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Comparison in Recovery Time and Patient Satisfaction Undergoing Neuraxial Anesthesia with Bupivacaine vs. Bupivacaine and Morphine in a Second Level Hospital

Fátima Careli Morado Manríquez[1,2], Mariana Tapia Ortega[1], Alberto López Bascopé[3], Erick Alejandro Ramírez Valencia[1], Aurora María Gil Fuentes[1], Rocío Carolina Sánchez Nava[1], Sandra Lizbeth Moran Chamorro[1], Sandra Berenice Somarriba Domínguez[4], Raquel Eugenia Espinosa Cárdenas[5*], Alberto Robles Méndez Hernández[6]

[1]AnesthesiologyServiceof Hospital Angeles Metropolitano, Mexico City, Mexico.
[2]Facultad Mexicana de Medicina, Universidad la Salle México, Ciudad de México, México.
[3]AnesthesiologyService Hospital AngelesMexico, Mexico City, Mexico.
[4]DepartmentofInternal Medicine Hospital Ángeles Metropolitano, Mexico City, Mexico.
[5]Medical Direction. Nube Advertising S. de R. L. de C.V. Mexico City, Mexico.
[6]Departmentof General Surgery Hospital Ángeles Metropolitano, Mexico City, Mexico.

Corresponding Author:** ***Raquel Eugenia Espinosa Cárdenas, *Medical Direction. Nube Advertising S. de R. L. de C.V. Mexico City, Mexico*

Abstract

Introduction: *In neuraxial anesthesia, the use of bupivacaine provides prolonged block time and good analgesia. On the other hand, morphine is one of the most used opioids for its analgesic properties. The combination of both drugs provides the advantage of prolonging the blockade time and improving analgesia, allowing early mobilization and recovery of the patient.*

Objective: *To compare the recovery time and satisfaction in patients under neuraxial anesthesia in whom bupivacaine was used vs. bupivacaine and morphine.*

Material and Methods: *Cross-sectional, descriptive, observational and open study. The patients were divided into two groups, the first treated with bupivacaine alone and the second with the combination of bupivacaine and morphine. Recovery time was monitored in both groups with the modified Bromage scale until complete limb mobility, and a satisfaction survey was conducted. Results: No significant difference was found in the recovery time of the patients (Bromage 3-2, Bromage2-1 and Bromage 1-0) (P=0.79, P=0.15, P=0.07, respectively). No difference was found in the degree of patient satisfaction under both types of anesthesia (71.42% and 68.75%).*

Conclusions: *In this study, it was found that the recovery time of patients did not differ with the use of bupivacaine alone or with bupivacaine and morphine, nor did patient satisfaction, which suggests that it is not necessary to administer morphine when using neuraxial anesthesia with bupivacaine.*

Keywords: *neuraxial anesthesia, bupivacaine, morphine, recovery time*

1. Introduction

One of the main goals within anesthesiology is the development of new methods to improve the management of peri- and postoperative pain, as well as its acute and chronic presentation; objective that has its historical record for more than 4,500 years in ancient Egypt where paintings of artifacts used to compress limbs for numbness were found, this primitive technique of anesthesia from a proximal site, probably without knowing it at the time, demonstrated the capabilities of conduction anesthesia.[1] From this moment and for many more years the search and replication of multiple techniques to relieve pain did not stop, from the use of medicinal herbs or the application of local cold to the use of electricity, ether and the discovery of the leaf of coca, all this allowed the development of the current regional and local anesthesia.

1.1. Neuraxial Anesthesia

Neuraxial anesthesia is a metameric local anesthetic technique that seeks to reduce complications or adverse effects related to general anesthesia, in addition to reducing postoperative pain, facilitating the early start of mobility and rehabilitation, which is directly associated with the decrease in morbidity in this period.[2] To achieve these objectives, different types of anesthetics are used that allow ideality in spinal anesthesia by maintaining a prolonged effective duration, rapid onset of action, and adequate analgesia and muscle relaxation.[2]

Local anesthetics have been used in clinical practice for more than a century, being described for the first time in 1889 by Dr. Carl Koller, in ophthalmic interventions. Thanks to their analgesic and anesthetic benefits and the versatility in their administration, they are applied in multiple branches of medicine, from minor dental surgeries to much more complex orthopedic or obstetric surgeries. These drugs are capable of reversibly blocking nerve impulse conduction at any spinal cord level, mainly through their action on voltage-gated sodium channels; Normally, electrical neuronal excitation drives a depolarizing stimulus that activates and allows sodium ions to cross the membrane. Local anesthetics interrupt the action potential and thus the influx of sodium ions, thus decreasing the excitability of the nerves that drive pain responses, leading to loss of sensation.[4] Currently, among the most widely used local analgesics we can find bupivacaine, which can be used alone or in combination with other drugs.

1.2. Bupivacaine

Bupivacaine is a powerful amide group anesthetic, created in Sweden in 1957 by Ekenstam, Egner and Pettersson.[5] It is available in 0.25, 0.5 or 0.75% solutions, its peridural onset of action is approximately 15-20 minutes and maintains a duration of 4 to 6 hours. It is metabolized mainly in the liver and its excretion is through the kidneys, therefore liver and kidney failure are relative contraindications for its use. Its main indications are long-term surgeries and for postoperative pain management.[6] Among its most relevant disadvantages is cardiac toxicity since it has a great depressant effect on the electrical conduction of the heart and its toxicity; In addition to this, the presence of hyperkalemia, acidosis, severe hypoxia or myocardial ischemia increase its cardiovascular depressant effects. Some of the most common adverse effects that we can find include nausea, vomiting, chills, headache, vertigo, anxiety, tinnitus and blurred vision,situations that can be reduced or eliminated through careful dosage and/or with the use of higher concentrations. casualties.[7,8] Its effects can be enhanced and prolonged if it is used in addition to alpha-2 agonists such as dexmedetomidine or epinephrine.[9,10] This is why over the years it has been regarded as the gold standard for spinal anesthesia due to its remarkable reliability and desirable side effect profile; in addition to its long duration.[11]

Even though the use of local anesthetics has become popular in all medical centers as a strategy to avoid the use of opioids, morphine continues to be one of the main options for pain control.

1.3. Morphine

Morphine belongs to the group of opioid analgesics; formed from opium, an extract of the Poppy plant of the species Papaver somniferous. It has been used for thousands of years for both social and medicinal purposes since it is characterized by being an inducer of euphoria, analgesia and sleep, but with negative connotations due to the dependency it generates. It has its beginnings in Great Britain at the end of the 17th century, where it was administered orally in the form of "laudanum tincture", a situation that would change after the invention of the hypodermic needle and syringe in the mid-19th century. Its analgesic effects are effective for 12 to 24 hours, an average of 20 hours.[10,12] However, its use is associated with undesirable adverse effects, particularly nausea, vomiting, lethargy, pruritus, and most concerning, respiratory depression .[13,14] Patients with renal insufficiency have shown increased sensitivity to morphine and may experience severe and prolonged respiratory depression. Despite this, it could be considered the gold standard of spinal opioids due to its spinal effect. The recommended dose is much lower than parenteral, recommending 50-100 mcg spinally, although lower doses have achieved good effect.[15]

Even today, the use of the best drug for neuraxial anesthesia is still under discussion, since while local anesthetics block the transmission of nerve impulses, opioids modulate pain in the opioid receptors of the dorsal horn.[10]

1.4. Bromage Scale

The assessment of motor blockade associated with neuraxial anesthesia and analgesia is commonly performed with the modified Bromage scale.[16] Based on the original Bromage scale, it allows us to evaluate the extension and intensity of motor blockade in the lower extremities, being a parameter used during the anesthetic procedure to corroborate the correct blockade of the patient, as well as a useful tool in the area of recovery to assess the progression of mobility and determine discharge from the area.

The scale goes from Grade 0 to 3 as described in the following table:

Table1. *Modified Bromage Scale*

MODIFIED BROMAGE SCALE
Grade 0 Without motor block
Grade 1 Inability to raise extended leg, is able to mobilize knee and feet
Grade 2 Unable to raise extended leg and flex knee; able to move feet
Grade 3 Complete motor block of the limb

Although it is a widely used scale, it has certain limitations, such as the fact that it is a qualitative evaluation that does not allow the monitoring of minor degrees of motor block. In the same way, the scale is not specific to a muscle group, it evaluates the muscle function of muscle groups with different nerve roots.

2. Objective

To compare the recovery time in patients under neuraxial anesthesia in which bupivacaine was used vs. bupivacaine and morphine.

3. Material and Methods

A cross-sectional, descriptive and observational study was carried out from July 4 to September 26, 2021 in patients admitted to the operating room area of the General Hospital of Cuautla, scheduled or emergency for surgery under neuraxial anesthesia, with the following inclusion criteria : Adult patients (over 18 years of age), both sexes (male and female), ASA 1-3. The following patients were excluded: Patients with a mental or psychiatric disorder, pediatric patients (less than 18 years old), patients with ASA 4 or patients undergoing combined anesthesia (general anesthesia with neuraxial), patients who did not sign an informed consent for anesthesia and patients who refused to participate in the study. The only criterion for elimination was that patients who did not have a clinical file or anesthetic record.

A convenience sampling of all patients who met the selection criteria was performed.

3.1. Formation of Two Study Groups

- Group 1: Bupivacaine was administered spinally, by subarachnoid block or mixed block at doses of 10-15 mcg.
- Group 2: Bupivacaine and morphine administered spinally at doses of 10-15 mcg and 50-100 mcg, respectively, in the subarachnoid space.

The patients who agreed to participate in the study were admitted to the operating room where, once the neuraxial anesthesia was performed, the duration of the anesthesia was timed and adjuvant medications were administered according to the consideration of each anesthesiologist. Once the surgical procedure was completed, the The patients went to the post-anesthetic recovery area, where non-invasive monitoring was started with blood pressure and oxygen saturation measurements, and the recovery time of the mobility of the pelvic limbs was monitored with the Bromage scale. of patient satisfaction taking into account postoperative analgesia and the presence or absence of adverse effects of the block. Discharge from the recovery area was performed once the mobilization of the lower limbs was complete (Bromage 0) and the patient denied symptoms such as pain, nausea or vomiting.

The following variables were studied in both groups: sex, age, BMI, comorbidities, weight, height, type of surgery, surgical and anesthetic time, type of anesthesia and medications administered with their doses, Bromage scale score, complications and patient satisfaction.

3.2. Statistical Analysis

An initial descriptive analysis was performed. The frequencies of the qualitative variables and the measures of central tendency and dispersion of the quantitative variables were determined according to their distribution. An inferential analysis was performed in which the difference in means of the quantitative variables of both groups was compared, using the Student's t test or Mann-Whitney (as appropriate), and using the Chi square or exact test of Fisher, the relationship between groups of qualitative variables was determined by obtaining an OR value. Statistical analysis was performed with the help of the Graph Pad Prism version 7 program.

4. Results

A total of 30 patients were included and divided into the two groups. Group 1 included 14 patients and group 2 16 patients.

4.1. Descriptive Analysis

Of the total number of patients included (30), 73.33% were women and 26.67% women. The mean age was 29.8±12.64.

The rest of the descriptive analysis is shown in Table 1. Briefly, in both groups, most of the patients were women (71.42% and 75%, respectively), in group 1, most of the patients were overweight, on the contrary, in group 2, most of the patients had obesity. The most frequent comorbidity found in both groups was systemic arterial hypertension (14.28% and 25%, respectively). In both groups (1 and 2), most of the surgeries performed were gynecological-obstetric (62.28% and 56.25%, respectively). In group 1, half of the patients received subarachnoid blockade and the other half received mixed blockade; on the contrary, in group 2, 75% of patients received BSA and 25% received mixed blockade. Most of the patients expressed "good" satisfaction with the anesthetic procedure (71.42% and 68.75%, respectively). In both groups, ketorolac and dexamethasone were administered as concomitant drugs in most patients.

Table2. *Descriptive analysis*

	Group 1			Group 2		
Sex (%)	Female	Male		Female	Male	
	71.42	28.58		75	25	
Age (±SD)	28.36±9.38			31.38±14.83		
BodyMassIndex	Overweight(%)	Obesity(%)		Overweight(%)	Obesity(%)	
	35.71	28.57		18.75	50	
Comorbilities	DM2(%)	HAS(%)		DM2(%)	HAS(%)	
	7.14	14.28		6.25	25	
Surgerytype (%)	Gyn	Ortho	GS	Gyn	Ortho	GS
	62.28	21.42	21.42	56.25	18.75	18.75
Surgical time (mean±SD)	59.07±30.77			66.06±34.59		
Anesthetic time(mean±SD)	65.5±31.26			77.56±38.58		
Anesthetictype(%)	Subarachnoid block	Mixed		subarachnoid block	Mixed	
	50	50		75	25	
Dose(mean±SD)	Bupivacaína (mg)			Bupivacaína (mg)	Morfina (mcg)	
	10.36±0.91			11.88±1.94	81.25±25	
Bromage 3 – 2 (mean±SD) (min)	43.93±24.81			42.31±32.43		
Bromage 2 – 1 (mean±SD) (min)	44.86±12.71			51.56±13.41		
Bromage 1 – 0 (mean±SD) (min)	37.79±11.34			49.06±18.86		
Sideeffects	None(%)	Pruritus(%)	Nausea orvomit(%)	None(%)	Pruritus(%)	Nausea orvomit(%)
	100	0	0	81.25	6.25	12.5
Satisfaction	Good (%)	Regular(%)	Bad(%)	Good (%)	Regular(%)	Bad(%)
	71.42	28.57	0	68.75	35.25	0
Ketorolac (%)	78.57			68.75		
Dexamethasone (%)	50			62.5		
Tramadol (%)	14.28			12.5		

4.2. Inferential Analysis

For the inferential analysis, a Student's t-test was performed to compare the quantitative variables of both groups and a Chi-square test/Fisher's exact test to compare the qualitative variables.

No significant difference was found in age between the patients of both groups (P = 0.86), neither was there a significant difference in the surgical time between both groups (P = 0.49), nor in the anesthetic time of both groups (P = 0.37).) (Figure 1).

Regarding the analysis of recovery time, no significant difference was found in the time in which the patients passed from Bromage 3 to Bromage 2 between both groups (P = 0.79), nor in the time in which the patients passed from Bromage 2 to Bromage 1 between both groups (P = 0.15) nor in the time at which patients crossed over from Bromage 1 to Bromage 0 between both groups (P = 0.07) (Figure 1).

For the inferential analysis of the satisfaction variable, a contingency table was made, in which said variable was dichotomized, taking only the "good" and "regular" results in both groups. No significant association was found in patient satisfaction in both groups (OR = 1.13, 95% CI 0.21 – 4.53, P >0.99). No significant association was found between the use of analgesics such as tramadol and ketorolac and both types of neuraxial anesthesia (OR = 1.17, 95% CI 0.16 - 8.27 and OR = 0.69, 95% CI 0.28 - 7.40, respectively).

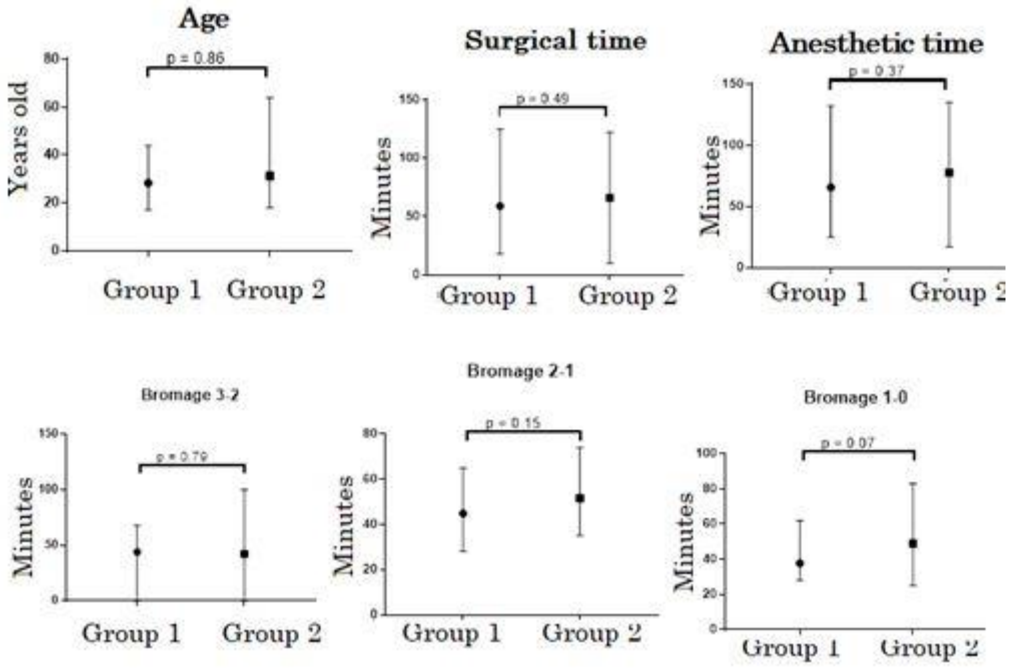

Figure1. *Difference in means between quantitative variables*

5. Discussion

The results of this study showed that, in terms of age, sex, comorbidities, the type of surgeries that were performed, the surgical time and the anesthetic time, both groups are homogeneous, which suggests that they may be comparable to each other.

Of the adverse effects associated with opioids, the one with the greatest presence was nausea and vomiting (12.5%), however this did not impact patient satisfaction. This is possibly associated with the use of medications with an antiemetic effect (dexamethasone) in the intraoperative period.

As there are no significant differences in recovery times in the two groups, it is possible to suggest that both types of neuraxial anesthesia provide similar recovery times, probably due to the use of adjuvant medications, such as ketorolac and dexamethasone, which act on the different pathways of pain and inflammation allowing the prolongation of the block time, a good analgesic control and a prompt recovery and early mobility.

When comparing both groups and no significant difference was observed between the bupivacaine group alone vs. Bupivacaine with morphine, we can suggest that in patients with a high risk of postoperative nausea or vomiting, risk of acute urine retention, in patients with any allergy or sensitivity to opioids or patients undergoing short-stay procedures, in whom it is sought timely discharge from the recovery area, bupivacaine can be used as the only drug for subarachnoid blockade and adequate postoperative analgesia can be provided.

One of the most important limitations of the study is the small sample size of both groups, it is possible that, if a new study is carried out that assesses the recovery time with each type of neuraxial anesthesia, but with a greater number of subjects of research, differences can be found that favor the use of one or another technique.

6. Conclusions

In this study, it was found that the patients' recovery time did not differ with the use of neuraxial anesthesia with bupivacaine alone or with bupivacaine and morphine. Likewise, patient satisfaction with both anesthetic techniques was good.

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