation • Scarce clinical evidence	• Bleeding diathesis • Infection at the site
Cryoanalgesia	• No risk of toxicity (no LA use)	• Unpredictable analgesic duration • Risk of permanent sensory and motor block • Scarce clinical evidence	• Raynaud syndrome • Cryoglubulinemia • Bleeding disorders • Active infection on the injection site[1,20]

Comparison among postoperative analgesic techniques for TKA. All thechniques are rarely associated with infectious complications. Neuroaxial procedures are related with 1.1- 2.3 infections per 100.000 neuroaxial blocks. Risk factors of infectious complications in peripheral nerve blocks are: ICU hospitalization, duration of catheter more than 48 hrs, lack of antibiotic prophilaxis, catheters in the femoral region and number of catheter dressing changes are considered risk factors of infectious complications in peripheal nerve blocks.



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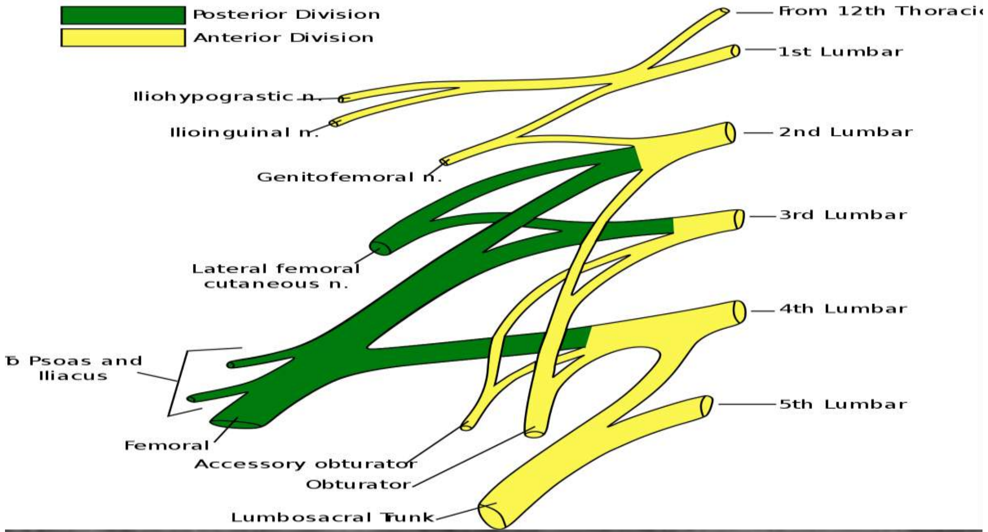
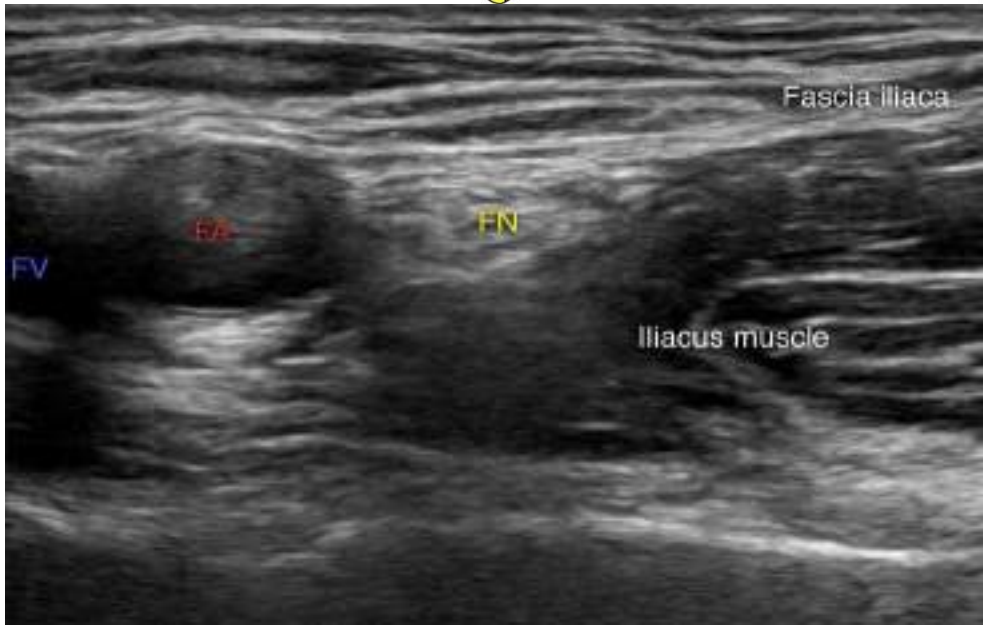




Nervo Femorale
(L2-L3-L4)

Nervo **misto**.

Attraversa la fossa iliaca, dove emette rami per il **m.ileo-psoas** e **muscolo pettineo**, e percorre la coscia *medialmente all'a. femorale*.

Nella coscia si divide nei rami terminali per **m. sartorio** e **quadricipite**, per la **cute della regione anteriore della coscia** e, tramite il **n.safeno** la **cute della regione mediale della gamba e del piede**.

Il n. safeno decorre vicino alla v. grande safena.

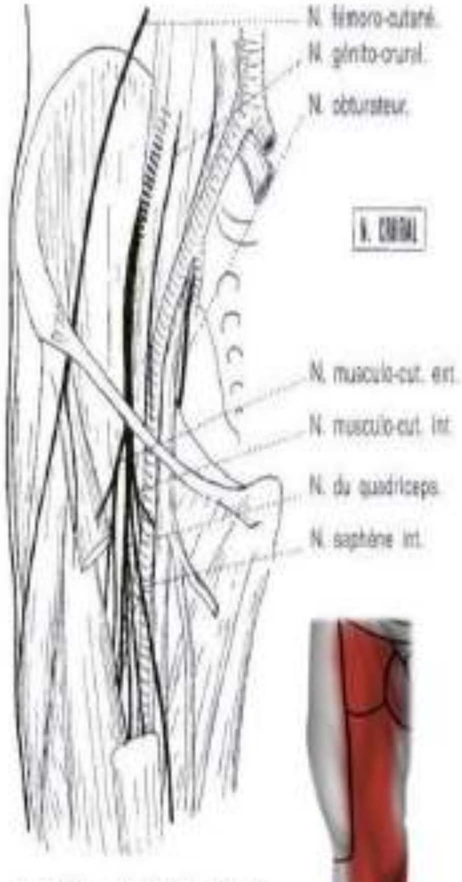


FIG. 216. — Le trajet et les ra

The Femoral 3-in-1 Block Revisited

Scott A. Lang, MD, FRCPC,*
Raymond W. Yip, MD, FRCPC,†
Paul C. Chang, MD,‡ Martin A. Gerard, MD‡

Department of Anaesthesia, Royal University Hospital, Saskatoon, Saskatchewan, Canada.

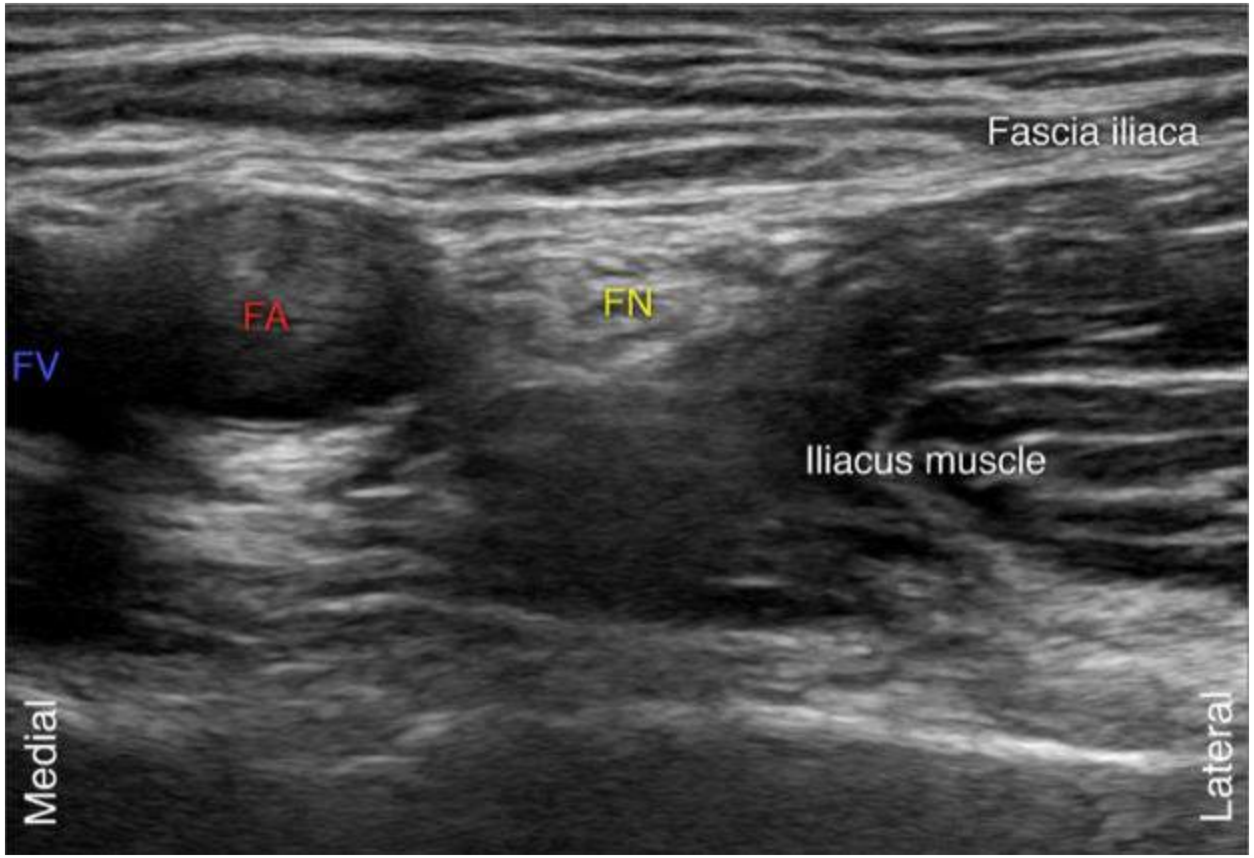
Table 2. Success Rate of Individually Assessed Nerve Blocks following a Femoral 3-in-1 Block (n = 32)

Nerve	Number of Successful Blocks
Femoral	26 of 32 (81%)
Lateral femoral cutaneous	25 of 26 (96%)
Obturator	1 of 26 (4%)
Saphenous	20 of 26 (77%)

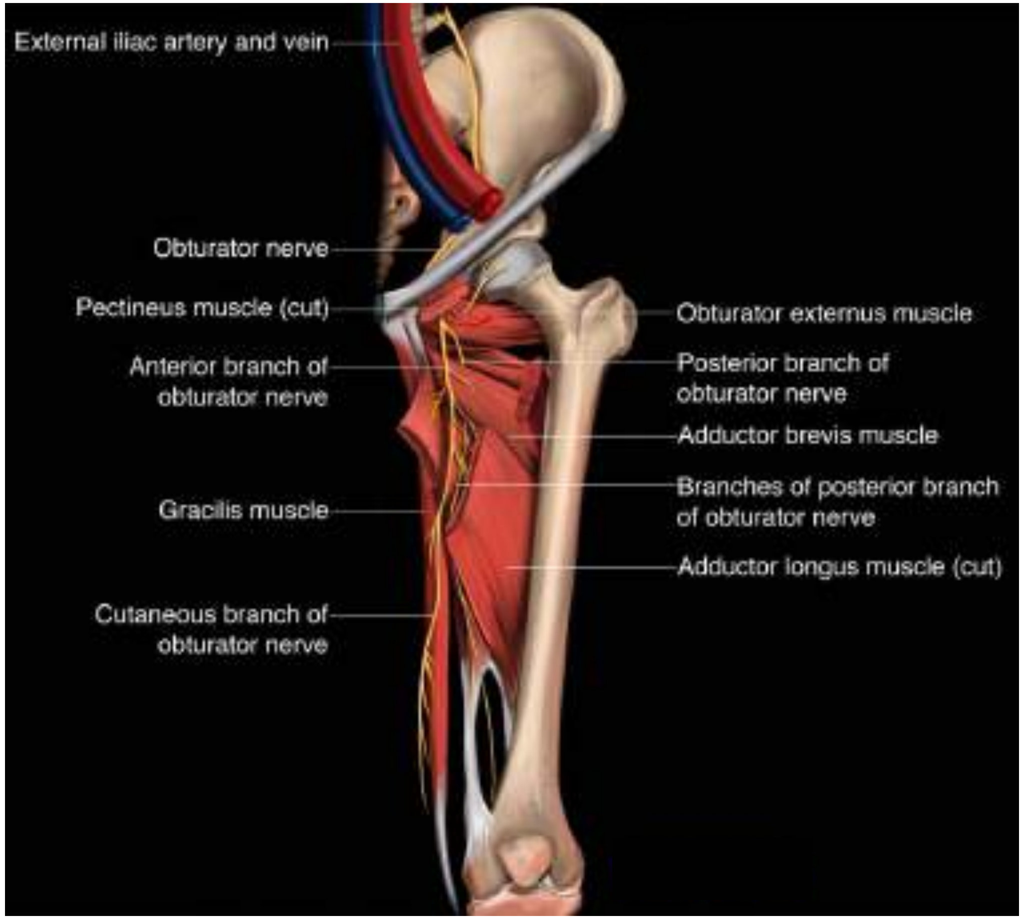
Comparison of the Three-in-One and Fascia Iliaca Compartment Blocks in Adults: Clinical and Radiographic Analysis

X. Capdevila, MD, MSc, Ph. Biboulet, MD, M. Bouregba, MD, Y. Barthelet, MD, J. Rubenovitch, MD, BSc, and F. d'Athis, MD

Department of Anesthesiology, Lapeyronie University Hospital, Montpellier, France



Blocco N. Otturatorio



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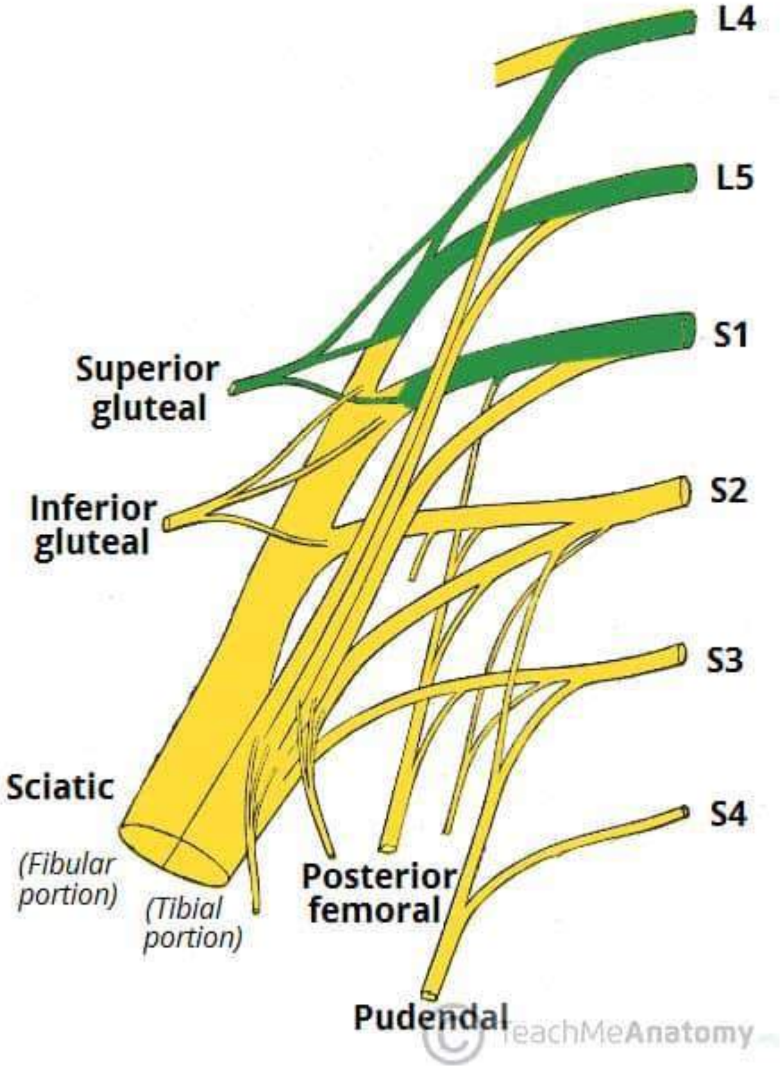
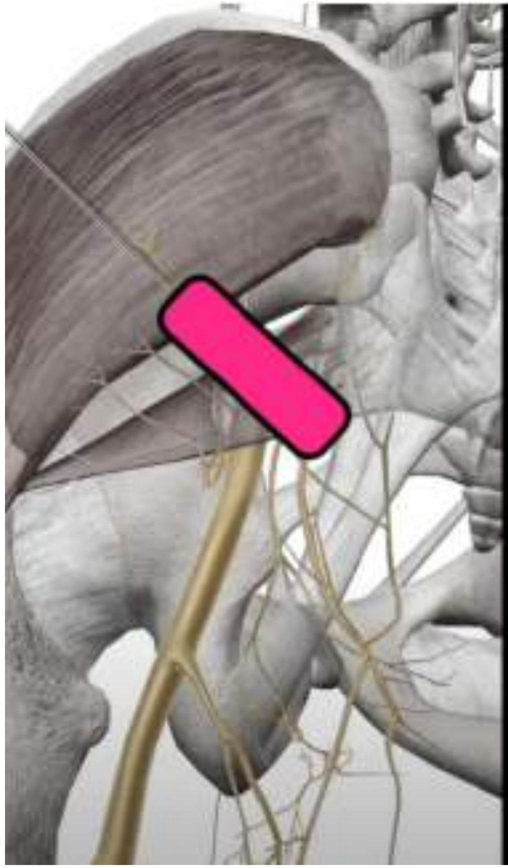
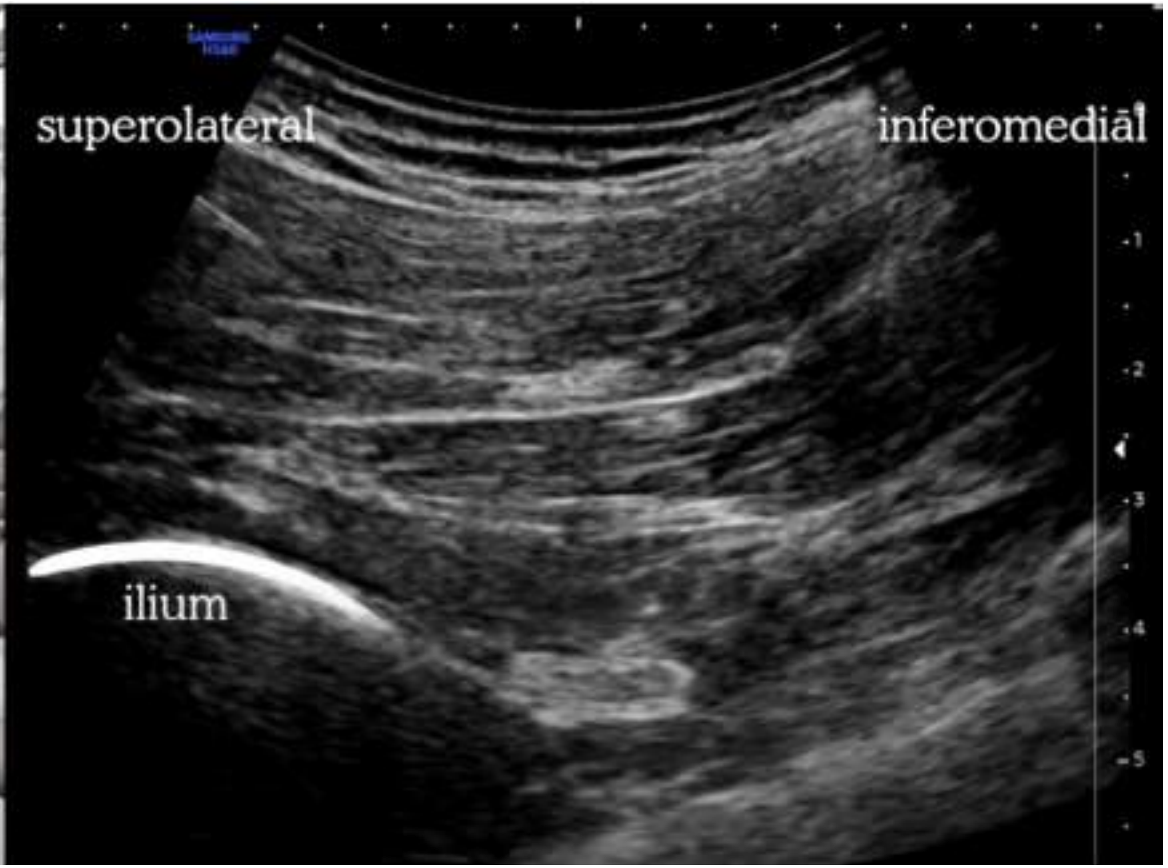
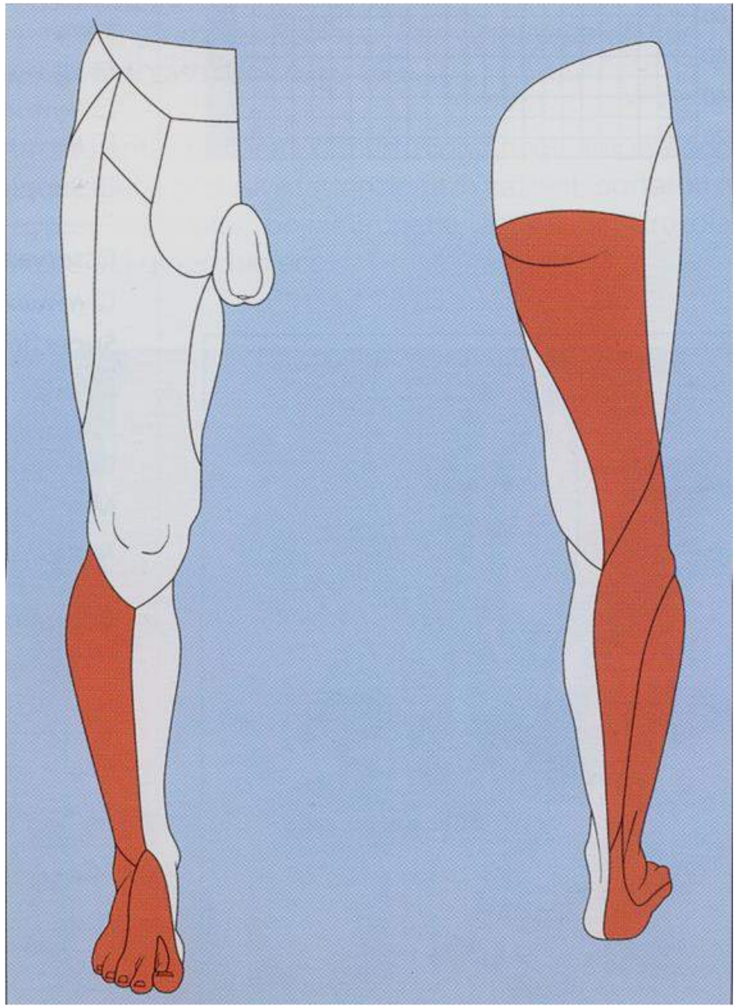
Nervo Sciatico

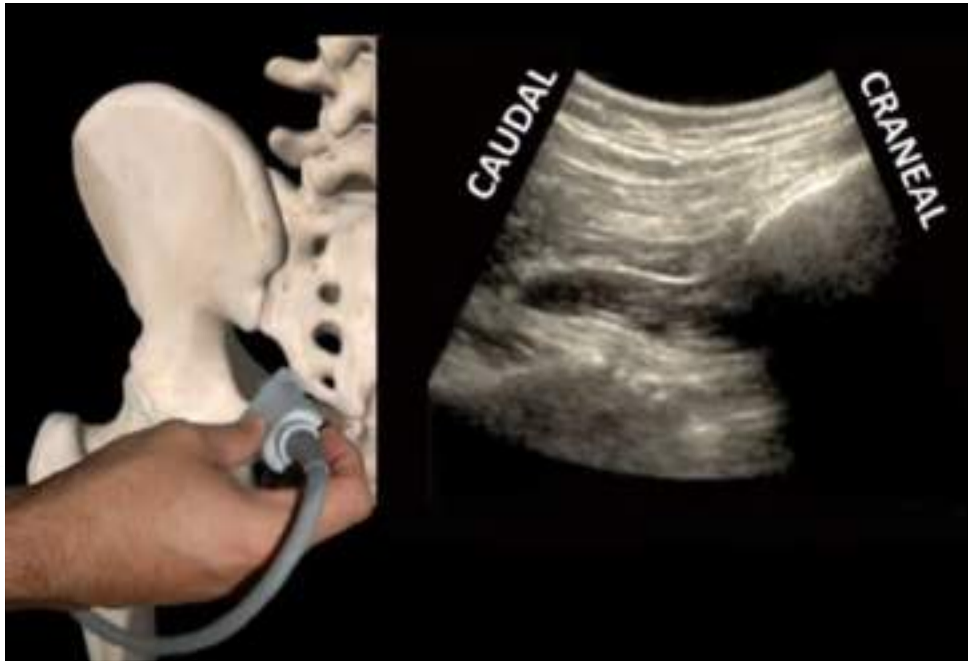






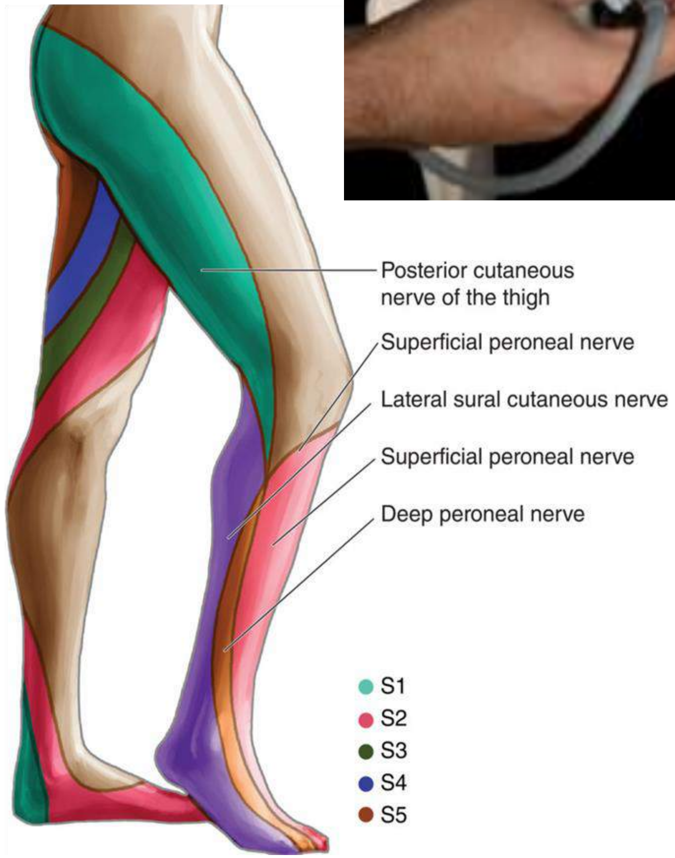

NYSORA©





BLOCCO PARASACRALE

- **Descritto da Mansour nel 1993, il blocco del nervo sciatico parasacrale produce l'anestesia dell'intero plesso sacrale**
- **Il blocco del nervo sciatico parasacrale provoca l'anestesia della cute e dei muscoli posteriori della coscia e del bicipite femorale, parte dell'articolazione dell'anca e del ginocchio e l'intera gamba sotto il ginocchio eccetto la cute della porzione mediale della parte inferiore della gamba**



APPROCCI TRANSGLUTEO E SOTTOGLUTEO

- Nell'approccio transgluteo, il nervo sciatico viene identificato al di sotto del muscolo grande gluteo tra due punti di riferimento ossei (tuberosità ischiatica e grande trocantere)
- Il muscolo grande gluteo è visto come lo strato muscolare più superficiale che collega le due strutture ossee, tipicamente spesso diversi centimetri
- Il nervo sciatico si trova immediatamente in profondità rispetto al muscolo grande gluteo e superficialmente rispetto al muscolo quadrato del femore e assume la forma di una struttura iperecogena ovale o approssimativamente triangolare

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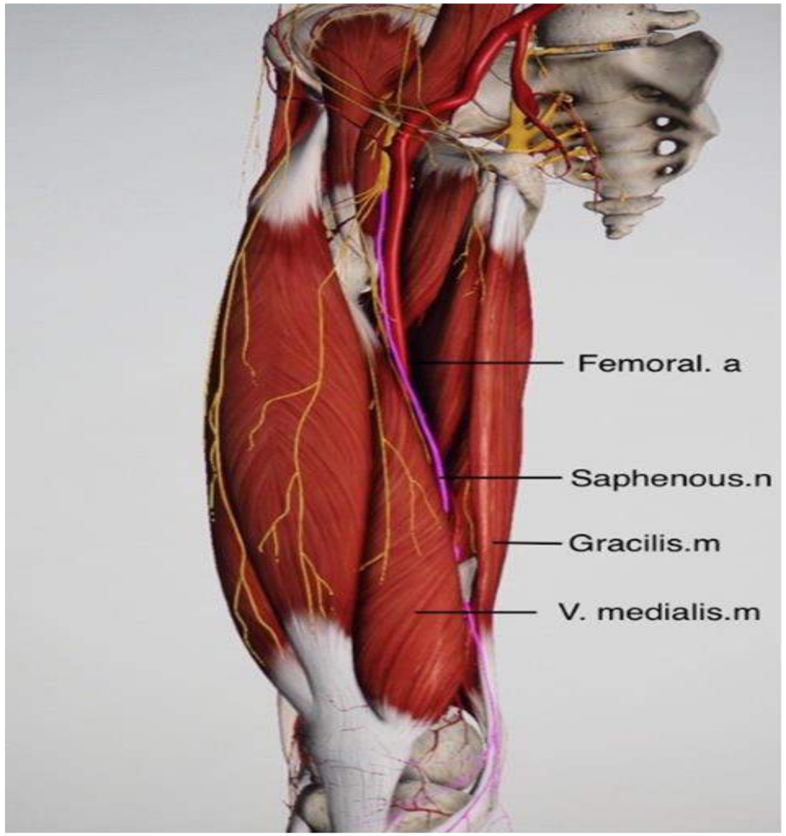
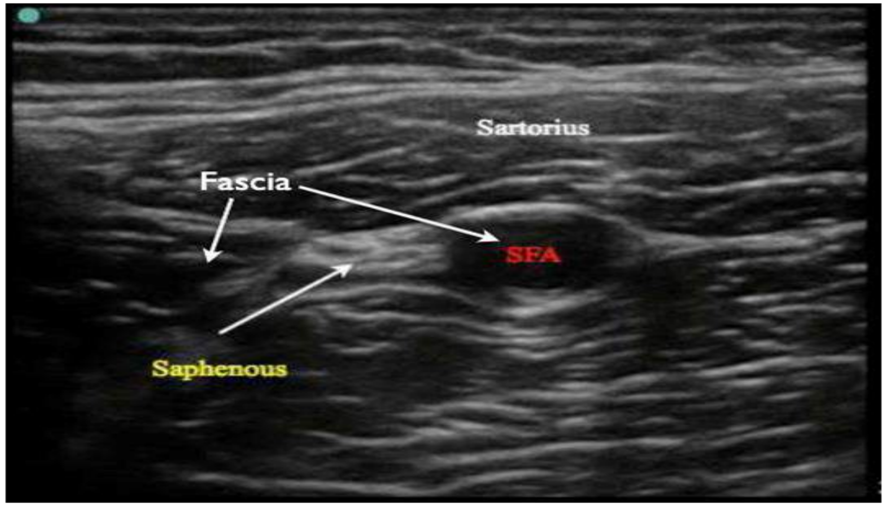
Canale degli Adduttori o di Hunter



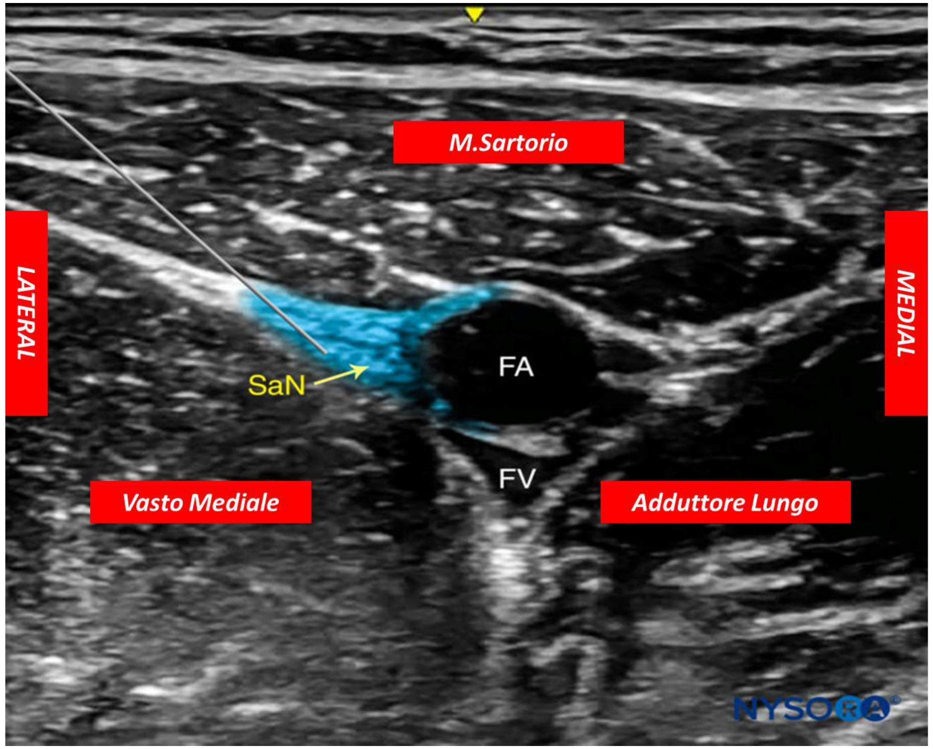


I nervi presenti nel canale degli adduttori sono prevalentemente sensitivi

Il rischio di blocco motorio è molto basso nonostante richieda elevate dosi di AL.

Kwofie MK, Shastri UD, Gadsden JC, et Al. The effects of ultrasound-guided adductor canal block versus femoral nerve block on quadriceps strength and fall risk; A blinded, randomized trial of volunteers. Reg Anesth Pain Med 2013;38: 321–325

Jenstrup MT, Jæger P, Lund J, et Al. Effects of Adductor-Canal-Blockade on pain and ambulation after total knee arthroplasty: a randomized study. Acta Anaesthesiol Scand 2012; 56: 357–364.



Reg Anesth Pain Med. 2019 Apr;44(4):527-528. doi: 10.1136/rapm-2018-100022.

'Inverse Double Bubble' sign for an effective adductor canal block: a novel approach for the ultrasound confirmation of being on the right site.

Fusco P[1], Di Carlo S[2], Scimia P[3], Petrucci E[4], Degan G[5], Marinangeli F[6].

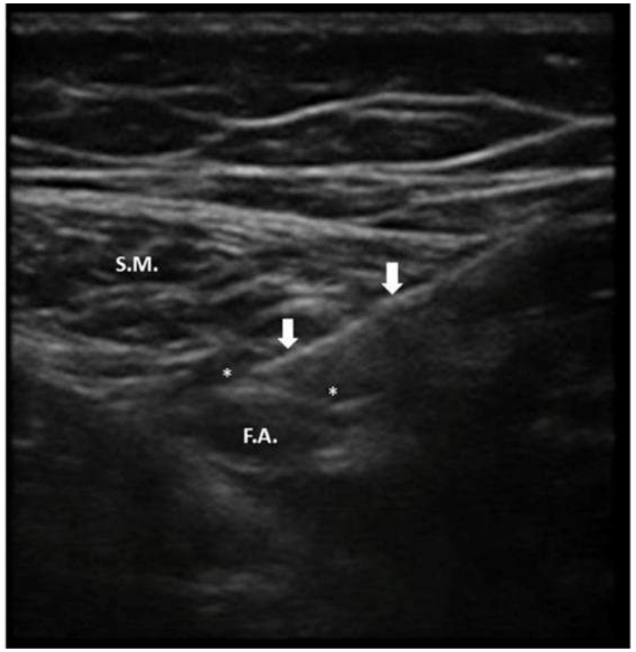


Figure 1 The image shows the needle (arrows) positioned at 12 o'clock in relation to the artery after injecting the local anesthetic (*) resulting in the formation of the 'double bubble' above the FA. FA, femoral artery; SM, sartorius muscle.

…we propose our approach based on a novel sign defined as 'inverse double bubble', inspired by the original work of De Tran et al. related to infraclavicular blockade.

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REGIONAL ANESTHESIA AND ACUTE PAIN

ORIGINAL ARTICLE

The Spread of Ultrasound-Guided Injectate From the Adductor Canal to the Genicular Branch of the Posterior Obturator Nerve and the Popliteal Plexus

A Cadaveric Study

Charlotte Runge, MD, Bernhard Moriggl, MD, PhD,† Jens Børglum, MD, PhD,‡ and Thomas Fichtner Bendtsen, MD, PhD§*

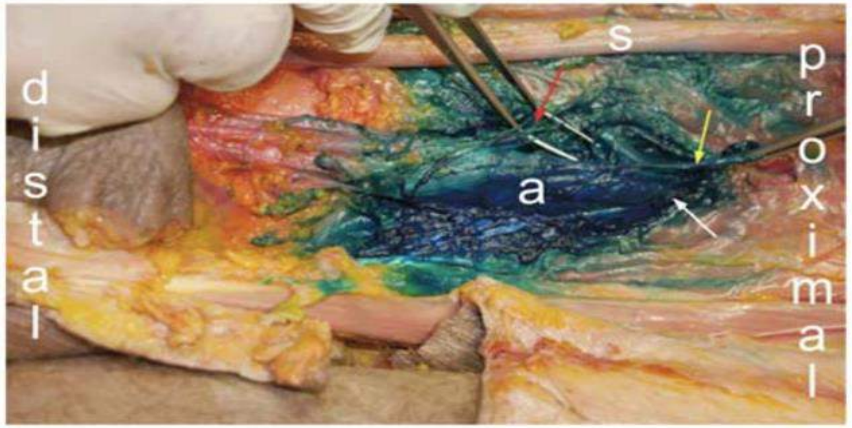

FIGURE 2. Spread of methylene blue from the AC through the adductor hiatus into the popliteal fossa. Sciatic nerve (S), popliteal vessels (a), popliteal plexus (red arrow), genicular ramus of the posterior obturator nerve (yellow arrow), adductor hiatus

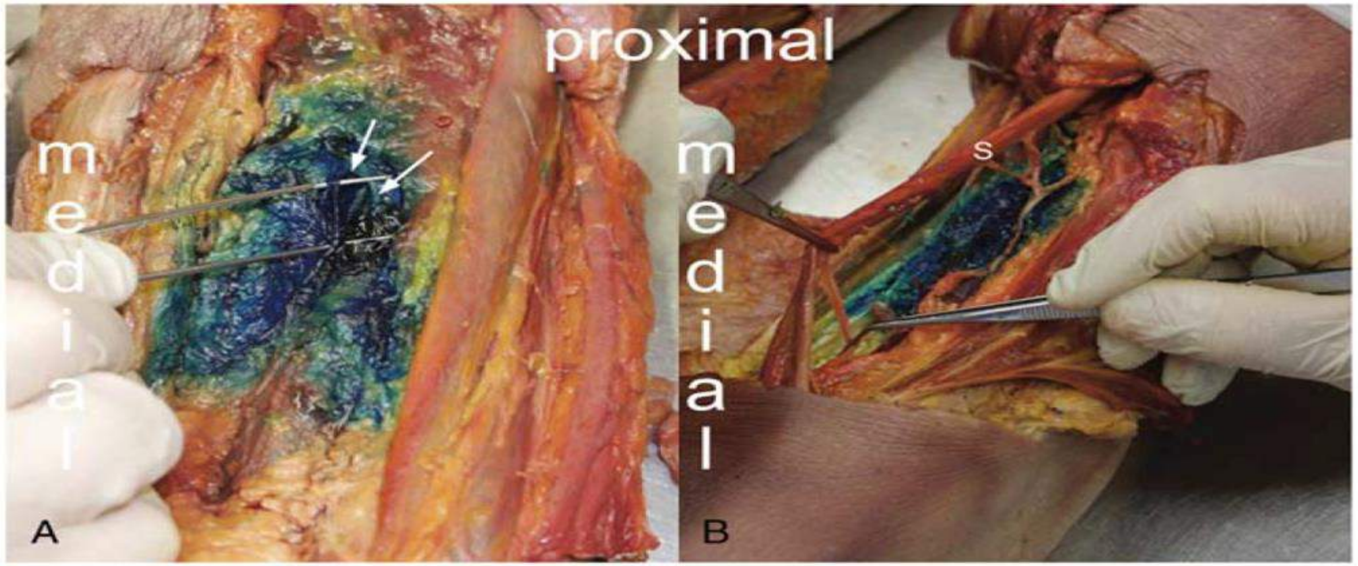

FIGURE 3. Coloring of nerve branches inside the popliteal fossa. A, Coloring of the genicular branch of the posterior obturator nerve (lifted by the forceps). B, The sciatic nerve (s) is not colored inside the popliteal fossa.

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> Am J Sports Med. 2015 Feb;43(2):331-6. doi: 10.1177/0363546514559823. Epub 2014 Dec 2.

Femoral nerve block is associated with persistent strength deficits at 6 months after anterior cruciate ligament reconstruction in pediatric and adolescent patients

T David Luo [1], Ali Ashraf [2], Diane L Dahm [1], Michael J Stuart [1], Amy L McIntosh [3]

TABLE 1
Patient Demographics[a]

	Femoral Nerve Block Group (n = 62)	Control Group (n = 62)	P Value
Age at surgery, y, mean ± SD (range)	16.2 ± 1.5 (11.4-17.9)	15.9 ± 1.4 (13.0-17.9)	.263
Sex, male:female, n	31:31	25:37	.279
BMI, kg/m^2, mean ± SD (range)	23.7 ± 4.1 (15.6-35.3)	23.8 ± 3.6 (17.6-33.3)	.890
Tegner score, mean ± SD	8.4 ± 1.0	8.2 ± 1.0	.295

[a]BMI, body mass index.

TABLE 2
Surgery Data[a]

	Femoral Nerve Block Group (n = 62)	Control Group (n = 62)	P Value
Autograft type, %			.701
BPTB	69	66	
HS	31	34	
Tourniquet time, min	81.6 ± 17.9	92.9 ± 17.2	.002
Operative time, min	134.2 ± 29.4	155.3 ± 45.1	.003
Anesthesia time, min	176.6 ± 29.6	199.5 ± 43.0	.001

[a]Values are presented as mean ± SD unless otherwise indicated. BPTB, bone–patellar tendon–bone; HS, hamstring.

TABLE 3
Isokinetic and Functional Testing 6 Months After Anterior Cruciate Ligament Reconstruction[a]

	Femoral Nerve Block Group (n = 62)	Control Group (n = 62)	P Value
Slow-extension deficit	22.3	18.7	.199
Slow-flexion deficit	13.0	8.5	.032
Fast-extension deficit	17.6	11.2	.009
Fast-flexion deficit	9.9	5.7	.041
Vertical-jump deficit	9.4	11.3	.304
Single-hop deficit	7.6	7.5	.964
Triple-hop deficit	8.0	6.6	.343
Cleared for sports	67.7	90.2	.002

[a]Values are presented as percentage deficit compared with the opposite leg.

Conclusion:

Pediatric and adolescent patients treated with FNB for postoperative analgesia after ACL reconstruction ***had significant isokinetic deficits in knee extension and flexion strength at 6 months*** when compared with patients who did not receive a nerve block. Patients without a block were 4 times more likely to meet criteria for clearance to return to sports at 6 months.

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Knee Surgery, Sports Traumatology, Arthroscopy
https://doi.org/10.1007/s00167-019-05628-7

KNEE

Fem... qua... of re-injury

Diminuzione forza isocinetica e aumento del rischio di rottura dell'innesto LCA entro il primo anno dall'intervento dopo utilizzo del FNB

Joshua S. Everhart[1] · Langston Hughes[2] · Moneer M. Abouljoud[2] · Katherine Swank[3] · Caroline Lewis[2,4] · David C. Flanigan[1,2]

Conclusion

Use of FNB at the time of primary ACL reconstruction can negatively affect achievement of isokinetic extension strength return to sport criteria. FNB increases risk of graft rupture within the first year after surgery but does not affect reinjury risk during the second. FNB may not be appropriate for use in patients already at high risk of ACL re-injury.

Femoral Nerve Block after Anterior Cruciate Lig...

Diminuzione della forza del quadricipite in quei pazienti che hanno ricevuto un FNB peri-operatorio a 6 settimane ma questo non è stato riscontrato a 6 mesi

Rober... T[1,2]
Mark V. Paterno, PhD, PT[3,4] Samuel C. Wordeman, PhD[2] Laura C. Schmitt, PhD, PT[2,5]
David C. Flanigan, MD[1,2] Christopher C. Kaeding, MD[1,2] Timothy E. Hewett, PhD, FACSM[2,6]

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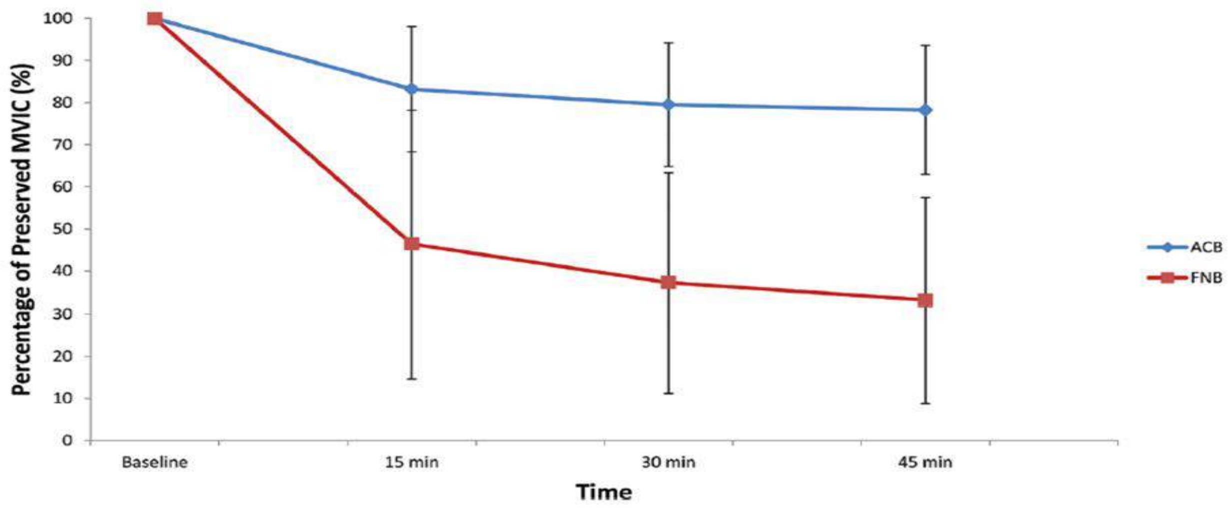
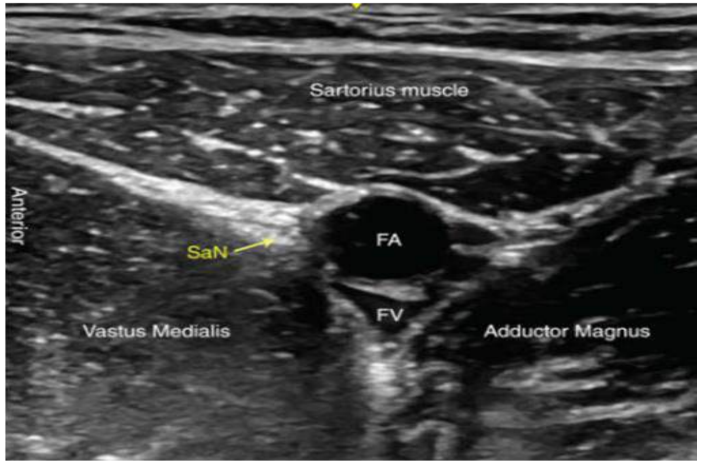
Adductor Canal Block Provides Noninferior Analgesia and Superior Quadriceps Strength Compared with Femoral Nerve Block in Anterior Cruciate Ligament Reconstruction

Faraj W. Abdallah, M.D., Daniel B. Whelan, M.D., F.R.C.S.C., Vincent W. Chan, M.D., F.R.C.P.C., Govindarajulu A. Prasad, M.D., F.R.C.P.C., Ryan V. Endersby, M.D., F.R.C.P.C., John Theodoropolous, M.D., F.R.C.S.C., Stephanie Oldfield, B.S., Justin Oh, B.A., Richard Brull, M.D., F.R.C.P.C.

Conclusion:

Compared with FNB, the study findings suggest that ACB preserves quadriceps strength and provides noninferior postoperative analgesia for outpatients undergoing anterior cruciate ligament reconstruction.





Local Infiltration Anesthesia LIA

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174 Acta Orthopaedica 2008; 79 (2): 174–183

Local infiltration analgesia: a technique for the control of acute postoperative pain following knee and hip surgery

A case study of 325 patients

Dennis R Kerr and Lawrence Kohan

2008

Joint Orthopaedic Centre, Bondi Junction, New South Wales, Australia
Correspondence DRK: drkerr@bigpond.net.au
Submitted 07-04-02. Accepted 07-07-30

Figure 1. Pain catheter placement in total knee replacement. The catheter is led along the medial femoral condyle, usually on raw bone, medial to the metal femoral component. Using artery forceps, it is then passed posterior to the medial femoral condyle so that the tip lies in front of the posterior capsule.

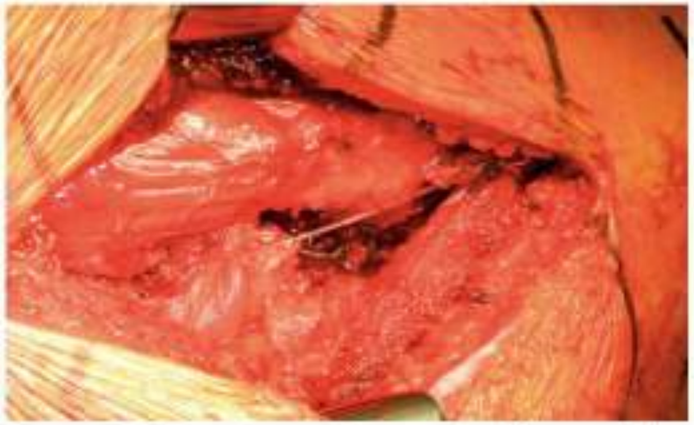

Figure 2. Pain catheter placement in hip resurfacing arthroplasty. The pain catheter is advanced to the superior apex of the wound and placed with forceps above the pyriformis tendon such that its tip lies within the capsule antero-superior to the joint. The slack is then taken up so that the catheter lies over the long axis of the wound, in the plane over the external rotator muscles

Table 3. Morphine usage over the first 48 h postoperatively by patients presenting between Jan 1, 2005 and Dec 31, 2006. Proportion of patients in each category. Dose in parentheses is average total dose in mg over 48 h for each category

	HRA n = 185	TKR n = 86	THR n = 54
No morphine	122/185	49/86	43/54
Morphine	63/185 (10 mg)	37/86 (11 mg)	11/54 (8 mg)
Morphine after 24 h	0/185	0/86	0/54

Table 4. Mobilization times. Values are time intervals from time zero (first injection of RKA mixture for hips or tourniquet release for knees) to first walk (time W1) and to independent mobility (time IM). Values are mean (SD) [range] hours

	HRA n = 185	THR n = 54	TKR n = 86
Time W1	9 (5.7) [2.7–26]	11 (7.4) [3.6–29]	13 (7.2) [2.7–39]
Time IM (h)	21 (5.4) [9.8–51]	24 (9.2) [7.2–50]	20 (9.6) [8.6–63]

Table 5. Length of stay in hospital

	HRA n = 185		THR n = 54		TKR n = 86	
Nights in hospital	n	%	n	%	n	%
1	165	89	22	41	44	51
2	11	5.9	11	20	25	29
3	4	2.2	3	5.6	3	3.5
> 3	5	2.7	18	33	14	16
Mean (SD) [range]	1.3 (1.5) [1–16]		4.3 (6.1) [1–27]		3.2 (5.9) [1–42]	

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TABLE 1. Comparison of local infiltration analgesia with other techniques

Author (Reference Number)	Patients (n)	Groups Intraoperative	Treatment Intraoperative	Groups Postoperative	Treatment Postoperative	Findings of LIA
1. Studies Comparing LIA With No Injections or Saline Injections						
Busch et al (2006)37	64	LIA (100 mL) No injection	400 mg ropivacaine 30 mg ketorolac 5 mg epimorphine 0.6 mg epinephrine	All patients	No injections into the knee Morphine PCA	Opioid consumption ↓ (0–24 h) Pain ↓ (0–8 h)
Vendittoli et al (2006)38	42	LIA (150 mL) No injection	275 mg ropivacaine 30 mg ketorolac 0.5 mg epinephrine	LIA (15 mL) No injection	150 mg ropivacaine after 16–20 h	Opioid consumption ↓ (0–48 h) Pain ↓ (0–48 h)
Andersen et al (2008)8	12 (24 knees)	LIA (170 mL) Control	340 mg ropivacaine 1.7 mg epinephrine Saline (170 mL)	LIA Control	8 h: 40 mg ropivacaine + 0.4 mg epinephrine (20 mL) 24 h: 100 mg ropivacaine + 0.5 mg epinephrine (50 mL) 8 h + 24 h: saline (20 + 50 mL)	Pain ↓ (0–32 h)
Essving et al (2010)40	40	LIA (150 mL) LIA (150 mL) Control	200 mg bupivacaine 0.5 mg epinephrine 200 mg levobupivacaine 0.5 mg epinephrine Saline (150 mL)	LIA (25 mL) LIA (25 mL) Control	10 h + 22 h: 120 mg bupivacaine 10 h + 22 h: 120 mg levobupivacaine + 0.5 mg epinephrine 10 h + 22 h: saline (25 mL + 25 mL)	Opioid consumption ↓ (0–48 h) Pain ↓ (0–48 h)
Essving et al (2010)42	48	LIA (165 mL) No injection	400 mg ropivacaine 30 mg ketorolac 0.5 mg epinephrine	LIA (22 mL) Control	21 h: 200 mg ropivacaine + 30 mg ketorolac + 0.1 mg epinephrine 21 h: saline (22 mL)	Opioid consumption ↓ (0–48 h) Pain ↓ (0–27 h)
2. Studies Comparing LIA With Femoral Nerve Block						
Carli et al (2010)46	40	LIA (112 mL) + peri- and intraarticulary FNB (8 mL) All patients + infiltration postoperative capsule (8 mL)	200 mg ropivacaine 30 mg ketorolac 0.5 mg epinephrine + 8 mL saline in femoral catheter 15 mg ropivacaine + 100 mL saline into periarticular catheter 300 mg ropivacaine 15 mg ketorolac 0.25 mg epinephrine	LIA (50 mL) FNB	24 h: 250 mg ropivacaine + 30 mg ketorolac + 0.25 mg epinephrine + 8 mL/h saline through femoral catheter for 48 h Ropivacaine 2 mg/mL 8 mL/h for 48 h + 50 mL saline into periarticular catheter 24 h after surgery	Opioid consumption ↑ (0–48 h) for LIA group (peri- and intraarticular infiltrations)
Toftdahl et al (2007)44	77	LIA (150 mL) FNB (20 mL)	300 mg ropivacaine 30 mg ketorolac 0.5 mg epinephrine 200 mg ropivacaine 4 mg morphine + 60 mg ropivacaine through intra-articular catheter	LIA (20 mL) FNB	12 h + 24 h: 200 mg ropivacaine + 30 mg ketorolac + 0.5 mg epinephrine Ropivacaine 2 mg/mL at 10 mL/h for 48 h	Opioid consumption ↓ (0–24 h) Pain ↓ (0–24 h)
3. Studies Comparing LIA With Epidural Analgesia						
Andersen et al (2010)47	40	LIA (152 mL) EDA	300 mg ropivacaine 30 mg ketorolac 0.5 mg epinephrine Test dose 3 mL lidocaine + epinephrine	LIA EDA	Continuous infusion at 4 mL/h for 48 h (300 mg ropivacaine, 60 mg ketorolac) Continuous infusion at 4 mL/h for 48 h (bupivacaine 2 mg/mL) Ketorolac 15 mg IV × 4	Opioid consumption ↓ (0–48 h) Pain ↓ (0–72 h)
Spreng et al (2010)51	99	LIA (150 mL) LIA IV (150 mL) EDA	150 mg ropivacaine 30 mg ketorolac 5 mg morphine 0.5 mg epinephrine 8 mL saline IV 150 mg ropivacaine 0.5 mg epinephrine 8 mL saline (LIA) 30 mg ketorolac IV 5 mg morphine IV Test dose 3 mL lidocaine + epinephrine	LIA (20 mL) LIA IV (20 mL) EDA	22–24 h: 142.5 mg ropivacaine + 30 mg ketorolac 1 mL saline IV 22–24 h: 142.5 mg ropivacaine + 1 mL saline (LIA) 1 mL ketorolac IV 6–12 mL/h for 48 h fentanyl 2 μg/mL + bupivacaine 1 mg/mL + epinephrine 1 μg/mL	Opioid consumption ↓ (0–72 h) Pain ↓ (24–72 h)
4. Studies Comparing Different LIA Techniques						
Andersen et al (2008)49	40	LIA ± compression bandage	300 mg ropivacaine 1 mg epinephrine (170 mL)	LIA ± compression bandage	6 h + 18 h: 40 mg ropivacaine + 0.2 mg epinephrine (20 mL) 24 h: 100 mg epinephrine (50 mL)	Pain ↓ (0–48 h) with compression bandage
Andersen et al (2010, p480)	45	All patients LIA (150 mL)	300 mg ropivacaine 1 mg epinephrine	LIA (20 mL) LIA (10 mL)	6 h + 24 h: ropivacaine 5 mg/mL 6 h + 24 h: ropivacaine 10 mg/mL	No difference between the groups
Andersen et al (2010, p645)45	16 (32 knees)	LIA 200 mL LIA 200 mL	200 mg ropivacaine 1 mg epinephrine 100 mg ropivacaine to superficial layers 200 mg ropivacaine 1 mg epinephrine 50 mL saline to superficial layers	LIA (20 mL) Control (20 mL)	24 h: 100 mg ropivacaine subcutaneously 24 h: saline subcutaneously	Pain ↓ (0–6 h) with infiltration of superficial layers, but no difference after 24 h
Andersen et al (2010, p904)	40	All patients LIA (150 mL)	300 mg ropivacaine 1 mg epinephrine	LIA (20 mL) intracapsular LIA (20 mL) intra-articular	6 h + 24 h: 100 mg ropivacaine	No difference between the groups
Andersen et al (2008, p800)49	32	All patients LIA (170 mL)	340 mg ropivacaine 1.2 mg epinephrine	LIA LIA	6 h + 12 h + 24 h: 40 mg ropivacaine + 0.2 mg epinephrine (20 mL) Additional 60 mg	No difference between the groups

THE CONCEPT OF LOCAL INFILTRATION ANALGESIA

High Volume of Diluted Long-Acting Anesthetic Drug

A problem with local anesthetic infiltration for major surgery is that many different structures and layers must be inf iltrated. In doing so, a certain minimum volume of local anesthetic is required for an effective local infiltration to cover all relevant structures. With conventional concentrations of local anesthetic solutions, such high volumes carry an unacceptable risk of systemic toxicity (see Local Anesthetic Systemic Toxicity). However, anesthesia of the small nerve endings in and around joints does not require high-concentration local anesthetic. Thus, the concentration of local anesthetic may be lowered and the volume increased, keeping the total dose within safe limits.

Nonlocal Anesthetic Adjuvants

As careful injections of local anesthetic are made close to the site of surgical injury, there is a potential for targeting the source of pain caused by local inflammation and pain to supply effective treatment close to the origin of pain. Nonlocal anesthetic adjuvants such as anti-inflammatory agents, nonsteroidal anti-inflammatory drugs (NSAIDs—traditional or cyclooxygenase [COX] 2 inhibitors) and steroids, as well as opioids and ketamine have all been used.

The role of epinephrine or clonidine in the LIA mixture, however, has not been well studied. While both drugs have an analgesic effect on the spinal α2 receptors when given epidurally or spinally, there is no documentation on any specific analgesic effect or target mechanism of these drugs when used peripherally.

Catheter Top-ups for 1 to 3 Days

Long-acting local anesthetics used for infiltration, perioperative injections, and infiltration all have a limited duration and wear off within a few hours after injection. Because repeated injection of the local anesthetic is painful or inconvenient, one approach is to leave one or more catheters in the wound or joint to provide the vehicle for boluses or continuous infusion of local anesthetics.

The use of catheters in a setting of major joint replacement, however, is controversial because of the potential for infection.

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POTENTIAL AND DOCUMENTED PROS AND CONS OF LOCAL INFILTRATION ANALGESIA AND ALTERNATIVES

Pro

- A major benefit of LIA is the lack of motor impairment often seen with alternative techniques of nerve blocks, such as femoral or sciatic nerve blocks, or epidural analgesia.
- With LIA, there is also a minor risk of hematoma formation, which is a feared complication of deep blocks, such as lumbar block or epidural analgesia.
- Also, LIA is not contraindicated in cases of increased bleeding risk from other causes, such as therapeutic anticoagulation, platelet inhibition, or even use of traditional NSAIDs or low-dose acetylsalicylic acid.
- Another argument for LIA is its simplicity; the infiltration is can be done by the surgeon intraoperatively or anesthesia providers using ultrasound. Postoperative top-ups of one or more catheters may be done easily by a nurse on the ward.

Con

- Some of the specific cons of LIA have to do with the potential dangers of supplying a potent drug close to delicate joint structures.
- The local anesthetic may be neurotoxic to small nerves when supplied repeatedly, although diluted ropivacaine has proven to be safe for 2–3 days of continuous infusion.
- A more serious concern may be the chondrotoxic effect, especially with bupivacaine.
- A concern has been voiced regarding a potential for increased risk of infection with LIA. This concern arises mainly from the postoperative use of a catheter with the risk of contamination from multiple injections as well as bacteria migration along the indwelling catheter,

La fascia e il tessuto sottocutaneo vengono infiltrati con 50 mL della soluzione LIA.

L'ultima iniezione attraverso il catetere: 10 ml per l'analgesia e per testare il catetere.

. Siti di infiltrazione di LIA nell'artroplastica dell'anca: area blu trasparente per la prima iniezione (vedi testo) e area verde trasparente per la seconda iniezione.

Tecnica di iniezione LIA in quattro fasi in pazienti sottoposti a sostituzione del ginocchio.

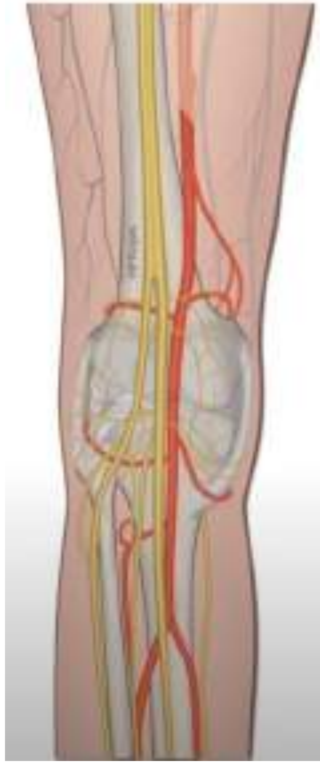
Il catetere viene posizionato lateralmente nel ginocchio.

Sebbene esistano numerose ricette, la seguente formula è efficace sia per l'intervento di sostituzione del ginocchio che dell'anca:

- **Volume totale 150 ml** (aggiungere soluzione fisiologica in base al numero di millilitri utilizzati dagli altri farmaci)
- **Ropivacaina 200 mg** (utilizzare qualsiasi preparazione pratica:5, 7,5 mg/ml, diluito)
- **30 mg di ketorolac**

L'aggiunta di **adrenalina** (p. es., 0,5 mg in 150 ml) può avere un effetto benefico sull'emostasi

SINHA 2012



Analgesic block
performed under ultrasound guidance
to provide pain relief to the posterior aspect of the knee, after TKA.

We find that the iPACK block can reach:

1) The articular branches of the tibial and common peroneal nerves
2) Posterior branch of the obturator nerve
3) The medial genicular nerve

IPACK:

I nfiltration between
P opliteal
A rtery and
C apsule of the
K nee

IPACK Block - Relevant Sonoanatomy

C: condyle, PA: popliteal artery, S: sartorious muscle, Sm: semimembranous muscle

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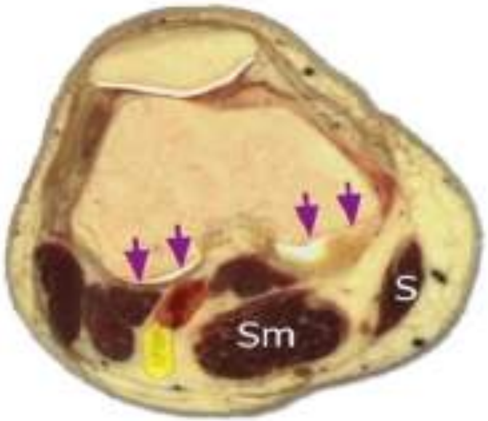
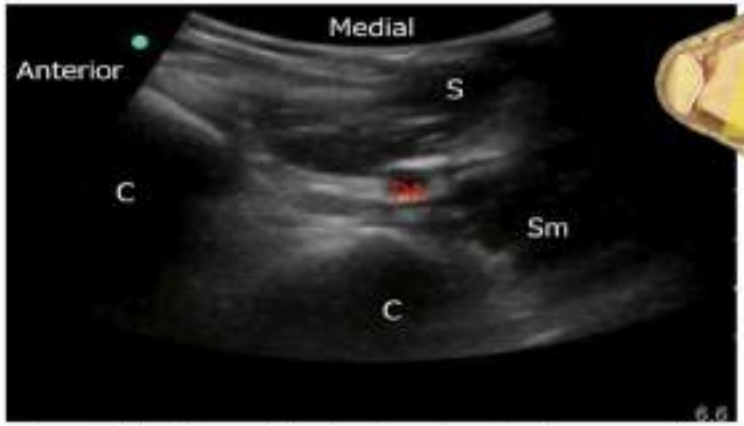


Anatomical images from the Visible Human Project 2003-2017

IPACK Block - Relevant Sonoanatomy

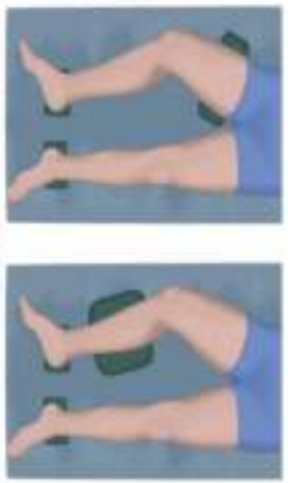


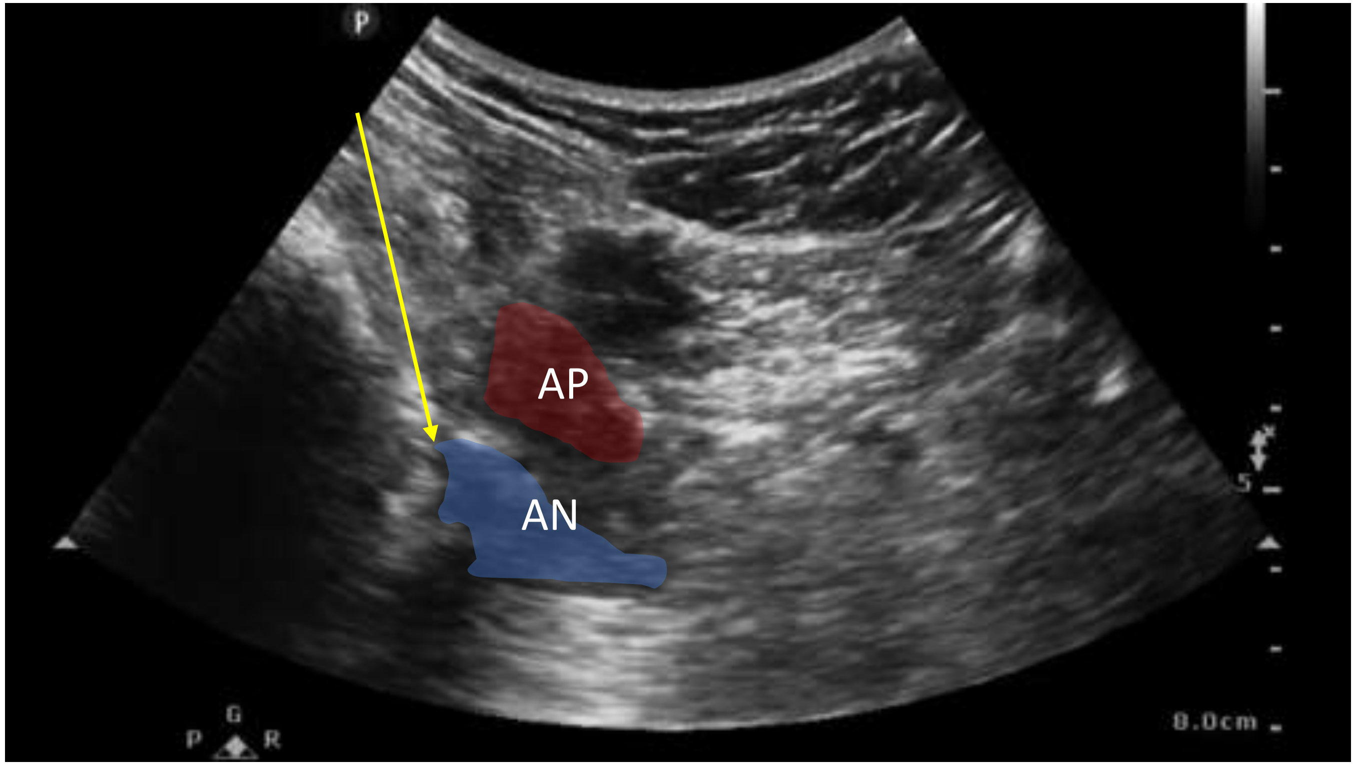
C: condyle, PA: popliteal artery, S: sartorious muscle, Sm: semimembranous muscle

Muscles: Sartorious (S) and semimembranous (Sm)

Bone: Femur condyle

Popliteal vessels Sciatic nerve





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Value of IPACK block (interspace between the popliteal artery and the capsule of the posterior knee) with adductor canal block in total knee arthroplasty

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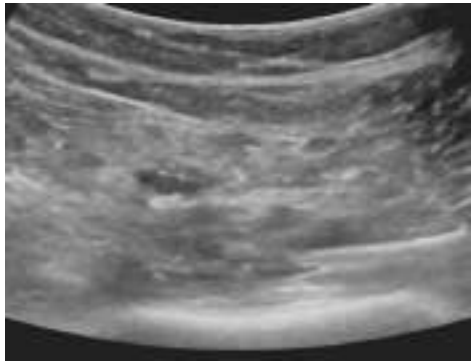

Conclusion:
The combination of IPACK block with ACB has the potential of being an adequate technique for management of acute postoperative pain after TKA but this needs more researches of larger samples and use of other types of local anesthetics with different volumes and concentrations.

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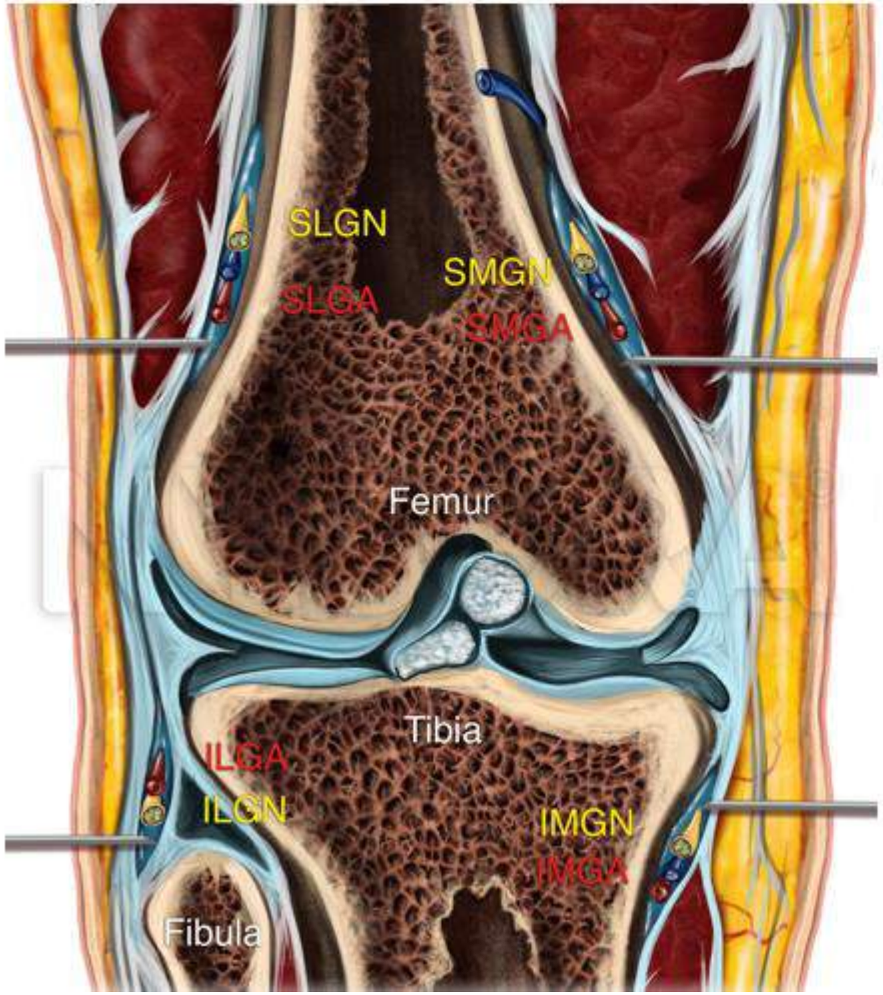
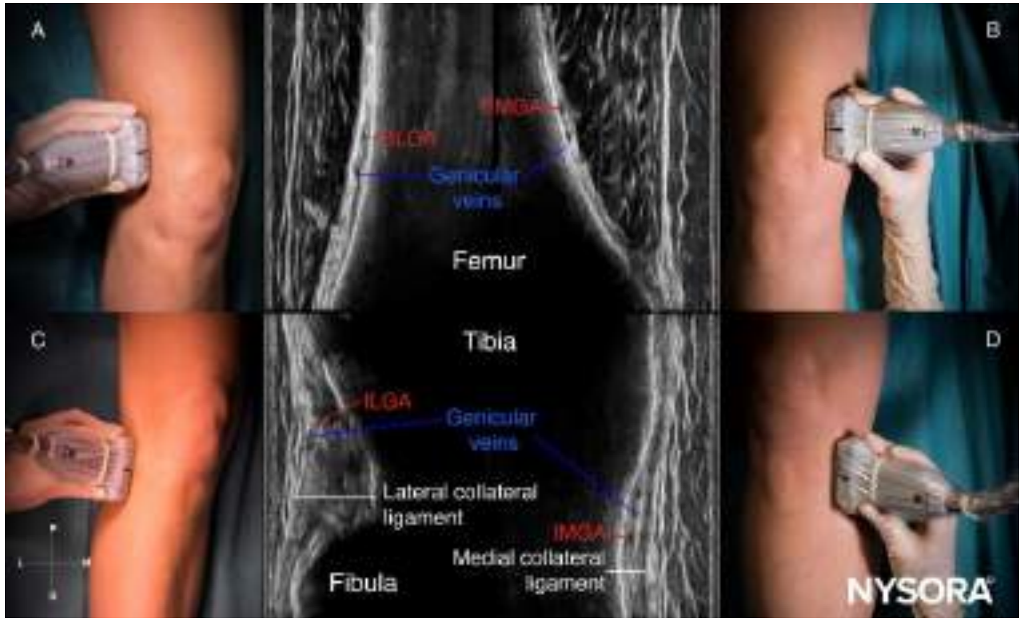
Nervi Genicolari





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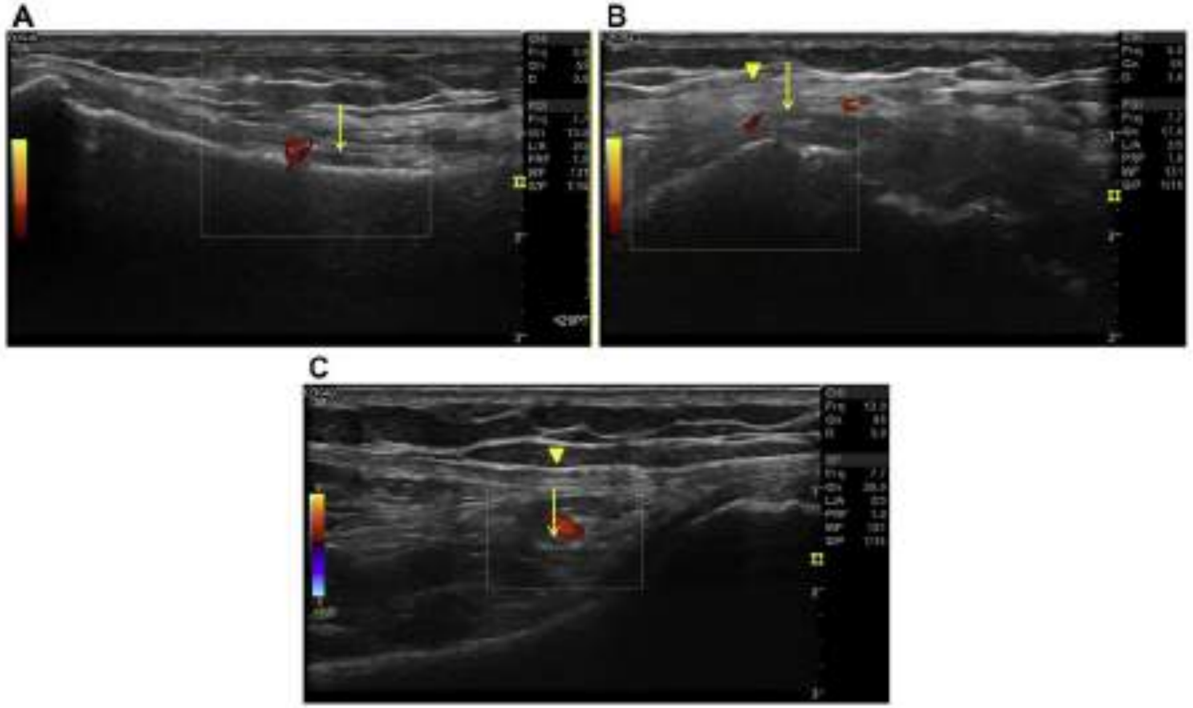
Genicular Radiofrequency Ablation for Treatment of Post Total Knee Arthroplasty Posterior Thigh Pain: A Case Report

Lauren N. Sylvester, MD, and Johnathan H. Goree, MD

We present a case of a 68-year-old woman with 6 months of chronic unilateral posterior thigh pain after a total knee arthroplasty. The patient's pain was refractory to various treatments. After appropriate diagnostic tests, a genicular nerve block and subsequent radiofrequency ablation were performed. These procedures provided substantial pain relief of her thigh pain at 3 months follow-up. (A&A Case Reports. 2017;XXX:00–00.)

Examining the Feasibility of Radiofrequency Treatment for Chronic Knee Pain After Total Knee Arthroplasty

Nicole M. Protzman, MS, Jennifer Gyi, DO, Amit D. Malhotra, MD, Jason E. Kooch, DO



ORIGINAL ARTICLE

A Comparison of Genicular Nerve Treatment Using Either Radiofrequency or Analgesic Block with Corticosteroid for Pain after a Total Knee Arthroplasty: A Double-Blind, Randomized Clinical Study

Salima Qudsi-Sinclair, MD*; Enrique Borrás-Rubio, MD†;
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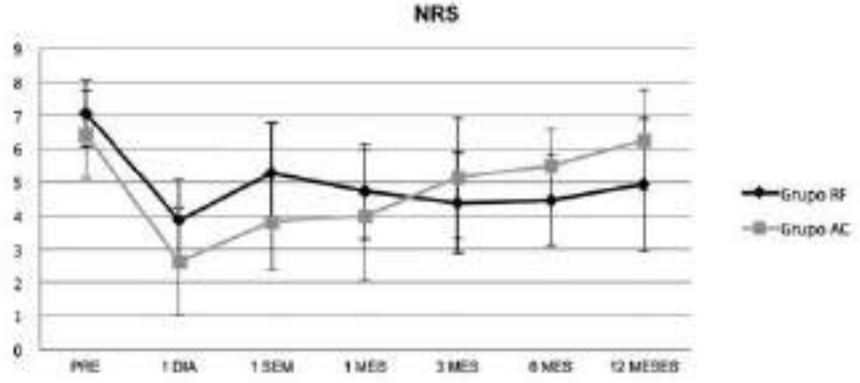

Figure 5. Numeric Rating Scale evolution during the year follow up in Group RF (radiofrequency) and Group AC (analgesic block with corticoesteroid).

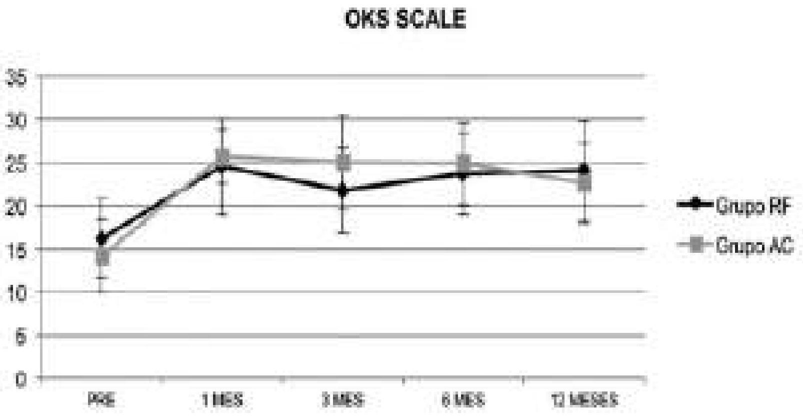

Figure 6. Oxford Knee Score scale evolution during the year follow up in Group RF (radiofrecuency) and Group AC (analgesic block with corticoesteroid).

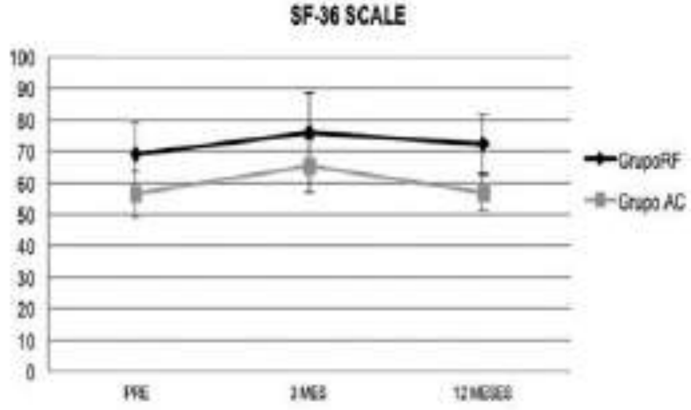

Figure 8. 36-Item Short Form Health Survey scale evolution during the year follow up in Group RF (radiofrecuency) and Group AC (analgesic block with corticoesteroid).

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KJA
Korean Journal of Anesthesiology

Case Report
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Ultrasound-guided percutaneous cryoneurolysis providing postoperative analgesia lasting many weeks following a single administration: a replacement for continuous peripheral nerve blocks?

-a case report-

Brian M. Ilfeld[1], Rodney A. Gabriel[1], and Andrea M. Trescot[2]

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Cryoneurolysis entails using low temperatures to reversibly ablate nerves, with a subsequent analgesia duration measured in weeks or months. Previously, clinical applications for acute pain were limited because treatment originally required exposing the target nerve surgically. However, three developments have now made it possible to provide prolonged postoperative analgesia by cryoneurolysis: 1) new portable, hand-held cryoneurolysis devices, 2) ultrasound machine proliferation, and, 3) anesthesiologists trained in ultrasound-guided peripheral nerve block administration. This report is the first to describe the use of a single preoperative administration of ultrasound-guided percutaneous cryoneurolysis to provide multiple weeks of analgesia following shoulder rotator cuff repair and total knee arthroplasty. Considering the significant benefits of cryoanalgesia relative to continuous peripheral nerve blocks (e.g., lack of catheter/pump care, extremely long duration), this analgesic modality may be a practical alternative for the treatment of prolonged post-surgical pain in a select group of surgical patients.

Contents lists available at ScienceDirect

The Knee

ELSEVIER

Percutaneous freezing of sensory nerves prior to total knee arthroplasty

Vinod Dasa[a,*], Gabriel Lensing[b], Miles Parsons[b], Justin Harris[b], Julia Volaufova[c], Ryan Bliss[a]

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Conclusions: Perioperative cryoneurolysis in combination with multimodal pain management may significantly improve outcomes in patients undergoing TKA. Promising results from this preliminary retrospective study warrant further investigation of this novel treatment in prospective, randomized trials.

Level of evidence: III

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ESRA MEETING
ANNUAL UPDATE

1 day, 1 programme, 3 cities

ROMA, 13 APRILE 2024

Responsabili scientifici:
Mario Bosco
Fabio Costa
Fabrizio Fattorini

SESSIONE 3

IL GINOCCHIO: PRIMA, DURANTE E DOPO

GRAZIE

anestesiologiche

R. Perna