Original Article

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Comparative Study of Lumbar Laminectomy under General Anaesthesia compared with Spinal Anaesthesia

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Abstract

Introduction: Present study was planned to know the benefits of laminectomy done under spinal anaesthesia compared with general anaesthesia. *Study Design:* During 2010 to 2015 seventy patients were operated for lumbar laminectomy, 40 cases under spinal anesthesia and 30 under general anesthesia. All were operated by posterior midline approach in prone position. All were disc prolapse at L3-L4 and L4-L5 level and spinal canal stenosis. All patients had backache with neurological symptoms in lower limb. Age group is 35 yrs. to 60 yrs. Males were 46 and 24 females. Preoperative clinical examination, MRI and X ray were done before selecting patients for surgery. Proper prior operative consent for operative intervention was obtained. *Results:* 1. Overall study revealed that L3-L4, L4-L5 and L5-S1 disc were commonly responsible for pain and neurological deficit. 2. Cases operated under Spinal anesthesia for lumbar disc had better recovery, less bleeding, less complications and early ambulation was possible. 3. General anesthesia has more complications and cardiorespiratory complications. *Conclusion:* Laminectomy done under spinal anesthesia has better outcome. Surgeon, anesthetist and patients have less problems intra and postoperative complications.

Keywords: S.A.-Spinal Anesthesia; G.A.-General Anesthesia.

Introduction

Surgery on the lower thoracic and lumbar spine can be safely performed under general or regional anesthesia. Patient satisfaction and the ability to carry out prolonged operations in prone position without airway compromise are advantages of using general anesthesia (GA) [1,2]. Alternatively, the important advantages of regional anesthesia are the decrease in intraoperative blood loss and consequently improving operating conditions,[3] the decrease in perioperative cardiac ischemic incidents, postoperative hypoxic episodes, arterial and venous thrombosis, and to provide proper postoperative pain control [4-7]. Additionally, in order to prevent brachial plexus injury and pressure necrosis of face, it is better if patients can position themselves while they are awake. This is possible only with spinal anesthesia (SA).

As Scott et al [8] showed, pulmonary complications were more common in patients who underwent GA compared with regional anesthesia. Two retrospective studies have shown that SA resulted in better outcome compared with GA in patients who underwent surgeries on lumbar spine [9].

An acceptable anesthetic technique must have characteristics such as rapid onset and reversal of effects. Also, it must maintain stable hemodynamics during operation without need to increase blood transfusion. Lastly, an excellent anesthetic must decrease recovery room stay while reduce postoperative pain, nausea, vomiting, and requirement for additional analgesics. As our search in medical literature showed, there are controversies whether SA or GA offers these advantages for lumbar disc surgery. Sadrolsadat et al [11] showed that in contrast to the previous studies that revealed SA was better than GA for patients undergoing lower thoracic and lumbar spine surgery SA had no advantages over GA. They also showed that SA accompanied with more adverse effects compared with GA. They emphasized that further study must be performed before final conclusion is elucidated.

In the clinical experience, it seems to the authors that patients who undergo lumbar spine surgery with SA have more satisfaction with lower adverse effect compared with those with GA. This is in accordance with the most previous studies but is opposite to Sadrolsadat et al study. For more clarification of this important topic, we designed to run the present study to evaluate both intraoperative and postoperative outcomes after SA or GA techniques, when employed in patients undergoing lumbar spine surgery.

Method

Seventy patients aged 35-60 years old who were scheduled for discectomy, laminectomy. Patients with history of seizure or intracranial hypertension, contraindication for spinal anesthesia (such as patients refusal, coagulopathy, infection at site of needling, hypovolemia), severe spinal stenosis, a near complete or total block, inadvertent production of high spinal, drug or alcohol abuse were excluded. If patients had any changes in surgical technique or massive bleeding during operation which needed blood transfusion, they were also excluded from the study. Eligible candidates were given written informed consent. The study was performed at PDVVPF'S Medical college and Hospital from 2010 to 2015. The sample size was estimated based on a power calculation which showed that at least 30 patients per group were necessary to achieve 80% power to detect a 20% difference between two groups in the VAS scoring with á equal to 0.05.

All surgeries were carried out by the same surgeon. Patients were randomly allocated into GA or SA groups with 30 and 40 patients in each group.

No premedication was given to the patients. Subsequently, the patients were properly placed in 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 face was placed on a smooth brace.

The heart rate, systolic, diastolic, mean arterial blood pressure and oxygen saturation were monitored every 15 minutes throughout the surgery using ECG, noninvasive blood pressure monitoring and pulse oximetry. After termination of operation, the anesthetic drugs were discontinued after patients received 100% oxygen. Subsequently, neuromuscular blockade was reversed by using Neostigmine 0.04 mg/kg and Atropine 0.02mg/kg. The trachea was extubated and patients transferred to the post-anesthesia care unit (PACU) if patients had spontaneous respiration, pulse oximeter oxygen saturation more than 95%, end-tidal carbon dioxide 35-40 mmHg, respiratory rate less than 30 per minutes, and tidal volume more than 5 ml per kilogram.

In SA group, the block was done with 3.0 – 3.2 ml 0.5% Bupivacaine in an 8.5. Thereafter, the patients were placed in sitting position and preparation and draping were done. Spinal anesthesia was performed using a 25-gauge Quincke spinal needle at either the L4 or L5 interspace after local infiltration of 2-3 ml of 2% Lidocaine. After observing spinal fluid 3cc Bupivacaine is added to Dexmeditomedine in a dose of 10 micro-grams and 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.

Fig. 1: Spinal Anesthesia

Throughout the surgery, if the patients had bradycardia (heart rate less than 60 per minutes) or hypotension (systolic blood pressure less than 90 mmHg), 0.5 mg Atropine or 5 mg Ephedrine was administered. Throughout the surgery, sedation of patients was done by a Propofol infusion of 25-50 μg/kg/min IV. At the end of surgery, the Propofol was discontinued and the patient was turned from the prone position to supine and transferred to the PACU.

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 PACU to discharge from it) were recorded. If patients were awake and had no pain, nausea, vomiting, or hemodynamic instability, they were discharged from PACU in Group GA. In Group SA, when patients had no pain, nausea, vomiting, and at least two segment regression of spinal block, they were discharged from the PACU.

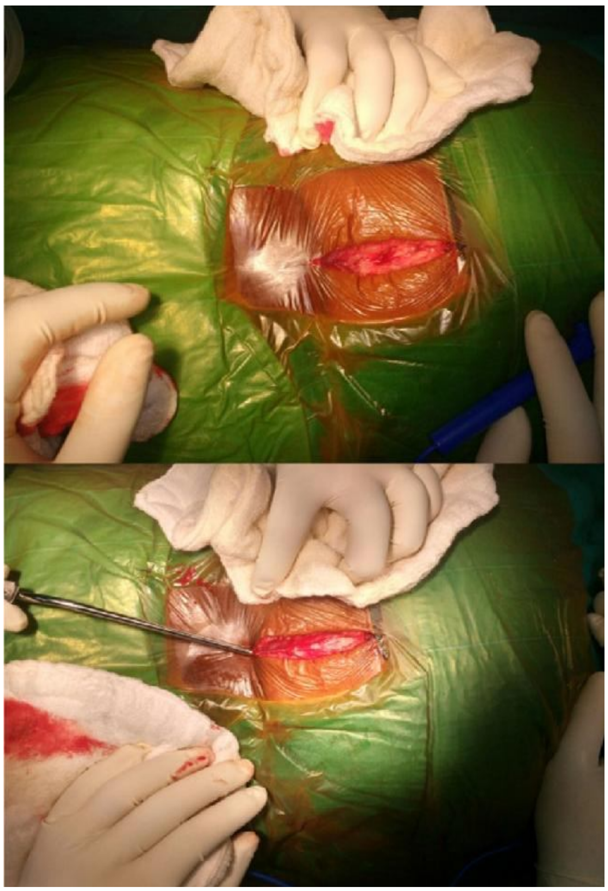

Fig. 2, 3: Intra-operative pictures: Incision

Data is presented as mean ± SD or number (percent), Age, weight, height, maximum blood pressure and heart rate changes, duration of surgery, duration of recovery stay and blood loss were compared between two groups using Student's t-test. Sex, ASA physical status, patients and surgeon satisfaction, postoperative analgesic use, and complication rates 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.16.0.

Fig. 4, 5: Intra-operative images after removal of Lamina

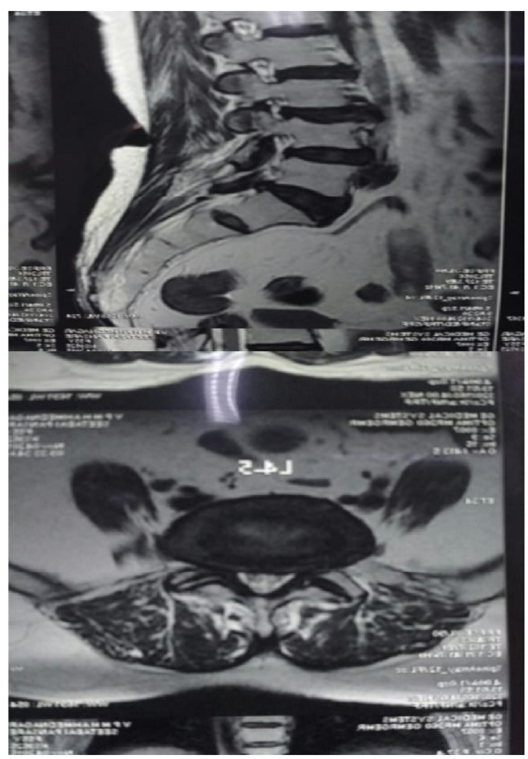

Fig. 6, 7: MRI images of PIVD L4-L5, L5-S1

Results

There was no significant difference between two groups with respect to demographic characteristics, duration of surgery and PACU stay. Intra-operative maximum mean arterial blood pressure and heart rate changes were significantly less in SA compared with GA ($p < 0.05$).

Blood loss was significantly less in SA group compared with GA group ($p < 0.05$). Surgeon and patients satisfaction were significantly more in SA compared with GA ($p < 0.05$).

Postoperative analgesic use and total Meperidine use was significantly less in SA group compared to GA group ($p < 0.05$). The incidence of postoperative nausea was not significantly different in two groups. There were no patients with hypotension or bradycardia in SA or GA groups.

Discussion

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.

McLain et al [12] in a case-controlled study in 400 patients who 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 findings of McLain et al study were in contrast with Sadrolsadat et al [11] study that showed SA had no advantages over GA. Furthermore, they concluded that GA can decrease adverse effects accompanied with technique of anesthesia. They requested further clinical trial studies to verify their results.

In retrospective chart review, Tetzlaff et al[13] investigated the outcomes of a large series of elective lumbar spine surgical procedures which performed under SA or GA. They concluded that SA can be considered as an effective alternative to GA for lumbar spine surgery as it had lower incidence of minor complications. Their study was retrospective and they emphasized doing a prospective randomized clinical trial study for documentation of their results.

The present study showed that SA is better compared to GA. SA diminished blood loss, maximum blood pressure and heart rate changes, and postoperative analgesic use. In addition, surgeon and patients satisfaction was significantly more in SA. All procedures were performed with the same surgeon and the anesthesia was constantly performed with meticulous obedience to the practice and consequently confounding variables were avoided.

As previous studies showed, SA reduced blood loss for lower limb orthopedic and vascular surgeries compared to GA [14-17]. Lumbar spine surgery under epidural anesthesia was associated with decreased blood loss compared with general anesthesia [18]. 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 [19]. Patients under SA have spontaneous ventilation which causes lower intra-thoracic pressure and consequently less distension of epidural veins. This is another and more important mechanism of decreasing bleeding after SA [19]. This finding that maximum intraoperative mean arterial blood pressure and heart rate changes over the basal value were significantly less in Group SA is not unexpected, because SA prevents the increase in stress hormones better than GA [20-25].

SA improved postoperative conditions of patients due to decreasing pain and need to give analgesia. Hassi et al [10] showed that patient satisfaction was high with a low level of complications in SA. 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.

Two different mechanisms 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 [18]. 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.

Conclusion

In our study of operative intervention done for lumbar disc and spinal canal stenosis, it was concluded that:

1. We can give prone position easily during spinal anesthesia compared to general anesthesia.
2. Bleeding during spinal anesthesia was less than general anesthesia.
3. Operative field was more clear as bleeding was less.
4. Surgery time was less as compared to G.A. in spinally operated patient.
5. Post-operative hematoma and infection incidence was reduced in spinal anesthesia.
6. There were no major mishaps in S.A.
7. Surgeon and patient were more comfortable during intra-operative and post-operative recovery

Authors' Contributions

DBN has planned the study and finalized it; VG has planned the study and finalized it too; DBN did the statistical analysis and prepared the first version of manuscript and revised final version to publish. All authors read and approved the final manuscript.

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Conflict of Interests

Authors have no conflict of interests.

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