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Anesthesia

Effects of Continuous Analgesic Titrated Spinal Anesthesia in Elderly Patients Undergoing Hip Fracture Surgery

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Abstract **Original Research Article**

Background and Objectives*:** Anesthetizing elderly patients with hip fractures poses a significant challenge in emergency settings, particularly given the aging population both in Algeria and worldwide. With a high prevalence of comorbidities and polypharmacy, effective anesthetic management becomes paramount. Continuous titrated spinal anesthesia (CTSA) has emerged as a promising technique for addressing these complexities by proposing lower doses of local anesthetic (LA) in this patient population. ***Methods*:** This retrospective study involved 40 elderly patients (>65 years) undergoing hip fracture repair. Patients received intermittent dosing of a local anesthetic solution via an intrathecal catheter, utilizing 0.25 ml increments of 0.5% isobaric bupivacaine and 0.25 ml of fentanyl (12.5 µg). Evaluation criteria included hemodynamic stability, incidence of hypotension, extent of sensory and motor blockade, total ephedrine consumption, and patient and surgeon satisfaction. ***Results: A female predominance was noted, with a mean age of 75 years, and 72% classified as ASA ≥ III. Pertrochanteric fractures accounted for 47% of cases, followed by femoral neck fractures at 53%. Nearly all patients achieved a sensory level ≥ D10, with a failure rate of only 2%. Sedation supplementation was required in 20% of cases, with conversion to general anesthesia in one patient. Complications were minimal, including arterial hypotension (3%), vasoconstrictor use (2%), and bradycardia (0.8%). Overall, both patients and surgeons reported high levels of satisfaction. ***Conclusions*:** Our findings demonstrate that CTSA is an effective technique for elderly patients undergoing hip fracture repair, offering the advantages of reduced LA doses, excellent hemodynamic stability, and minimal side effects. Its simplicity and cost-effectiveness further enhance its appeal in clinical practice.

Keywords: Hip, fracture, elderly, continuous spinal anesthesia.

INTRODUCTION

Anesthetizing elderly patients for hip fractures is a daily challenge in emergency departments. The aging of both the Algerian and global populations is an undeniable demographic and social reality. With patients often presenting with multiple pathologies and polypharmacy, anesthetic and analgesic management poses a significant challenge.

In this context, titrated spinal anesthesia (TSA) emerges as a promising technique for this indication. The aim of this study is to propose a lower dose of local anesthetic (LA) analgesic than is commonly used.

MATERIALS AND METHODS

We conducted a retrospective study at the emergency department of Bab El Oued University Hospital in 2016. Inclusion criteria were patients with either femoral neck or pertrochanteric fractures, aged 65 years or older, and who provided informed consent or had parental consent.

Exclusion criteria were allergy to local anesthetics, infection at the puncture site, and severe hemostatic disorders. An analgesic femoral nerve block was performed as the first-line approach using 0.25% Bupivacaine + Lidocaine with adrenaline + Catapressan 30µg.

Spinal anesthesia was performed in a semi-sitting or lateral position after puncturing the L4-L5 vertebral level using a 19 G directional Tuohy needle with a 22 G catheter inserted 3 to 4 cm into the subarachnoid space. A bolus injection of 1.25 mg of 0.5% Bupivacaine and 12.5 µg of Fentanyl was given as

the initial dose, followed by 1.25 mg of local anesthetic alone upon patient request, along with the addition of Dexamethasone (4-8 mg IV slowly) in the absence of contraindications.

Postoperative analgesia included femoral nerve block, Dexamethasone, and the administration of Prodafalgan with or without Diclofenac, depending on contraindications. Evaluation parameters included blood pressure, heart rate, oxygen saturation (SPO2), modified Bromage scale, level of sensory block, concomitant anesthesia, occurrences of failures, intra- and postoperative incidents and accidents within 48 hours, patient and surgeon satisfaction.

Statistical analysis was performed using EPI data software.

RESULTS

The number of enrolled patients was 80, with a predominance of females (sex ratio: 0.74). The mean age was 75 ± 7 years, and 75% of the patients were classified as ASA ≥ III (18 ASA II/57 ASA III/4 ASA IV). The most common comorbidities observed were diabetes, hypertension (HTA), and ischemic heart disease.

Fractures of the femoral neck were more frequent (55 cases, 67%) compared to pertrochanteric fractures (25 cases, 33%). The mean sensory level achieved was at D12, with motor levels ranging between 4 and 5 on the modified Bromage scale.

The failure rate was 2% (cases converted to general anesthesia), with an average procedure duration of 2 hours and 5 minutes ± 30 minutes. The average dose of local anesthetic used was 3.75 ± 1.25 mg, while the average dose of fentanyl was 12.5 µg.

Supplemental sedation with ketoprofen (Ketamine 0.1 mg/kg + Deprivan 0.25 mg/kg) was administered to 20% of the patients. Complications were minimal, with one case of postoperative transient ischemic attack (TIA) and reversible mild cognitive impairment observed in 5 patients. There were no postoperative nausea or vomiting (PONV) or hypotension reported, and both patients and surgeons expressed satisfaction with the procedure.

DISCUSSION

The practice of CTSA in our study serves several objectives:
Improved hemodynamic stability.

Effective analgesia and anesthesia with the administration of low doses of local anesthetics (AL) and reduced side effects.

The search for newer molecules and techniques that allow for lower doses of local anesthetics, enhanced analgesic effects, and improved safety profiles should guide our practice [2]. The decrease in myelinated nerve fibers with reduced conduction velocity, prolonged block, and increased sensitivity and toxicity to local anesthetics in the elderly justify the choice of CTSA in our study [3].

Sarcopenia, often overlooked, results in an abnormal decrease in muscle mass and strength due to aging [4], explaining the use of lower concentrations of local anesthetics driven by reduced interest in motor block for hip surgery in elderly patients.

The low incidence of post-spinal anesthesia headaches in our study can be explained by reduced elasticity of the dura mater, making it more difficult for cerebrospinal fluid (CSF) to leak through the puncture hole, a weaker response of cerebral vessels to CSF hypotension, and a reduced vertebral extradural space, leading to minimal CSF accumulation [5].

The average sensory level achieved at D12 was sufficient for the majority of patients, despite the theoretical recommendation of a level at D10. This explains the use of ketofol-based supplemental sedation, which is recommended for sedating fragile subjects in our study [6, 7]. The ketofol mixture, comprising propofol and ketamine with fewer respiratory and hemodynamic effects, resulted in fewer side effects in our study, likely due to the dosage and synergy of the two agents [6, 7]. The preoperative femoral nerve block allowed for a seated position during the CTSA procedure and significantly contributed to postoperative multimodal analgesia, in conjunction with other medications [8].

CONCLUSION

Normal aging is a process that involves the loss of functional reserve in most organ systems of the human body, particularly the cardiovascular, pulmonary, renal, and nervous systems. Advances in surgery and anesthesia, such as regional anesthesia techniques, have made it safer to operate on older patients with multiple serious comorbidities.

Regional anesthesia techniques provide alternatives that can optimize acute pain control and reduce the incidence of devastating side effects during the perioperative period. They also allow for early ambulation and shorter hospital stays. These techniques, such as continuous titrated spinal anesthesia CTSA and femoral nerve block, have shown positive outcomes in terms of hemodynamic stability, effective analgesia, and patient and surgeon satisfaction.

The use of lower doses of local anesthetics in the elderly population, considering their reduced sensitivity and increased risk of toxicity, is supported by the findings of this study. Additionally, the combination of ketofol as a supplemental sedation agent has

demonstrated favorable effects on respiratory and hemodynamic parameters.

Further research and incorporation of recent references are necessary to continually improve the practice of regional anesthesia in the elderly population, taking into account their specific physiological changes and comorbidities.

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