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Original Article

Comparison of Outcome between Patients Receiving General Anesthesia Combined with Continuous Epidural Anesthesia and Patients Receiving General Anesthesia Combined with Intermittent Epidural Anesthesia

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Abstract

Background: The use of combined anesthesia including general and epidural anesthesia has been known to have better outcomes than the use of general anesthesia alone. The combination technique results in fewer complications and lower mortality rates, in addition to better control of pain. This study aims to analyze the outcomes of patients receiving a combination of general and continuous epidural anesthesia (GA-CEA) compared to patients receiving a combination of general and intermittent epidural anesthesia (GA-IEA). **Patients and Methods:** Thirty patients undergoing hysterectomy were randomly divided into two groups: those receiving a combination of GA-CEA and those receiving a combination of GA-IEA. After the surgery, patients were assessed for their pain levels, physical performances (using the Seven-Level Mobilization Scale), mortality, and morbidities. **Results:** There were neither mortalities nor morbidities observed among participants in both groups. The pain levels and physical performance between the two groups showed no statistical difference on days 1, 3, and 7. GA-CEA group required fewer doses of epidural analgesia compared to the GA-IEA group (14.53 mL vs. 19.47 mL, $P < 0.001$). **Conclusion:** Overall, there was no difference between GA-CEA and GA-IEA techniques on mortality, morbidities, pain levels, and physical performance. However, the GA-CEA technique did require a fewer dose of analgesic.

Keywords: Combination anesthesia, continuous epidural, epidural anesthesia, general anesthesia, intermittent epidural

Introduction

Anesthesia techniques are generally divided into general and regional anesthesia. Majorities of surgical procedures can be performed using either technique. Recent studies reported that general anesthesia is associated with higher mortality and morbidity.[1] Patients undergoing general anesthesia lose consciousness, which causes the central nervous system to produce more global hemodynamic and metabolic disturbances.[2,3] A combination of regional and general anesthesia, such as epidural and general anesthesia combination, has a lower mortality rate, better control of pain, and fewer complications compared to general anesthesia alone in several types of surgery.[4-8]

Epidural anesthesia can be given intermittently or continuously. A comparative study of intermittent and continuous epidural analgesia during labor reported that fewer drug and additional injections were required in the intermittent group compared to the continuous group to maintain similar motor and sensory block as well as pain scores.[9] A systematic review and meta-analysis of intermittent epidural bolus compared with continuous epidural infusions for labor analgesia showed that intermittent epidural bolus resulted in better maternal satisfaction, measured by the Visual Analog Scale (VAS), and required less local anesthetic usage, although a definite

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conclusion could not be made due to the large confidence interval.[10-12] Another study comparing the two techniques for postoperative analgesia concluded that continuous epidural infusion was superior compared to intermittent epidural bolus for postoperative analgesia.[13]

The study aimed to assess the outcomes of patients receiving the combination of general and continuous epidural anesthesia (GA-CEA) compared to patients receiving the combination of general and intermittent epidural anesthesia (GA-IEA), including pain levels, physical performance, mortality, and morbidities.

Patients and Methods

This is an experimental study done in Dr. Soetomo General Hospital, Surabaya, Indonesia, on March 2019–May 2019. Patients were enrolled from Dr. Soetomo General Hospital undergoing hysterectomy using general anesthesia by a systematic random sampling method. Inclusion criteria included patients undergoing elective transabdominal hysterectomy surgeries using general anesthesia, those under American Society of Anesthesiologists Physical Status I or II, those aged 18–55 years, and patients with body mass index 18–28 kg/m^2. Exclusion criteria included patients who declined to be a part of the study, patients with contraindications for epidural anesthesia, and patients undergoing hormone therapies. The study protocol was approved by the Research Ethical Committee of Faculty Medicine, Airlangga University.

Thirty patients were included in the study and randomly divided into the following two groups: those receiving a combination of GA-CEA and those receiving a combination of GA-IEA. The epidural catheter was inserted in L3–4/L2–3 space, 4–5 cm to the cranial direction. We used 3 ml of lidocaine 1.5% and adrenaline 1:200.000 as a test dose. The target of nerve block height was T4–5. In the GA-CEA group, we administrated 5–6 ml/h of lidocaine 1.5% by a syringe pump. In the GA-IEA group, we topped up 4–5 ml of lidocaine 1.5% boluses every 30 min.

Induction of anesthesia was then conducted using fentanyl 2 µg/kg, propofol 1–2 mg/kg, and atracurium 0.5 mg/kg. The patients were then intubated and given the maintenance of anesthesia by isoflurane 1%. Ventilation was controlled by a tidal volume of 6–8 ml/kg, with an end-tidal CO_2 target of 30–35 mmHg. After the surgery was completed, patients were assessed for anesthesia outcomes.

The observed outcomes included pain, physical performance, mortality, and morbidities. The pain was measured using VAS on days 1, 3, and 7 after the surgery. The physical performance was assessed using the Seven-Level Mobilization Scale (SLMS) on days 1, 3, and 7 after the surgery. Mortality was defined as the presence of signs of brain stem death within 7 days after the surgery. Morbidity was defined as the presence of complications within 7 days after the surgery. Complications observed included respiratory failure, pulmonary emboli, new myocardial infarction, congestive heart failure (new or exacerbation), persistent ventricular tachyarrhythmia, new total atrioventricular block, severe hypotension (mean arterial pressure <50 mmHg), cerebrovascular accident, kidney failure, pneumonia, respiratory depression, sepsis, gastrointestinal bleeding, new angina pectoris, atrial fibrillation, deep-vein thrombosis, epidural hematoma, paralytic ileus, somnolent, and additional surgery due to complications.

Statistical analysis was done using SPSS 25.0 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, version 25.0. IBM Corp., Armonk, NY, USA). A normality test was performed using the Shapiro–Wilk test. Data were then analyzed using the Mann–Whitney U-test. P <0.05 was considered statistically significant.

Results

This study examined 30 patients who were randomly divided into the following two groups: those who received GA-CEA and those who received GA-IEA. The GA-CEA group had an average age of 40.27 years, compared to GA-IEA of 43.67 years. Comorbidities found in the patients included anemia, hypertension, chronic kidney disease, an increase of renal function test, ascites, allergy, pleural effusion, hyponatremia, mild hydronephrosis, malignancy, diabetes mellitus, hydroureter, distended abdomen, hypoalbuminemia, and hypokalemia. The randomization succeeded in balancing the two groups for their comorbidities, as shown in Table 1.

Table 1: Baseline characteristics

Characteristics	GA-CEA (%)	GA-IEA (%)
Total number of patients	15	15
Age (years), mean±SD	40.27±8.648	43.67±11.356
ASA classification		
ASA I	1 (6.67)	0 (0)
ASA II	14 (93.33)	15 (100)
Anemia	2 (13.3)	7 (46.67)
Hypertension	1 (6.67)	4 (26.67)
Chronic kidney disease	0 (0)	1 (6.67)
Increase of RFT	3 (20)	0 (0)
Ascites	1 (6.67)	1 (6.67)
Allergy	0 (0)	1 (6.67)
Pleural effusion	1 (6.67)	1 (6.67)
Hyponatremia	0 (0)	1 (6.67)
Mild hydronephrosis	0 (0)	1 (6.67)
Malignancy	6 (40)	3 (20)
Diabetes mellitus	1 (6.67)	1 (6.67)
Hydroureter	0 (0)	1 (6.67)
Distended abdomen	0 (0)	4 (26.67)
Hypoalbuminemia	3 (20)	0 (0)
Hypokalemia	2 (13.3)	0 (0)

GA-CEA: General and continuous epidural anesthesia, GA-IEA: General and intermittent epidural anesthesia, SD: Standard deviation, ASA: American Society of Anesthesiologists, RFT: Renal function tests

Pain levels were measured using VAS on days 1, 3, and 7. None of the pain levels were significantly different between the two groups. The summary of pain comparison between the two groups is shown in Table 2. The average amount of epidural analgesic drug used in the GA-CEA group was 14.53 mL of lidocaine, whereas the GA-IEA group required 19.47 mL of lidocaine. The difference was statistically significant ($P < 0.001$). Four participants in the GA-CEA group required rescue dose, whereas only one in the GA-IEA group required rescue ($P = 0.330$). The comparison of the analgesic dose is summarized in Table 2.

Physical performance was assessed using the SLMS. This scale is measured as 0 (incapable of doing any tasks), 1 (sit-up on bedside with support), 2 (sit-up on bedside without support), 3 (stand with support), 4 (stand without support), 5 (walk with support), and 6 (walk without support). We found no significant differences between the two groups. There were neither mortalities nor morbidities among the participants from either group.

Discussion

Choices for epidural infusion usually are considered based on the desired length of action.[11,14,15] For short surgical procedures, the commonly used agent is chloroprocaine, due to its rapid elimination.[14] Lidocaine is popularly used for intermediate-acting anesthetic, while longer surgical procedures often use bupivacaine or ropivacaine in varying concentrations.[14] Research samples in this study were undergoing hysterectomy, which is the reason why we chose lidocaine.

Overall, based on the results of our study, the two anesthesia techniques compared made no differences in mortalities, morbidities, as well as pain and physical performance levels on days 1, 3, and 7 post surgery. A previous study comparing intra-abdominal surgical patients given general anesthesia and postoperative analgesia with parenteral opioids (Group 1) and those given epidural with light general anesthesia and postoperative epidural morphine (Group 2), reported that mortalities and morbidities were significantly lower in Group 2 for abdominal aortic surgical patients, but not in other types of surgeries (biliary, gastric, and colon).[16]

Table 2: Mean difference in Visual Analog Scale score

	GA-CEA	GA-IEA	*P*
VAS score (mean)			
Day 1	3.4	2.67	0.158
Day 3	1.2	0.67	0.113
Day 7	0.07	0.07	1.00
Mean analgesic dose (mL)	14.53	19.47	<0.001
SMLS			
Day 1	1.87	2.20	0.145
Day 3	5.00	4.80	0.524
Day 7	6.00	6.00	1.000

GA-CEA: General and continuous epidural anesthesia, GA-IEA: General and intermittent epidural anesthesia, VAS: Visual Analog Scale, SMLS: Seven-level mobilization scale

Another previous study comparing continuous and intermittent epidural analgesia during labor using ropivacaine with fentanyl concluded that the intermittent group was able to produce similar pain scores using less drug and supplementary injections.[9,17-20] Our present study, however, showed that the patients receiving GA-CEA required less dose of lidocaine than those receiving GA-IEA, with both combinations able to produce nonstatistically different pain levels on days 1, 3, and 7 post surgery. Our study did find that more patients required rescue analgesia in the GA-CEA group, but it was not statistically significant.

We also found no significant difference in physical performance on days 1, 3, and 7 post surgery between the two groups. We concluded that with less analgesia drug, the GA-CEA technique was able to produce a similar physical performance to GA-IEA technique.

The limitation of our present study was the lack of surgical procedure variations. This study only assessed patients undergoing hysterectomy. The small number of samples in our study most likely caused the statistical nonsignificance, given the number of patients requiring rescue was actually quite different between the two groups (26.67% vs. 6.67%).

Conclusion

There was no significant difference between the two combinations of anesthesia techniques, except for the number of drugs required, which was smaller in the GA-CEA group. Therefore, either technique may be safely performed interchangeably.

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Conflicts of interest

There are no conflicts of interest.

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