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Original Research

Spinal anesthesia versus general anesthesia for elective lumbar spine surgery

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ABSTRACT:
Background: Lumbar disk surgery can be performed using either general or regional anesthesia. This study's objective was to assess and compare the intraoperative and postoperative results between spinal anesthesia (SA) and GA for subjects undergoing this procedure. **Materials & Methods:** In this study, a total of 40 patients participated and were allocated into two groups: 20 patients in the General Anesthesia (GA) Group and 20 patients in the Spinal Anesthesia (SA) Group. Comparison was made followed by data analysis using the SPSS software. **Results:** No significant distinctions were observed between the two groups in terms of demographic characteristics and the duration of the surgical procedures. During the surgery, the maximum mean arterial blood pressure was significantly lower in the Spinal Anesthesia (SA) group in comparison to the General Anesthesia (GA) group ($p < 0.05$). **Conclusion:** Spinal anesthesia (SA) demonstrated superior effectiveness compared to general anesthesia (GA) in terms of postoperative pain relief and reduction in blood loss.
Keywords: General anesthesia, Spinal anesthesia, Surgery.

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INTRODUCTION

Surgery on the lower thoracic and lumbar spine can be safely performed under general or regional anesthesia. Patients satisfaction and the ability to carry out prolonged operations in the prone position without airway compromise are of advantages of using general anesthesia (GA). [1,2] Alternatively, the most 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. [4–6] 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).

The GALA trial did not show an unequivocal benefit from receiving LA rather than GA. It demonstrated that outcomes from carotid endarterectomy have improved when compared with earlier studies where the 30 day incidence of stroke and death was 6.5% (4.5% in GALA). A substantial difference between LA and GA would be required to achieve statistical significance with this low event rate. GALA was a well-conducted study with a 99.9% follow-up rate, but there were issues with 167 cross-overs between the study groups and the possibility of selection bias, where high-risk patients were excluded. [7,8]The trial was a pragmatic study with neither the surgery nor anaesthesia standardized. Conventional or eversion endarterectomy was allowed and the proportion of patients undergoing each procedure was similar in the two arms. Superficial or deep cervical plexus block or combinations, plus surgical LA infiltration, were acceptable, but precise details were not recorded. Other studies have suggested that superficial and deep blocks alone or in combination provide comparable anaesthesia, but there is a higher risk of complications related to deep blocks. [9] A dye study has suggested the blocks may not be that anatomically distinct. [10]

The choice of anesthesia technique depends on the surgical disease, the general condition of the patient, the level and extent of the surgical operation, as well as the availability of resources required for anesthesia.

Many surgical procedures can be done under spinal anesthesia, which has been used in clinical practice for more than a hundred years. The advantages of regional anesthesia over general anesthesia are documented in many studies (e.g., inhibition of metabolic and hormonal responses to stress, reducing the incidence of post-operative pain, speeding peristalsis after abdominal operations, reducing the incidence of deep vein thrombosis, and shorter hospital stay). Unfortunately, it cannot always be applied. The potential lack of regional anesthesia is that its limited duration has an impact on the management of surgery. [11,12] The advantages of general anesthesia are its simple and easy method of application, rapid sedation of the patient, and increased comfort of surgeons and anesthesiologists when the surgery has to last longer. The disadvantages of general anesthesia are poor control of anesthetics (depends on the individual ability of the organism to degrade and eliminate them) and postoperative adverse effects (e.g., sickness, nausea, vomiting, and pain). [11,13] Hence, this study was conducted to assess and compare the intraoperative and postoperative results between spinal anesthesia (SA) and GA for subjects undergoing this procedure.

MATERIALS & METHODS

In this study, a total of 40 patients participated and were allocated into two groups: 20 patients in the General Anesthesia (GA) Group and 20 patients in the Spinal Anesthesia (SA) Group. Parameters such as Mean Arterial Pressure (MAP), blood loss, surgeons' satisfaction with the surgical conditions, postoperative pain intensity assessed using the Visual Analogue Scale (VAS), and analgesic consumption were meticulously documented. A comparison between these two groups was made employing Student's t-test, with a significance level set at a p-value of less than 0.05 to determine statistical significance. The data analysis was conducted using the SPSS software.

RESULTS

No significant distinctions were observed between the two groups in terms of demographic characteristics and the duration of the surgical procedures. During the surgery, the maximum mean arterial blood pressure was significantly lower in the Spinal Anesthesia (SA) group in comparison to the General Anesthesia (GA) group ($p < 0.05$). The SA group also exhibited significantly reduced blood loss in comparison to the GA group ($p < 0.05$). Surgeon satisfaction was notably higher in the SA group compared to the GA group ($p < 0.05$). Additionally, there was a significant decrease in postoperative analgesic usage in the SA group as opposed to the GA group ($p < 0.05$).

Table 1: Patient characteristics

Parameters	Group SA (mean)	Group GA
Age	43.5	46.8
Duration of surgery (min)	113.5	110.4

SA: spinal anesthesia, GA: general anesthesia

Table 2: The intraoperative and postoperative results in both groups

Parameters	SA (mean)	GA	P value
Mean arterial blood pressure changes (mmHg) (Maximum)	-27.5	+23.8	<0.05
Blood loss (mL)	218	345	<0.05
Surgeon satisfaction	20 (100%)	13 (65%)	<0.05
Postoperative analgesic use	0	4 (20%)	<0.05

DISCUSSION

Lumbar laminectomy and discectomy is most commonly performed under general anesthesia (GA). This technique can be accompanied by several perioperative morbidities including blood loss, postoperative pain, nausea, vomiting, and prolonged postanesthesia recovery period. [14] Patient's satisfaction and the ability to carry out prolonged operations in prone position without airway compromise are the main advantages of using GA. [15] Hence, this study was conducted to assess and compare the intraoperative and postoperative results between spinal anesthesia (SA) and GA for subjects undergoing this procedure.

In the present study, no significant distinctions were observed between the two groups in terms of demographic characteristics and the duration of the surgical procedures. During the surgery, the maximum mean arterial blood pressure was significantly lower in the Spinal Anesthesia (SA) group in comparison to the General Anesthesia (GA) group ($p < 0.05$). A study by Attari A et al, was to compare the intra and postoperative outcomes of spinal anesthesia (SA) with GA in these patients. Seventy-two patients were enrolled in the study. They were randomized into two groups with 37 patients in GA Group and 35 ones in SA Group. The heart rate (HR), mean arterial pressure (MAP), blood loss, surgeons satisfaction with the operating conditions, the severity of postoperative pain based on visual analogue scale (VAS) and analgesic use were recorded. The mean blood loss was significantly less in the SA Group compared to GA Group ($p < 0.05$). Intraoperative maximum blood pressure and heart rate

changes were significantly less in SA Group ($p < 0.05$). The surgeons satisfaction was significantly more in the SA Group ($p < 0.05$). The number of patients who used postoperative analgesic as well as postoperative mean VAS was significantly less in SA Group in comparison with GA group ($p < 0.05$ for both). SA was superior to GA in providing postoperative analgesia and decreasing blood loss while maintained better perioperative hemodynamic stability without increasing adverse side effects. [15]

In the present study, the SA group also exhibited significantly reduced blood loss in comparison to the GA group ($p < 0.05$). Surgeon satisfaction was notably higher in the SA group compared to the GA group ($p < 0.05$). Additionally, there was a significant decrease in postoperative analgesic usage in the SA group as opposed to the GA group ($p < 0.05$). Another study by Jellish WS et al, general or regional anesthesia may be used for lumbar laminectomy. To determine whether one method is superior, 122 patients were randomly assigned to receive either a standard general anesthetic (GA) or spinal anesthesia (SA) supplemented with intravenous (IV) propofol sedation. Data from the intraoperative period through hospital discharge were collected and compared. Demographically, both groups were similar. Total anesthesia (131.0 +/- 4.3 vs 106.6 +/- 3.2 min) and surgical times (81.5 +/- 3.6 vs 67.1 +/- 2.8 min) were longer in the GA group. Intraoperative hemodynamics were similar between groups except that the incidence of increased blood pressure was more frequent with GA (26.2% vs 3.3%). Blood loss was less during SA (133 +/- 18 mL vs 221 +/- 32 mL). Postanesthesia care unit (PACU) heart rates and mean arterial pressures were higher in the GA group. Peak pain scores in the PACU were higher after GA compared with SA (58 +/- 4 vs 22 +/- 3) as were the number of patients who required analgesics. Severe nausea was more common in the GA group both in the PACU and during the 24 h after surgery. Analgesic requirements after discharge from the PACU, urinary retention, and days in the hospital did not differ between groups. This study suggests that SA may be superior to GA both intraoperatively and postoperatively for lumbar spine procedures lasting less than 2 h. [16] Tetzlaff JE et al, evaluated a large series of elective lumbar spine surgical procedures by a single surgeon whose patients were all offered spinal anesthesia. The records of all elective lumbar spine procedures between 1984 and 1995 performed by one surgeon (GRB) were obtained, and 803 were identified. Of those 803 patients, 611 accepted spinal anesthesia. Data collected included patient demographics, details of the spinal and general anesthesia, perioperative complications, and impact of the spinal anesthetic options on the outcome of spinal anesthesia. General and spinal anesthesia patients were comparable for age, gender, height, and ASA physical status. Patients who received spinal anesthesia were significantly heavier than the general anesthesia patients. Among perioperative complications, nausea and deep venous thrombosis occurred significantly more often in the general than spinal anesthesia patients. Mild hypotension and decreased heart rate (HR) were the most common hemodynamic changes with spinal anesthesia, whereas hypertension and increased HR were the result of general anesthesia. Among spinal anesthetic drugs, plain bupivacaine was associated with the lowest incidence of supplemental local anesthetic use intraoperatively compared to hyperbaric bupivacaine or hyperbaric tetracaine. Spinal anesthesia is an effective alternative to general anesthesia for lumbar spine surgery and has a reduced rate of minor complications. [17]

An acceptable anesthetic technique must have characteristics such as rapid onset and reversal of effects. Also, it must maintain stable hemodynamic 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 disk surgery. Sadrolsadat et al 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 elucidated. [18] Davis et al. [19] concluded that unilateral spinal anesthesia more effectively suppresses the metabolic stress response in orthopedic patients undergoing total hip arthroplasty compared with general anesthesia. Anesthesia is performed adequately if the AP and HR do not exceed 20% of the values before induction. Hemodynamic parameters showed that the suppression of the adrenergic response was adequate in both investigated groups. In the general anesthesia group, systolic AP was significantly higher 30 min after the surgical incision, 1 h postoperatively, and 24 h after surgery, but with no substantial oscillation of the values. The diastolic AP was significantly lower in the spinal anesthesia group 30 min after the surgical incision and 1 h postoperatively, but there were no differences in their dynamics. The values of HR were significantly higher in the general anesthesia group, but without significant fluctuations at the different points of measurement, which indicates a satisfactory depth of anesthesia. Wolf reported that the sympathetic block induced by regional anesthesia resulted in a profound suppression of hemodynamic and stress response to pediatric surgery. [20] SA improved postoperative conditions of patients due to decreasing pain and need to the analgesia. Hassi et al 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. [21]

CONCLUSION

Spinal anesthesia (SA) demonstrated superior effectiveness compared to general anesthesia (GA) in terms of postoperative pain relief and reduction in blood loss.

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