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Original Article

A Prospective Randomized Comparative Study of Anesthetic Technique for Laparoscopic-assisted Vaginal Hysterectomy

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Abstract

Introduction: General anesthesia (GA) is a commonly administered technique for laparoscopic-assisted vaginal hysterectomy and procedure although laparoscopic is still most painful to patient irrespective of opioid usage intraoperatively when providing GA alone. Combined techniques of subarachnoid block (SAB) along with GA provide good pain relief, surgical relaxation, and better intraoperative hemodynamics. And further addition of clonidine in SAB will produce prolonged pain relief and controllable hemodynamics.

Aims and objectives: The aim of our study is to compare the plain GA group with the combined spinal and GA group on anesthetic requirements and hemodynamic alterations.

Materials and Methods: Patient was assigned randomly to receive GA (group GA), spinal with GA (group SGA), and spinal additive clonidine with GA (group SGA-C) each group of 30 patients. Group GA receives only GA group SGA receives SAB with bupivacaine hyperbaric 10 mg and followed by GA and group (SGA-C) SAB with bupivacaine 10 mg with 30 μg clonidine. Maintenance was done with N_2O, O_2, and sevoflurane. The primary objective is to compare the hemodynamic changes between the groups after creating pneumoperitoneum and also to compare anesthetic requirements. The secondary objective of our study is to compare the recovery time and surgical relaxation by the numerical rating scale.

Statistics Used: Comparison of heart rate, and mean arterial pressure (MAP) was done with student's *t*-test or Mann–Whitney test. One-way analysis of variance was applied, with Chi-square tests for categorical variables and the *post hoc* Bonferroni test for interval variables. Descriptive statistics in the form of mean standard deviation are used.

Results: Patients in the group SGA-C and SGA group had stable and better hemodynamics when compared to the GA group throughout pneumoperitoneum. Group GA required more doses of opioids and labetalol when compared to the other two groups ($P < 0.001$) to maintain the MAP within the normal range. The difference between the groups is statistically significant ($P < 0.01$). Group SGA-C had a longer duration of pain relief when compared to the SGA group. Recovery at the end of surgery and surgical relaxation was better with Group SGA and Group SGA-C compared to the GA group.

Conclusion: The benefit of spinal anesthesia such as maintaining good surgical relaxation and managing the adverse effects of pneumoperitoneum can be better used in this laparoscopic lower abdominal procedures

Key words: General anesthesia, Hemodynamic changes, Pneumoperitoneum, Subarachnoid block

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INTRODUCTION

General anesthesia (GA) is a widely accepted technique for the laparoscopic surgery resulting in better patient acceptance and early return to normal life. Creating pneumoperitoneum leads to an increase in arterial carbon dioxide tension results in raise in systemic vascular

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resistance and rise in blood pressure (BP) and heart rate (HR).[1-3] Such hemodynamic alteration is managed and treated with increasing usage of inhalational agents, sometimes antihypertensives, opioids leading to a deeper plane of anesthesia and delayed recovery, whereas subarachnoid block (SAB) alone is not sufficient for laparoscopy because of patient discomfort, shoulder pain due to pneumoperitoneum.

Combined usage of spinal and GA will provide better hemodynamics and reduced usage of anesthetic agents.[4] Many articles published in the literature are based on epidural combined with GA. Only few publications are available on subarachnoid block with GA.

Considering the surgical part which involves pelvic and vaginal dissection to the removal of the uterus, intraoperative hemodynamic alterations can be easily managed with sympathectomy caused by spinal anesthesia.[5] In our study, additional use of clonidine in SAB provides better surgical relaxation and early completion of surgery. The primary objective of the study is pneumoperitoneum effects on hemodynamics and the secondary objective is to study recovery profile and surgical relaxation.

MATERIALS AND METHODS

After getting ethical committee approval from our institution, informed and written consent from the patients, 30 patients in each group total of 90 patients were included in the study.

Inclusion criteria are patients belonging to ASA I, II body mass index <30, assigned to one of the three groups. Group GA – 30, Group spinal with GA (SGA) – 30, and spinal additive clonidine with GA (SGA-C) – 30, group sizes were calculated based on previous studies analyzed by standard deviation power analysis.

Exclusion criteria were patient refusal, infection at the regional site, patient with cardiac disease.

Patient were randomly assigned to three groups below:
- Group GA – Received GA.
- Group SGA – Received SAB followed by GA.
- Group SGA-C – Received SAB with clonidine additive followed by GA.

Group assigned is by another person not involved in the study and the anesthesiologist who is performing the anesthesia technique will not take part in further study.

After initial baselines electrocardiogram, HR, mean arterial pressure (MAP), and saturation are recorded and all patients are preloaded with PlasmaLyte 250 mL after securing an intravenous cannula. Group GA receives conventional balanced anesthesia and group SGA receives spinal anesthesia with GA. SAB was given in a sitting position with 25G Quincke needle at L3L4 interspace and injection. Bupivacaine 0.5% heavy 10 mg is given and group SGA-C received SAB in a sitting position with 25G Quincke needle at L3L4 interspace with injection. Bupivacaine 0.5% heavy 10 mg with 30 μg clonidine. After spinal anesthesia, group SGA/SGA-C – patient was made supine immediately and onset of sensory anesthesia with pinprick and motor block with modified bromage scale was assessed. After spinal blockade, GA was proceeded. Any case of failed spinal anesthesia was excluded from the study. Premedication with injection of glycopyrrolate 0.2 mg iv, patient was pre-oxygenated with 100% for 3 min injection of fentanyl 2 μg/kg, injection of propofol 2 mg/kg till loss of verbal commands, and injection of succinylcholine 2 mg/kg was given after loss of consciousness and endotracheal intubation done with 7/7.5 size ETT and connected to the ventilator. Maintenance of anesthesia by N_2O: O_2 50:50 ratio, sevoflurane 1–2% concentration based and injection. atracurium loading dose 0.5 mg/kg followed by maintenance dose. HR and MAP were kept within 20% of baseline by sevoflurane inhalational anesthetics and opioids injection fentanyl is given 20 μg every 40 min after loading dose. Injection labetalol bolus 1–2 mg iv bolus given if systemic BP and MAP raises above the baseline range. Hemodynamic monitoring is done and the duration of pneumoperitoneum and duration of surgery are noted and recorded. CO_2 pneumoperitoneum was kept between 12 mmHg and 15 mmHg for all subjects. At the end of procedure, surgical relaxation by numerical rating scale (NRS) from 1 to 10 was obtained from the surgeon. Patient was reversed with neostigmine and glycopyrrolate 40 μg/kg and 10 μg/kg, respectively, intravenously and extubation was done once patient regained their consciousness and adequate muscle power.

The parameter that are included are
- Opioid requirement
- Sevoflurane concentration
- Recovery time
- NRS (surgeons satisfaction)
- Labetalol (total dosage used)
- Mean HR/min
- MAP baseline,15 min,30 min,45 min, 60 min, 75 min,90 min,105 min
- Complication in the form of hypotension, bradycardia, postoperative nausea, and vomiting
- Duration of surgery
- Duration of pneumoperitoneum.

Table 1:

Variables	Group GA		Group SGA		Group SGA-C		*P*-value
Mean HR/min	92.97	9.49	75.94	7.99	71.87	6.63	<0.001
MAP baseline	74.26	7.51	71.06	5.21	74.06	7.36	0.225
MAP 15 min	95.13	7.77	64.42	3.04	64.90	2.79	<0.001
30 min	95.94	1.50	63.84	2.60	64.26	2.32	<0.001
45 min	91.90	3.51	64.00	2.72	64.10	2.20	<0.001
60 min	91.45	4.06	63.00	2.38	63.10	1.66	<0.001
75 min	82.77	5.36	64.94	1.77	65.16	1.37	<0.001
90 min	89.65	3.93	63.90	2.39	63.90	1.66	<0.001
105 min	86.26	4.09	64.45	1.46	64.03	0.98	<0.001

HR: Heart rate, MAP: Mean arterial pressure, GA: General anesthesia, SGA: Spinal with general anesthesia, SGA-C: Spinal additive clonidine with general anesthesia

Table 2:

Variables	Group GA		Group SGA		Group SGA-C		*P*-value
Opioid requirement (micro-g)	193.55	10.82	117.42	12.37	101.94	6.01	<0.001
Recovery time	12.19	3.59	8.68	3.06	6.65	2.70	<0.001
NRS	7.39	0.72	9.52	0.68	9.58	0.56	<0.001

NRS: Numerical rating scale

Statistical Analysis

A confidence interval of 95% was used in all statistical tests, and significance was considered when $P < 0.05$. All values are expressed as mean with standard deviation in parentheses unless otherwise stated. Statistical Package for the Social Sciences 18.0 statistical software was used for the analysis comparison of HR, MAP was done with Student's *t*-test or Mann–Whitney test. One-way analysis of variance was applied, with Chi-square tests for categorical variables and *post hoc* Bonferroni test for interval variables. Descriptive statistics in the form of mean and standard deviation are used.

RESULTS

Totally 90 patients fitting to our inclusion criteria were enrolled in our study, with 30 in each group. Demographic profile and surgery characteristics are all comparable between the three groups. Baseline HR and MAP values were comparable in both groups. Rise in MAP after the creation of pneumoperitoneum was significant in Group GA but well maintained in Group SGA-C and SGA which was statistically significant. After the release of pneumoperitoneum, the difference was not statistically significant and MAP values were within 20% of baseline. Recovery time was less and postoperative pain was better with SGA-C group. No patients in group SGA and SGA-C had vomiting and postdural puncture headache.

DISCUSSION

Laparoscopic hysterectomy is commonly done under GA alone. The combination of spinal and GA is our study resulted in good hemodynamic stability, decreased use of anesthetic agents, and good surgical relaxation and early recovery.

The laparoscopic pneumoperitoneum will cause a significant rise in MAP and that may lead the anesthesiologist to deepen the plane of anesthesia by use of various pharmacological drugs such as opioids, inhalational agents, NTG, labetalol, esmolol, and α_2 agonist.[6] This can be overcome using additional technique of SAB mediated by sympathectomy thereby, reduction of SVR and MAP.[7] In addition, the use of α_2 agonist clonidine provided good surgical exposure as reflected by the NRS rating score by surgeon in our study and also better hemodynamic stability when using doses 30 μg clonidine as compared to 75 μg clonidine in SAB resulting in mean fall and HR and BP.[8]

Generally, combination of epidural and GA is practiced for abdominal procedures, and in various studies referred that this technique is safe and effective.[9] Only few studies are found in the literature for the combined spinal and GA group has various advantages of reduction in usage of inhalational agents, opioids, the better hemodynamic stability during pneumoperitoneum in the SGA group, and SGA-C group and is concordance with early recovery from anesthesia.[10] The mean time for two segments of sensory level was significantly prolong is SGA-C group compared to GA/SGA group. This finding is not our objective but the additive effect of α_2 agonist will take care of sensory analgesia both intraoperatively and postoperatively.[11]

Performing a lumbar puncture in case of laparoscopy surgery can cause post-dural puncture headache (PDPH), but in our study, none of the patient complained of PDPH.[12] Combined SGA maintained better hemodynamic stability, shorter hospital stay, and lesser postoperative pain when compared to the GA group.[13-18]

The postoperative pain and duration of hospital stay were shorter in the SGA-C group compared to the other two groups that was similar to as described by Hwang,[1] Kim *et al.*[14] Tables 1 and 2.

CONCLUSION

Although the technique of anesthesia for laparoscopic procedures remains debatable, for laparoscopic-assisted vaginal hysterectomy combined spinal anesthesia with GA provide better hemodynamics, surgical relaxation, and postoperative pain relief.

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