Scholars Journal of Applied Medical Sciences (SJAMS)
Abbreviated Key Title: Sch. J. App. Med. Sci.
©Scholars Academic and Scientific Publisher
A Unit of Scholars Academic and Scientific Society, India
www.saspublishers.com

ISSN 2320-6691 (Online)
ISSN 2347-954X (Print)

Anaesthesiology

Comparison between Combined Spinal and General AnaesthesiaVs General Anaesthesia and Vasodilator Durgs as a Means to Achieve Controlled Hypotension in Lumbar Spine Surgery

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Original Research Article

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Article History
Received: 05.09.2018
Accepted: 16.09.2018
Published: 30.09.2018

DOI:
10.36347/sjams.2018.v06i09.047

Abstract: We have combined spinal anaesthesia with general anaesthesia and general anaesthesia along to compare the quality of anaesthesia, requirement of various drugs intraoperatively, and use of hypotension that occurred after giving spinal anaesthesia and vasodilator drugs.Group “A”- Surgeries performed under General anaesthesia and IV vasodilator drugs for controlled hypotension. Group “B” – Surgeries performed under general anaesthesia and use of spinal anaesthesia for controlled hypotension. Systolic, diastolic, mean arterial blood pressures and heart rate were recorded.Our study demonstrates that combination of SA and GA technique provided better hypotensive anaesthesia which is beneficial for clear operative field, less blood loss and prolong post-operative pain relief compared to general anaesthesia alone

Keywords: blood loss, controlled hypotension, general anaesthesia, spinal anaesthesia.

INTRODUCTION

Surgery on the lumbar spine can be safely performed under general or regional anesthesia[1]. Extensive surgical procedures on spine such as scoliosis correction, posterior lumbar inter-body fusion is associated with considerable hemorrhage during and after surgery. Patients satisfaction and the ability to carry out prolonged operations in the prone position[2] without airway compromise are of advantages of using general anesthesia (GA). Alternatively, the most important advantages of regional anesthesia are the decrease in intraoperative blood loss [3] and consequently improving operating conditions, the decrease in perioperative cardiac ischemic incidents, postoperative hypoxic episodes, arterial and venous thrombosis, and to provide proper postoperative pain control[4].

Controlled, or deliberate, hypotension[5] has been used for many years as a means of reducing intraoperative blood loss and facilitating surgical exposure. Induced hypotension has been advocated as means of reducing blood loss and improving the operating conditions during spine surgery with the commonly used drugs, such as sodium nitroprusside, isoflurane [5] there are chances of tolerance, tachyphylaxis and cyanide toxicity, halothane induces hypotension by depressing myocardium. NTG[6] Fentanyl and Metoprolol, Labetalol and Sodium Nitroprusside has been used to control blood pressure perioperatively during coronary artery surgery and to reduce the blood loss in total hip replacement. Here we have combined spinal anaesthesia with general anaesthesia, and compared the quality of anaesthesia, requirement of various drugs intraoperatively, and use of hypotension that occurred after giving spinal anaesthesia along with good analgesia.

MATERIALS AND METHODS

The study was conducted at Department of Anaesthesiology& Critical Care, DVVPF‟s Medical College & Hospital, Ahmednagar. After getting approval from the institutional ethical committee, an informed consent was taken from every patient enrolled in the study.

A total of 40 patients posted for different lumbar spine surgeries satisfying the inclusion criteria were selected.

- Group “A”- Surgeries performed under General anaesthesia and IV vasodilator drugs for controlled hypotension.

- Group "B" – Surgeries performed under general anaesthesia and use of spinal anaesthesia for controlled hypotension.

SELECTION OF CASES:

- **Inclusion Criteria**
  - Patients scheduled for elective Lumber spine surgeries.
  - Age between 20 to 60 years of both the sexes.
  - Patient with ASA Grade I & II.

- **Exclusion Criteria**
  - Emergency surgeries
  - Patients with coagulopathies.
  - Patient with IHD, Valvular heart disease & arrhythmia.
  - Patient having allergy to any drug.
  - Pregnant patients

ANAESTHESIA TECHNIQUE

The following procedure was carried out. ASA Grade I & Grade II patients are selected. Written informed valid consent obtained. Patient kept nil by mouth for more than 6 hours is confirmed.

An 18G intracath with IV drip of RL started 1 hours before surgery Patient was taken on operation table. Multipara monitor consisting of ECG, NIBP, SPO2, EtCo2, temperature probe was connected to patient. InjOndansetron 4mg + InjGlycopyrrolate 0.2mg given IV 30 minutes prior to surgery. Following anaesthesia technique is selected

Group A

General anaesthesia (GA) is chosen as the technique. Premedicated with 1mg Midazolam &Inj.Fentanyl 1µg/kg IV. Patient is pre-oxygenated with 100% oxygen for 3 min. Patient induced with Inj.Propofol 1 to 2.5 mg/kg IV**.** Musc**le** Relaxant used is inj. Atracurium 0.5 to 0.7 mg/kg IV (intubating dose), intubated with ETT No 8.5 in male & 7.5 in female. Intraoperative anaesthesia maintained with 50% O2 +50% N2O.Vasodilator drugs like Dexmedetomidine 50 µg, NTG 2-5 µg/kg/min, Sodium Nitroprusside, Labetalol or Metoprolol.

Group B

Technique used was combined spinal anaesthesia (SA) and general anaesthesia. Initially, patient put in sitting position, and under all aseptic precaution L2, L3 interspace selected. Subarachnoid space is reached with spinal needle no 26G and free flow of CSF is confirmed and 3ml of 0.5% Bupivacaine(hyperbaric) + Inj.Fentanyl 25 mcg is 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 15 min or time for maximal spinal action, whichever occurred earlier, was allowed to pass before GA induction. Any cases of failed SA were managed by giving GA and excluded from the study. Hypotension below the target level was treated with Inj. Mephentermine 3mg.

GA

Patient is premedicated with Inj Midazolam 1 mg and Inj Fentanyl 1 µg/kg IV. All patients were preoxygenated with 100% oxygen for 3 min. Induction done with InjPropofol 1 to 2.5 mg/kg IV. Muscle relaxant used is Inj. Atracurium 0.5 to 0.7 mg/kg. Intubation done under direct laryngoscopic vision with ETT No 8.5 in male & 7.5 in female.Anaesthesia is maintained with 50% O2 +50% N20.

Following parameters were recorded:

Systolic, diastolic, mean arterial blood pressures and heart rate were recorded at the following points of time:

- At 10 min, after arrival to the operation theatre, (Baseline Reading)
- At 20 min after arrival and on Induction of general anaesthesia.
- Every 10 min, from induction of anaesthesia till extubation.

Following parameters are studied in addition to basic monitoring (heart rate, blood pressure, oxygen saturation):

- Blood Loss
- Surgeons Score (Numeric rating scale)
- Patients Score (Visual analogue scale)
- Recovery Score
- Time taken for the surgery in two groups.
- Post-operative analgesia used
- Post-operative complications (nausea, vomiting)

Statistical presentation and analysis of the present study were conducted, using the mean, standard deviation; Chi-square, paired t-test and unpaired t-test with windows Microsoft excel software.

OBSERVATION AND RESULTS

Table-1: Demographic Data

	GROUP A (n=20)	GROUP B (n=20)
MALE	12	8
FEMALE	8	12
AGE (mean±SD)	43.5±12.80	42±18.42
WEIGHT (mean±SD)	52.3±10.20	56.87±0.42

p value of all demographic data is >0.05, so all the parameters were comparable.

Table-2: Changes in systolic blood pressure

TIME (min)	GROUP A	GROUP B	p Value
5	132.6±07.12	134.3±10.04	0.125
15	122.3±15.42	120.3±17.98	0.23
25	109.4±08.14	106±12.85	0.12
35	101±15.52	98.02±17.98	0.46
45	98.3±9.36	94.81±14.21	0.63
55	97.82±8.20	91±6.32	0.52
65	94.36±4.47	90.16±9.25	0.06
75	92.73±6.28	90.78±9.45	0.09
85	95.28±6.54	91.45±10.50	0.10
95	93.02±15.38	90±10.22	0.15
110	94.56±8.55	92.66±11.52	0.27
120	95±7.02	94±10.35	0.06
130	93.47±6.15	96.35±9.12	0.44
140	94.23±5.36	97.36±12.05	0.12
150	96.48±7.24	96.23±8.63	0.06

Baseline average systolic blood pressure was comparable in both groups. It was observed that, intraoperative systolic blood pressure falls significantly compared to baseline values but There was no significant difference (p-value > 0.05) in average systolic blood pressure of two groups. The target systolic BP was 90±3 mmHg. Fluctuation in systolic BP is more with Group A as compared to Group B.

Table-3: Changes in diastolic blood pressure

TIME (min)	GROUP A	GROUP B	p Value
5	90.66±11.50	86.45±14.82	0.25
15	82.42±10.38	78.48±14.62	0.83
25	74.33±08.24	68±10.35	0.67
35	68.62±06.22	60.02±09.98	0.38
45	62.43±12.55	56.31±10.22	0.08
55	67.12±14.08	58±08.20	0.42
65	74.66±06.41	60.66±10.83	0.09
75	66.30±13.02	54.78±44.08	0.10
85	59.28±10.58	54.59±14.04	0.15
95	53.02±12.20	50±76.16	0.34
110	56.36±10.82	54.86±12.53	0.23
120	52.84±16.38	52±12.47	0.08
130	59.17±12.75	56.16±16.12	0.48
140	60.42±0.8.46	51.24±11.45	0.80
150	58.35±08.24	56.23±10.30	0.08

Table-4: Changes in heart rate

TIME (min)	GROUP A	GROUP B	p Value
5	88.24±08.57	78.67±10.45	0.42
15	86.76±06.46	78.28±08.52	0.63
25	80.62±08.62	74.40±10.30	0.06
35	88.82±10.84	78.52±12.08	0.12
45	82.20±08.30	74.02±06.48	0.22
55	84.05±06.64	76.16±06.88	0.06
65	84.34±04.38	78.88±06.38	0.04
75	88.25±03.56	82.70±05.81	0.0002
85	86.42±04.07	76.52±06.24	0.002
95	82.66±02.68	76.14±04.52	0.001
110	80.16±04.72	74.82±06.08	0.003
120	82.18±06.18	78.68±03.16	0.004
130	86.60±06.82	76.92±04.74	0.002
140	78.28±02.52	72.46±04.60	0.001

150	86.72±04.44	70.72±02.89	0.006

Baseline diastolic blood pressure was comparable in both groups. There was no significant difference (p-value > 0.05) in diastolic blood pressure of two groups throughout the procedure.

Baseline HR was comparable in both groups. There was no significant difference (p-value > 0.05) in heart rate of two groups till 65 min intraoperatively, however after 65 minutes' heart rates in Group B were less than Group A which was statically significant (p-value <0.05).

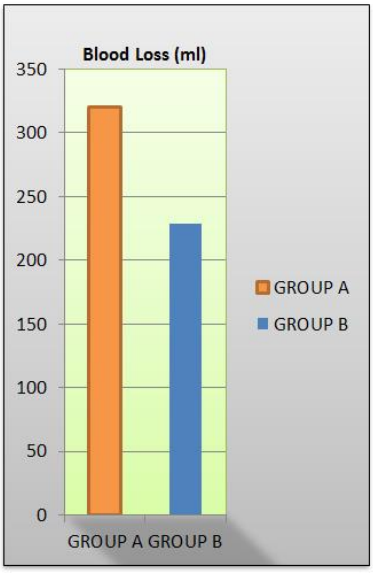
Table-5: Changes in mean arterial pressure

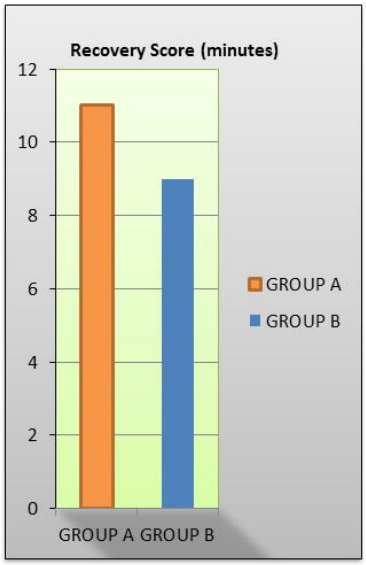
Time (min)	GROUP A	GROUP B	p Value
5	96.25±14.54	94.74±16.85	0.82
15	87.06±16.22	90.62±14.38	0.41
25	84.04±09.35	86±11.75	0.12
35	79.72±10.82	76.20±08.64	0.9
45	76.14±8.36	75.65±8.88	0.06
55	70.09±8.52	69.76±9.12	0.08
65	72.30±6.63	69.70±7.02	0.06
75	70.55±8.76	69.20±8.01	0.07
85	73±7.32	69.92±6.86	0.48
95	70.90±6.62	68.50±7.02	0.16
110	71.80±7.08	69.04±6.26	0.06
120	72.70±7.85	70±6.20	0.11
130	72.62±6.32	70.44±7.13	0.25
140	74.45±8.70	72.98±10.40	0.72
150	76.86±12.32	78.08±14.12	0.86

Baseline mean arterial pressures were comparable in both groups. There was no significant difference (p-value > 0.05) in mean arterial pressure of two groups. Intraoperatively there was no significant difference in MAP of two groups. At no point the MAP was allowed to fall <60 mmHg in both the groups. Use of Mephentermine was made to treat hypotension due to spinal anaesthesia.

Table-6: Anaesthesia Characteristics

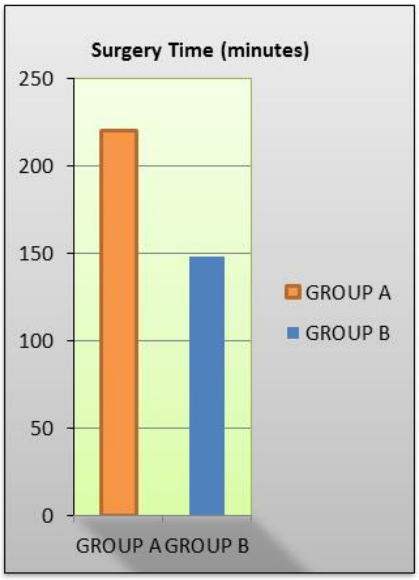
Variables	GROUP A	GROUP B	p Value
Blood Loss (ml)	320±80	228±36	<0.05
Surgeons Score	5.25±4.68	8.75±6.84	<0.05
Patients Score	10 (50)	20 (100)	
Recovery Score (minutes)	11.24±2.38	9.86±2.02	<0.05
Surgery Time (minutes)	220.2±2.84	148.22±2.08	<0.05
Post-Operative Analgesia use	10 (50)	0 (0)	
Postoperative Nausea	8 (40)	2 (10)	





We found that average amount of blood loss (ml) is more in Group A (320±80) than the blood loss in patients of Group B (228±36) which was statistically significant (p-value =0.001)

Surgeons were asked to grade the operative field on the basis of amount of bleeding inside the operative field. Surgeon's satisfaction was quantified by NRS from 1 to 10, with 1 meaning poor operative field and 10 meaning best operative field. In our study, we found that NRS in Group A was 5.24+4.68 and that for Group B was 8.75 ±6.84. This difference was statistically significant with *P* value <0.05.



It was observed that; Average amount of inspiratory Isoflurane required in group A (1.2 %) was higher than average Isoflurane required in Group B (0.82 %). This difference was statistically significant (p-value 0.007).

Average requirement of Fentanyl during surgery was 190 µg for Group A and 50 µg for Group B. However, in Group A, 12 out of 20 patients (60%) required Nitroglycerine and 10 out of 20 patients (50 %) required Dexmeditomedine. None of Group B patient required either of these two drugs. Average Nitroglycerine and Dexmeditomedine required in Group A 8 mg and 50 µg respectively. The average use of Labetalol and Metoprolol was also higher in achieving the controlled hypotension, whereas in Group B no drugs were used.

DISCUSSION

Hypotension is one of the disadvantages of spinal anaesthesia, taking advantage of this and allowing only controlled hypotension was used for

spine surgery. It also provides good intra and post-operative anaesthesia. Our study shows that once the level of Bupivacaine is set at desire level i.e. after 15-20 minutes no fluctuation in BP was noted in Group A, in contrast the Group B we have used α2 agonist, vasodilators and β blockers, to achieve same target level of controlled hypotension.

Spinal, epidural or general anesthesia have been performed for lower spine surgery, but limited randomized controlled prospective investigations have been carried out to establish whether one of these procedures is better in decreasing peri-operative complications[7].

McLain *et al*. [8], in a case-controlled study in 400 patients underwent either spinal anesthesia or general anesthesia for performing lumbar decompression, showed that SA was as effective as GA. They concluded that SA caused shorter anesthesia duration, decreased incidence of nausea and analgesic needs, and accompanied with fewer adverse effects.

The benefits of induced hypotension during spine surgery include reduction in blood loss and need for blood transfusion[9], improved operating conditions and shorter duration of surgery. It is reported that decrease in systolic blood pressure to 80-100 mm Hg was enough to reduce the blood loss. The present study shows that spinal anaesthesia along with general anaesthesia was more effective than general anaesthesia in reducing blood loss, anaesthesia requirement and patients and surgeons satisfaction.

In retrospective chart review, Tetzlaff*et al.* [10] investigated the outcomes of a large series of elective lumbar spine surgical procedures which performed under SA or GA. They concluded that SA along with general anaesthesia can considered as an effective alternative to GA for lumbar spine surgery as it had lower incidence of minor complications.

The present study showed that GA along with SA is better than GA alone. SA diminished blood loss, maximum blood pressure and heart rate changes, and postoperative analgesic use. In addition, surgeon and patient's satisfaction was significantly more in SA with general anaesthesia[11]. All procedures were performed with the same spine surgeon and the anesthesia was constantly performed with meticulous obedience to the practice and consequently confounding variables effects were avoided.

As previous studies showed, SA reduced blood loss for lower limb orthopedic and vascular surgeries compared to GA.Lumbar spine surgery under epidural anesthesia was associated with decreased blood loss compared with general anesthesia. The results of our study confirm these conclusions. SA presumably decreases blood loss by two mechanisms. One mechanism is vasodilatation and hypotension caused by sympathetic blockade. SA improved postoperative conditions of patients due to decreasing pain[12] and need to the analgesia. Hassi et al,[13] showed that patient satisfaction was high with a low level of complications in SA [14]. Nevertheless, their study was retrospective and did not compare it with the other anesthetic techniques. They, nonetheless, emphasize a general patient satisfaction with SA that was also described in our study.

In this study we added Fentanyl 25µg to Bupivacaine to increase the duration of action, also Fentanyl provides prolonged post-operative analgesia. Addition of Fentanyl does not cause bradycardia which was observed in study done by Vishnu *et al*. [15].

Two different mechanisms[16] can explain decreasing postoperative analgesic use in the SA. One mechanism is the preemptive effect of SA that decreases the pain scores by preventing afferent nociceptive sensitization pathway. Lower analgesic requirement after operation pointed out such an effect. The second mechanism is probably existence of some residual sensory blockade in SA group. This is due to lagging of sensory recovery behind motor recovery.

Limitation of our study

- In our study only one spine surgeon carried all the surgeries. So result may vary from surgeon to surgeon.
- Immediate post-operative neurological assessment not is possible in study group B patients due spinal anaesthesia involving nerve roots involved in assessment.
- Our study was conducted on ASA-I and II class patients. So further studies on elderly and compromised cardiac function patients are required to recommend its use in such high risk patients. but the utility cannot be denied in high-risk, hypertensive or obese patients

CONCLUSION

Our study demonstrates that combination of SA and GA technique provided better hypotensive anaesthesia which is beneficial for clear operative field, less blood loss and prolong post-operative pain relief compared to general anaesthesia alone.

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