Original Research Article

General anaesthesia versus combined spinal plus general anaesthesia for elective lumbar spine surgeries: A randomized comparative study

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Abstract

Background: Lumbar spine surgeries are most commonly performed under general anaesthesia. It allows better patient satisfaction and prolong surgeries but can be accompanied by several perioperative morbidities. Spinal anaesthesiain such cases gives excellent patient compliance and good surgical exposure with bloodless field. **Aim:** To compare the intra-operative variables and post-operative outcome after general anaesthesia versus combined spinal plus general anaesthesia in patients undergoing elective lumbar spine surgery. **Material and Methods:** A total of 60 adult cases from both sexes were randomly grouped into group A (received general anaesthesia) and group B (received spinal, Heavy 0.5%Bupivacaine plus Clonidine 30 µg, plus general anaesthesia). **Results:** Hemodynamics (mean pulse rate, systolic and diastolic blood pressure) at time of intubation (0min.), intraoperatively (10, 20, 30, 60, 90, 120 min.) and postoperatively (150, 180 min.) were significantly stable in Group B than Group A ($p<0.05$). Surgeon's satisfaction was higher in Group B than Group A. None of patients in both groups had bradycardia. In group A, 2 out of 30 patients had vomiting and there was no incidence of vomiting in group B. In group B 3 out of 30 patients had urinary retention while there was no incidence of urinary retention group A.Group A had post-operative analgesia 41.17±11.27 minutes and in Group B it was 396.16±47.80 minutes ($p<0.05$). The need of rescue analgesics was more in Group A than in Group B. **Conclusion:** Considering hemodynamic stability, profound and prolonged pain relief, significant decrease in blood loss, duration of surgery and need of anaesthetic agents with spinal anaesthesia and securing airway with general anaesthesia, combined spinal anaesthesia with general anaesthesia is safe and better technique than general anaesthesia alone for elective lumbar spine surgeries.

Key Words: Lumbar spine surgeries, general anaesthesia, combined spinal anaesthesia, outcome, complications.

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INTRODUCTION

Lumbar spine surgeries such aslumbar laminectomy and discectomy are most commonly performed under general anaesthesia (GA). Patients satisfaction and ability to carry out prolonged operations in prone position without airway compromise are main advantages of using general anaesthesia.[1-3] But stress response of laryngoscopy, intubation may increase blood pressure and bleeding. This may increase obstruction in surgical field, duration of surgery, blood loss and requirement of blood transfusion.[3] This technique may also be accompanied by several perioperative morbidities including postoperative pain, nausea, vomiting and prolonged post anaesthesia recovery period.[4] Spinal anaesthesia for surgery on back have been described in large series of patients in the past with excellent patient compliance and good surgical exposure with bloodless field. Proper choice of local anaesthetics with or without adjuvant added, helped to prolong the anaesthesia time and to extend post-operative analgesia. Technique of spinal anaesthesia (SA), may

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reduce blood pressure resulting in reduction of blood loss and clear field of surgery.[3,5-7] SA may also lower the incidence of pulmonary complications.[6,7] In the clinical experience, that patients who underwent thoracolumbar and lumbar spine surgeries with SA have more satisfaction with lower adverse effect compared with those with GA.[1] The surgical management of a prolapsed lumbar disc, lumbar canal stenosis, various spinal fusion procedures are commonly performed under spinal anaesthesia leading to reduced recovery time and early discharge from the hospital, which also leads to financial considerations in terms of cost. But prone position without securing airway in SA is not safe. So, we had planned to take advantage of both techniques i.e. hemodynamic stability and securing airway which are advantages of spinal and general anesthesia respectively. The aim of the study was to compare the intra-operative variables and post-operative outcome after general anaesthesia versus combined spinal plus general anaesthesia in patients undergoing elective lumbar spine surgery.

MATERIAL AND METHODS

A total of 60 adult cases were enrolled for elective Lumbar spine surgeries after ethical committee approval and obtaining informed consent. Cases were randomly divided in two equal groups.

Group A (n=30) – Elective lumbar spine surgery under general anaesthesia.

Group B (n=30) – Elective lumbar spine surgery under spinal plus general anaesthesia.

Selection of cases: Patients under the study underwent thorough preoperative anaesthesia assessment including detailed case history, clinical examination and necessary laboratory investigations depending on age and disease of patient.

Inclusion Criteria

1. Age group: 18 - 60 years
2. Sex: both male and female
3. ASA grade: I, II

Exclusion Criteria

1. Patient refusal
2. Local Infection
3. Bleeding diathesis
4. Neurological deficit
5. ASA grade - III,IV

Anaesthesia Technique: Preloading was done in both groups with Ringer lactate solution 10ml/kg over 15-20 minutes. After written informed consent and applying monitors, baseline hemodynamic parameters were noted. Premedication was given in both groups with inj. Ranitidine 1 mg/kg and inj. Metoclopramide 0.2 mg/kg.

Spinal anaesthesia technique: Under all aseptic precautions, patients in left lateral / sitting position, lumbar puncture (LP) was done in L3 – L4 space with 25G spinal needle. After confirming free, clear continuous flow of CSF present Injection Bupivacaine 0.5% (Heavy) (dose 0.3 mg/kg) plus Injection Clonidine 30 µg was given. Patients were immediately made supine and the table height was adjusted to reach a spinal level of T6. Onset of sensory anesthesia was checked with pin prick, and motor block assessment was carried out with modified Bromage scale. A waiting period of 20 min or time for maximal spinal action, whichever occurred earlier, was allowed to pass before GA induction. Any cases of failed spinal anaesthesia were managed by giving general anesthesia and excluded from the study. After obtaining adequate analgesia and anaesthesia patients were given general anaesthesia as explained below.

General anaesthesia technique: Premedication was given with injection Glycopyrrolate 0.2mg intravenous, injection Midazolam 1mg intravenous, injection Pentazocine 18mg intravenous. Then patients were preoxygenated with 100% oxygen for 3 minutes. All patients were induced with Injection Propofol 2 mg/kg Intravenously. Neuromuscular blockade was achieved with Injection Vecuronium bromide 0.12 mg/kg Intravenously to facilitate intubation. Intubation was done under direct laryngoscopic vision with appropriate size endo tracheal tube. Patients were given prone position with proper padding of eyes and covering of pressure points to avoid possible nerve injuries. Precautions were taken to keep abdomen free in prone position. Anaesthesia was maintained with oxygen and nitrous oxide (50%-50%) and Isoflurane. Patients were ventilated with closed circuit. Pulse rate, systolic and diastolic pressure and oxygen saturation were monitored throughout procedure and recordings were noted at 10 minutes interval for first 30 minutes and then every 30 minutes till 180 minutes. A note was also made for blood loss, urine output, intravenous fluid given. At the end of procedure endotracheal tube was removed after thorough suction and reversal of neuromuscular blockade with Injection Neostigmine 0.05 mg/kg intravenously and injection Glycopyrrolate 0.008 mg/kg intravenously. Intraoperative blood loss was calculated at the end of procedure by measuring the amount of blood in the suction machine and the number of mops (1 mop = 100ml). Surgeon satisfaction was recorded using 10 cm visual anologue scale (VAS) in terms of bloodless surgical field. Severity of pain was measured using a 10 cm visual analogue scale (VAS) at hourly interval for next 24 hours by the nursing staff that was unaware of the group the patient belonged to. The pain free postoperative interval was observed and recorded and rescue analgesia was provided by injection Tramadol 2mg/kg

intravenously. All findings were recorded in the case proforma.

RESULTS

Most of the patients are middle aged men and women in both the groups. The mean age of patients in Group A and B were 50.1±7.45 and 48.7±7.05 respectively. There were 14 male and 16 female in Group A and 11 male and 19 female in Group B. The demographic characteristics were comparable in both groups. Pulse rate, systolic and diastolic blood pressure after taking patient on operation table were considered as baseline. Mean of these parameters were measured in both groups. It showed significant changes in these hemodynamic parameters at various periods as compared with the baseline values in Group B patients (Table 1-3).

Table 1: Changes in mean pulse rate/min at various periods

PR	Group A (GA) Mean (SD)	Group B (CSGA) Mean (SD)	p value	Inference
Baseline	84.43 (5.77)	83.83 (6.20)	0.0978	Not significant
0 min	99.3 (4.82)	79.93 (4.70)	0.0001	Significant
10 min	88.03 (4.35)	70.73 (3.15)	0.0001	Significant
20 min	82.33 (3.47)	69.1 (4.13)	0.0001	Significant
30 min	78.06 (3.59)	71.2 (4.60)	0.0001	Significant
60 min	71.86 (1.83)	74.73 (3.27)	0.0001	Significant
90 min	70.43 (1.95)	67.1 (4.06)	0.0001	Significant
120 min	73.33 (5.44)	65.33 (4.70)	0.0001	Significant
150 min	83 (11.04)	72.7 (3.83)	0.0001	Significant
180 min	87.73 (5.33)	76.5 (4.95)	0.0001	Significant

Table 2: Mean systolic blood pressure (mm Hg) in both groups

SBP	Group A (GA) Mean (SD)	Group B (CSGA) Mean (SD)	P value	Inference
Baseline	132.06 (10.15)	133.77 (7.88)	0.4873	Not significant
0 min	144.73 (8.29)	119.46 (4.68)	0.0001	Significant
10 min	129.66 (8.67)	100.33 (3.46)	0.0001	Significant
20 min	120.53 (8.46)	90.83 (2.32)	0.0001	Significant
30 min	110.86 (8.85)	91.86 (2.84)	0.0001	Significant
60 min	103.2 (6.17)	91.16 (2.56)	0.0001	Significant
90 min	100 (3.83)	90.8 (2.05)	0.0001	Significant
120 min	109.06 (6.14)	97.96 (2.97)	0.0001	Significant
150 min	125.06 (12.33)	117.2 (5.56)	0.002	Significant
180 min	133.5 (4.35)	123.3 (4.71)	0.0001	Significant

Table 3: Mean diastolic blood pressure (mm Hg) in both groups

DBP	Group A (GA) Mean (SD)	Group B (CSGA) Mean (SD)	p value	Inference
Baseline	81.33 (6.33)	83.83 (5.63)	0.1114	not significant
0 min	96.46 (4.68)	78.76 (4.23)	0.0001	Significant
10 min	85.53 (6.63)	62.46 (2.75)	0.0001	Significant
20 min	77.6 (5.69)	59.73 (1.57)	0.0001	Significant
30 min	69.7 (3.35)	60.46 (4.05)	0.0001	Significant
60 min	62.4 (3.52)	58.4 (1.90)	0.0001	Significant
90 min	60.2 (3.34)	58.2 (2.94)	0.0168	Significant
120 min	65.03 (3.49)	62.8 (4.18)	0.0287	Significant
150 min	83.8 (10.22)	78 (4.01)	0.0054	Significant
180 min	86.86 (4.09)	82.83 (4.15)	0.0004	Significant

Duration of surgery in group A was more than in group B. The mean blood loss in group A was higher than group B.None of the patients in both groups required blood transfusion. Rescue analgesics requirement was much less in Group B than in Group A. There was significant difference in both the groups. The VAS in group B is higher than in group A (Table 4).

Table 4: Duration of surgery, mean blood loss, duration of analgesia and VAS in both groups

	Group A (GA) Mean ±SD	Group B (CSGA) Mean±SD	p value	Inference
Duration of surgery	124.16±15.97	111.33±9.97	0.0001	Significant
Mean blood loss	414.66±30.48	269.86±61.90	0.0001	Significant
Duration of analgesia	41.17 ±11.27	396.16 ±47.80	0.0001	Significant
VAS	3.43 ±0.568	7.73 ±0.583	0.0001	Significant

None of the patient in group A had hypotension while in group B, 4 out of 30 patients had hypotension who needed injection mephentermine 6mg iv, (p value 0.0019; significant). But none of the patients required inotropic supports. None of patients in both groups had bradycardia. In group A, 2 out of 30 patients had vomiting and there was no incidence of vomiting, (p value 0.1524; not significant). In group B, 3 out of 30 patients had urinary retention while there was no incidence of urinary retention group A, (p value 0.07; not significant). None of patients had headache postoperatively. No other major complications were observed in both the groups.

DISCUSSION

For lumbar spine surgeries general anaesthesia is given routinely. Several studies have been performed where spinal anaesthesia has been given successfully for lumbar spine surgeries. In present study, the average age in both the groups was comparable. When both the groups were compared for hemodynamic parameters, Group B showed statistically significant fall in blood pressure as compared to their baseline values, whereas there was no change in Group A in terms of systolic and diastolic blood pressure. Sethi *et al* studied the efficacy of analgesic effects of low dose intrathecal clonidine as adjuvant to bupivacaine and found that the decrease in mean heart rate from 45 minutes until the end of 6 hours was greater in clonidine group than in the control group.[7] Our study results in group B who received combine spinal general anesthesia coincide with this study. Sale *et al* observed that Group B (received combine spinal general) patients unlike Group A (received general anaesthesia) patients showed less tachycardia intraoperatively.[8] The mean HR preoperatively was statistically insignificant. The mean HR at different time intervals intraoperatively was higher in the GA group and was statistically significant at all time intervals. This study shows similar results as observed in our study. In a study by Sethi *et al*, the mean arterial pressure (MAP) showed a statistically significant lower mean arterial pressure in the Clonidine group compared to the Control group from 45 minutes after test drug administration until the end of 6 hours.[7] Our study results coincide with Sethi *et al* study. It has been observed that there is a perception of less surgical blood loss associated with cases performed under spinal anesthesia. This study shows similar results as observed in our study. Attari *et al* studied spinal anesthesia versus general anesthesia for elective lumbar spine surgery. They found that intra-operative maximum mean arterial blood pressure and heart rate changes were significantly less in SA compared with GA. This study shows similar results as observed in our study.[9]In a study by Sale *et al*, mean SBP and DBP was found to be higher in Group A (received general anaesthesia) compared to Group B (received combine spinal general anaesthesia) at all time intervals during the procedure.[8] Thus, indicating that SA if combined with GA provides an overall better hemodynamic picture as compared to only GA. An added cardiovascular advantage cited has been the decrease in surgical bed oozing because of hypotension, bradycardia and improved venous drainage associated with SA.[10] This study shows similar results as observed in our study. Duration of surgery in group A was more than in group B. So, we can conclude that due to less blood loss and clear surgical field in group B than group A lead to reduced duration of surgery in group B. The mean blood loss in group A was higher than group B. But, none of the patients in both groups required blood transfusion. Jellish *et al*[11]observed that there is a perception of less surgical blood loss associated with cases performed under spinal anesthesia. Preload is markedly reduced during spinal anesthesia and there is a resultant drop in mean arterial pressure (MAP). This reduction will produce a decrease in vertebral interosseous pressure during neuraxial anesthesia which may lead to reduced blood pressure within the bone itself, considered the main source of bleeding during posterior lumbar spine surgery.[12] The mechanism in which spinal anesthesia may reduce blood loss may possibly be related to the fact that spinal anesthesia leads to a marked reduction in the high venous pressure that occurs in response to sympathetic activity provoked by pain produced by tissue damage during surgery.[13] On the contrary, inhalational anesthesia does not totally block these sensory signals but these signals are effectively inhibited with spinal anesthesia. This study shows similar results as observed in our study. In our study the need of postoperative opioid requirement was much less in Group B than in Group A. Sale *et al* found that intensity of pain was less in Group B (received combined spinal general anaesthesia) as compared to Group A (received general anaesthesia) during early post-operative period until 6-h.[8] This study shows similar results as observed in our study. Several studies comparing spinal versus general anaesthesia techniques demonstrated that patients who with spinal anesthesia had lower pain scores and analgesic requirements.[5,7,14] Patients who received spinal anesthesia had much lower initial pain scores than general anesthesia patients. There may be a preemptive effect in which spinal anesthesia attenuates pain by inhibiting afferent nociceptive pathways.[15] In our present study, we did not find any significant complications and hemodynamic instability during the surgery and postoperatively. None of the patient in group A (GA) had hypotension while in group B (CSGA) 4 out of 30 patients had hypotension, but none

of the patient required inotropic supports. None of patients in both groups had bradycardia. In group A (GA) 2 out of 30 patients had vomiting and there was no incidence of vomiting in group B (CSGA). Vomiting probably has to be attributed to the anesthetic concentrations, since by using less halogenated agents, consciousness level is recovered more quickly and secondary effects such as PONV diminish. Ghodki *et al*[16]also concluded that PONV is less in patients who receive combined spinal general anaesthesia due to lower inhalational agent concentrations. In group B (CSGA), 3 out of 30 patients had urinary retention while there was no incidence of urinary retention group A (GA). None of patients had headache postoperatively. A possible explanation is that surgery near the spinal cord elicits inflammatory responses that help seal any small puncture site. In addition, the presence of small amounts of post-procedural blood may serve to seal the site similar to applying a blood patch. No other major complications were observed in both the groups. To conclude, considering hemodynamic stability, profound and prolonged pain relief, significant decrease in blood loss, duration of surgery and need of anaesthetic agents with spinal anaesthesia and securing airway with general anaesthesia, combined spinal anaesthesia with general anaesthesia is safe and better technique than general anaesthesia alone for elective lumbar spine surgeries.

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