e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15(11); 160-165

Original Research Article

Epidural Injection of Local Anesthetic As an Adjunct to General Anesthesia Prolongs Postoperative Analgesia in Elective Laminectomy/Discectomy Cases

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Received: 25-08-2023 / Revised: 28-09-2023 / Accepted: 30-10-2023

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Conflict of interest: Nil

Abstract:

Background: General anesthesia is used worldwide frequently for lumbar spine surgeries and when it combines with regional anesthesia, will give better result in view of recovery, analgesia and postoperative stay.

Aims & objectives: The aim of this study was to compare the intraoperative hemodynamic variables, post-operative visual analog score(VAS score), time to first rescue analgesia and total analgesic requirements in patients undergoing elective one or two lumbar laminectomy/discectomy cases performed under combined epidural-general anesthesia(CEGA) and general anesthesia only.

Material & Methods: This randomized controlled prospective study was conducted after taking approval from institutional ethics committee. One hundred twenty patients of either gender between 18 to 60 years, weighing 50-70kg, of ASA grade I & II, undergoing one or two segment lumbar laminectomy/discectomy surgery were included. Patients were divided in two groups of 60 each. In Group CEGA, all patients received epidural(single injection of 11ml of 0.25% bupivacaine plus 1ml (50 µg) of fentanyl was injected epidurally, after confirmation of epidural space by hanging drop method)in sitting position then general anesthesia was induced with standard protocol and Group GA, patients received general anesthesia alone. Patients were monitored for Heart rate(HR), Mean Arterial Pressure(MAP), and Peripheral saturation(SpO_2), before induction (baseline), after placing patient in prone position, at the time of incision and 5 min interval thereafter, throughout the procedure. All the surgeries were carried out by a single surgeon. Anesthesia induction, maintenance and monitoring were carried out by a single anesthesiologist. VAS score was evaluated by an anesthesiologist posted ICU, at the time of arrival in the PACU, and 15 mins, 30 mins, 1 hour, 2 hours, 6 hours, and 24 hours thereafter. Time for first rescue analgesia & Total analgesic drug used in 24hr postoperatively was noted.

Result: We found that intraoperative heart rate and mean arterial blood pressure were more stable in Group CEGA, receiving combined epidural and general anesthesia. Post-operative pain and total analgesic requirement was significantly less (p value <0.0001) in Group CEGA as compared to Group GA.

Conclusion: It can be concluded that single epidural injection of bupivacaine with fentanyl in patients undergoing general anesthesia prolongs analgesia, reduces severity of pain post-operatively and helps in providing stable hemodynamics throughout intraoperatively.

Keywords: Bupivacaine; Fentanyl; Laminectomy; Visual Analog Scale.

Introduction

General anesthesia as well as regional anesthesia or both, as combination can be safely used for lumbar spine surgeries. [1] Surgeries in lumbar spine/disc are done in prone positions. Prone position is an uncomfortable position for awake patients, under local and regional anesthesia alone. General anesthesiais when used as sole anesthesia to spine patients, it will be accompanied by several

perioperative morbidities including blood loss, postoperative pain, nausea, vomiting, and prolonged post-operative recovery period. [2] So we decided to combined both the techniques together to add benefits of both techniques as in combination it provides secured airway, reduced intraoperative anesthetic requirement [7] decreased intraoperative blood loss [3],cardiac dysrhymias or ischemic events, postoperative analgesia [4], reduced demand for painkillers [5], early recovery [6] and less chances of post-operative deep venous thrombosis [8].

Aims & Objectives: Primary aim of our study was to compare postoperative VAS scores, time to first resue analgesia used, total tramadol requirement in first 24hours postoperatively. Secondary aim was to compare intraoperative heart rate and mean arterial pressures in both the groups.

Methodology:

In this randomized, prospective comparative study 120 patients of age between 18-60 years ASA class I & II, posted for elective lumbar spine one/two level laminectomy/discectomy were enrolled. After approval from Institutional Ethics Committee, written informed consent was taken from each and every patient and whole procedure was explained in details and pre anesthesia check-up was done. Patient with bleeding diathesis, having local infection, allergic to local anesthetics, with severe cardio-pulmonary diseases, with history of seizures and raised intracranial pressure, severe renal and hepatic disease and patients with psychiatric disorders, pregnant and lactating women, patient with severe hypovolemia and severe spinal deformity were excluded from the study.

Patients were randomly allocated to CEGA or GA groupswith60patientsin each group, using the sealed envelope technique based on a computer-generated list. As the patient entered the operating room, routine monitoring devices for measuring heart rate (HR) ECG, NIBP, SpO_2, $EtCO_2$& temperature were attached and baseline values were recorded. Intravenous access was established with two 18G intravenous cannula through which Ringer's lactate solution was given. In Group CEGA, after taking all aseptic precautions, with the patient in sitting position, 18G Touhy needle was passed at the same level or 1 level above or below the level of surgery and the needle was advanced till "loss of resistance" was encountered and confirmed with "hanging drop" technique. Then a single injection of 11ml of 0.25% bupivacaine plus 1ml (50 µg) of fentanyl was injected epidurally and patient was placed in supine position. General anesthesia was given to patients of both the groups with the standard protocol described below.

Patients were premedicated with injection glycopyrrolate 0.2 mg IV and injection midazolam 1 mg IV, and then induced with IV fentanyl (2 µg /kg), IV Thiopentone (4-5mg/kg), and IV vecuronium (0.1mg/kg). Intermittent positive pressure ventilation (IPPV) was given for 3 minutes, followed by endotracheal intubation. Correct endotracheal placement of the tube and bilateral air entry were checked by five point auscultation and confirmed by end tidal carbon di oxide ($EtCO_2$) value. The tube was then fixed, followed by covering of eyes with cotton pads then patient was placed in prone position for surgery. Bilateral air entry was checked again and cotton rolls were placed under pressure points. For maintaining the anesthesia, combination of N_2O (66%) and O_2(33%), isoflurane (1MAC) and intermittent doses of vecuronium(0.01mg/kg) were used throughout the surgery. The Heart rate(HR), Mean arterial pressure (MAP) and Peripheral Oxygen saturation (SpO_2) were monitored before induction (baseline), after placing patient in prone position, at the time of incision and 5 min interval thereafter, throughout the surgery. On completion of surgery, patient was reversed with injection Neostigmine 0.05 mg/kg IV& inj. Glycopyrrolate 0.005 mg/kg IV. After extubation patient was shifted to Neuro-Intensive care unit (NICU) for further observation. All the surgeries were carried out by a single surgeon. Anesthesia induction, maintenance and monitoring were carried out by a single anesthesiologist. Bradycardia and Hypotension were considered when HR<60 and MAP<65mm Hg. Pain scores were evaluated by anaesthesiologist who was not aware of group allocation, at the time of arrival in the NICU, and 15 mins, 30 mins, 1 hour, 2 hours, 6 hours, and 24 hours thereafter, using visual analog scale (VAS). Tramadol 2mg/kg IV was used for post-operative rescue analgesia when VAS score >4.

Visual analog scale: Severity of pain was evaluated using a 10 cm visual scale. One end point of the scale represented no or zero pain ('0' point of VAS Scale) and the other end represented worst pain ('10' point of VAS). This has limitations, but it is the easiest and simplest type.

Statistical Analysis Plan: Categorical variables were summarized in frequency and percentage distribution and Pearson's Chi square statistics was used to analyze the differences in contingency tables. Fisher's exact test was applied if frequency was less than five. Continuous variables were summarized in mean ± standard deviation (SD) and student t test was applied to test mean difference between two independent means. P value >0.01 was considered statistically significant. All the statistical analysis was performed in SPSS 20.0 for Windows.

Result

No statistical differences were found between the two groups with respect to age, sex, weight, baseline HR, SBP, DBP, MAP, and SpO2 (Table1,2,3). No

postoperative neurological, cardiovascular or any complications were recorded in any patient. The VAS score at admission to PACU in group A and group B was 1.25 ± 0.47 & 4.02 ± 1.24 respectively, which was highly significant (p<0.0001). The difference between VAS scores of group A and group B at 15 minutes (1.47 ± 0.57 for group A and 4.38 ± 0.83 for group B), 30 minutes (2.05 ± 0.53 for group A and 3.35 ± 0.88 for group B), 60 minutes (2.10 ± 0.4 for group A and 2.80 ± 0.44 for group B) and 24 hours (2 ± 0.52 for group A and 2.58 ± 0.5 for group B) were also significant (p<0.0001) and showed that postoperative VAS score was significantly less in group A as compared to group B.

Table 1: Demographic detail in both groups

	Group CEGA	**Group GA**	
Age (Year)	39.1±10.35	41.18± 9.83	P= 0.731
Sex Ratio	41:19	38:22	P = 0.564
Weight	57.15± 6.71	57.12 ± 6.16	P = 0.591

(P > 0.05; insignificant)

Table 2: **Comparison of intraoperative heart rate**

Time (Min)	**Group CEGA**		**Group GA**		**p value**	**Significance**
	Mean	**Standard Deviation**	**Mean**	**Standard Deviation**		
Baseline	83.7	6.92	84.2	6.23	0.658	Insignificant
After Prone Position	82.5	7.88	93.4	5.48	<0.0001	Significant
After Incision	84.5	7.8	85.7	6.7	0.371	Insignificant
5 Min	81.3	8.16	92.9	6.23	<0.0001	Significant
10	82.3	13.12	90.1	7.8	<0.0001	Significant
15	83.4	9.18	91.5	6.12	<0.0001	Significant
20	86	9.03	89.9	5.97	0.006	Significant
25	81.4	8.61	85	5.94	0.008	Significant
30	78.9	8.27	84	7.31	0.001	Significant
35	77.3	9.21	81.8	6.91	0.003	Significant
40	75.2	9.48	80.2	8.07	0.002	Significant
45	73.4	10.03	79.7	6.47	<0.0001	Significant
50	72.3	9.39	84.5	5.29	<0.0001	Significant
55	71.3	9.6	85.3	5.5	<0.0001	Significant
60	70.4	9.83	88.1	6.26	<0.0001	Significant
65	69.4	8.65	87.1	7.12	<0.0001	Significant
70	68.7	8.93	88.9	4.87	<0.0001	Significant
75	70.1	9.76	93	5.91	<0.0001	Significant
80	71.1	8.44	89.4	6.63	<0.0001	Significant
85	71.1	8.94	87.1	6.85	<0.0001	Significant
90	69.2	8.14	86.3	7.13	<0.0001	Significant
95	67.3	9.13	85.5	5.06	<0.0001	Significant
100	68.2	9.29	84.2	5.08	<0.0001	Significant
105	73.3	9.66	83.9	5.28	<0.0001	Significant
110	72.1	10.59	81.9	6.81	<0.0001	Significant
115	71.6	6.62	80.1	6.79	<0.0001	Significant
120	69	3.58	79.6	6.14	<0.0001	Significant

The baseline mean HR of group CEGA (83.7 ± 6.92/min) was comparable to that of group GA (84.23 ± 6.23/min) with p value >0.05. In prone position, there was rise in mean HR in group GA (93.43 ± 5.48/min) as compared to group CEGA (82.52 ± 7.88/min) which was statistically significant (p<0.05). At incision, the difference between mean HR between the two groups was not significant (p value=0.371). Thereafter, till the end of surgery, mean HR in group GA was significantly higher than that of group CEGA (p<0.05). At the end of surgery, the mean HR of group CEGA (69 ± 3.58/min) was significantly lower than that of group GA (79.62 ± 6.14/min). (p value<0.0001)

Table 3: Comparison of intraoperative mean arterial blood pressure (mmHg)

Time	Group CEGA		Group GA		p value	Significant
	Mean	Standard Deviation	Mean	Standard Deviation		
Baseline	93.7	7.53	95.9	5.82	0.074	Insignificant
After Prone Position	83.4	7.89	87.25	5.91	0.003	Significant
After Incision	80.4	8.1	79.67	5.94	0.576	Insignificant
5 Min	77.8	8.42	76.96	5.1	0.491	Insignificant
10	77.1	6.78	80.24	5.15	0.005	Significant
15	76.3	5.27	78.58	4.35	0.011	Significant
20	74.3	4.06	76.68	3.66	0.001	Significant
25	75.5	5.05	73.19	3.14	0.003	Significant
30	74.7	4.67	71.51	2.76	<0.0001	Significant
35	76.3	3.74	75.75	2.99	0.342	Insignificant
40	75.6	3.79	81.49	3.17	<0.0001	Significant
45	74	3.4	84.32	3.44	<0.0001	Significant
50	72	3.17	85.27	3.29	<0.0001	Significant
55	73.8	3.03	87.15	3.58	<0.0001	Significant
60	75.6	3.83	84.05	3.48	<0.0001	Significant
65	76.6	4.2	82.14	3.94	<0.0001	Significant
70	77.5	4.98	80.69	3.72	<0.0001	Significant
75	79.9	5.64	85.72	3.54	<0.0001	Significant
80	83.1	5.58	89.36	3.33	<0.0001	Significant
85	85	5.76	93.28	3.7	<0.0001	Significant
90	88.2	4.69	97.17	3.33	<0.0001	Significant
95	85.4	4.82	92.76	4.16	<0.0001	Significant
100	82.2	4.84	95.06	4.29	<0.0001	Significant
105	84.4	6.73	96.69	4.11	<0.0001	Significant
110	86.3	5.54	97.86	3.74	<0.0001	Significant
115	88.1	5.7	100.2	7.14	<0.0001	Significant
120	85.8	6.54	100.8	3	<0.0001	Significant

This Table 3, shows the baseline values of MABP (93.68 ± 7.53 mm Hg in group CEGA vs 95.90 ± 5.82 mm Hg in group GA) was comparable with p value=0.074.

After prone position, there was fall in MABP in both groups and the difference between them (83.42 ± 7.89 mm Hg in group CEGA vs 87.25 ± 5.91 mm Hg in group GA) was statistically significant ($p<0.05$). The MABP values in both groups at incision were comparable ($p>0.05$).

Starting from 10 minutes after incision, the difference between MABP in both groups, measured at 5 minute interval, was statistically significant throughout the surgery ($p<0.05$) with MABP of group GA significantly higher than that of group CEGA.

Table 4: Comparison of VAS score

Time	Group CEGA		Group GA		p Value	Significance
	Mean	Standard Deviation	Mean	Standard Deviation		
Admission To PACU	1.25	0.47	4.02	1.24	<0.0001	Significant
15 Min	1.47	0.57	4.38	0.83	<0.0001	Significant
30 Min	2.05	0.53	3.35	0.88	<0.0001	Significant
60 Min	2.1	0.4	2.8	0.44	<0.0001	Significant
120 Min	2.78	0.74	2.87	0.34	0.430	Insignificant
6 Hours	2.55	0.57	2.83	0.49	0.004	Significant
24 Hours	2	0.52	2.58	0.5	<0.0001	Significant

Table 4 showing the difference between VAS score of group CEGA and group GAat admission to NICU at admission to Neuro-ICU (1.25 ± 0.47 & 4.02 ± 1.24 respectively), at 15 minutes (1.47 ± 0.57 and 4.38 ± 0.83 respectively), at 30 minutes (2.05 ± 0.53 and 3.35 ± 0.88 respectively), at 60 minutes (2.10 ± 0.4 and 2.80 ± 0.44 respectively) and at 24 hours (2 ± 0.52 and 2.58 ± 0.5 respectively) were highly significant ($p<0.0001$).

Table 5: Time for first rescue analgesia

Group CEGA		Group GA		p value
Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	
127.25 min	28.97 min	18.1min	6.55min	<0.0001

(Highly Significant). This Table 5, shows the mean time for first rescue analgesia used postoperatively, in group CEGA is 127.25 ± 28.67 min and group GAis 18.1 ± 6.55 min. The difference between the two groups are highly significant (p<0.0001). This represents those patients in group CEGA experienced much less pain postoperatively and demanded for first rescue analgesia later, than group GA.

Table 6: Total analgesic (tramadol) requirement in first 24 hours postoperatively

Group CEGA		Group GA		p value
Mean	**Standard Deviation**	**Mean**	**Standard Deviation**	
121.17mg	18.3mg	231.25mg	26.29mg	<0.0001

(Highly Significant). Table 6, clearly shows that group CEGA patient's needed less tramadol within 24 hours postoperatively, as compared to group GA.

Discussion

Lumbar spine surgeries are usually performed under general anaesthesia (GA) [1]. Although when general and regional anaesthesia is combined for spine surgeries results are good. Like any other surgeries, spine surgeries are painful if pain is not suppressed adequately, this can result in intraoperative increase in HR, MAP as well as postoperative VAS. In Combined epidural and general anaesthesia (CEGA), the epidural component provides the advantages of regional anesthesia and the GA component secures the airway and ensures that surgery can be carried out for longer durations. In group B, Intraoperative hemodynamic parameters (HR and MAP) had shown much variability whereas patients in group A had stable mean HR and MAP, and the difference between mean HR and MAP in both the groups was highly significant (p<0.0001)These findings are also in agreement with the studies of Demirel CB et al [13], Mohammad Reza Khejavi et al [11], Alaa M Atia et al [14], John E Tetzlaff et al [15], Semra Calimli et al and D. Matheson et al. [16] These authors also observed that intraoperative heart rate and mean arterial pressure in general anesthesia were higher as compared to regional anesthesia.

Mohammad Reza Khejavi et al [11], in their comparison of GA vs combined epidural and general anesthesia (CEGA) in lumbar laminectomy study found that mean PR and MAP values were significantly higher in group receiving GA as compared to the group receiving CEGA (p<0.05). They concluded that CEGA provided stable intraoperative hemodynamic parameters as compared to GA. Peripheral saturation was maintained in normal limits (95-100%) throughout the study in both the groups

Post-operative pain scores at 0, 15 min, 30 min, 1 hour, 6 hour and 24 hours were more in group B as compared to group A and highly significant (p<0.0001). Demand for first rescue analgesia: The difference between mean time for first rescue analgesia used postoperatively in group A (127.25 ± 28.67 min) and group B (18.1 ± 6.55 min) was very significant (p<0.0001). Thus, the time to use first rescue analgesia was more in group A as compared to group B.

Our results were similar to the study conducted by Mohammad Reza Khejavietal [11] compared GA vs CEGA in lumbar laminectomy cases. They found that the mean pain score in the PACU in CEGA group was significantly lower in comparison with that of GA group (P<0.01) and analgesic requirements (GA: 72.3%,CEG: 18.6%,P<0.001) were higher in the GA group. Time to first rescue analgesia in the postoperative period was significantly longer in CEGA group (P=0.001)

Total analgesic (tramadol) used within 24 hours: The total analgesic (tramadol) used within 24 hours post operatively in both the groups was statistically significant (p<0.05), showing that group A patients required less analgesia (tramadol) within 24 hours postoperatively, as compared to group B.

There are certain limitations of our study that includes: Any surgery with duration longer than 2 hours were excluded, Unavailability of equipment's to monitor BIS (Bispectral index) levels during GA in both groups and unavailability of laboratory tests to monitor intraoperative indicators of stress response to surgery: plasma cortisol, plasma insulin, plasma TSH, CRP, plasma epinephrine. [12,17]

Conclusion

We conclude that epidural injection of bupivacaine with fentanyl along with general anesthesia is a better alternative to general anesthesia alone, used for lumbar laminectomy/discectomy surgery as it provides stable hemodynamic parameters in intraoperative and early postoperative period and less requirement of rescue analgesia in the postoperative period.

References

1. De Rojas JO, Syre P, Welch WC. Regional anesthesia versus general anesthesia for surgery on the lumbar spine: a review of the modern

literature. Clin Neurol Neurosurg. 2014;119:39–43
2. Gulur P, Nishimori M, Ballantyne JC. Regional anaesthesia versus general anaesthesia, morbidity and mortality. Best Pract Res Clin Anaesthesiol. 2006; 20:249-63.
3. Papadopoulos EC, Girardi FP, Sama A, Pappou IP, Urban MK, Cammisa FP Jr. Lumbar microdiscectomy under epidural anesthesia: A comparison study. Spine J. 2006;6: 561-4.
4. Sadrolsadat SH, Mahdavi AR, Moharari RS, Khajavi MR, Khashayar P, Najafi A. A prospective randomized trial comparing the technique of spinal and general anesthesia for lumbar disk surgery: A study of 100 cases. Surg Neurol. 2009; 71:60-5.
5. Simpson PJ, Radford SG, Forster SJ, Cooper GM, Hughes AO. The fibrinolytic effects of anaesthesia. Anaesthesia. 1982; 37(1):3-8.
6. Greenbarg PE, Brown MD, Pallares VS, Tompkins JS, Mann NH. Epidural anaesthesia for lumbar spine surgery.j spinal Disord. 1988;1:139-43
7. Hodgson PS, Liu SS.Epidural lidocaine decreases sevoflurane requirements for adequate depth of anaesthesia as measured by the bispectral index monitor. Anaesthesiology. 2001; 94:799-803
8. Rodgers A, Walker N, Schug S, McKee A, Kehlet H, et al. Reduction of postoperative mortality and morbidity with epidural or spinal anaesthesia: results from overview of randomized trials. BMJ. 2000;321:1493
9. Domino KB, Posner KL, Caplan RA, Cheney FW Awareness During anesthesia: a closed claims analysis. Anesthesiology. 1999;90: 1053-1061.
10. SenagoreAJ, Whalley D, Delaney CP, Mekhail N, Duepree HJ. Epidural anesthesia-analgesia shortens length of stay after laparoscopic segmental colectomy for benign pathology. Surgery. 2001; 129:672-676.
11. Khajavi MR, Asadian MA, Imani F, Etezadi F, Moharari RS, Amirjamshidi A. General anesthesia versus combined epidural/general anesthesia for elective lumbar spine disc surgery: A randomized clinical trial comparing the impact of the two methods upon the outcome variables. SurgNeurolInt2013; 4:105.
12. Semra Calimli, Ahmet Topal, Atilla Erol, Aybars Tavlan and Seref Otelcioglu. The Effect of General Anesthesia and General Anesthesia Plus Epidural Levobupivacaine or Bupivacaine on Hemodynamic Stress Response and Postoperative Pain, book- Pain Management - Current Issues and Opinions edited by Dr. Gabor B Racz& Carl E Noe. December 2011; 211-219.
13. Demirel CB, Kalaycı M, Özkoçak I, Altunkaya H, Özer Y. A prospective randomized study comparing perioperative outcome variables after epidural or general anesthesia for lumbar disk surgery. J Neurosurg Anesthesiol. 2003; 15(3): 185-92.
14. Alaa M Atia and Khaled A Abdel-Rehman. Combined thoracic epidural with general anaesthesia vs general anaesthesia alone for major abdominal surgery: anaesthetic requirements and stress response. J Anesth. Clin. Res. 2016, 7:4
15. Tetzlaff JE, Dilger JA, Kodsy M, al Bataineh J, Yoon HJ, Bell GR. Spinal anesthesia for elective lumbar spine surgery. J Clin Anesth. 1998; 10(8):666–9.
16. D. Matheson. Epidural anaesthesia for lumbar and laminectomy and spinal fusion. Canadian Anaesthetists Society Journal.1960; 7:149-157.
17. Essam A. Eid, Samarkandi A.H., Faisal Alsaif. Combined epidural-general anesthesia (CEGA) in patients undergoing pancreatic surgery: comparison between Bupivacaine 0.125% and 0.25%. AJAIC 2007;10(1).