ORIGINAL ARTICLE (APMC – 465) DOI: 10.29054/APMC/18.465

Comparison of General and Spinal Anesthesia in Patients Undergoing Open Abdominal Hernia Repair in Terms of Post-Operative Pain

Shaheer Sultan, Saad Sultan Rana, Arsalan Hafeez, Umair Tariq, Rubina Firdous

ABSTRACT

Background and Objectives: Abdominal hernioplasty is a very common intervention that can be performed under general or spinal anesthesia. We compared general and spinal anesthesia in patients undergoing open abdominal hernia repair on elective basis. **Study Design:** Randomized control study. **Place of Study:** Allied Hospital Faisalabad. **Period:** September 2017 to December 2017. **Methodology:** Forty (40) adults received either General Anesthesia with succinylcholine, propofol, nelbuphine and atrarcurium (group A, n=20) or spinal anesthesia (L3–L4) with bupivacaine 0.5% 10mg (group B, n=20). Then the Hemodynamic data (blood pressure, pulse), pain scores, time to first analgesic and side-effects were recorded of the patients. **Results:** Among the patients, hernia was supraumbilical in 6, umbilical in 7 and infraumbilical in 7 patients of group A and in 6, 6 and 8 in group B patients, respectively, p value >0.05. Maximum decrease of systolic blood pressure was 10±6 in group A and 21±6% in group B, p value <0.05 and of heart rate 11±5 and 17±7%, p value >0.05, respectively. Pain scores at 0, 2, 4 and 8 hours after surgery were: 4 (2–6), 5 (2–7), 5 (1–6) and 4 (2–6) in group A and 0, 0, 0 (0–2) and 1 (0–3) in group B, respectively, p value <0.05. Pain scores at 12 and 24 hours were 4 (1–5) and 3 (0–4) in group A and 2 (0–4) and 1 (0–3) in group B, respectively, p value >0.05. Time to first analgesic was 28±10 in group A and 580±138 min in group B, p value <0.001. 7 (35%) of the patients in group A and 1 (5%) in group B patients had post-operative nausea and vomiting, p value <0.05. **Conclusion:** Patients undergoing open ventral hernia repair and received general anesthesia were more stable in terms of blood pressure and heart rate but the patients who received spinal anesthesia had less postoperative pain and less post-operative nausea and vomiting.

Keywords: Spinal anesthesia, Hernia repair, Post-operative pain.

Corresponding Author
Dr. Shaheer Sultan
House Officer, Anesthesia
Allied Hospital, Faisalabad
Contact: +92 300-8980204
Email: shaheersultan31@gmail.com

Submitted for Publication: 08-03-2018 *Accepted for Publication: 23-03-2018*

Article Citation: Sultan S, Rana SS, Hafeez A, Tariq U. Comparison of General and Spinal Anesthesia in Patients Undergoing Open Abdominal Hernia Repair in Terms of Post-Operative Pain. APMC 2018;12(1):70-3.

INTRODUCTION

A ventral hernia is defined as a facial defect located to the abdominal wall. Primary ventral hernias are divided as umbilical, epigastric, spigelian and lumbar hernias, whereas secondary (acquired) ventral/abdominal hernias are incisional hernias which typically occur at the site of previous surgical incision.[1] Open ventral hernia repair is a common surgical procedure that is often performed under general anesthesia (GA). However, side-effects of GA, such as postoperative nausea and vomiting, short-term cognitive impairment, prolonged sedation and early postoperative pain maybe undesirable in outpatients, elderly and cardiovascular compromised patients.[2-4] Spinal anesthesia (SA) is a relatively simple technique that has been widely used for a various kind of surgeries, due to its easy reproducibility, rapid onset, effective sensory and motor blockade, prolonged postoperative analgesia and low incidence of major complications.[5-7] In this prospective study we compared clinical profile of patients undergoing elective open ventral hernia repair either by general anesthesia or spinal anesthesia and tested the hypothesis that neuroaxial block would provide adequate anesthesia, better postoperative pain control and less side-effects than general anesthesia.

METHODOLOGY

Study Design: Randomized control study.
Place of Study: Allied Hospital Faisalabad.
Duration of Study: September 2017 to December 2017.
Sample Technique: Non-probability consecutive sampling.
Sample Size: Total 40, 20 in each group
Inclusion Criteria: All patients btw the age of 15 to 60 of either gender having ventral hernia of any type (infra umbilical, supra umbilical, para umbilical hernia)
Exclusion Criteria: Advanced malignancy with metastasis, patients who refused to be part of this research, and patients suffering from co morbid conditions like multi organ failure.

After obtaining patients' informed consent, a total of 40 adult patients were included in the study, which were undergoing elective open ventral hernia repair. Patients were randomly assigned to one of the two groups, the group A (n=20) or the group B (n=20). Patients with history of allergy to anesthetic drugs, body mass index > 35 or with neurologic or neuromuscular diseases were excluded. All patients were given midazolam (7.5 mg) per oral 45 minutes before surgery. An intravenous cannula of 20 guage was inserted in antecubital

vein of the forearm and ringer lactate infusion was started after arrival in the operating room. Standard intraoperative monitoring, including pulse, oxygen saturation and blood pressure was done in all patients. In the group A, anesthesia was induced with succinylcholine 1 mg/kg, nalbuphine 10-15 mg/kg, propofol 2 mg/kg and atracurium 25-35 mg/kg. Subsequently, the trachea was intubated and mechanical ventilation was performed in a volume-controlled mode with fresh gas flow of 1.0 liter/min (air/O_2, FiO_2=0.4). Anesthesia was maintained with additional boluses of atracurium (40 mg) and propofol (30–50 mg) as deemed necessary by attending anesthetist. At the beginning of the skin closure, tracheal extubation was performed following reversal of neuromuscular blockade with atropin (1.0 mg) and neostigmin (2.5 mg) when needed. In the group B, spinal anesthesia was performed in the sitting position and dura mater punctured at the L2–L3 intervertebral space, using a 25-gauge spinal needle through midline approach. After free flow of cerebrospinal fluid (CSF) was noted, 10 mg of bupivacaine 0.5% was infused. Then, patients were placed in slight Trendelenburg position (15–20°) for the next 10 minutes in order to achieve adequate level of sensory block. The quality of SA was evaluated according to the need for supplementary intravenous analgesia. SA was considered as adequate when no analgesic was required and failed when GA had to be applied to complete the surgery. In both groups, hemodynamic values like heart rate (HR), systolic, diastolic and mean arterial blood pressure were recorded after every 10 minutes during the first 60 minutes after induction of anesthesia. Relative hypotension (falling SAP 25% of baseline value) was treated with a rapid intravenous infusion of 250 ml of Ringer solution and absolute hypotension (fall in SAP < 90 mmHg) was treated with intravenous bolus of ephedrine 5–10 mg. Clinically relevant bradycardia (decrease in HR to less than 45 bpm) was treated with 0.5 mg of intravenous atropine. Postoperative pain intensity was evaluated with a visual analog scale (VAS) from 0 = no pain to 10 = the worst pain imaginable at 0, 2, 4, 8, 12 and 24 hours after surgery. Rescue analgesic drug (tramadol100 mg IV) was given on patient request or when VAS score was 3. All patients were given 1g of paracetamol IV every 6 hours, starting immediately after receiving first rescue analgesic drug. The time between end of surgery and first analgesic was recorded. Side-effects, such as pruritus, nausea, vomiting, headache and neurological complications were also documented. Data were statistically analyzed and expressed as mean ± standard deviation (SD) or median ± range for quantitative variables and percentage of patients for nominal variables. Averages were compared using unpaired two-sample t-test. P value less than 0.05 was considered statistically significant.

RESULTS

There were no significant differences between the groups with respect to age, gender, weight, height and operation time (Table 1) and start values of SAP, DAP, MAP and HR, Table 2. Abdominal hernias were umbilical in 7, supraumbilical in 6 and infra umbilical in 6 group A and in 6, 6 and 8 group B patients, respectively, Table 3. Anesthesia was adequate in 18 (90%) group B patients and inadequate in 2 (10%) patients who additionally required nalbuphine supplementation to complete the surgery. No case of failed SA was documented.

The mean values of SAP and DAP in the first 60 min after start of anesthesia were significantly lower in the SPA group at 10, 20, 30 and 40 min after start of anesthesia. Maximum decrease of basal SAP was 10 ± 6 in group A and 21 ± 6% in group B, p value < 0.05 and of HR 11 ± 5 and 17 ± 7%, p value > 0.05, respectively. Relative hypotension was recorded in 2 (10%) group A and 4 (20%) group B patients, p value > 0.05 and absolute hypotension in 0% in group A and in 4 (20%) group B patients p value=0.11. Decrease of HR<45/min was recorded in 1 (5%) group A and 4 (20%) group B patients, p value = 0.34. Postoperative VAS pain scores at 0, 2, 4 and 8 hours after surgery were higher in group A than in group B, p value < 0.05, but did not differ significantly at 12 and 24 hours after surgery, Table4. Time to first analgesic in minutes was 28±10 min in group A and 580 ± 138 minutes in group B, p value < 0.001. Postoperative nausea and vomiting (PONV) had 7 (35%) group A and 1 (5%) group B patients, p value=0.04 and mild to moderate pruritus 14 (70%) group B patients, p value < 0.001. No case of headache or neurological complications was documented.

Table 1: Patients characteristics and operation time

	Group A (n=20)	Group B (n=20)	P value
Age (years)	46±16	47±16	0.96
Gender **Male %** **Female %**	 6 (30) 14 (70)	 8 (40) 12 (60)	0.74
Weight (kg)	79±5	81±7	0.22
Height (cm)	171±9	171±8	0.75
Operation Time (min)	63±17	62±18	0.73

Values are mean ± standard deviation or number of patients (percentages)

Table 2: Basal hemodynamic parameters

	Group A (n=20)	Group B (n=20)	P value
SAP (mm Hg)	125±9	129±8	0.15
DAP (mm Hg)	74±9	76±8	0.33
MAP (mm Hg)	91±8	92±7	0.52
HR (bpm)	75±6	73±6	0.22

Values are mean ± standard deviation. SAP: systolic arterial pressure; DAP: diastolic arterial pressure; MAP: mean arterial pressure; HR: heart rate

Table 3: Ventral hernia localization

	Group A (n=20)	Group B (n=20)
Umbilical	7	6
Supraumbilical	6	6
Infraumbilical	7	8

Table 4: Postoperative VAS pain scores at 0, 2, 4, 8, 12 and 24 hours after surgery in the group GA and the group SPA patients

Time	Group A (n=20)	Group B (n=20)	P value
0	4 (2-6)	0	<0.05
2 h	5 (2-7)	0	<0.05
4 h	5 (1-6)	0 (0-2)	<0.05
8 h	4 (2-6)	1 (0-3)	<0.05
12 h	4 (1-5)	2 (0-4)	<0.05
24 h	3 (0-3)	1 (0-3)	<0.05

DISCUSSION

General anesthesia (GA) and spinal anesthesia (SA) proved to be effective anesthetic methods for patients undergoing open abdominal hernioplasty, but both of these techniques are associated with some complications and side-effects.[2-7] SA often results in hypotension, urinary retention and prolonged motor recovery and all of that can limit its routine use in ambulatory surgery and in geriatric population with limited cardio-respiratory reserve. On the other side, SA provides excellent sensory and motor blockade, prolonged postoperative analgesia and significantly lower drug and supply costs and therefore, represents a more suitable and cost-effective alternative to GA.[4-5] In the present study we compared GA performed as TIVA and hyperbaric bupivacaine SA in inpatients undergoing elective open ventral hernioplasty. The study demonstrated that open ventral hernia repair can be successfully performed under SA because reliable surgical anesthesia was provided in all 20 group SPA patients. In present study, GA provided more stable hemodynamic profile with minimal cardiovascular disturbance, which maybe important benefit, especially in elderly and cardiac risk patients. The incidence of hypotension in patients with spinal anesthesia depends on the level of sympathetic block, preoperative condition, age of patient, blood volume, type of surgery and amount of blood loss. In patients undergoing laparoscopic ventral hernioplasty under spinal anesthesia, hypotension occurred in 68% of patients and was easily resolved by fluid administration.[17] In our study in which open ventral hernioplasty was performed, clinically relevant hypotension (decrease of SAP < 90 mmHg) was observed in only 20% patients under SA and was easily treated with fluid bolus. Mean SAP decline from baseline was only 21% which can obviously be attributed to the fact that relatively low local anesthetic dose was administered. Heart rate during high neuraxial block typically decreases as a result of blockade of the cardio accelerator fibers arising from T1 to T4 but it may also decrease as a result of a fall in right atrial filling. In present study, mean decrease of HR from baseline during first 60 min of spinal anesthesia was 17% and clinically relevant bradycardia (HR < 45/min) was observed in 20% group SPA patients. Open ventral hernia repairs are often associated with substantial postoperative pain, frequently requiring narcotic analgesics. Early postoperative pain can decrease early ambulation, delay the return of bowel function and be a major problem in the acceptance of early discharge by patients.[18] In this study, SA provided excellent and prolonged postoperative analgesia and markedly better pain relief in the first 8 hours after surgery and time to first analgesic was more than 9 hours longer in SA than in GA group patients. Postoperative pain scores were lower at 12 and 24h after surgery, too, but the difference was not found to be statistically significant. Previous studies also reported superiority of SA to GA in providing not only better postoperative analgesia after various types of surgery but also in reducing the need for blood transfusion, incidence of thromboembolic disease, pulmonary embolism, postoperative hypoxic episode and total drug and supply costs.[4,19] PONV is one of the main complaints in patients undergoing surgery under general anesthesia and one of the most important factors that determines the length of hospital stay after ambulatory anesthesia.[20] We reported PONV in 35% of the patients in GA group and in 5% of the patients in the SPA group and all were successfully treated with intravenous metoclopramide. We did not report any case of urinary retention requiring bladder catheterization, headache or neurological complications in both groups.

In conclusion, results of this prospective study demonstrate that SA produced with hyperbaric bupivacaine 10 mg provides safe and reliable surgical anesthesia in adult patients undergoing elective open ventral hernioplasty. Although GA has shown more stable hemodynamic profile, SA provided less PONV and better postoperative pain control.

CONCLUSION

Patients undergoing open ventral hernia repair and received general anesthesia were more stable in terms of blood pressure and heart rate but the patients who received spinal anesthesia had less postoperative pain and less post-operative nausea and vomiting.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

AUTHORS	Contribution to The Paper	Signatures
Dr. Shaheer Sultan House Officer, Anesthesia Allied Hospital, Faisalabad	Study Designing, Collection / Processing of Data, Preparation of Results	
Dr. Saad Sultan Rana House Officer Sheikh Khalifa bin Zayd Hospital, Lahore	Manuscript designing, Data analysis, Tabulation of Results, References writing	
Dr. Arsalan Hafeez Medical Officer Independent University Hospital, Faisalabad	Designing of Tables, Statistical analysis	
Dr. Umair Tariq House officer Surgical Unit-III Allied Hospital, Faisalabad	Reference writing, Comparison and discussion	
Prof. Dr. Rubina Firdous Head of Department of Anesthesia FMU/Allied Hospital, Faisalabad	Review of literature, Proof reading