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Epidural Anaesthesia vs. General Anaesthesia for Surgical Procedures: An Outcome Assessment Study From a Tertiary Care Hospital

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ABSTRACT

This study aimed to examine the impact of epidural anaesthesia (EA) compared to general anaesthesia (GA) in individuals undergoing lower lumbar spine surgeries. Lumbar spine surgeries can be conducted under either GA or regional anaesthesia. GA, commonly employed in lumbar spine surgery, immobilizes the patient during the procedure and ensures a secure airway. Although EA is linked to improved hemodynamic status, reduced operation duration, lower healthcare costs and a decreased incidence of surgical complications compared to GA, there remains controversy around optimal anaesthesia choice. The study enrolled 123 consecutive patients undergoing lower lumbar surgery with either EA or GA, Age, gender, medical conditions, surgical time, operation procedure, blood loss, intraoperative hypertension, tachycardia and the occurrence of nausea, vomiting, delirium or cardiopulmonary complications were recorded. Postoperative pain and satisfaction were also assessed. A total of 89 patients were included, with 58 undergoing GA and 65 undergoing EA. The incidence of hypertension and tachycardia during anesthesia was significantly higher in the GA group compared to EA. Patients receiving EA experienced significantly less delirium, nausea and vomiting. Visual Analog Scale scores were significantly higher in the GA group post-surgery. Patients who underwent EA reported higher satisfaction levels than those with GA. A correlation was observed between the administration of EA and superior perioperative outcomes. However, certain considerations, including airway security, operation duration and obesity, require careful evaluation. Additionally the retrospective nature of this study introduces the possibility of selection bias, potentially influencing the results. Epidural anaesthesia, general anaesthesia, surgery, elderly.

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Key Words
Epidural anaesthesia, general anaesthesia, surgery, elderly

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INTRODUCTION

Lumbar spine surgery can be conducted under various anesthetic modalities, such as general anesthesia (GA) or regional anesthesia (RA) which includes epidural, spinal or a combination of these techniques. Despite the prevalence of GA in lumbar spine surgery, an ongoing debate exists regarding the optimal choice of anesthesia. The definitive determination of whether GA or RA is safer, more efficient and cost-effective remains elusive. Consequently the selection between GA and RA in spinal surgery is contingent upon the preferences and biases of the anesthesiologist, surgeon and patient[1-3].

General anesthesia induces immobility throughout the procedure and ensures a secure airway however, it may result in hemodynamic instability, increased intraoperative blood loss and postoperative nausea and vomiting[1-3]. Recent investigations suggest that employing RA, particularly epidural anesthesia (EA) is linked to improved hemodynamic stability, reduced operation duration, lower healthcare costs and a decreased incidence of surgical complications compared to GA[4-8]. EA has demonstrated enhanced postoperative recovery with fewer side effects. Furthermore, studies indicate that EA during lumbar surgery may offer greater reliability than GA by facilitating communication between the surgeon and the patient[6-8]. Despite previous examinations of the impact of GA versus EA on perioperative outcomes in lumbar spine surgery the results exhibit inconsistencies [7-11]. Notably, elderly patients face an increased anesthetic risk due to multiple health issues and diminished physiological reserves. Research indicates that RA, specifically EA, may lower the occurrence of postoperative delirium in the aging population compared to GA[4]. Although recent studies have encompassed patients aged 70 years or older the influence of GA or EA on lower lumbar surgery in elderly patients remains uncertain[7,9,10]. This retrospective study aims to investigate the effects of GA versus EA in elderly patients undergoing lower lumbar spine surgeries.

MATERIALS AND METHODS

The study encompassed 123 consecutively treated patients at a tertiary care Indian hospital by a single surgeon. Inclusion criteria were patients aged 70 years or older with degenerative lower lumbar diseases, undergoing posterior lower lumbar fusion surgery and receiving either GA or EA. Patients with coagulopathy, infection at the surgical site, rheumatologic or demyelinated diseases a history of active illicit drug abuse, spine tumor, infection or fracture were excluded.

The decision between EA and GA was made following clinical policy, considering the patient's physical status, anatomical considerations and a consensus decision involving the patient, surgeon, and anesthesiologist. A premedication of 0.5 mg atropine intramuscularly and antibiotic prophylaxis with 2 g cefazolin before skin incision were administered to all patients.

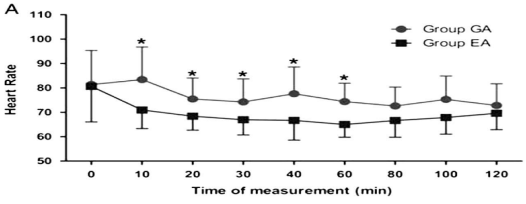
In the GA group, preoxygenation with 4-6 L min oxygen was done before induction. Induction included sufentanil (0.2-0.3 μg kg^{-1}) propofol (2-2.5 mg kg^{-1}) and cisatracurium (0.2 mg kg^{-1}) intravenously. Anesthesia maintenance consisted of remifentanil (0.15-0.2 μg kg min) sevoflurane (1.5-2%) and a fresh gas flow of 2 L min (50% O2-50% air mix). Postoperatively, nonsteroidal anti-inflammatory drugs were used for analgesia, with tramadol (100 mg intramuscularly) as a supplemental agent if needed.

EA was administered in the operating room, involving epidural catheterization and test dose administration with 1% lidocaine. If no signs of subarachnoid injection were observed, an epidural catheter was advanced and ropivacaine (0.5%) and sufentanil were injected. Intraoperative hypertension and tachycardia were defined as a 25% increase from baseline for systolic arterial pressure and heart rate, respectively.

Postoperatively, patients were monitored for 6-8 hrs and the drain was removed when drainage was $\leq$50 mL^{-1}. Functional leg exercises were encouraged and patients were allowed ground activity with a custom-made brace 3-5 days after surgery. Clinical assessments recorded patient demographics, hemodynamic parameters, surgical details, postoperative pain using Visual Analog Scale (VAS) patient satisfaction and complications. Statistical analyses were performed using IBM SPSS 20.0, presenting parametric values as Mean±SD or percentage as appropriate. Pairwise comparisons were analyzed using ANOVA with a Tukey post hoc test and nonparametric variables were assessed using Kruskall-Wallis analysis. The significance level was set at $p<0.05$.

RESULTS

Table 1 presents an overview of the demographic characteristics. No statistically significant differences were observed between the two groups. Conversion to GA was unnecessary in any case. Table 2 provides a comprehensive account of intraoperative and postoperative characteristics. No significant differences were noted between the two groups concerning the duration of surgery, hospital stay or blood loss.



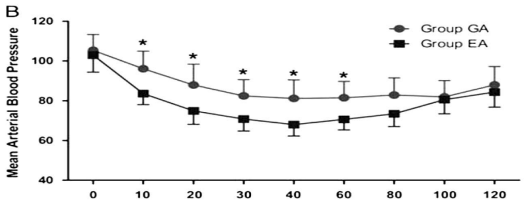


Fig. 1: Comparison of Mean intraoperative Heart Rate and Blood Pressure

Table 1: Demographic parameters of study participants

Veriables	GA group (N = 58)	EA group (N = 65)	p-value
Age (in years)	78.1±4.2	75.8±4.8	0.32
Weight (in kg)	58.3±3.9	59.4±4.2	0.22
Height (in cm)	162.7±8.2	165.2±6.8	0.11
ASA grade	2.0±0.2	2.4±0.6	0.45
Comorbidity present			
Cardiac disease	15	17	0.32
Respiratory disease	7	5	0.14
Diabetes	10	12	0.09

Throughout the postoperative period, group GA exhibited higher frequencies of nausea, vomiting and delirium. However, no significant differences were observed in other complications such as pneumonia, urine retention or wound infection. Neurological complications were absent in both groups and no mortalities occurred during the hospital stay. In the GA group the mean intraoperative heart rate (HR) and mean arterial blood pressure (MABP) were significantly higher compared to the EA group, particularly between the 10 and 60 min time points, as illustrated in Figure 1. Postoperative pain levels are delineated in Table 3. The average VAS scores were notably higher in the GA group, especially between 0 and 8 hrs after surgery. Notably, patients in the EA group expressed greater satisfaction with their postoperative pain management compared to those in the GA group.

DISCUSSIONS

The outcomes of our retrospective investigation revealed that EA yielded lower HR and MABP, reduced occurrences of delirium, nausea and vomiting, enhanced pain control and greater patient satisfaction compared to GA in elderly individuals undergoing lower lumbar spine surgeries. GA remains the predominant technique for spine surgery, owing to its widespread acceptance by patients and its suitability for prolonged operations in the prone position with a secured airway[1-3]. Nonetheless, mounting evidence supports the preference for RA, including epidural, spinal or a combination, over GA for lumbar spine procedures[5, 8, 10, 12-14].Mergeay *et al*.[14] reported that EA surpassed GA in inducing fewer episodes of hypertension and tachycardia. Consistent with prior research, our data indicated that elderly patients undergoing EA exhibited more stable intraoperative MABP and HR values, with a lower incidence of hypertensive and tachycardic episodes. Plausible explanations include distinct pharmacological sympatholysis, profound surgical analgesia, reduced stress response and the avoidance of endotracheal instrumentation[14,15].EA demonstrated decreased blood loss in lumbar spine surgery compared to GA, likely attributed to more stable intraoperative hemodynamics, sympathetic block-induced vasodilatation and hypotension[14,16]. In our study, although no significant difference was observed between the two groups, it may be attributed to the relatively small sample size. Key advantages of RA

Table 2: Intra and postoperative parameters of study participant

Variables	GA group (N = 58)	EA group (N = 65)	p-value
Total hospital stay in days	16.3±4.2	13.7±3.9	<0.05
Duration in operation room in minutes	216.8±9.5	160.2±8.7	<0.05
Duration of surgery in minutes	120.2±7.1	114.8±5.8	0.123
Intraoperative complications			
Estimated Blood Loss (in mL)	202.7±38.8	185.9±44.6	0.215
Hypertension	6	3	<0.05
Tachycardia	7	3	
Postoperative nausea and vomiting	17	10	<0.05
Postoperative complications	20	14	<0.05
Wound infection	1	1	1
Delirium	3	0	<0.05
Pneumonia	2	4	0.932
Pulmonary embolism	0	0	-
Deep vein thrombosis	0	1	0.076
Cardiac-cerebrovascular accident	1	0	0.112
Urine retention	3	1	<0.05
Satisfaction with pain management	2.0±0.1	3.4±0.2	<0.05

Table 3: Comparison of mean VAS scores at various postoperative time points

Intensity of post-operative pain (Hrs)	GA group (N = 58)	EA group (N = 65)	p-value
0	4.2±1.0	1.0±0.6	<0.05
2	4.0±1.2	0.8±0.9	<0.05
4	3.6±0.9	1.2±0.8	<0.05
8	2.9±1.2	2.0±0.7	<0.05
24	2.2±1.1	1.8±0.6	0.51
36	1.7±0.7	1.3±1.0	0.29
48	1.6±1.2	1.7±1.0	0.89

include excellent postoperative analgesia and a reduced incidence of nausea and vomiting[14-16]. Mergeay *et al*.[14] proposed that postoperative vomiting was more prevalent in patients recovering from GA compared to EA. Additionally, EA or spinal anesthesia has been associated with a decreased incidence of postoperative delirium in the elderly population compared to GA[4-9].

Prior investigations have consistently reported lower postoperative pain scores and/or reduced narcotic requirements for the RA group compared to GA. Our study similarly demonstrated improved postoperative pain (0-8 hrs) and higher patient satisfaction in the EA group. The presence of residual sensory blockade after EA could explain the lower postoperative pain in this group. Furthermore, decreased pain scores in the EA group may be attributed to RA's more selective inhibition of afferent nociceptive sensitization pathways[5,15,17,18]. Several limitations warrant consideration in this study. Firstly, it is a retrospective analysis of a selected cohort. Secondly the overall patient number is small, potentially limiting the study's power. To address this the number needed to treat and number needed to harm were calculated to assess relative benefits and harms. The study's power is also constrained by patient selection from a single institution and within a restricted time period.

CONCLUSION

Our observations suggest an association between the administration of EA and favourable perioperative outcomes. This association includes lower intraoperative HR and MABP, enhanced management of delirium and nausea and heightened patient satisfaction. However, certain considerations, such as airway security, operation duration and obesity, necessitate thorough evaluation when comparing different anaesthesia techniques.

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