Original paper

Intraoperative Comparison between Spinal and General Anaesthesia for Lumbar Laminectomy Regarding Effectiveness and Hemodynamic Stability in Karbala

Jaber Mohsin Al-Goraby^*

^Al-Hussein Medical City, Karbala, Iraq

Abstract

Background: General anaestheia is the most frequently used method For spinal surgery. Neuraxial blocks have proved most useful in lower abdominal, inguinal, urogenital, rectal, and lower extremity surgery. Lumbar spinal surgery may also be performed under spinal anaestheia.

Aim: To assess the notion that spinal anaestheia can be both safe and effective in the treatment of patients undergoing lumbar spinal surgeries.

Methods: The study was performed in Al-Imam Al-Hussein medical city, Karbala, Iraq from April 2010 to April 2014, 60 patients in whom either spinal anaestheia SA or general anaestheia GA was induced to perform a lumbar laminectomy. Patients were matched for anaestheia-related class, age, gender and preoperative vital sign. Thirty patients in each group both groups were well matched.

Results: The heart rate (HR) and blood pressure (NIBP) was higher in SA during induction, but they were higher in GA during surgery and recovery time. Recovery time was longer in GA group, patient and surgeon were more satisfy with GA p-value <0.05.

Conclusion: Spinal anaestheia is a suitable alternative to general anaestheia for lumbar disc surgery, but need cooperative patient.

Recommendation: Spinal anaestheia for spinal surgery is good choice for cooperative patient it's better to avoid if surgical time might be prolonged or in risky patient.

Keywords: Intraoperative, Spinal anaestheia, General Anaestheia, lumbar laminectomy.

Introduction

As a primary anesthetic, neuraxial blocks have proved most useful in lower abdominal, inguinal, urogenital, rectal, and lower extremity surgery. Lumbar spinal surgery may also be performed under spinal anaestheia [(1)]. The often-cited relative contraindication of preexisting neurologic disease (e.g., lower extremity peripheral neuropathy) is not usually based on medical criteria but rather on legal considerations [(2)]. General Anaestheia is the most frequently used method for spinal surgery, General Anaestheia may be preferred as routine accepted practice, because of greater patient acceptance and the ability to perform longer operations, or because the anesthesiologist feels more comfortable seeing that the airway secured before placing the patient in the prone position.

The risk of deep vein thrombosis, pulmonary embolism, transfusion requirements, pneumonia, respiratory depression, myocardial infarction, and renal failure were more common in patients underwent GA compared with regional anaestheia[(3)]. Spinal anaestheia advantages include patients self-positioning, so that they could regulate the respiratory functions and it also has the advantage of decreasing intraoperative

*For Correspondence: E-Mail jabergoraby@gmail.com

bleeding by decreasing peripheral venous pressure [4, 5]. Two retrospective studies shown that Spinal anaestheia resulted in better outcome compared with General Anaestheia in patients underwent surgeries on lumbar spine[6,7] . Other study revealed that SA has no advantages over GA [8]. So in This study we try to assess the view that spinal anaestheia can be both safe and efficacious in the treatment of patients undergoing lumbar spinal surgeries, by compare peri and post-operative variables, the results could help the patients and surgeons to select the best Technique.

Patients and methods

Sixty patients, American Society of Anesthesiologist Physical Status (ASA) I-II, aged 24-77 years old who were scheduled for lumber laminectomy were selected. Patients with history of seizure or intracranial hypertension, any contraindication for spinal anaestheia (such as coagulopathy, infection at site of needling, hypovolemia), severe spinal stenosis, a near complete or total myelographic block, drug or alcohol abuse , patients who needed anaestheia higher than T4 and lower than T10 levels, Patients with hepatic renal disease, hypertension or severe cardiac disease, were excluded. If patients had any changes in surgical technique or massive bleeding during operation which needed blood transfusion, they also excluded from the study. Eligible candidates were given written informed consent. The study protocol was approved by our institute Ethics Committee. The study was performed in AL-Imam Al-Hussain Medical City from April 2010 to April 2014. All surgeries were carried out by two surgeons. They randomly allocated thirty patients for spinal anaestheia (SA) group and thirty patients general anaestheia (GA) group.

At the time of patient arrival to the operating room, age, sex, weight, heart rate, oxygen saturation, noninvasive blood pressure and ASA physical status were recorded. No premedication was given to the patients. Before the starting of anaestheia, patients were informed about the procedure. In spinal anaestheia (SA) group An 18 gauge IV cannula was cited in the non-dominant hand and 500 ml of Ringer's lactate solution was given as a preload after that the patient in the sitting position with routine monitoring and all aseptic precautions were undertaken, Spinal anesthesia was performed using a 24-gauge Quincke spinal needle at L3 – L4 interspace after local infiltration of 2-3 ml of 2% Lidocaine and observing cerebrospinal fluid (CSF), the block was done with 2,5 ml 0.5% Bupivacaine (Marcain Heavy spinal) combined with 25 microgram Fentanyl was administered into intrathecal space and patients were placed in supine position. Five to ten minutes after establishment of spinal level of block (which usually occurred between T-6 and T-10), the patients were placed into prone position. Oxygen at 2L/min via nasal cannula was administered afterwards. Then surgery was allowed The heart rate, systolic, diastolic, mean arterial blood pressure, and oxygen saturation were monitored every 10 minutes throughout the surgery using ECG, noninvasive blood pressure monitoring and pulse oximetry. In prolonged cases, spinal anaestheia was occasionally augmented with an intrathecal injection through a 25 gauge needle. At the end of surgery, the patient was turned from the prone position to supine then transferred to the recovery room.

In GA group, patients were anesthetized with thiopental (5mg/kg), Lidocaine (1mg/kg), Fentanyl (1μg/kg), and ketamine (0.5mg/kg) intravenously.

Endotracheal intubation was facilitated with pancuronium (0.1mg/kg IV).

Anaestheia was maintained with 1% halothane Oxygen. Subsequently, the patients were properly placed onto a prone position, arms resting on the arm boards

while they were flexed 90 degrees at elbow. For prevention of pressure on nose and globe of the eyes, the faces placed on a smooth brace.

The mean arterial blood pressure every 10 minutes, heart rate, and oxygen saturation were monitored throughout the surgery using ECG, noninvasive blood pressure monitoring and pulse oximetry. After termination of operation, the anesthetic drugs were discontinued and patients received 100% oxygen.

Subsequently, neuromuscular blockade was reversed by using Neostigmine 0.04 mg/kg and Atropine 0.02 mg/kg. The trachea was extubated if patients had spontaneous respiration, pulse oximeter oxygen saturation more than 95%, respiratory rate less than 30 per minutes, and tidal volume more than 5ml/kg and transferred to recovery room.

Throughout the administration of anesthetics, heart rate, mean arterial blood pressure and oxygen saturation recorded. During the course of the anesthetic, hypotension or bradycardia was defined as the reduction of MAP to less than 80% of the baseline recording or HR less than 60 and treated (5 mg) Ephedrine or 0.5 mg Atropine. Hypertension or tachycardia was considered when mean arterial blood pressure (MAP) had raised to more than 120 % of the baseline values or HR more than 110 and treated by either increasing the inhaled concentration of halothane in the GA group or by giving propofol 20-30 mg IV in SA group.

The patients and surgeon satisfaction was also evaluated as a dichotomized factor (Yes or No). Duration of surgery (the time from beginning surgery to the closure of wound by the last suture) and duration of recovery stay (the time from arrival to the recovery room to discharge from it) were recorded. If patients were awake and had no pain, nausea, vomiting, or hemodynamic instability, they were discharged from recovery room in Group GA. In Group SA, when patients had no pain, nausea, vomiting, hemodynamic instability and at least two segment regression of spinal block, they were discharged from recovery room. Before shifting the patients to postoperative ward again heart rate, mean arterial blood pressure, and oxygen saturation were recorded.

Data are presented as mean ± SD or number (percent). Age, weight, heart rate, oxygen saturation, mean blood pressure and duration of surgery, duration of recovery stay were compared between two groups using Student's t-test. Gender, ASA physical status, patients and surgeon satisfaction were assessed by Pearson chi-square test or Fisher's exact test if needed. P-value < 0.05 was considered statistically significant. All statistical analyses were done using SPSS ver.22.0.

Result

There were no significant difference between two groups (SA,GA) with respect to demographic characteristics, Age, weight , gender , ASA (American Society of Anesthesiologists) class and Preoperative heart rate, mean noninvasive blood pressure and oxygen saturation the p-values were > 0.05 (Table **1**). The oxygen saturation in general anaestheia (GA) group was statistically significant increased at induction, shifting into prone position and intraoperative measurement P-value < 0.05 (Table 2), (figure 3). With starting of anaestheia induction there was significant elevation of mean noninvasive blood pressure (MNIBP) and heart rate (HR) in spinal anaestheia (SA) group P-value < 0.05 (Table 2), (figure 1). At time of shifting into prone position heart rate was significant increase in general anaestheia GA group P-value was 0.03 (Table2).

Intraoperative heart rate and mean noninvasive blood pressure were higher in GA group.

Surgery time (operative time) and recovery oxygen saturation had no

statistical difference in both groups (Table 2), (Table 3).

Recovery time was longer in GA group with elevation of heart rate and mean blood pressure. Patient and surgeon were more satisfy with general anaestheia (GA). During this study 2 patient complain of distress due to position at 75 and 87 minute of surgery in SA.

Table 1. demographic data and preoperative data for SA and GA

Variable		SA no.30	GA no.30	P-value*	Significances
Age Mean ± SD, y		51.2 ±15.13	49.4 ±13.65	0.643	Not significant
Weight Mean ± SD, kg		73.6 ±7.80	73.5 ±7.00	0.986	Not significant
Gender	**Male no. %**	22 / 73.3%	18 / 60.0%	0.273	Not significant
	Female no. %	8 / 26.7%	12 / 40.0%		
Asa	**Asa1 no. %**	3 / 10.0%	4 / 13.3%	0.688	Not significant
	ASA2 no. %	27 / 90.0%	26 / 6.7%		
Pre-operative HR mean ±sd		84.27 ±7.24	87.67 ±8.11	0.092	Not significant
Pre-operative MNIBP m±sd		90.23 ±9.94	94.33 ±8.01	0.084	Not significant
Pre-operative SPO2 m±sd		96.03 ±1.56	96.77 ±1.40	0.061	Not significant

*p value is<0.05 it's significant

Table 2. Heart rate, mean noninvasive blood pressure and O_2 saturation from induction until recovery

Variable	SA Mean±SD	GA Mean±SD	P-value	Significances
Induction HR	91.90±4.03	87.17±4.87	< 0.05	Significant
Induction MNIBP	97.03±8.21	91.53±7.25	0.008	Significant
Induction SPO2	96.20±1.80	98.63±0.89	< 0.05	Significant
Prone positioning HR	88.00±7.93	91.67±4.94	0.036	Significant
Prone positioning MNIBP	86.00±8.28	89.07±8.72	0.168	Not significant
Prone positioning SPO2	95.80±1.27	98.50±0.90	< 0.05	Significant
Intra operative HR	89.57±7.16	94.77±7.859	0.010	Significant
Intra operative MNIBP	88.50±8.79	93.43±8.752	0.034	Significant
Intra operative SPO2	96.03±0.99	98.53±0.62	< 0.05	Significant
Recovery HR	84.93±6.16	93.80±5.24	< 0.05	Significant
Recovery MNIBP	86.83±5.18	98.10±7.84	< 0.05	Significant
Recovery SPO2	95.83±1.663	96.13±1.592	0.478	Not significant

If the p value is<0.05 it's significant.

Table 3. Operative and recovery time, patient and surgeon satisfaction.

Variable	SA	GA	p-value	Significances
Operative time	82.80 ± 17.85	81.53 ± 17.4	0.782	Not significant
Recovery time	9.20 ± 4.080	19.77 ± 6.89	0.000	Significant
Patient satisfy NO	16 / 53.3%	5 /16.7%	0.003	Significant
patient satisfy YES	14 / 46.7%	25 / 83.3%		
surgeon satisfy NO	15 / 50.0%	5 / 16.7%	0.006	significant
surgeon satisfy yes	15 / 50.0%	25 / 83.3%		

If the p value is<0.05 it's significant

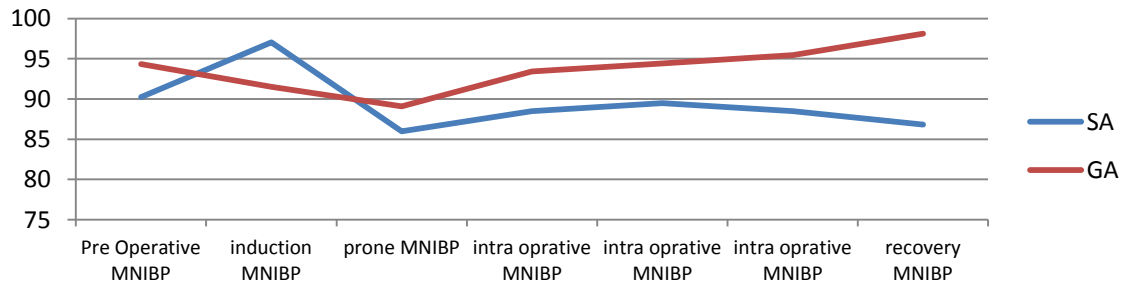

Figure 1. Trends of Mean noninvasive blood pressure

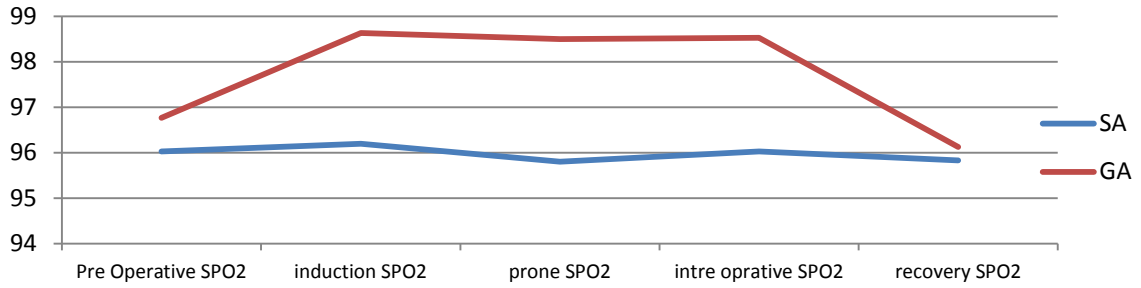

Figure 2. Trends of Oxygen saturation

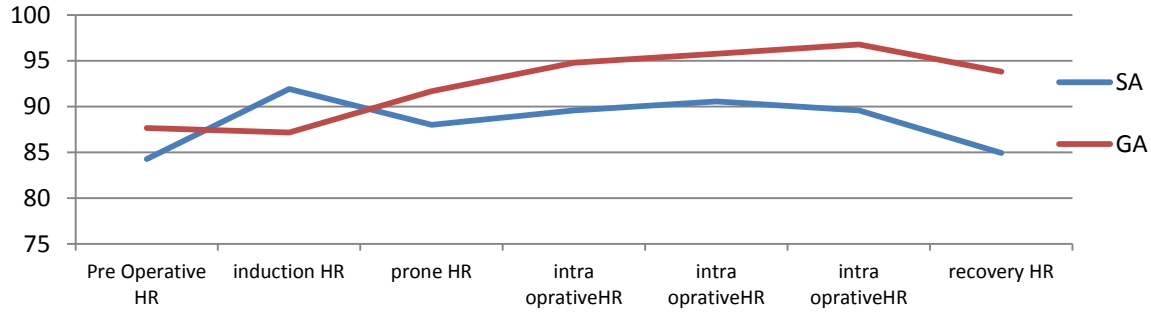

Figure 3. Trends of heart rate

Discussion

Traditionally, general anaestheia is used in lumbar surgery; and spinal or epidural, has been a safe alternative in spine surgeries [1, 2, 14]. Our finding in this study showed there was higher MNIBP and heart rate during induction time in SA which can be explained because we didn't give preoperative sedation for SA so we advise to use small dose of anxiolytic that not affect the cooperation for SA, while in GA group there is increase in HR and NIBP intraopeartively and statistically significant between the two groups and this also seen by other studies [6, 8-11]. Regarding patient satisfaction about the type of anaesthesia used 83.3% of the patients given GA are satisfied with this type of anaesthesia as compared to 46.7% of spinal anaesthesia group were satisfied to the spinal anaestheia. these figures may be attributed to the patients complained of distress due to prolong stay in prone position, In our study two patient complain of distress due to position at 75 and 87 minute of surgery in SA and one patient complain of pain at 90th minute of surgery, so we need other intrathecal dose of 1,5ml 0.5% Bupivacaine.

While the second beneficiary from the service of anaesthesia (surgeons) report to us that they were 83.3% satisfied with GA in GA group and only 50% satisfied with SA in SA group while in other studies [10-13] they mentioned SA as the prefer method but in our study it is not the prefer method to anesthetize such patients although it is still the a suitable alternative to general anaesthesia Another issue is the stress burden to the anaesthesiologist who gave SA to patient for surgery to be done under prone position which is not assessed in this study [15] There is no significant difference in operation time between both groups while there is significant difference in recovery time and there is less analgesic requirement and fewer complications.

Conclusion

Spinal anaestheia is a suitable alternative to general anaestheia and as safe and effective as general anaestheia in the care of patients undergoing lumbar disc surgery, but need more cooperation from the patient. The advantages of regional anaestheia are less analgesic requirements, and fewer complications, excellent

postoperative analgesia along and less recovery time.

Recommendation

Spinal anaestheia for spinal surgery is good choice for cooperative patient especially patient with respiratory disease, it's better to avoid if surgical time might be prolonged or in patients at risk as patient with ischemic heart disease or heart failure. General Anaestheia will provide more intraoperative control of oxygenation and hemodynamic stability. We should inform preoperatively the patients that general anaestheia cannot be excluded.

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