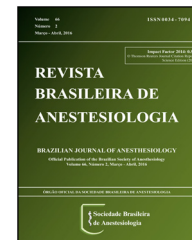




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## SCIENTIFIC ARTICLE

# Anesthetic requirements measured by bilateral bispectral analysis and femoral blockade in total knee arthroplasty

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### KEYWORDS

Nerve block;  
Pain management;  
Bispectral index monitor;  
Levopubicaïne hydrochloride;  
Knee arthroplasty

### Abstract

**Background and objectives:** A continuous peripheral nerve blockade has proved benefits on reducing postoperative morphine consumption; the combination of a femoral blockade and general anesthesia on reducing intraoperative anesthetic requirements has not been studied. The objective of this study was to determine the relevance of timing in the performance of femoral block to intraoperative anesthetic requirements during general anesthesia for total knee arthroplasty.

**Methods:** A single-center, prospective cohorts study on patients scheduled for total knee arthroplasty, were sequentially allocated to receive 20 mL of 2% mepivacaine throughout a femoral catheter, prior to anesthesia induction (Preoperative) or when skin closure started (Postoperative). An algorithm based on bispectral values guided intraoperative anesthetic management. Postoperatively analgesia was done with an elastomeric pump of levobupivacaine 0.125% connected to the femoral catheter and complemented with morphine patient control analgesia for 48 h. The Kruskal Wallis and the chi-square tests were used to compare variables. Statistical significance was set at  $p < 0.05$ .

**Results:** There were 94 patients, 47 preoperative and 47 postoperative. Lower fentanyl and sevoflurane were needed intraoperatively in the Preoperative group; median values and range: 250 (100–600) vs 450 (200–600)  $\mu\text{g}$  and 21 (12–48) vs 32 (18–67) mL  $p = 0.001$ , respectively. There were no differences in the median verbal numeric rating scale values 4 (0–10) vs 3 (0–10); and in median morphine consumption 9 (2–73) vs 8 (0–63) mg postoperatively.

**Conclusions:** A preoperative femoral blockade is useful in decreasing anesthetic requirements in total knee arthroplasty surgery but no added effect in the postoperative analgesic control.

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## PALAVRAS-CHAVE

Bloqueio de nervos;  
Tratamento da dor;  
Monitor de índice  
bispectral;  
Cloridrato de  
levobupivacaína;  
Artroplastia de joelho

## Necessidade de anestésicos avaliada com a análise do índice bispectral bilateral e bloqueio femoral em artroplastia total de joelho

### Resumo

**Justificativa e objetivos:** O bloqueio contínuo de nervos periféricos provou ser benéfico para reduzir o consumo de morfina no pós-operatório. A combinação de um bloqueio femoral e anestesia geral para reduzir a necessidade de anestésicos no intraoperatório ainda não foi avaliada. O objetivo deste estudo foi determinar a relevância do momento propício durante a realização do bloqueio femoral para a necessidade de anestésicos no intraoperatório durante a anestesia geral para artroplastia total de joelho (ATJ).

**Métodos:** Estudo prospectivo de coortes de pacientes agendados para ATJ. Os pacientes foram sequencialmente alocados em grupos para receber mepivacaína a 2% (20 mL) durante a inserção do cateter femoral, antes da indução da anestesia (pré-operatório) ou no início do fechamento da pele (pós-operatório). Um algoritmo com base nos valores do BIS orientou o manejo da anestesia no intraoperatório. Analgesia no pós-operatório foi administrada via bomba elastomérica de levobupivacaína a 0,125% conectada ao cateter femoral e complementada com analgesia (morfina) controlada pelo paciente durante 48 horas. Os testes de Kruskal Wallis e do qui-quadrado foram usados para comparar as variáveis. A significância estatística foi estabelecida em  $p < 0,05$ .

**Resultados:** Noventa e quatro pacientes foram avaliados, 47 no pré-operatório e 47 no pós-operatório. Houve menos necessidade de fentanil e sevoflurano durante o período intraoperatório no grupo pré-operatório; medianas e variações dos valores: 250 (100–600) vs. 450 (200–600)  $\mu\text{g}$  e 21 (12–48) vs. 32 (18–67) mL  $p = 0,001$ , respectivamente. Não houve diferenças nas medianas dos valores das escalas de classificação numérica e verbal, 4 (0–10) vs. 3 (0–10), e nas medianas do consumo de morfina, 9 (2–73) vs. 8 (0–63) mg no pós-operatório.

**Conclusões:** O bloqueio femoral no pré-operatório é útil para diminuir a necessidade de anestésicos em ATJ, mas não tem efeito adicional no controle da analgesia no pós-operatório.

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## Introduction

The incidence of primary total knee arthroplasty (TKA) reported annually ranges from 30 to 199 per 100,000 inhabitants.<sup>1</sup> Different anesthesia techniques have been used to perform TKA, including general anesthesia and different forms of regional anesthesia: neuraxial blockade and peripheral nerve blockade of lower extremity.<sup>2</sup> TKA produces severe pain in the postoperative period, and treatment of this complication is challenging for both patient comfort and early rehabilitation. Standard care for adequate analgesia in TKA consists of balanced intravenous administration of opioids combined with nonsteroidal anti-inflammatory drugs. Recently, continuous peripheral nerve block has been demonstrated to be beneficial, basically through reducing postoperative morphine consumption and consequently, morphine-related side effects.<sup>3,4</sup>

A femoral catheter can be placed in patients undergoing TKA before anesthesia induction or after the conclusion of the surgery. Performing the block prior to surgery is intended to prevent pain; however, it has not shown a clear benefit.<sup>5–7</sup> The association of a neuraxial block and general anesthesia has been shown to reduce hypnotic and opioid requirements,<sup>8–10</sup> and to produce better postoperative pain control.<sup>11</sup> Nevertheless, the combination of a continuous femoral block and general anesthesia has not been studied.

The hypothesis this study addressed was that a pre-surgery incision femoral block would reduce the general anesthetic requirements during the procedure, and would reduce pain and analgesic consumption in the postoperative period. The principal objective of the study was to determine the relevance of the timing of a femoral block to intraoperative anesthetic requirements during general anesthesia for knee replacement surgery. We also studied whether the timing of the femoral blockade influenced postoperative variables, such as pain, opioid consumption and blood loss.

## Methods

This was a single-center, prospective cohort study. Patients were allocated to one of two groups; the anesthesiologist in charge of the patient was not blinded. All the patients were always managed during the intraoperative period by a strict anesthesia protocol. Surgeons and physicians that followed up on patients, as well as nurses from the Postoperative Anesthesia Care Unit (PACU) and ward were blinded to patient allocation.

The study was conducted after written patient consent was given and approval was obtained from the institutional review board of the University hospital of Bellvitge

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