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Effectiveness and safety of exclusive spinal anesthesia with bupivacaine versus femoral sciatic block during the postoperative period of patients having undergone knee arthroscopy: systematic review

Efectividad y seguridad de la anestesia espinal exclusiva con bupivacaína vs el bloqueo ciático femoral en el postoperatorio de pacientes llevados a artroscopia de rodilla: revisión sistemática

Keywords: Arthroscopy, Knee, Anesthesia, Spinal, Nerve Block, Bupivacaine

Palabras clave: Artroscopia, Rodilla, Anestesia Raquídea, Bloqueo Nervioso, Bupivacaína

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Abstract

Introduction: Spinal anesthesia (SA) and sciatic-femoral nerve block are the most widely used anesthesia techniques for knee arthroscopy; however, there is still some controversy with regard to which anesthetic procedure offers improved safety, better pain control, and higher patient satisfaction.

Objective: To assess the effectiveness of exclusive SA with bupivacaine versus sciatic-femoral nerve block, regardless of the

drug, during the postoperative period of patients having undergone knee arthroscopy, through a systematic review of the scientific literature.

Methods: A search of Randomized Clinical Trials was conducted in a number of databases including Ovid, Cochrane, Embase, Lilacs, Open Grey, ClinicalTrials.gov, and academic Google. The snowball technique was also used to identify additional trials. The design of the search strategy included Boolean operators and considered studies in English, Spanish,

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and Portuguese, with no date restrictions. The information is presented in narrative form.

Results: The search identified 478 studies, of which 3 met the eligibility criteria. The effectiveness was evaluated based on total anesthesia time and rescue analgesia. Safety was evaluated with heart rate monitoring and time to first micturition. Patient satisfaction was identified through surveys to measure the acceptance of the anesthetic technique.

Conclusion: SA is effective as assessed based on the motor-sensory blockade effect and pain control, but its adverse events shall be taken into consideration when making a decision. The anesthetic techniques of the peripheral sciatic-femoral nerve block present less undesirable side effects than spinal analgesia and provide better postoperative pain control.

Resumen

Introducción: La anestesia espinal y el bloqueo de nervios ciático-femoral son las técnicas de anestesia regional más utilizadas para la artroscopia de rodilla, sin embargo, existe controversia en relación a qué procedimiento anestésico ofrece mayor seguridad, mejor control del dolor y satisfacción del paciente.

Objetivo: Evaluar la efectividad de la anestesia espinal exclusiva con bupivacaína vs el bloqueo de nervio ciático – femoral sin distinción de fármaco en el postoperatorio de pacientes intervenidos con artroscopia de rodilla, a través de una revisión sistemática de la literatura científica.

Métodos: se realizó una búsqueda de Ensayos Clínicos Aleatorizados en las bases de datos Ovid, Cochrane, Embase, Lilacs, al igual que en Open Grey, ClinicalTrials.gov y Google académico, también se utilizó la técnica bola de nieve para encontrar estudios adicionales. El diseño de la estrategia de búsqueda incluyó operadores booleanos y consideró estudios en inglés, español y portugués, sin restricción de fecha. La información se presenta de forma narrativa.

Resultados: la búsqueda identificó 478 estudios de los cuales tres cumplieron los criterios de elegibilidad. La efectividad fue valorada con el tiempo total de anestesia y analgesia de rescate. La seguridad fue evaluada con monitoreo de frecuencia cardíaca y tiempo de primera micción. La satisfacción del paciente se indagó a través de encuestas de aceptación de la técnica anestésica.

Conclusiones: la anestesia espinal resulta efectiva valorada por el efecto de bloqueo motor-sensitivo y control del dolor, pero sus eventos adversos deben ser considerados en la selección. Las técnicas anestésicas de bloqueo periférico del nervio ciático-femoral presentan menos efectos indeseables que la analgesia espinal y ofrecen un mejor control del dolor postoperatorio.

Introduction

Arthroscopy is an ambulatory, minimally invasive, and useful technique for managing most pathological and trauma lesions of the knee.¹⁻³ Through 2 or 3 ports or incisions, the injured tissue is repaired. This procedure may be conducted under general, regional, or local anesthesia.⁴

Postoperative pain control is a crucial clinical factor for the recovery of the patient, since pain limits adequate rehabilitation and resuming of daily activities,^{5,6} with subsequent social and economic impact, not just for the patient, but also for the healthcare system.⁷

There are different techniques for regional anesthesia, based on the site of administration of the local anesthetic (LA) agents, and 2 of these are: sciatic-femoral peripheral nerve block (SFNB) and spinal anesthesia (SA) administered with bupivacaine as the only LA. These techniques have been used in daily practice of anesthesiology and orthopedics for the last decades, specially due to the lower incidence of complications, greater convenience, and usefulness.⁸

SA is considered to be safe, though not risk-free.⁹ One of its advantages is easier administration and patient comfort; however, some disadvantages have been described, such as puncture site pain, post-puncture headache, urinary retention, and a high level of nerve block that compromises the heart rate (HR). This technique requires longer patient isolation time and delays the start of the surgical procedure.¹⁰

The sciatic-femoral nerve block technique requires the localization of the site of needle insertion using anatomical landmarks, and neurostimulation or ultrasound-guided support,^{11,12} as indicated in some studies.¹³ The SFNB is effective for controlling postoperative pain,¹⁴ and some of its advantages include lesser hemodynamic changes, and preserved intestinal and bladder function, with a lower risk of neuro-infectious complications.¹⁵ Some of the disadvantages described are the time required for administration, and the need of technologies to guide the placement of the LA agent, the development of hematomas, and potential HR alterations.^{16,17}

There is currently a controversy around the selection of the anesthetic technique for knee arthroscopy,^{18,19} in search of effectiveness, safety, patient satisfaction, and practitioner comfort. However, in clinical practice there is a preference for bupivacaine as the LA of choice for these techniques,²⁰ but over the last few decades, the combination between LAs and the peripheral nerve block technique has emerged, in the quest for postoperative management that favors early rehabilitation²¹ and less adverse events such as bladder globus and postoperative joint pain that requires rescue analgesia.

Due to the rapid administration and therefore, shorter time to start surgery, some anesthesiologists prefer SA with bupivacaine²², which is a long-lasting LA agent that provides up to 6 hours range for the surgical procedure. No instances of decreased levels of hemoglobin in blood have been described and allergic reactions are minor, as compared against other LA agents. However, the presence of other adverse events and limitations such as anatomical alterations of the lumbosacral spine, mostly in elderly patients, increases the use of peripheral nerve blocks²⁰ that have anatomical

landmarks for ease of administration and better post-operative pain control.

In view of the clinical practice heterogeneity, the authors conducted this systematic review (SR) with a view to establishing the effectiveness and the safety during the postoperative period of adult patients undergoing arthroscopic knee surgery, using exclusive spinal analgesia with bupivacaine, as compared with sciatic-femoral nerve block.

Method

Eligibility criteria

The Randomized Clinical Trials (RTC) considered included adult population having undergone knee arthroscopy using SA or sciatic-femoral nerve block as the comparator, excluding any trials using an anesthetic agent other than bupivacaine in SA and nerve block other than sciatic-femoral nerve block, simultaneously.

The primary outcomes evaluated were effectiveness, safety of anesthesia, and patient satisfaction.

Search methods to identify the trials

The keywords selected to design a search strategy using synonyms, indexed terms, truncation and proximity operators, were: "spinal anesthesia", "bupivacaine", "nerve block", and "knee arthroscopy". The search was conducted in the following databases: Ovid, Cochrane, Embase, Lilacs, Open Grey, ClinicalTrials.gov, and academic Google, in English, Spanish, and Portuguese, with no date restrictions. The snowball technique was also used. See Annex 1.

Data selection and data mining

Two authors (FACO, AAMO) independently selected the trials following the Cochrane methodology for SRs. The first step is the review and selection of titles and abstracts; the second step is the selection of potential articles for reading of the full text, and a final step of review and selection of the articles based on compliance with all the inclusion criteria. The authors settled their discrepancies consulting a third and a fourth reviewer (IP and GR).

One of the inclusion criteria considered for this SR was the selection of RCTs since the expectation was to avoid trials with design limitations that could bias the estimates of the impact of the intervention. Similarly, RCTs provide better-quality evidence in studies comparing techniques, due to less bias in the design and in the procedures.

Data mining was independently conducted by the authors (FACO, AAMO), using an extraction matrix that included variables such as: name of the first author, year of

the intervention, type of surgery, number of patients, age of patients, sample size by group and sub-group, LA agent used, time of total analgesia, length of time of the procedure, adverse events, time of the first spontaneous micturition (minutes), need for rescue analgesia, length of the recovery for discharge (minutes) and patient satisfaction, as information related to effectiveness, safety, and satisfaction.

Evaluation of risk of bias in the trials included

The evaluation of the methodological quality of the trials was done with the Risk of Bias Assessment Tool proposed by the Cochrane collaboration for randomized trials, adapted from Higgins et al.²³

This tool was used to assess the following biases: selection, performance, detection, abandonment, report, etc., with a view to making a comprehensive qualified judgment such as: low, unclear, or high. Both authors (FACO, AAMO) independently evaluated each domain and a shared a joint was reached on the risk of bias for each trial.

Treatment effect and analysis measures

Based on the selected outcomes, 5 statistical parameters were chosen for evaluation: total anesthesia time, rescue analgesia, HR, time to first micturition (TFM), and acceptance of the anesthetic technique.

Statistical analyses such as meta-analyses are not applicable for the selected trials, which is considered a limitation for this review. For the evaluation of biases, the Review Manager (RevMan) [Programa informático]. Versión 5.3. Copenhagen: The Nordic Cochrane Center, The Cochrane Collaboration, 2014 was used.²⁴

Heterogeneity may not be assessed through statistical tests due to the inability to group the numerical data for outcomes, since these are estimated differently in each trial. If the golden rule criterion is used for I^2 value, this may be low because it is $<40\%$.²⁵ For this reason, a narrative study was conducted to consider the clinical and methodological heterogeneity among the trials.

Likewise, the publication bias could not be statistically identified because the review included only 3 articles²⁵ with a small sample size.

Results

Trial identification

A total of 478 references were analyzed, of which 12 were reviewed as full text, and 3 that complied with the eligibility criteria were selected; the 9 trials not included were ruled out because the SA was administered with a LA agent other than bupivacaine and the lower limb blockade was not consistent with knee arthroscopy (Fig. 1). Of the

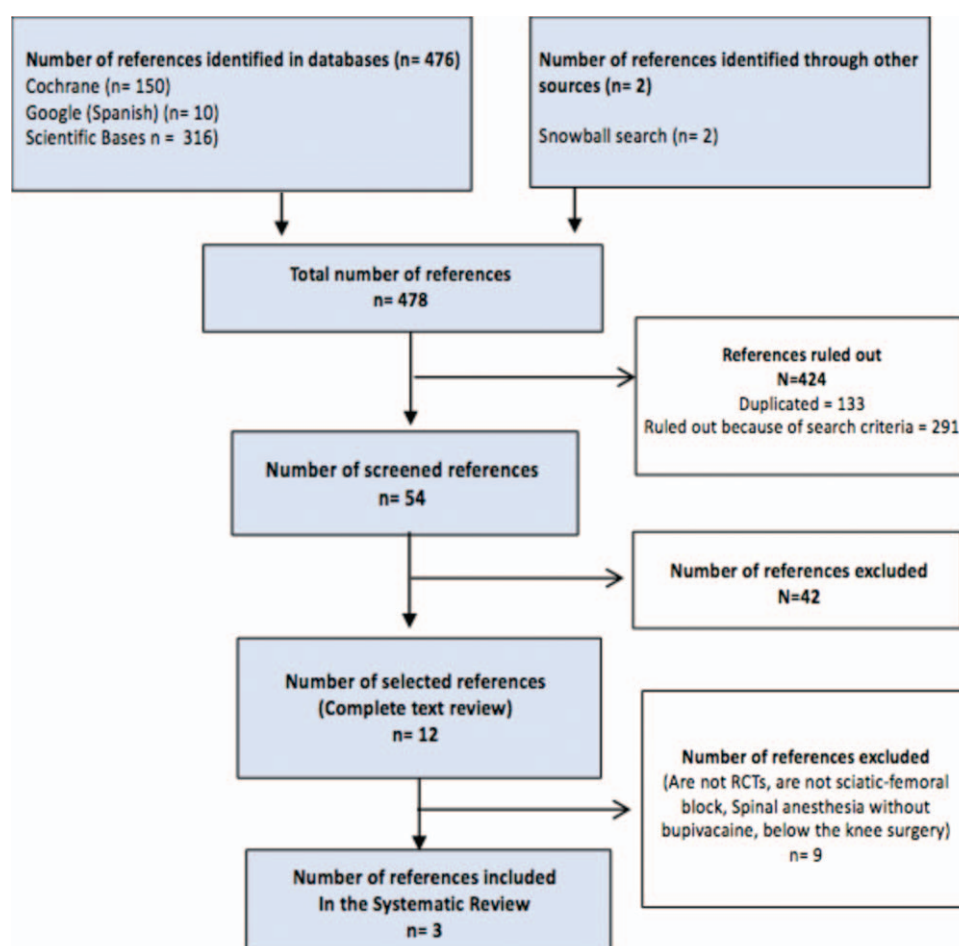


Figure 1. Selection process flowchart for inclusion of trials PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses). Source: Authors.

trials selected, 2 were conducted in Italy^{16,26} and 1 in Colombia.²⁷

Characteristics of the trials

The population in the 3 RCTs corresponds to 100% of patients undergoing elective knee arthroscopy, which makes the populations comparable. However, the use of the various tools for monitoring of the times in each of the trials limits the comparison of the results.

The total population was 132 patients, with a distribution of 50% for each anesthetic technique. Table 1 depicts the characteristics of the trials included.

In the SA groups, the studies used the single injection technique for the administration of LA at low doses of bupivacaine.²⁸ According to the literature, low doses range between 5 and 8 mg.²⁹ For the SFNB groups, the studies report a technique using electro-stimulation to identify the peripheral nerves, with variations in the procedure for administering the LA agent. Table 2 illustrates the characteristics of both techniques.

The results reported correspond to the sample of 131 patients because of a technical anesthetic failure in the SFNB in the Montes et al²⁷ trial; the patient required general anesthesia and therefore was excluded from the analysis.

Effectiveness of anesthesia

The effectiveness was evaluated in terms of quality of anesthesia during the postoperative period of the 3 trials from the time of the anesthetic injection until patient discharge. This assessment included both the sensory and motor blockade, using various techniques and scales.

The 3 trials evaluated the sensitivity block before the start of surgery using the prick test, with total loss of sensation for both anesthetic techniques. The trial by Spasiano et al²⁶ used a numerical frequency scale (NFS) during the application of the tourniquet, to complement the sensitivity blockade evaluation.

The motor blockade was evaluated using the Bromage scale with a score of 3 as the optimum value for Casati et al¹⁶

Table 1. Characteristics of the trials included.

Authors	Year	Number of patients	Population	Age	Sample size by group	Outcomes reported
Casati et al ¹⁶	2000	50	M: 54% F: 46%	M: 43 ± 11 F: 39 ± 13	SA Group 25 SFNB Group 25	Total anesthesia time Rescue analgesia TFM HR
Montes et al ²⁷	2007	50	M: 41% F: 59%	M: 46 ± 15 F: 49 ± 14	SA Group 25 SFNB Group 25	Total anesthesia time Rescue analgesia TFM HR Acceptance of the technique
Spasiano et al ²⁶	2007	32	H: 53% M: 47%	H: 39.2 ± 18.5 M: 45.8 ± 18.7	SA Group 16 SFNB Group 16	Total anesthesia time Rescue Analgesia TFM HR Acceptance of the technique

F=female, HR=heart rate, M=male, SA=spinal anesthesia, SFNB=sciatic-femoral nerve block, TFM=time to first micturition.
Source: Authors.

and Montes et al,²⁷ while Spasiano et al²⁶ used an orthopedic evaluation of freedom of knee movement during SA, with 94% rated as excellent, 6% as sufficient. With regards to SFNB, 81% rated excellent and 19% rated as sufficient.

Quality of anesthesia. The 3 trials evaluate the quality of anesthesia for the 2 techniques with different tools. The sufficiency of anesthesia over the postoperative period is rated as inadequate in the presence of pain and need for

Table 2. Characteristics of the anesthetic technique.

Trial	SA			SFNB		
	LA type	Dose	Procedure	LA type	Dose	Electro-stimulator
Casati et al ¹⁶	0.5% Hyperbaric Bupivacaine	8 mg	25-ga Whitacre needle. L3-L4 space lateral position	2% Mepivacaine	25 mL distributed: 10 mL for the sciatic nerve 15 mL for the femoral nerve	Frequency of stimulation 2 Hz Intensity of the stimulating current: initial 1 mA and gradual tapering to less than 0.5 mA
Montes et al ²⁷	0.5% Hyperbaric Bupivacaine	7.5 mg	26-ga Whitacre needle. L2-L3 or L3-L4 spaces	2% Lidocaine and 0.5% isobaric Bupivacaine	Mix of 40 mL: 20 mL of 2% Lidocaine + 20 mL of 0.5% isobaric Bupivacaine 20 mL of the mix into each nerve	Connected to the 21-ga needle 100 mm de long Frequency of stimulation 2 Hz Intensity of the stimulus between 0.3-0.5 mA
Spasiano et al ²⁶	0.5% hyperbaric Bupivacaine	7 mg	25-ga Sprotte needle into the L2-L3 space	1% Mepivacaine	40 mL distributed: 15 mL sciatic nerve block 25 mL femoral nerve block	Connected to isolated 22-ga needles: 120 and 35 mm Frequency of stimulation of 2 Hz. Stimulating current between 0.4 and 0.6 mA

SA=spinal anesthesia, SFNB=sciatic-femoral nerve block.
Source: Authors.

rescue analgesia, and adequate when no additional analgesia was required.

In the trial by Casati et al,¹⁶ sufficiency of anesthesia was evaluated every 30 minutes using the modified Bromage scale during the postsurgical period until discharge, with 84% of the patients in the SA group being adequate and 92% in the SFNB group. Furthermore, Montes et al²⁷, evaluated the sufficiency of anesthesia during the postsurgical period in the OR until hospital discharge at 15-minute intervals; the presence of pain was evaluated using the visual analog scale (VAS), with 88% of the patients reporting adequate results in the SA group and 92% in the SFNB group. Spasiano et al²⁶ evaluated the sufficiency of anesthesia during the postsurgical period using the NFS with 94% of the patients rated as adequate in both groups; in addition, 13 patients (41%) still maintained the effect after 2 hours, 3 patients (9%) after 4 hours, and the effect resolved in all patients after 6 hours.

Use of rescue analgesia. Postoperative pain was monitored using various instruments and at different points in time in each trial. Casati et al,¹⁶ continued monitoring through a telephone survey 24 hours later and 1 week after the intervention during the postoperative control visit for both groups, reporting that 12% (3 patients) required rescue analgesia in the SA group and 8% (2 patients) in the SFNB group.

The trial by Montes et al²⁷ used the VAS for inpatient monitoring every 15 minutes and then continued daily home monitoring at 6, 12, 18 and 24 hours for both types of anesthesia, reporting that 16% (4 patients) in the SA group required additional analgesia, while none of the patients in the SFNB group required additional analgesia.

Spasiano et al²⁶ used the NFS in both anesthetic techniques 2, 4, and 6 hours during the postoperative period, reporting that 1 patient (6.2%) required rescue analgesia after 4 hours in the SA group and 1 patient (6.2%) after 5.1 hours in the SFNB group.

Safety of anesthesia and adverse events (AE)

Time to first micturition. The time to the first spontaneous micturition was observed in each group, although Montes et al²⁷ indicates that he does not consider this variable in the results.

According to Casati et al,¹⁶ the TFM report is 231 ± 93 minutes for SA and 145 ± 36 for SFNB. On the other hand, the trial by Spasiano et al²⁶ reports a TFM of 269 ± 66 for SA for SFNB. The TFM results in these 2 trials show a difference in favor of SFNB.

In addition, Casati et al report 12% (3 patients) in the SA group who experienced urinary retention and required a urinary catheter. There were no reports of urinary retention and urinary catheter in the SFNB group.

Changes in heart rate (HR) and other hemodynamic parameters. The 3 trials conducted a routine HR control with non-

invasive techniques and other hemodynamic parameters. The study by Casati et al¹⁶ emphasized vital signs monitoring and patient awareness during the postoperative period and reported 3 patients (12%) with bradycardia in the SA group and no reports in the SFNB group. The study by Montes et al²⁷, reported ECG conventional monitoring, HR and blood pressure during the procedure, with measurements every 15 minutes during the postsurgical time, with no patient alterations reported.

The study by Spasiano et al²⁶ monitored 4 parameters: systolic blood pressure, diastolic blood pressure, mean arterial pressure, and HR, which were measured at 5 time points (t: 0 minute, t: 5 minutes, t: 10 minutes; t: 15 minutes, t: 30 min). Changes in blood pressure were minimal and the HR was lower in the SA group, as compared against the SFNB group.

Patient satisfaction

Acceptance of the anesthetic technique. Two of the 3 trials included this outcome for the 2 anesthetic techniques. The study by Casati et al¹⁶ did not.

The studies by Montes et al²⁷ and Spasiano et al,²⁶ evaluated satisfaction using a dichotomous survey, asking whether the patients would undergo a new procedure with the same anesthetic technique. In both trials, 100% of the patients responded positively. The study by Spasiano et al²⁶ also used an ordinal scale in 3 categories to have patients assess the anesthetic technique with the following results: 93% excellent for SA and 87% for SFNB; 6% good for SA and 6% for SFNB; and 0% sufficient for SA and 6% for SFNB.

The consolidated results are illustrated in Table 3.

Risk of bias assessment of included studies

Figure 2 shows the quality evaluation of the studies identified over the search process.

The conclusion is that the trials included in the SR have a low risk of bias for the domains of random sequence, performance, detection, attrition, reporting, and other biases due to explicit non-compliance with the processes and procedures. A clarification must be made regarding the study by Montes et al,²⁷ where 1 patient had to be operated under general anesthesia because of block failure in the SFNB group and was excluded from the analysis by the author.²⁷

Two of the studies show an indeterminate risk of bias for the detection domain. The study by Montes et al²⁷ identified a research assistant doing post-operative monitoring of all patients, but does not specify blinding; and Spasiano et al²⁶ describes the follow-up and recording process without indicating the observer's conditions. Moreover, the study by Casati et al¹⁶ assesses the bias of reporting the use of a blind observer for monitoring during the postoperative period until discharge as low risk.

Table 3. Consolidated results during the postoperative period.

Author	Casati et al ¹⁶		Montes et al ²⁷		Spasiano et al ²⁶	
Variables	SA Group	SFNB Group	SA Group	SFNB Group	SA Group	SFNB Group
No. of patients	25	25	25	24	16	16
Total anesthesia time*	137±49 min	206±51 min	217±85 min	219±69 min	NR	NR
Rescue analgesia	4 patients medicated during the first 24 h	2 patients with additional analgesia	3 patients experienced postoperative pain after 2 h	2 patients experienced postoperative pain after 4 h	1 patient required analgesia after 4 h	1 patient required analgesia after 5.2 h
Heart rate	3 patients experienced bradycardia	NR	NR	NR	Decreased HR	Increased HR
Time to first micturition	231±93 min	145±36 min	NR	NR	269±66 min	200±69 min
Satisfaction	NR	NR	100% Acceptance	100% Acceptance	93% excellent 6% good 0% sufficient	87% excellent 6% good 6% sufficient

HR=heart rate, NR=Not reported, SA=spinal anesthesia, SFNB=sciatic-femoral nerve block.

*The total anesthesia time reported in the studies corresponds to the sum from the time of anesthesia preparation, surgical preparation, duration of surgery, time in the recovery room, until effective discharge, in minutes.

Source: Authors.

Discussion

The SA technique has been the most widely used technique in knee arthroscopy and the literature reports that it provides a complete sensory and motor blockade of the lower extremity when using low single doses.³⁰ The 3 studies for the SA groups achieved sensory and motor block in all patients with no reports of intraoperative rescue analgesia using a single dose of 0.5% bupivacaine (7, 7.5, and 8 mg).

Bupivacaine as a LA agent has been widely studied³¹ and used in regional anesthesia techniques, with a half-life of 3.5 hours of complete sensory and motor blockade.²⁶ The block times achieved in the 3 studies for the SA group are consistent with the literature,³² but do not allow for an association between the dose and the block, because the results reflect contradictory anesthesia times.

The study by Casati et al¹⁶ used the highest dose of hyperbaric bupivacaine (8 mg) which is associated with a

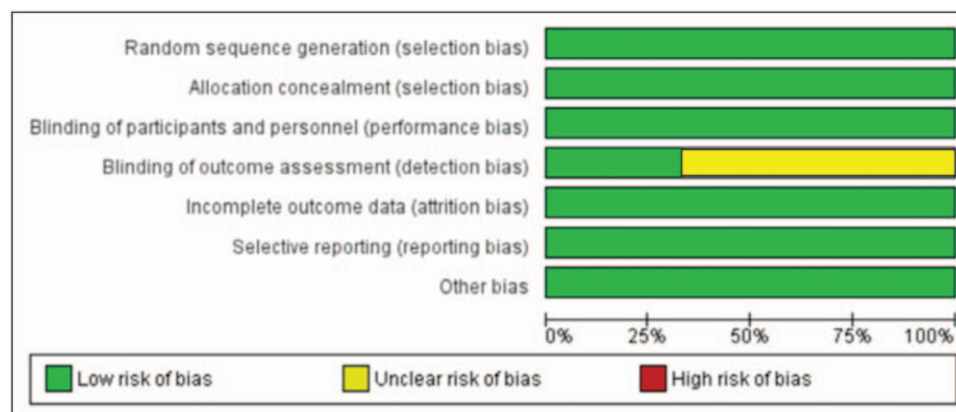


Figure 2. Risk of bias assessment per domain.

Source: Authors.

higher risk of transient neurological symptoms, more adverse event reports such as cardiovascular dysfunction and urinary retention with urinary catheter, and these results are consistent with the reports of previous research studies,³³ but the findings are not significant because of the sample size used. According to Montes et al²⁷ and to other researchers, the preoperative times with SA are shorter and no differences are reported in the total OR time and hospital discharge. However, 12% of the patients required rescue analgesia after 2 hours. The study by Spasiano et al²⁶ used lower doses of bupivacaine (7 mg) with lower requirement of rescue analgesia and no significant adverse effects.

The effectiveness of the SFNB as described in the literature³⁴ is mostly based on the successful unilateral motor and sensory blockade and on the postoperative anesthesia time with a lower risk of hemodynamic changes, preserving the intestinal and bladder function.^{30,35} The SFNB technique uses multiple procedures that are described in the various approaches,³⁶ demanding knowledge and experience in the technique for a successful outcome.^{37,38} Greater patient safety and stability is also reported during the perioperative period, reducing the adverse effects and the need for postoperative analgesia.³⁹

In the study by Casati et al¹⁶ the postoperative analgesia times were longer and the TFM was shorter, as compared with SA; 2 patients required rescue analgesia associated with hip pain subsequent to limb manipulation during the procedure. The study by Montes et al²⁷ compared the level of analgesia effect during the postoperative period (6 hours) and found a superior effect in the SFNB group, with no significant differences in other outcomes. In this study, there was a technical failure on the SFNB that required the use of general anesthesia, which evidences the need to strengthen the anesthetic technique-patient relationship. Spasiano et al²⁶ showed that it is possible to achieve a successful SFNB with low LA concentrations using shorter administration times, that are associated with minimal hemodynamic changes and significant cardiovascular stability. The changes described in HR correspond to mild increases in the SFNB group and decrease in the SA group. The SFNB group experienced longer postoperative analgesia and shorter spontaneous micturition times, as compared to the SA group. One patient from each group required rescue analgesia, but the administration for the SFNB patient was 80 minutes later as compared to the patient in the SA group.

When comparing the outcome of rescue analgesia between the 2 groups, there is a significant difference in favor of SFNB with 3% of the patients requiring rescue therapy, versus 12% in the SA group.

In the 3 trials, the postoperative analgesia times favor the SFNB group, with 1 additional benefit associated with

the preservation of organic functions that contribute to patient discharge, as expected for ambulatory surgery.

The 3 studies show evidence of higher patient safety with SFNB, associated with less cardiovascular and neurological function risk, and less urinary retention. Other adverse effects described may be due to LA-related complications and the route of administration of the agent.⁴⁰

Patient satisfaction was evaluated using different tools in each trial, with no differences found in favor of 1 or other technique.

The 3 trials are relatively homogeneous with regards to the SA technique, but the results differ in the safety evaluation and this may be explained based on the dose of LA used by Casati et al¹⁶, 8 mg versus 7.5 and 7 mg in Montes et al²⁷ and Spasiano et al,²⁶ respectively. There are differences in the injection technique and the drug used for SFNB, but the results reported are very similar with regard to the quality of the block and the safety of the patient, though there were some differences in the way the outcomes were assessed; for instance, when evaluating the quality of the postoperative analgesia, the trials used VAS, modified Bromage scale, and NFS.

This SR failed to statistically assess the potential existence of publication bias; however, it is presumed to be low on account of the comprehensive search of the studies and the reference to additional sources.

With the results obtained for the continuous numerical variable of TFM, it is possible to argue in favor of the SFNB technique since it does not interfere with voiding. Unfortunately, the trials do not report separately the anesthesia times, limiting the analysis of this SR which focuses on postoperative time.

Finally, the potential occurrence of bias risk in the trials is overall low, which does not compromise the validity of the trials.

Conclusion

There are not enough studies to definitely compare the 2 anesthetic techniques based on the outcomes proposed for this SR. In terms of the effectiveness of anesthesia, both the SFNB and SA deliver highly satisfactory postoperative analgesia times; and in terms of safety, there is a lower risk of adverse events and earlier recovery with SFNB. However, the studies do not allow for conclusive statements.

SA is more widely accepted among the professional anesthesiologists because of ease and quick administration, while SFNB requires technological support, training, and skills for a successful result. Considering that knee arthroscopy is an ambulatory procedure, further research is needed to determine which technique should be used for each particular case.

Ethical responsibility

This is a secondary study and hence it is not governed by the ethical standards for research on human beings. Nevertheless, from the ethical point of view, this systematic review pulls together current concepts about residual and postoperative analgesia control in knee arthroscopy, keeping in mind the benefit for the patients undergoing this procedure in our daily practice.

The privacy of the patients included in the randomized clinical trials used for this review, the authors, their rights and outcomes shared shall be respected.

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Conflicts of interest

There is no conflicts of interest to disclose in this research project.

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ANNEX

Annex 1: Search strategies

Database	Terms
.....Ovid MEDLINE(R) <1946 to September Week 4 2017>, Ovid MEDLINE(R) Epub Ahead of Print <October 06, 2017>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <October 06, 2017>, Ovid MEDLINE (R) Daily Update <October 06, 2017>	1 exp Arthroscopy/ (22520) 2 Arthroscopi*.ti,ab. (21233) 3 (Arthroscopic adj6 Surgical adj6 Procedure*).ti,ab. (214) 4 (Arthroscopic adj6 Surger*).ti,ab. (3604) 5 1 or 2 or 3 or 4 (29642) 6 exp Knee/ (13554) 7 knee.ti,ab. (125425) 8 6 or 7 (130189) 9 5 and 8 (9973) 10 exp Anesthesia, Spinal/ (11974) 11 (Spinal adj6 Anesthesia*).ti,ab. (8145) 12 (Anesthesia* adj6 Spinal).ti,ab. (8145) 13 (spinal adj6 anaesthesia*).ti,ab. (3860) 14 10 or 11 or 12 or 13 (16731) 15 exp Bupivacaine/ (11726) 16 Bupivacaine.ti,ab. (12258) 17 Buvacaina.ti,ab. (0) 18 Dolanaest.ti,ab. (0) 19 Sensorcaine.ti,ab. (12) 20 Marcain.ti,ab. (72) 21 Carbostesin.ti,ab. (24) 22 Marcaine.ti,ab. (314) 23 15 or 16 or 17 or 18 or 19 or 20 or 21 or 22 (16010) 24 14 and 23 (3068) 25 exp Nerve Block/ (20305) 26 (Nerve adj6 Block*).ti,ab. (14553) 27 (Block* adj6 Nerve).ti,ab. (14553) 28 (Nerve* adj6 Blockade).ti,ab. (2530) 29 (Blockade* adj6 Nerve).ti,ab. (2311) 30 (combined adj6 sciatic-femoral adj6 nerve* adj6 block*).ti,ab. (22) 31 (surgical adj6 block*).ti,ab. (2165) 32 25 or 26 or 27 or 28 or 29 or 30 or 31 (29476) 33 24 or 32 (32069) 34 9 and 33 (200) 35 limit 34 to "therapy (best balance of sensitivity and specificity) " (306)
EMBASE	(((('knee arthroscopy'/exp OR 'knee arthroscopy') OR ('knee arthroscopy'/exp) OR ('knee arthroscopy':ab,ti)) AND (('arthroscopic surgery') OR ('arthroscopic surgery'/exp) OR ('arthroscopic surgery':ab,ti))) AND (((('spinal anesthesia') OR ('spinal anesthesia'/exp) OR ('spinal anesthesia':ab,ti)) AND (((('bupivacaine') OR ('bupivacaine'/exp) OR ('bupivacaine':ab,ti)) OR ((dolanaest:ab,ti) OR (sensorcaine:ab,ti) OR (marcain:ab,ti) OR (carbostesin:ab,ti) OR (marcaine:ab,ti)))) OR (((('sciatic nerve block') OR ('sciatic nerve block'/exp) OR ('sciatic nerve block':ab,ti)) AND (('femoral nerve block') OR ('femoral nerve block'/exp) OR ('femoral nerve block':ab,ti)))) AND ([controlled clinical trial]/lim OR [randomized controlled trial]/lim) (4)
The Cochrane Library (CLIB)	#1 MeSH descriptor: [Arthroscopy] explode all trees 1454 #2 Arthroscopi* 2262 #3 (Arthroscopic near Surgical near Procedure*) 22 #4 (Arthroscopic near Surger*) 1165 #5 #1 or #2 or #3 or #4 2755

Database	Terms
	#6 MeSH descriptor: [Knee] explode all trees 706 #7 knee* 17993 #8 #6 or #7 17993 #9 #5 and #8 1532 #10 MeSH descriptor: [Anesthesia, Spinal] explode all trees 2200 #11 (Spinal near Anesthesia*) 4931 #12 (Anesthesia* near Spinal) 4931 #13 (spinal near anaesthesia*) 1999 #14 #10 or #11 or #12 or #13 5551 #15 MeSH descriptor: [Bupivacaine] explode all trees 3894 #16 Bupivacaine 8989 #17 Buvacaina 8 #18 Dolanaest 3 #19 Sensorcaine 13 #20 Marcain 44 #21 Marcaine 114 #22 Carbostesin 12 #23 #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 9021 #24 #14 and #23 2491 #25 MeSH descriptor: [Nerve Block] explode all trees 3362 #26 (Nerve near Block*) 6028 #27 (Block* near Nerve) 6028 #28 (Nerve* near Blockade) 570 #29 (combined near sciatic-femoral near nerve* near block*) 22 #30 (surgical near block*) 698 #31 (Blockade* near Nerve) 534 #32 #25 or #26 or #27 or #28 or #29 or #30 or #31 6464 #33 #24 or #32 8368 #34 #9 and #33 in Trials 150
LILACS	((((tw:(artroscopia)) OR (tw:(artroscopi\$)) OR (tw:(("artroscopia quirurgico procedimiento\$")))) OR (tw:(("Artroscopia quirurgica\$")))) AND ((tw:(rodilla)) OR (tw:(rodilla\$))) AND (((tw:(Anestesia, espinal)) OR (tw:(("espinal Anestesia\$")))) OR (tw:(("Anestesia\$ espinal")))) OR (tw:(("espinal anaestesia\$")))) OR ((tw:(Bupivacaine)) OR (tw:(Buvacaina)) OR (tw:(Dolanaest)) OR (tw:(Sensorcaine)) OR (tw:(Marcain)) OR (tw:(Carbostesin)) OR (tw:(Marcaine)))) AND ((tw:(bloqueo nervioso)) OR (tw:(("bloqueo\$ nervioso")))) OR (tw:(("nervioso loqueo\$")))) OR (tw:(("Nervioso\$ Bloqueado")))) OR (tw:(("Bloqueado\$ Nervioso")))) OR (tw:(("combinar ciatico-femoral nervio \$ bloqueo\$")))) OR (tw:(("quirurgico bloqueo\$")))) (6)
Google	(("knee arthroscopy") and (((("spinal anesthesia") and (bupivacaine)) and ((("sciatic nerve block") and ("femoral nerve block"))))) (10)
Clinical Trials.gov	(("knee arthroscopy") and (((("spinal anesthesia") and (bupivacaine)) and ((("sciatic nerve block") and ("femoral nerve block"))))) (0)
Open Grey	(("knee arthroscopy") and (((("spinal anesthesia") and (bupivacaine)) and ((("sciatic nerve block") and ("femoral nerve block"))))) (0)

Source: Authors.