Continuous pericapsular nerve group (PENG) block through an elastomeric infusion system, associated with the lateral cutaneous nerve block of the thigh for total hip arthroplasty

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SUMMARY
Orthopaedic surgeries can lead to pain that is difficult to treat, sometimes requiring prolonged hospitalisation. Peripheral nerve blocks stand out as an efficient strategy within the context of multimodal analgesia. The hypothesis is that continuous pericapsular nerve group block, when combined with lateral femoral cutaneous nerve block, can provide excellent analgesic coverage for hip surgeries. Continuous infusion systems can prolong analgesia, minimising opioid consumption, adverse effects and providing faster recovery. We describe a case of efficient analgesia, in which a catheter was positioned between the iliopsoas muscle plane and the iliopubic eminence for total hip arthroplasty.

BACKGROUND
Total hip arthroplasties are major surgeries capable of offering an attempt to improve quality of life and functional status of patients who are refractory to conservative therapies. However, patients can present intense pain in the immediate postoperative period, resulting in immobility, increased risk of complications and greater opioid consumption, generating adverse effects and prolonged hospitalisation.

The difficult management of pain is explained by the complex innervation of the hip joint, in which the articular branches of the femoral, obturator and accessory obturator nerves are responsible for the sensory innervation of the anterior capsule.

Additional anaesthetic techniques, such as peripheral nerve blocks, are part of a multimodal analgesic strategy and are often used to allow better management of acute pain. The inadequate treatment can lead to persistent painful status.

Despite of innumerable nerve blocks for this purpose, some may fail because they do not cover the entire innervation of the anterior hip capsule. Our hypothesis is that the pericapsular nerve group block (PENG block), described in 2018, by allowing the deposition of local anaesthetic between the psoas muscle tendon plane and the iliopubic eminence, associated with the lateral cutaneous nerve block thigh, would enable efficient analgesia, without causing motor block.

In addition, the application of continuous infusion systems could provide prolonged postoperative analgesia, with little interference in the routine of the service, due to the use of elastomeric pumps with local anaesthetic coupled to the perineural catheter, through single injection.

In this paper, we report the case of a patient who underwent total hip arthroplasty, with a history of thrombophilia, in which the PENG block was performed, with a continuous technique, and a single shot block of the lateral cutaneous nerve of the thigh.

CASE PRESENTATION
A man, with thrombophilia (Factor V Leiden mutation) and recurrent episodes of deep vein thrombosis, on Rivaroxaban 20 mg/day (suspended 2 days before) was admitted to the operating room for right hip arthroplasty due to coxarthrosis and aseptic necrosis of the head of the femur, resulting in an important functional limitation of the hip. The preoperative pain score was 8/10 on the verbal numerical scale (VNS).

After standard multiparametric monitoring and installation of venoclysis with J18G in the left upper limb, simple spinal anaesthesia was performed with a 25G Quincke needle, L2–L3, via median, with 15 mg of isobaric bupivacaine, sensitive level at T10. He was sedated with propofol 0.375%, guided by ultrasound, to contemplate the colour Doppler feature (figure 1). Bolus with 15 mL ropivacaine 0375%+10 mg dexamethasone was performed and coupled to the elastomeric infusion system (EasyPump II LT B|Braun), filled with ropivacaine 0.375%, guided by ultrasound, to contemplate the incised region. Postoperative analgesia was complemented with parecoxib 40 mg two times a day and dipyrone 1 g of 4/4 hour intravenously. There was no opioid consumption.

The patient was followed by the anaesthesiology service until the time of hospital discharge (2 days),...
and the perineural catheter was then removed with no signs of infection. Lower limb muscle strength remained preserved throughout the hospital stay.

The analgesic strategy used allowed an efficient control of pain, besides having ensured that the patient sat out of bed the next morning, underwent physiotherapy and walked 48 hours after surgery.

The patient continues in rehabilitation, with good clinical evolution, without pain complaints in the operated limb and functional improvement, progressing in motor physiotherapy.

**DISCUSSION**

In this study, we demonstrate a case in which continuous PENG block (using a perineural catheter and elastomeric infusion system) was performed, associated with the lateral cutaneous nerve block of the thigh, in total hip arthroplasty surgery, in a patient with thrombophilia.

In this context, the nerve supply of the hip joint has been described in detail in various studies. The hip capsule is divided into two parts: anterior and posterior, with nociceptive fibres mostly present on the anterior part while the posterior part has mechanoreceptors. An anatomic study by Gerhardt et al., demonstrated that proximal branches of both the femoral and obturator nerves provide innervations to the anterior hip capsule. The accessory obturator nerve was found to innervate the medial capsule, which has sensory fibers. In a cadaveric study of the PENG block, injected dye stained the entire anterior hip capsule area innervated by the articular branches of femoral, obturator, and accessory obturator nerves area.

Since total hip arthroplasties are a highly complex procedure, it can present an enormous challenge in adequate pain management. Pain is a risk factor for increased postoperative complications, such as immobility (risk for deep vein thrombosis and thromboembolic complications) and risk of delirium, especially in the elderly.

Due to this technique, it was achieved pain control for a longer time, without motor impairment, ensuring early walking and recovery. In addition, patient was considerably content with minimal interference in the service’s routine.

Thus, peripheral nerve blocks are part of an arsenal of multimodal analgesic strategies in the perioperative context of orthopaedic surgery.

Dulaney-Cripe demonstrated that the fascia iliaca compartment block continuous infusion was effective in controlling pain and reducing opioid consumption in elderly patients undergoing corrective surgery for hip fracture. However, some studies discuss the fact that there are possible failures of one of the nerve branches in this approach, requiring larger volumes of local anaesthetic for better efficacy. This point must be taken into account, as motor blockade in the quadriceps muscles (femoral nerve territory) is possible, resulting in a delay in postoperative walking.

O’Reilly et al showed that, despite chemical and physical thromboprophylaxis, the incidence of deep vein thrombosis was still high (around 8.9% in hip surgeries). Therefore, early ambulation is a very important factor for these patients.

The continuous PENG block technique, associated with the lateral cutaneous nerve block of the thigh, appears as an efficient and safe perioperative analgesic approach, allowing an upstanding coverage of the hip joint territory, acting specifically
Peripheral nerve blocks are highlighted as an efficient technique, mainly because it is easy to perform and has a fast learning curve.

Learning points

- Major orthopaedic surgeries can cause difficult-to-treat pain, delaying hospital discharge.
- Peripheral nerve blocks are highlighted as an efficient analgesia strategy within the multimodal therapeutic arsenal.
- The hypothesis is that continuous pericapsular nerve group block, when combined with the lateral femoral cutaneous nerve, can provide excellent analgesic coverage for total hip arthroplasty surgeries.
- The result of this case report demonstrates that the use of a continuous infusion system, through an elastomeric pump and perineural catheter, is an effective and safe method for analgesia, after total hip arthroplasty, enabling early ambulation and recovery, in addition to lower consumption of opioids.

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Case reports provide a valuable learning resource for the scientific community and can indicate areas of interest for future research. They should not be used in isolation to guide treatment choices or public health policy.

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