Rev Bras Anestesiol. 2018;68(4):400–403

Sociedade Brasileira de Anestesiologia

REVISTA BRASILEIRA DE ANESTESIOLOGIA

Publicação Oficial da Sociedade Brasileira de Anestesiologia
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CLINICAL INFORMATION

Superior gluteal nerve: a new block on the block?

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Received 8 July 2016; accepted 25 November 2016
Available online 27 December 2016

KEYWORDS
Superior gluteal nerve;
Ultrasound;
Pain;
Regional anesthesia

Abstract
Background and objectives: The superior gluteal nerve is responsible for innervating the gluteus medius, gluteus minimus and tensor fascia latae muscles, all of which can be injured during surgical procedures. We describe an ultrasound-guided approach to block the superior gluteal nerve which allowed us to provide efficient analgesia and anesthesia for two orthopedic procedures, in a patient who had significant risk factors for neuraxial techniques and deep peripheral nerve blocks.
Clinical report: An 84-year-old female whose regular use of clopidogrel contraindicated neuraxial techniques or deep peripheral nerve blocks presented for urgent bipolar hemiarthroplasty in our hospital. Taking into consideration the surgical approach chosen by the orthopedic team, we set to use a combination of general anesthesia and superficial peripheral nerve blocks (femoral, lateral cutaneous of thigh and superior gluteal nerve) for the procedure. A month and a half post-discharge the patient was re-admitted for debriding and correction of suture dehiscence; we performed the same blocks and light sedation. She remained comfortable in both cases, and reported no pain in the post-operative period.
Conclusions: Deep understanding of anatomy and innervation empowers anesthesiologists to solve potentially complex cases with safer, albeit creative, approaches. The relevance of this block in this case arises from its innervation of the gluteus medius muscle and posterolateral portion of the hip joint. To the best of our knowledge, this is the first report of an ultrasound-guided superior gluteal nerve block with an analgesic and anesthetic goal, which was successfully achieved.

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https://doi.org/10.1016/j.bjane.2016.11.001

PALAVRAS-CHAVE
Nervo glúteo superior;
Ultrassom;
Dor;
Anestesia regional

Nervo glúteo superior: um novo bloqueio a caminho?

Resumo
Justificativa e objetivos: O nervo glúteo superior é responsável pela inervação dos músculos glúteo médio, glúteo mínimo e tensor da fáscia lata, todos podem ser lesados durante procedimentos cirúrgicos. Descrevemos uma abordagem guiada por ultrassom para bloqueio do nervo glúteo superior, o que nos permitiu fornecer analgesia e anestesia eficientes para dois procedimentos ortopédicos a uma paciente que apresentava fatores de risco significativos para técnicas neuraxiais e bloqueios profundos de nervos periféricos.
Relato de caso: Paciente do sexo feminino, 84 anos, cujo uso regular de clopidogrel contraindicava técnicas neuraxiais ou bloqueios profundos de nervos periféricos, apresentou-se para hemiartroplastia bipolar urgente em nosso hospital. Levando em consideração a abordagem cirúrgica escolhida pela equipe de ortopedia, estabelecemos o uso de uma combinação de anestesia geral e bloqueios superficiais de nervos periféricos (femoral, cutâneo lateral da coxa e nervo glúteo superior) para o procedimento. Um mês e meio após a alta, a paciente foi readmitida para desbridamento e correção da deiscência de sutura quando fizemos os mesmos bloqueios e sedação leve. A paciente permaneceu confortável em ambos os casos, sem queixa de dor no período pós-operatório.
Conclusões: A compreensão profunda da anatomia e da inervação capacita os anestesiologistas a resolver casos potencialmente complexos com abordagens mais seguras, até criativas. A relevância desse bloqueio neste caso resulta da sua inervação do músculo glúteo médio e da porção posterolateral da articulação do quadril. De acordo com nossa pesquisa, este é o primeiro relato de um bloqueio do nervo glúteo superior guiado por ultrassom com objetivo analgésico e anestésico que foi obtido com sucesso.

Background and objectives

The superior gluteal nerve (SGN) is responsible for innervating the gluteus medius, gluteus minimus and tensor fascia latae muscles, all of which can be injured during surgical procedures. The individual block of this nerve is made redundant by the use of neuraxial techniques or deep peripheral nerve blocks (PNB) such as the sacral plexus block; however, not all patients can be subjected to these techniques. We describe an ultrasound-guided approach to block the SGN, which allowed us to provide efficient analgesia and anesthesia for two orthopedic procedures in a patient who had significant risk factors for neuraxial techniques and deep PNBs.

Case report

We present the case of a 60 kg 84-year-old female who presented for urgent bipolar hemiarthroplasty due to left femur hip fracture after falling in our hospital's medicine ward, where she had been undergoing antibiotherapy for 7 days to treat a community-acquired pneumonia.

She had a known history of atrial fibrillation with controlled ventricular response, myocardial infarction in 2015 (for which she underwent percutaneous coronary intervention), NYHA class II heart failure, controlled arterial hypertension, dyslipidemia, depression, and had previously undergone mitral valvuloplasty in 1988 due to rheumatic fever. She regularly took acenocumarol, clopidogrel, digoxin, carvedilol, ramipril, furosemide, rosuvastatin and sertraline, and had no history of tobacco or alcohol abuse or known allergies. She was previously independent for her daily activities.

There were no relevant findings on her pre-operative exams, aside from and discrete lung bilateral infiltrates on her chest X-ray. Her hemoglobin level was 13.9 $g.dL^{-1}$, platelet count 335.000 per μL, and coagulation status had been promptly corrected with vitamin K. A transthoracic echocardiogram performed after her infarction episode showed moderate mitral stenosis and mild mitral regurgitation with severe left atrial dilation, borderline criteria for pulmonary hypertension, moderate tricuspid regurgitation, preserved left ventricle ejection fraction and lowered right ventricle function.

After discussing the risks and surgical plan with the orthopedic team and patient, we obtained her consent. Seeing as neuraxial techniques or deep PNBs were contraindicated by her regular usage of clopidogrel, our anesthetic plan consisted of a combination of superficial peripheral nerve blocks and general anesthesia. The patient was monitored according to American Society of Anesthesiology monitoring standards. Her vitals were BP of 150/92 mmHg and HR of 88 bpm. We performed a femoral and lateral cutaneous nerve of thigh block using a 21G 80 mm needle (Stimuplex® Ultra 22 gauge, B. Braun, Melsungen, Germany) under ultrasound guidance (Venue 40 Ultrasound, GE Healthcare, with a 5–13 MHz wide-band linear array

transducer) with an *in-plane* approach, totaling 15 mL of 0.5% ropivacaine.

The surgical team opted for a lateral (Hardinge) approach, which involves the incision of the fasciae latae and gluteus medius muscle 5 cm proximal to the great trochanter extending caudally down the line of the femur. In order to provide adequate analgesia for these incisions, we executed a SGN block with 10 mL of 0.375% ropivacaine, using the same equipment by putting the ultrasound probe in a transverse plane caudally to the iliac crest and cephalically to the greater trochanter, and identifying the fascial plane between the gluteus medius and minimus (where the SGN travels) as our target point of injection. We used an in-plane approach, from lateral to medial.

After performing the block, eventless anesthetic induction was performed with 75 μg of fentanyl and 60 mg of propofol. General anesthesia was maintained under spontaneous ventilation with a number 3 laryngeal mask at 0.5 MAC of sevoflurane and a mixture of O_2: Air 40:60. The BIS values were kept around 50 throughout the procedure. The procedure lasted 90 minutes, during which she was hemodynamically stable (BP around 120/70 mmHg and HR around 70 bpm). Urinary output remained well above 1 mL.kg^{-1}.h^{-1}. Post-operative nausea and vomiting prophylaxis was ensured with 4 mg dexamethasone and additional analgesia consisted solely of 1 g paracetamol. After emerging from anesthesia and for the following days, the patient reported no pain at rest or movement nor side-effects. She was prescribed 1 g Paracetamol and 100 mg Tramadol 8 hourly for the following days.

Post-surgical recovery was complicated by methicillin-resistant *Staphylococcus aureus* bacteremia and complete dehiscence of the surgical wound, which was successfully managed with antibiotherapy and negative pressure therapy. She was discharged 44 days after surgery, able to immediately resume her normal life.

A month and a half post-discharge, the patient was re-admitted for debriding and correction of suture dehiscence. Because it was predictably a simple procedure, we once again obtained the patient's consent and replicated the PNBs mentioned above with a mixture of 15 mL mepivacaine 1.5% and 10 mL ropivacaine 0.375%. The patient remained comfortable with only light sedation (30 mg propofol throughout the hour-long procedure) and reported no pain during surgery or in the following day, when she was discharged from our hospital. There were no noteworthy events during the intra-operative and post-operative period.

Discussion

Ultrasound-guided PNBs are becoming an increasingly popular option for analgesia and anesthesia, particularly in the elderly whose comorbidities might pose significant threats to their safety. Traumatology, in particular, challenges anesthesiologists to optimize patients and find solutions within a limited time-frame for maximum patient benefit. These facts notwithstanding, proficiency in PNBs demands more than image recognition and needle-eye coordination: deep understanding of anatomy and skin, muscle and bone innervation empowers anesthesiologists to solve potentially complex cases with safer, albeit creative, approaches.

Figure 1 Probe position for the SGN block. With the patient in lateral decubitus, place the probe in a transverse plane caudally to the iliac crest and cephalically to the greater trochanter.

In this case, the block of the SGN allowed for painless incision of the gluteus medius muscle in two different circumstances, without the resort to neuraxial approaches or deep PNBs in a patient under anti-platelet therapy, representing an excellent option for pain-control and safe anesthetic management of a patient with significant comorbidities.

The SGN arises from the sacral plexus and has its origins on the dorsal rami of L4, L5 and S1; after descending through the great sciatic foramen it courses over the piriformis and between the gluteus medius and minimus, supplying branches for these muscles before reaching the tensor fascia latae, which is also innervates.[1] These muscles work

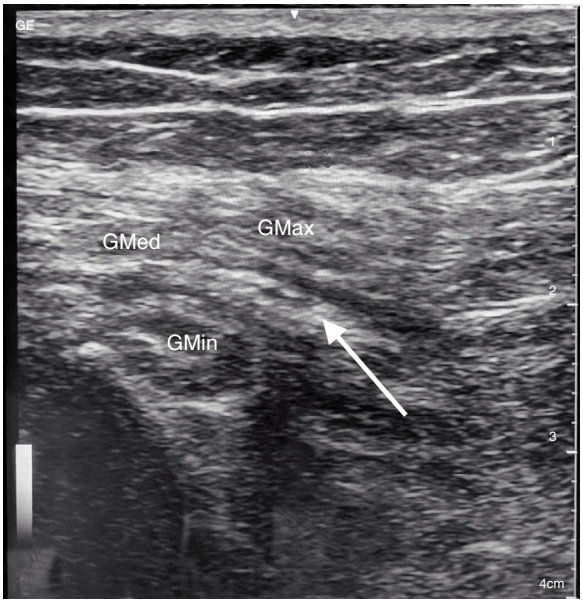

Figure 2 Sonoanatomy of the SGN nerve (GMax, Gluteus Maximus Muscle; GMed, Gluteus Medius Muscle; GMin, Gluteus Minimus Muscle). The arrow points to the fascial plane between GMed and Gmin, where the hyperechoic superior gluteal nerve and the pulsating superior gluteal artery can be seen.

to concentrically abduct the thigh, stabilize of stance hip, and maintain the horizontal pelvic position during single leg stance.[2] Some references also mention a contribution to the posterolateral section of the hip joint capsule.[1,3] The SGN does not innervate cutaneous or bone structures.

Had the surgical team opted for the more commonly performed posterolateral (Moore or Southern) approach, the gluteus medius muscle would have been spared (in exchange for the gluteus maximus muscle, which is innervated by the inferior gluteal nerve). Both approaches involve a skin incision of the lateral aspect of the thigh (covered by the lateral cutaneous of thigh nerve, provided that the incision is not as cephalad so as to affect subcostal nerve territory) and dissection of the vastus lateralis muscle (covered by the femoral nerve). Innervation of the hip joint capsule is still controversial, meaning it is difficult to detail the role of each nerve; nevertheless, as mentioned above, the SGN might contribute to the posterolateral section.[3]

In order to locate the SGN, the probe was positioned in a transverse plane caudally to the iliac crest and cephalically to the greater trochanter (Fig. 1). These references correspond to the origin and insertion of the gluteus medius muscle, respectively. Superficially to the iliac bone, the gluteus medius and minimus muscles are identifiable (Fig. 2). The nerve travels within the fascial plane between them, and is accompanied by the superior gluteal artery; the pulsation of this artery can aid in the correct identification of the target point of injection, but should also be a source of concern in regards to safety. Furthermore, care should be taken because permanent injury to the SGN could compromise function of the gluteus medius, minimus, and tensor fascia late, causing Trendelenburg gait.

To the best of our knowledge, this is the first report of ultrasound-guided SGN block with an analgesic and anesthetic goal. There have been some scarce reports of blockade of this nerve for chronic pain (superior gluteal neuralgia). As anatomy and sonoanatomy knowledge thrives within the medical community, it is to be expected that new blocks will be described and that anesthetic practices evolve and change accordingly.

Conflicts of interest

The authors declare no conflicts of interest.

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