Research Article

Efficacy of different regimens used for postoperative analgesia in patients undergoing lumbar disc surgery

Ahmed K. Mohamed, Jozef Z. Attia Ali E. Abdul-Gaber
Department of Anesthesia and ICU, El-Minia Faculty of Medicine

Abstract

Introduction: Gabapentin (1-aminomethyl-cyclohexaneatic acid) is a structural analogue of the neurotransmitter γ -amino butyric acid (GABA), It is a novel drug used for the treatment of post-operative pain with antihyperalgesic prosperities and has a unique mechanism of action. It has been shown to be beneficial in the treatment of neuropathic pain as well as postoperative pain following spinal surgery, Gabapentin works by reducing lesion induced hyper excitability of posterior horn neurons, which is responsible for central sensitization (Khan, et al., 2011). **Aim of the work:** The aim of our study were to asses and compare the post-operative analgesic effect of Gabapentin given preoperatively, in addition to bupivacaine locally infiltrated by surgeon in the paravertebral muscles and subcutaneous tissues, just before closure of tissues, and epidural bupivacaine soaked gel foam in patients undergoing lumbar laminectomy operations. **Patients and Methods:** After obtaining the local ethics committee of El-Minia university hospital approval and written informed consent was taken of the patient, sixty patients of both gender, ASA I and II ,aged between 18-62 years old scheduled to undergo elective lumar laminectomy under general anesthesia were enrolled in this prospective, randomized, single-blind controlled study. This study was conducted from March 2017, to November 2017. In El-Minia university hospital. **Results:** This study had been carried out in El-Minia university hospital, 60 patients, aged 18-62 years old, scheduled for lumbar laminectomy under general anesthesia, after the study was completed. Patients enrolled and randomized into 2 equal groups. **Discussion:** Even though postoperative pain management and its implications have gained a significant attention in health care during last three decades, it continues to be a major challenge that still remains disregarded.

Kay words: preoperative Gabapentin, bupivacaine, epidural gelfoam

Introduction

Gabapentin (1-aminomethyl-cyclohexaneatic acid) is a structural analogue of the neurotransmitter γ -amino butyric acid (GABA), It is a novel drug used for the treatment of post-operative pain with antihyperalgesic prosperities and has a unique mechanism of action. It has been shown to be beneficial in the treatment of neuropathic pain as well as postoperative pain following spinal surgery, Gabapentin works by reducing lesion induced hyper excitability of posterior horn neurons, which is responsible for central sensitization (Khan, et al., 2011).

Postoperative pain is often regarded a clearly of nociceptive (transient) pain, but may contribute as inflammatory, neurogenic and visceral mechanisms. Despite all proceedings in recognition of pathophysiology of pain, pharmacology of analgesics and development of advanced techniques in control of pain, postoperative pain is still a major issue in patient care. Pre-emptive analgesia strategies have included infiltration with local anesthetics nerve block, epidural block, intravenous analgesics and anti-inflammatory drugs (Banerjee , 2014).

Neuropathic pain is still widely considered a chronic pain state. However, clinical experience and clinical data are showing that neuropathic pain can occur acutely and can be a component of postoperative pain (Alston and pechon 2005).

Laminectomy is associated with considerable post-operative pain, good and optimal pain relief is important for postoperative laminectomy, and it may influence the

overall outcome, different modalities and drugs for pain management following lumbar laminectomy have been evolved over time, this include intravenous, intramuscular, epidural, spinal instillation and infiltration routes of analgesia (Rudra, et al. 2015).

Addition of adjuvants like clonidine, magnesium and dexemetomomidine has shown promising results, Providing infiltration analgesia locally in the area of surgical trauma, with minimal side effect, is an attractive option (Chan, 2010).

There are few studies reporting the usage of infiltration anesthesia with local anesthetics for relief of postoperative pain following lumbar laminectomy procedure (Banerjee, 2014).

Aim of the work

The aim of our study were to asses and compare the post-operative analgesic effect of Gabapentin given preoperatively, in addition to bupivacaine locally infiltrated by surgeon in the paravertebral muscles and subcutaneous tissues, just before closure of tissues, and epidural bupivacaine soaked gel foam in patients undergoing lumbar laminectomy operations.

Our objectives were to asses efficacy of post-operative analgesia and hemodynamic changes primary, financial cost, time to first analgesic request and total analgesic consumption secondary after lumbar laminectomy in the study patients.

Patients and Methods

After obtaining the local ethics committee of El-Minia university hospital approval and written informed consent was taken of the patient, sixty patients of both gender, ASA I and II ,aged between 18-62 years old scheduled to undergo elective lumar laminectomy under general anesthesia were enrolled in this prospective, randomized, single-blind controlled study. This study was conducted from March 2017, to November 2017. In El-Minia university hospital.

Exclusion criteria:

Previous history of spine surgery.
History of substance abuse.
Patients have significant medical diseases especially neuromuscular disease, psychological disease, renal impairment, morbid obesity, and obstructive sleep apnea (OSA).
ASA class III and IV.
Allergy or intolerance to the study drugs.
Refusal by the patient.

Preoperative assessment and preparation

A careful medical history was taken.
General examination including pulse, arterial blood pressure and respiratory rate were recorded.

Physical examination including chest, heart, abdomen, and other systems were recorded.
Routine investigations including, complete blood count (CBC) and coagulation profile for all patients were done.
Renal function test, liver function test, random blood sugar and electrocardiogram for patients over 40 years old were done.

We explained to patients all steps of general anesthesia, and how to evaluate their own pain intensity using the visual analogue scale of pain (VAS), explanation of VAS was done, VAS is consisted of a straight, vertical 10-cm line; the bottom point represented "no pain"=(0 cm) and the top "the worst pain you could ever have "= (10 cm). Preoperative VAS scores were obtained from all patients as a base line data, by asking the average intensity of pain at the preanesthetic checkup.

Drugs and tools used in the study

1- Gabapentin (400mg, Cap, Eva pharma, Egypt)
2- Bupivacaine (Bupivacaine hydrochloride 100mg/20ml, 0.5%, Sunny pharmaceutical, Egypt)
3- A sterile gel foam (Cuarspon, Curamedical B.V, Amsterdam, Holand, Imported by Cleopatra scientific office, Egypt)
4- Normal saline (0.9%)
5- 10-ml syringes for injection.

Preparation of the study drugs
3 caps. of Gabapentin (400mg) were prepared for each patient.
10 ml of Bupivacaine 0.5% was diluted up to 20ml by Saline 0.9 to produce 20ml Bupivacaine 0.25%
A sterile piece of gel foam measuring 5cm X1cm.

Study patient groups
Patients were randomly classified into two groups using computer generated table number, each one contained (30) patient.
Group (A) received 3 caps of Gabapentin (400mg) 1h before operation, and intra-operative 20 ml Bupivcaine (0.25%) by intramuscular infiltration.
Group (B) received 3 caps of Gabapentin (400mg) 1h before operation, and intra-operative epidural gel foam soaked with 20ml Bupivacaine 0.25%.

Parameters assessed
Hemodynamic parameters: hemodynamic variables as heart rate (HR) (beat/min), systolic blood pressure (SBP) (mmHg), and diastolic blood pressure (DBP) (mmHg), and respiratory rate (RR) (cycle/min) were assessed. The parameter were recorded preoperatively just before induction of anesthesia as a base line value, 1h, 2h, 4h, 8h, 12h, and 24h postoperative.

Visual analogue pain scale (VAPS)
Pain intensity was assessed using VAPS. Patients were asked to make a horizontal mark across the line at the place that indicated the amount of their pain sensation. When it was more or equals 3 cm we gave analgesia using nalbuphine (0.1mg/kg) [Nalbuphine hydroclride 20mg/ml, Amoun pharmaceutical , Egypt],

VAS scale was recorded during pre-anesthetic check up as a baseline value, patients were asked to rate their pain intensity at 1h,2h,4h, 8h, 12h, 24h postoperative.

The time to first analgesic request was recorded, analgesic duration was defined as the time from completion of surgery till the time for first request for analgesia.

Total analgesic requirement was recorded for 24h, as total consumption of Nalbuphine.
Ramsay Sedation Score (RSS): Developed in 1974 and designed as a test of arousability. This was the first established assessment tool and the most employed for 25 years. It consists of 6 points: (Sessler, et al., 2002)
Anxious and agitated, or restless or both.
Cooperative, oriented and tranquil.
Respond to command only.
Brisk response light glabellar tap or load auditory stimulus.
Sluggish response to light glabbellar tap or loud auditory stimulus.
No response to stimulus.

Results
This study had been carried out in El-Minia university hospital, 60 patients, aged 18-62 years old, scheduled for lumbar laminectomy under general anesthesia, after the study was completed. Patients enrolled and randomized into 2 equal groups.

Table (1): Comparison of VAS score between groups data are presented as median and Inter-Quartile Range.

	GROUP A N=30	GROUP B N=30	P-VALUE
	Mode Median (IQR)	Mode Median (IQR)	
Preoperative	1 1 (0-1)	0 0 (0-1)	0.180
One hour postoperative	1 1(0.75-1)	1 1 (0-1)**	0.639
Two hour postoperative	1 1(0.75-1)	1 1 (1-1)***	0.390
Four hour postoperative	2 2(1-2)***	2 2 (1-2)***	0.380
Eight hour postoperative	4 4 (3.75-5.25)***	2 2 (1.75-3)***	<0.001
Twelve hour postoperative	5 5(5-6)***	4 4 (4-5)***	0.012
Twenty-four hour postoperative	7 6(4.75-7)***	5 5 (4-5)***	0.008

Analysis of quantitative data by Mann-Whitney test, intragroup comparison by Wilcoxon sign ranked test, p-value is considered significant at <0.05
*: significant difference from basal measurement at <0.05 level
**: significant difference from basal measurement at <0.01 level
***: significant difference from basal measurement at <0.001 level

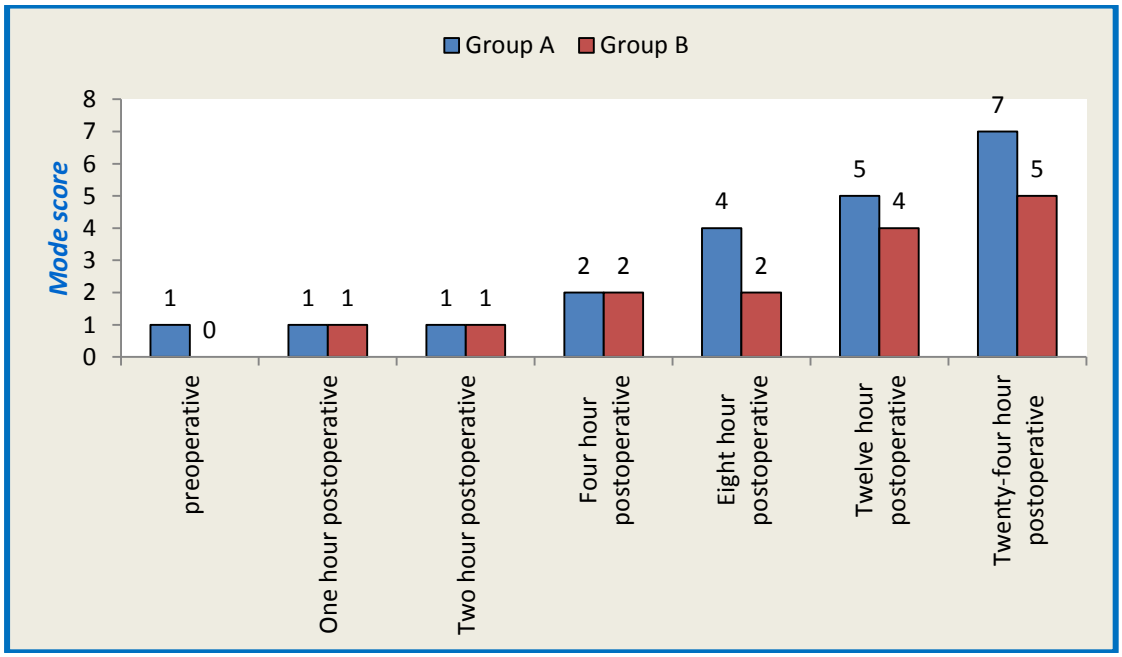

Fig (1) Comparison of VAPS score among groups

Table (2): Comparison of complications between groups data are expressed at number and frequency**.** .

Variables		Group A N=30	Group B N=30	P-value
		Freq. (%)	Freq. (%)	
Urinary retention	**Yes**	0(0%)	0(0%)	1.000
	No	30(100%)	30(100%)	
Nausea and vomiting	**No**	24 (80%)	25(83.3%)	0.974
	1_{attack}	2(6.7%)	2(6.7%)	
	2_{attack}	3(10%)	2(6.7%)	
	3_{attack}	1(3.3%)	1(3.3%)	
Incidence of arrhythmia	**Yes**	0(0%)	0(0%)	1.000
	No	30(100%)	30(100%)	

Analysis of qualitative data by chi-squared test, p-value is considered significant at <0.05

3- Comparison pressure symptom as aggravation of preoperative symptoms and neurological signs as

Radicular pain, Paresthesia Hyperthesia, Bowel and bladder dysfunction. None of our patients developed such symptoms.

Discussion

Even though postoperative pain management and its implications have gained a significant attention in health care during last three decades, it continues to be a major challenge that still remains disregarded.

Postoperative analgesia has traditionally been provided by administration of opioid analgesics. However, excessive opioids administration is associated with a variety of side effects including ventilatory depression, drowsiness and sedation, nausea and vomiting, pruritus, ileus, urinary retention, and constipation. Prescription of multimodal analgesic regimens contains non-opioid analgesics (e.g., local anesthetics, nonsteroidal anti-inflammatory drugs, cyclooxygenase inhibitors, acetaminophen, ketamine, clonidine, dexmedetomodine, gabapentin) as supplement of opioid analgesics can provide better postoperative pain management outcome. The opioid-sparing effects of these compounds may lead to reduce side effects of opioids.(White, 2005)

Nowadays variety of new drugs, analgesic techniques and devices, and preventive approaches are available for anesthesia-logists (Strohbuecker, 2005)

Following spine surgery, majority of patients report moderate to severe pain, which persists for at least initial 3-4 days. The pain is proportional to the number of operated vertebrae and the invasiveness of the procedure. It seems to be no significant difference in the severity of pain between cervical, thoracic, and lumbar spine surgeries. Minimally invasive neurosurgical techniques are associated with minimum postoperative pain. (Rudra, 2015)

The use of opioids is limited because of its side effects and the poor response to opioids of certain types of pain. The multiplicity of mechanisms involved in pain suggests that a combination of opioid and non-opioid analgesic drugs will enhance analgesia and reduce opioid requirements and side effects after surgery.

Gabapentin is a structural analog of γ-aminobutyric acid, which is an anticonvulsant drug. Clinical studies have found Gabapentin to be effective in treating neuropathic pain Pretreatment with Gabapentin also blocked the development of hyperalgesia. (Seib & Paul, 2006)

Evidence-based guidelines now recommend the use of combinations of two or more analgesic medications or techniques with different sites or mechanisms of action ("multimodal" or "balanced") analgesia.

Advantages of multimodal analgesia include Improved analgesia, Reduced opioid requirements ("opioid sparing"), Reduced adverse effects of opioids (Glowacki, 2015).

In addition to that Infiltration analgesia had shown a significant steep rising curve for immediate postoperative pain management. Infiltration with local anesthetics acts directly on the pain-producing mechanisms with lesser incidence of side effects. Infiltration with local anesthetics acts directly on the pain-producing mechanisms with lesser incidence of side effects. Therefore, infiltration mode of analgesia was considered for this study. Literature had shown effective use of bupivacaine, levo-bupivacaine and ropivacaine for infiltration analgesia .Bupivacaine was regularly used for the same issue. Addition of adjuvants to local anesthetics for postoperative analgesia in patients undergoing lumbar laminectomy was rarely reported (Hernandez-Palazon, et al., 2001).

Epidural and intrathecal (IT) opioids are also effective means of pain control in several major surgical interventions including spinal surgery. However, some of the side effects have limited their widespread use (eg, late-onset respiratory depression). (Kundura, et al., 2014)

Therefore, alternative measures of pain control including infiltration of paraspinal musculature with local anesthetics have been investigated with conflicting results. In situations such as laminectomies, where the epidural space is exposed as part of the surgical procedure, the application of absorbable gelatin sponge soaked in local anesthetics appears to be an alternative for providing postoperative analgesia.

That is why we selected gabapentin with bupivacaine intramuscular infiltration, versus gabapentin and epidural bupivacaine soaked gel foam in laminectomy for postoperative analgesia, the alleviation of suffering is of course is a primary concern for health care provider and pain manager, who try to use various method to provide a satisfactory level of pain management.

We conclude that preoperative 1200mg gabapentin combined with postoperative epidural bupivacaine soaked gel foam provide better late postoperative analgesia with higher cost, but comparable hemodynamic stability, total analgesic consumption, duration of analgesia, incidence of nausea and vomiting, and level of sedation compared to preoperative 1200mg gabapentin combined with postoperative wound infiltration with bupivacaine inpatient undergoing elective lumbar laminectomy.

Recommendation

Based on the current study we recommend

Usage of analgesic with various mechanism of action is more usefull in post-operative pain management especially after spinal surgery.

Further studies to test different doses of used drugs.

Further controlled studies to asses efficacy of various epidural drugs other than opioid.

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