

Unilateral spinal anesthesia with hypobaric bupivacaine for regularization of the right lower limb amputation stump: a case report with video

Abstract

Background: Patients with poorly controlled diabetes mellitus have an increased risk of lower limb amputation (LEA), being associated with a high risk of postoperative mortality. Several studies have shown that the type of anesthesia did not significantly affect mortality or morbidity after LEA. In a literature search, no study was found comparing general anesthesia and unilateral spinal anesthesia. We will show a case of a patient, operated under unilateral spinal anesthesia with 5 mg of 0.15% hypobaric bupivacaine, in left lateral decubitus to regularize the stump of an amputation of the right lower limb.

Case report: Woman aged 70 years, 66 kg, 160 cm, physical status ASA III, with type I diabetes controlled with insulin and systemic arterial hypertension. Patient underwent amputation two months ago and admitted for regularization of the stump of the amputation. Laboratory tests and chest X-ray and ECG were normal. After signing the informed consent form and a detailed explanation of the anesthetic technique for the patient and her family, and unilateral spinal anesthesia with hypobaric bupivacaine solution is being proposed. Routine monitoring and venoclysis with a 20G catheter. Abbreviation for CHO fasting. Sedation with 50 µg of fentanyl and 1 mg of midazolam. In left lateral decubitus, the L3-L4 interspace was punctured with 27G Quincke and after the appearance of CSF, 5 mg of 0.15% hypobaric bupivacaine was injected, remaining in this position for 10 minutes. The sensory and motor blockade was restricted to the limb to be operated and the patient was placed in the supine position for the surgical procedure. The procedure lasted 40 minutes and was taken to the PACU, and after 200 ml CHO and the end of the block, she was taken to the room.

Conclusion: The technique provided great cardiocirculatory stability and patient satisfaction as there was no degree of blockage in the contralateral limb. Discharged from hospital on the 2nd postoperative day.

Keywords: lower extremity amputation, diabetes, peripheral vascular disease, type of anesthesia, morbidity

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Introduction

In a recent systematic review and meta-analysis of general anesthesia (GA) versus regional anesthesia (RA) for lower extremity amputation from 1990 to 2022 for studies investigating the effect of the anesthetic modality on the postoperative outcomes after lower extremity amputation (LEA) showed that GA could be associated with a higher rate of respiratory failure and sepsis compared with RA.¹ Of 756 studies following consort flowchart only 10 studies were included in this systematic review and meta-analysis, and there are no studies with unilateral spinal anesthesia.¹ Between January 2012 and May 2023, more than 282,000 amputation surgeries were performed by the Brazil Unified Health System (SUS).² In a recent Editorial I demonstrated the different positions for performing spinal anesthesia (SA).³ Previously in the same journal, we had demonstrated that SA is much more than a hyperbaric bupivacaine injection and sitting position.⁴ In schools that teach SA performed in the sitting position, they no longer teach the spinal hemianesthesia technique, which can be unilateral with a puncture in the lateral decubitus position or posteriorly with a puncture in the prone position. Unilateral spinal anesthesia can be performed with hyperbaric or hypobaric solutions.⁵ Maintenance in lateral decubitus for a certain period may restrict surgical anesthesia to side to be operated. We will show a case of a patient, operated under unilateral spinal anesthesia with 5 mg of

0.15% hypobaric bupivacaine, in left lateral decubitus to regularize the stump of an amputation of the right lower limb.

Case report

Woman aged 70 years, 66 kg, 160 cm, physical status ASA III, with type I diabetes controlled with insulin, systemic arterial hypertension controlled by hydrochlorothiazide (25 mg/day) and losartan (50 mg/day), smoker of a pack of cigarettes for more than 50 years, and she had no history of hyperlipidemia, and cardiac arrhythmia, admitted for regularization of the stump of the amputation of the right lower limb, carried out two months ago, under hyperbaric SA in another hospital. Her hemoglobin was 11.2 g/dL, 38% hematocrit, 3,900,000/mm³ red cells, platelets 165,000/mm³, prothrombin time 13 s, PTT 75%, and INR 1.2. Tests revealed all electrolytes were normal. Bilirubin, urea, and creatinine unchanged. Chest X-ray and ECG were normal. Heart rate of 73 bpm and blood pressure of 148/64 mmHg.

Fasting was shortened with 200 ml of maltodextrin orally, 2:30 hours before being taken to the operating room. This case report is part of the protocol for the application of accelerating total postoperative recovery (ACERTO) was approved by the Research Ethics Committee (No. 171,924) and registered on Platform Brazil (CAAE: 09061312.1.0000.5179). After signing the informed consent

form and a detailed explanation of the anesthetic technique for the patient and her family. The regularization of the stump was indicated by unilateral spinal anesthesia with hypobaric bupivacaine solution.

After monitoring with continuous ECG in CM5, pulse oximetry and NIBP, a peripheral vein access with 20G extracath, started with 500 ml of lactate ringer solution was infused with the following medications ranitidine (50 mg), omeprazole (40 mg), dexamethasone (10 mg), ondansetron (4 mg). After sedation with 50 µg of fentanyl and 1mg of midazolam, the patient was placed in the left lateral decubitus position and antisepsis was performed with 70% alcohol. Local anesthesia was performed with 1% lidocaine, initially with a 1 ml insulin needle and later with 3 ml with a 27G needle of the L3-L4 interspace structures. The SA was performed with a 27G Quincke type were inserted without discomfort and a free flow of cerebrospinal fluid (CSF) obtained before injection of 5 mg of 0.15% hypobaric 0.5% bupivacaine, remaining in this position for 10 minutes. A sensory (pinprick) block reached the level of T12 and grade 3 motor block in the stump and no sensory or motor block in the contralateral limb (Video). The patient was placed in the supine position for the surgical procedure. The patient received oxygen 2 l/min through combination with the collector tube of the capnograph was placed at the nostril of the patient and exhibited the capnogram, and EtCO₂ during all the time. A bladder catheter was also not used to control diuresis.

Video: Patient in left lateral decubitus, puncture between L3-L4 with 27G Quincke needle, after asepsis with 70% alcohol, injection of 5 mg of 0.15% bupivacaine. Remain in the decubitus position for 10 minutes and placed in the prone position for surgery. An assessment of unilaterality was carried out, which showed complete sensory and motor blockade of the stump in the right lower limb and no degree of sensory and motor blockade in the left limb. The surgery lasted 45 minutes and the anesthesia lasted 1:25 h, before being released to the room.

Hemodynamic parameters were stable during all the time and the patient received and infusion of 300 ml of ringer lactate, and the surgical procedure lasted 45 minutes. At the end of surgery, dipyrone 3 g were administered. SpO₂ assessment throughout the procedure was between 96% and 100% and EtCO₂ between 30 and 36 mmHg. After the end of the surgery the patient was sent to PACU, staying for 40 minutes and released to the room, after administration of 200 ml of CHO, and no sensory and motor blockade in the operated limb. Discharged from hospital on the 2nd postoperative day.

Discussion

Diabetes and peripheral vascular disease are the leading causes of LEA. Performing unilateral spinal anesthesia with a low dose of 0.15% hypobaric bupivacaine and remaining in lateral decubitus for 10 minutes, showing that this technique was perfect for the surgeons and the patient's complete satisfaction, with sensory and motor blockade of the stump of the lower limb and without any degree of sensory and motor blockade of the contralateral limb. The low dose used, and the unilateral technique allowed no hemodynamic and respiratory changes to occur, in the operated limb it lasted around 1:20 hours. In a study carried out in 2005, which examined reamputation patterns, it showed that 26% of patients required reamputation procedures within a 12-month period and more than a third died within 1 year of the initial amputation.⁶ In the present case, reamputation occurred at the beginning of the 2nd month of the initial amputation.

The 0.15% hypobaric bupivacaine was introduced in Brazil in 1985.⁷ The onset of action and the duration of unilateral spinal anesthesia will depend on the dose and the type of local anesthetic used, tetracaine, lidocaine, bupivacaine, ropivacaine, and levobupivacaine

in enantiomeric excess (S75:R25) were used. The difference in density between the CSF and the anesthetic solution in addition to the length of stay in the lateral decubitus position are the most important factors to be considered for restrict a hemi spinal block. One hundred and fifty patients were randomly divided in three groups to receive 5 mg of 0.5% isobaric bupivacaine, 5 mg of 0.5% hyperbaric bupivacaine, or 5 mg of 0.15% hypobaric bupivacaine, showed that spinal anesthesia with hypobaric solutions (90%) and hyperbaric solution (84%) provided a higher frequency of unilaterality, whereas the isobaric solution resulted in only 28% of unilaterality.⁸

A study using three different doses of 0.15% hypobaric bupivacaine, administered at a rate of 1 ml/15 s, for unilateral orthopedic surgery showed that recovery from blockade is dose and length of stay dependent.⁹ As the patient's surgery would be to regularize the amputated stump, the dose of 5 mg of 0.15% bupivacaine provided enough time to perform the surgery, which lasted 40 minutes, with both sensory and motor blocks sufficient to perform the surgery.

In a retrospective study over 10 years, the primary outcomes were 30-day and 90-day mortality, and secondary outcomes were postoperative morbidity, intraoperative events, postoperative intensive care unit admission, and postoperative length of stay, showed that the type of anesthesia did not significantly affect mortality or morbidity after LEA.¹⁰ However, intraoperative hypotension, vasopressor use, and postoperative ICU admission rates were lower with RA. In all the literature researched, no comparison between GA and USA article, since the use of unilateral spinal anesthesia, which is known to cause minor hemodynamic and respiratory changes.⁹ In addition to providing satisfaction for patients by remaining without any degree of sensory or motor blockage in the contralateral limb.

In a retrospective cohort included all subjects who underwent LEA for 10 years, it showed that long-term survival was worse in patients who underwent a major amputation with a 5-year mortality of 65.6%.¹¹ Elderly patients indicated for LEA with any functional impairment are at high risk for adverse events. The type of anesthesia, GA vs RA, did not have significant effect on perioperative outcomes after major lower extremity amputation in the functionally impaired geriatric population. These findings provide an evidence base that will allow surgeons, anesthesiologists, and patients to make an informed decision about anesthesia type for their procedure.¹² This case report emphasizes that no study was found comparing GA and unilateral spinal anesthesia, whether with hyperbaric or hypobaric solution.

Unilateral spinal anesthesia with 7.5 mg of hyperbaric bupivacaine was performed in two patients, classified as ASA 5.¹³ After the injection, both patients remained in lateral decubitus for only 5 minutes, having developed arterial hypotension requiring dopamine. It is known by those who practice unilateral spinal anesthesia that the stay in lateral decubitus should vary according to the dose.¹⁴ When using bupivacaine, the patient should remain in lateral decubitus for 15 to 20 minutes, and for lidocaine, 5 to 10 minutes.¹⁴ In these two cases, the dose used required a longer duration and the sensory and motor blocks in the contralateral limb were not evaluated, nor described in the reported cases. Significant global variation exists in the incidence of lower extremity amputation, being ethnicity and social deprivation play a significant role.¹⁵ However, it is the role of diabetes and peripheral arterial occlusive disease, plays a fundamental role in complications that are most serious.

Conclusion

Major lower extremity amputation, including below the-knee amputation and above-the-knee amputation, remains one of the

most common vascular surgery procedures performed in the Brazil SUS. Despite advancement in perioperative care and anesthesia management, with high perioperative mortality rates. Multivariable analyses confirmed that anesthesia type did not significantly affect morbidity and mortality.¹¹ Unilateral spinal anesthesia is a technique little used by most anesthesiologists. If you always keep the patient in the left lateral decubitus position, if you are going to operate on the left limb (downwards) you must use the hyperbaric solution, and if you are going to operate on the upper limb (upwards and in the present case) you must use the hypobaric solution. Finally, this technique should be used mainly in outpatient surgical procedures, in patients who want great cardiocirculatory stability and do not want to obtain unpleasant bilateral motor block.

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Conflict of interest

No

Contribution

None

IRB

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References

1. Mufarrih SH, Qureshi NQ, Yunus RA, et al. A systematic review and meta-analysis of general versus regional anesthesia for lower extremity amputation. *J Vasc Surg.* 2023;77:1542–1552.
2. <https://sbacv.org.br/brasil-bate-recorde-de-amputacoes-de-pes-e-pernas-em-decorren-cia-do-diabetes/sociedade-brasileira-de-angiologia-e-cirurgia-vascular>. Visit the website on July 7, 2024. visit the website on July 7, 2024.
3. Imbelloni LE. Spinal anesthesia: position of puncture, ultrasound, and local anesthetics solution. *Int J Anesthetic Anesthesiol.* 2022;9(2):149.
4. Imbelloni LE, Gouveia MA, Ghoryeb NM, et al. Spinal anesthesia: much more than single shot of hyperbaric bupivacaine. *Int J Anesthetic Anesthesiol.* 2021;8(1):122.
5. Imbelloni LE. Spinal hemianesthesia: Unilateral and posterior. *Anesth Essays Res.* 2014;8:270–276.
6. Dillingham TR, Pezzin LE, Shore AD. Reamputation, mortality, and health care costs among persons with dysvascular lower-limb amputations. *Arch Phys Med Rehabil.* 2005;86(3):480–486.
7. Gouveia MA, Labrunie GM. Raqui-anestesia hipobárica com bupivacaína 0.15%. *Rev Bras Anestesiol.* 1985;35:519–521.
8. Imbelloni LE, Beato L, Gouveia MA, et al. Low dose isobaric, hyperbaric, or hypobaric bupivacaine for unilateral spinal anesthesia. *Rev Bras Anestesiol.* 2007;57(3):261–271.
9. Imbelloni LE, Gouveia MA, Vieira EM, et al. A randomized, double-blind comparison of three different volumes of hypobaric intrathecal bupivacaine for orthopaedic surgery. *Anaesth Intens Care.* 2009;37(2):242–247.
10. Kim SJ, Kim N, Kim EH, et al. Use of regional anesthesia for lower extremity amputation may reduce the need for perioperative vasopressors: A propensity score-matched observational study. *Ther Clin Risk Manag.* 2019;15:1163–1171.
11. López-Valverde ME, Aragón-Sánchez J, López-de-Andrés A, et al. Perioperative and long-term all-cause mortality in patients with diabetes who underwent a lower extremity amputation. *Diabetes Res Clin Pract.* 2018;141:175–180.
12. Moreira CC, Farber A, Kalish JA, et al. The effect of anesthesia type on major lower extremity amputation in functionally impaired elderly patients. *J Vasc Surg.* 2016;63(3):696–701.
13. Chuah KH, Thong CL, Krshnan H, Chan L. Low dose unilateral spinal anaesthesia for lower limb amputation in critically ill patients. Case report. *Med J Malaysia.* 2007;62(1):81–82.
14. Imbelloni LE. The state of the art of unilateral spinal block. Editorial. *Rev Bras Anestesiol.* 2007;57:589–591.
15. Moxey PW, Gogalniceanu P, Hinchliffe RJ, et al. Lower extremity amputations. A review of global variability in incidence. *Diabet Med.* 2011;28(10):1144–1153.