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STUDY ON COMPARATIVE ANALYSIS OF SPINAL ANESTHESIA VERSUS GENERAL ANESTHESIA FOR ELECTIVE LUMBAR SPINE SURGERY

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ABSTRACT

BACKGROUND: Either general or regional anaesthesia can be used for lumbar disc surgery. The common anaesthetic technique is general anaesthesia (GA). Some studies have shown reduced surgical time, postoperative pain, time in the postanesthesia care unit (PACU), incidence of urinary retention, postoperative nausea, and more favourable cost-effectiveness with spinal anaesthesia. Hence we have taken up this study to compare the intra and postoperative outcomes of SA with GA in these cases.

METHODS: We enrolled a total of 62 cases posted for lumbar spine surgery. Out of which, 32 cases were posted under GA and 30 cases under SA. The heart rate (HR), mean arterial pressure (MAP), blood loss, surgeons satisfaction with the operating conditions, and analgesic use were recorded.

RESULTS: A total of 62 cases were included in our study, which had been posted for the surgical procedures. We included 32 cases posted for surgery under GA and 30 under SA. There were no statistically significant differences between two groups for demographic characteristics, duration of surgery and PACU stay. There were statistically significant differences in Intra-operative maximum mean arterial blood pressure and heart rate changes between SA and GA ($p < 0.05$).

CONCLUSIONS: In our study, we found that SA is effective for use in patients undergoing lumbar spine surgery was shown to be the more expedient anaesthetic choice in the perioperative setting. SA was superior to GA in providing postoperative analgesia and decreasing blood loss.

KEYWORDS : Spinal Anaesthesia, General Anaesthesia, Lumbar disc Surgery, Heart rate, Mean arterial pressure

INTRODUCTION:

Either general or regional anaesthesia can be used for lumbar spine surgery. The common anesthetic technique is general anaesthesia (GA). However, several studies have been performed comparing these two anaesthetic techniques and have revealed essentially different results.[1-3] SA for spine surgery can include epidural anaesthesia via catheter infusion and SA via injection Some studies have shown that with spinal anaesthesia there was reduction in surgical time, postoperative pain, time in the post anaesthesia care unit (PACU), incidence of urinary retention, postoperative nausea, and more favourable cost-effective. The other benefits of spinal anaesthesia include rapid onset, less intraoperative blood loss, thrombotic events, pulmonary complications, and postoperative cognitive dysfunction. It also allows the patient to breathe spontaneously and reposition themselves to avoid compression injuries during the procedure.[4-6] The most commonly used technique is endotracheal general anaesthesia (GA) for spinal surgeries. This may be due to a variety of factors, including greater patient acceptance, its enabling of long surgeries, and capacity for secure airway establishment in the prone position. Despite this, many centres advocate the use of neuraxial techniques, such as spinal anaesthesia (SA), for lumbar surgical techniques, such as discectomy and laminectomy.

Despite encouraging results in favour of SA, SA does not come without risk, and there is no clear evidence to delineate the difference in morbidity and mortality between the two approaches. Besides considering specific risks of SA itself, one must consider the context in terms of the type of surgery to estimate the real risk better. A rare complication that may occur after lumbar decompression is symptomatic epidural hematoma. Although the reported incidence is only 0.1%–0.24%, prompt diagnosis is required, and thus arises the concern that any residual anesthetic effect from SA may obscure its signs and symptoms, resulting in delayed emergent evacuation of the hematoma and consequent permanent neurological deficits.[7-8] In a study conducted by Scott et al, showed that the pulmonary complications were more common in cases who underwent GA compared with regional anaesthesia. Some other retrospective studies shown that SA resulted in better outcome compared with GA in patients underwent surgeries on lumbar spine.[9-11] Hence we have taken up this study to compare the intraoperative and postoperative outcomes of spinal anaesthesia with GA in these cases.

OBJECTIVE OF THE STUDY:

The objective of the study is to compare the intraoperative and postoperative outcomes of spinal anesthesia versus general anesthesia in the cases undergoing lumbar surgery

MATERIALS AND METHODS:

Source of data and Study design: This is a randomised clinical study, conducted at Dept. of Anaesthesia Noida International Institute of Medical Sciences Gautham Budh Nagar, Greater Noida, UP. We included 62 cases aged 18-60 years old who were scheduled for discectomy, laminectomy, for aminotomy or cord tumour. Patients with history of seizure or intracranial hypertension, contraindication for spinal anaesthesia, severe spinal stenosis, a near complete or total myelographic block, myelographic demonstration of arachnoiditis, 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, were excluded from the study. Patients were randomly allocated into GA or SA groups with 32 and 30 patients in each group respectively. No premedication was given to the patients.

In GA group, patients were anesthetized with Propofol (2 mg/kg IV), Lidocaine (1.5 mg/kg), and Fentany (1.5 µg/kg IV). Endotracheal intubation was facilitated with Atracurium (0.6 mg/kg IV). Anaesthesia was maintained with 1.2% Isoflurane and Nitrous Oxide 50% in Oxygen. Nalbuphine was administered for intraoperative analgesia. The heart rate (HR), systolic (SBP), diastolic (DBP), mean arterial blood pressure (MABP), and oxygen saturation were monitored every 15 minutes throughout the surgery using ECG, non-invasive blood pressure monitoring and pulse oximetry. Mean arterial blood pressure (MAP) is the measurement of average blood pressure in a person's blood vessels during a single cardiac cycle. Mean arterial pressure is significant because it measures the pressure necessary for adequate perfusion of the organs of the body. It is considered by many to be a better indication of perfusion than systolic blood pressure. It is vital to have a MAP of at least 60 mmHg to provide enough blood to the coronary arteries, kidneys, and brain. The normal MAP range is between 70 and 100 mmHg. After termination of operation, the anaesthetic drugs were discontinued after 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 and patients transferred to the postanesthesia care unit (PACU) if patients had spontaneous respiration, pulse oximeter oxygen saturation more than 95%, end-tidal carbon dioxide 25-35 mmHg, respiratory rate less than 25 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% Dextrose solution combined with 25 µg Fentanyl after preloading patients with 7 ml/kg Lactated Ringer's solution over 10-15 minutes. Thereafter, the patients were placed into a sitting position and preparing and draping were done. Spinal anaesthesia 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, Bupivacaine and Fentanyl was administered into intrathecal space and patients were placed in supine position. Five to ten minutes after establishment of spinal level of block, the patients were placed into prone position. Oxygen at 2L/min via nasal cannula was administered afterwards. Throughout the surgery, if the patients had bradycardia (HR <60 per minutes) or hypotension (SBP < 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 were transferred to the PACU. At the time of patient arrival to the operating room, age, sex, height, weight, and ASA physical status were recorded. Throughout the administration of anaesthetics, maximum HR and MABP changes compared to the baseline were recorded. Blood loss was monitored and recorded by calculating the volume of blood suctioned from the surgical field. Postoperative analgesic use and total administered dosage of Meperidine were recorded till 24 hours after surgery. In addition, the incidence of nausea was recorded. Intravenous Ondansetron IV was administered to patients with vomiting and for nausea if lasted more than 10 minutes. If the VAS score was more than 4 mm, Nalbuphine was given intravenously. 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.

STATISTICALANALYSIS:

Data are presented as mean ± SD or number (percent). The parameters mentioned in table 1 are compared using Student's t-test & table 2 using chi-square test. P-value < 0.05 was considered statistically significant.

RESULTS AND DISCUSSION:

A total of 62 cases were included in our study, who had been posted for the surgical procedures. We included 32 cases posted for surgery under GA and 30 under SA. There were no statistically significant differences between two groups for demographic characteristics, duration of surgery and PACU stay (table 1)

Table 1: Shows demographic characteristics, duration of surgery and recovery stay in two groups

	GA (no=32)	SA (no=30)
Age (in years)	40.1 4.2	432.3
Gender (M/F)	18/14	19/11
Weight (kg)	683.4	662.1
Duration of surgery (min)	1203.6	1186.4
Duration of recovery stay (min)	626.4	596.7

Table 2: Shows that there was Intra-operative maximum MABP and HR changes were significantly less in SA compared with GA (p < 0.05)

Table 2: Shows intra-operative MABP and HR changes between two groups

	GA(no=32)	SA(no=30)	P value
Maximum MABP (mmHg)	+21.0 5.7	-24.64.9	<0.05
Maximum HR changes	+18.2 4.9	-13.8 4.1	<0.05
Blood loss (mL)	33040	21030	<0.05
Surgeon satisfaction	31 (93.9)	22 (73.3)	<0.05
Patients satisfaction	31 (93.9)	21 (70)	<0.05
Post-operative analgesic use	7 (21.8)	0	<0.05
Post-operative nausea	2 (6.6)	1 (3.33)	>0.05

DISCUSSION:

In our study, we included 32 cases posted for surgery under GA and 30 under SA. There were no statistically significant differences between two groups for demographic characteristics, duration of surgery and PACU stay. that there was Intra-operative maximum mean arterial blood pressure and heart rate changes were significantly less in SA compared with GA. Our results were similar to the case-control study conducted by McLain et al in 400 patients underwent either SA or GA for performing lumbar decompression, showed that SA was as effective as GA. They concluded that SA caused shorter anaesthesia duration, decreased incidence of nausea and analgesic needs, and accompanied with fewer adverse effects. This finding was in contrast to the study conducted by Sadrolsadat et al study that showed SA had no advantages over GA. Furthermore, they concluded that GA can decrease adverse effects accompanied with technique of anaesthesia. They requested further clinical trial studies to verify their results.[12] The results of our study are in conclusion with studies conducted in the past. The mechanism why SA presumably decreases blood loss is vasodilatation and hypotension caused by sympathetic blockade Patients under SA have spontaneous ventilation which causes lower intrathoracic pressure and consequently less distension of epidural veins. This is another and more important mechanism of decreasing bleeding after surgery. 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. 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. 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.[13-16]

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