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Combined Spinal-Epidural Anaesthesia and General Anaesthesia For Total Abdominal Hysterectomy- A Comparative Study

KEYWORDS: Total abdominal hysterectomy, general anaesthesia, combined spinal epidural anaesthesia.

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ABSTRACT

Background: *Abdominal hysterectomy can be performed under general or regional anaesthesia, but preferred anaesthetic technique is general anaesthesia. The aim of this study was to compare two anaesthetic techniques, general anaesthesia (GA) and combined spinal epidural anaesthesia (CSEA) in these patients.*

Methods: *It was a prospective and randomized study. Sixty patients of age group 30-60 years, ASA physical status I or II, scheduled to undergo total abdominal hysterectomy were enrolled in the study. They were randomized into two groups of 30 patients each. Group G received GA and group C received CSEA. The haemodynamic changes, surgeon's satisfaction, complications, patients satisfaction, severity of postoperative pain based on visual analogue scale and analgesic used were recorded.*

Results: *Intraoperative hemodynamic changes was significantly lower in group C as compared to group G ($p<0.05$). Surgeon's satisfaction, patient's satisfaction and quality of pain relief in two groups were comparable. Blood loss was significantly more in group G as compared to group ($p<0.05$). Time to first rescue analgesia was significantly more in group C. Total dose of bupivacaine through epidural in 24 hour postoperatively was also significantly more in group G ($p<0.05$).*

Conclusions: *Our study showed that both CSEA and GA provide comparable surgeon's satisfaction and patient's satisfaction. However, CSEA provide better hemodynamics with less postoperative analgesic requirement and less blood loss. So, CSEA is better alternative to GA in TAH patients.*

Introduction:

Throughout the world hysterectomy remains one of the most frequently performed of all major surgical procedures. Choice of anaesthetic technique depends on surgeon's and anaesthetist's preference. Comparing anaesthetic techniques after abdominal hysterectomy they invariably choose general anaesthesia.[1]

General anaesthesia (GA) has the advantage of rapid induction, less hypotension, cardiovascular stability and better control over airways and ventilation. Along with its advantages it carries various drawbacks like increased postoperative pain and nausea, multiple drug usage leading to increased risk of anaphylaxis, slow recovery of bowel function, increased pulmonary complications and increased surgical haemorrhage hamper patient's recovery in the postoperative period.[2] Regional anaesthesia has an advantage of retaining of conscious state and relatively simple and cost effective technique with less surgical bleeding. Moreover it is associated with decreased incidence of deep vein thrombosis and reduced postoperative risk of pulmonary, cardiovascular and gastrointestinal complications. But it requires additional performance time, technical skills and has its own inherited side effects such as urinary retention, hypotension and post-dural puncture headache (PDPH) etc.[3]

Hence we planned this study which compared the effect of general and combined spinal epidural anaesthesia (CSEA) on intraoperative hemodynamic changes, patient's and surgeon's satisfaction, complication and 24 hour analgesic consumption. Secondary outcomes for the study included anaesthesia time, operative time, postoperative pain scores and time to first rescue analgesia.

Material and Methods:

The study was approved by Hospital Ethical Committee and informed consent from all the participants was obtained. Sixty female patients in the age group of 30-60 years belonging to American Society of Anesthesiologists physical status I or II, scheduled to undergo total abdominal hysterectomy under pfannenstiel incision were enrolled in this prospective randomized study. Patients with coagulation abnormalities, morbid obesity (BMI >35), vertebral deformities and refusal for regional anaesthesia were excluded from the study.

All the patients were randomly allocated to one of the Two groups (n = 30 each) depending upon type of anaesthesia received. Group G received GA with epidural catheter for postoperative analgesia. Group C received CSEA using needle through needle technique. Patients were examined preoperatively and were subjected to complete general physical as well as systemic examination. All routine investigations were carried out. Patients were kept fasting for 6 h and premedicated with oral alprazolam 0.25 mg at the previous night and 2 h preoperatively. In the operating room, after the establishment of intravenous line, all the

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patients were monitored for noninvasive blood pressure, electrocardiography and pulse oximetry, using Philips IntelliVue MP50 monitor.

In group G patients, epidural catheter was placed in L_{3-4} in sitting position under aseptic conditions prior to induction. Induction of anaesthesia was achieved with injection glycopyrrolate (0.2mg), injection thiopentone sodium 5 mg/kg, and inj vecuronium bromide (0.1 mg kg-1) was given to facilitate endotracheal intubation. All patients were manually ventilated using oxygen 33%, nitrous oxide 67% and isoflurane 1% for 180 seconds. Intubation was performed with appropriate size endotracheal tube. Analgesia was maintained using Inj fentanyl (2 µg kg -1). At the end of surgery all the patients were extubated after reversal of neuromuscular blockade with intravenous glycopyrrolate 0.02 mg kg-1 and neostigmine 0.05 mg kg-1.

Group C received CSEA at L_{2-3} or $L_{3-4,}$ using needle through needle technique. With 18G Tuohy needle epidural space was localized using loss of resistance technique, and thereafter dural puncture was done with 27G spinal needle. Three ml (15mg) of 0.5% hyperbaric bupivacaine was injected intrathecally. Further epidural catheter will be inserted 3cm into epidural space. Surgery was commenced when the desired sensory level of $T_4$was achieved. The epidural catheter was left in place in both the groups for postoperative pain control. Plain Bupivacaine was supplemented through epidural catheter when Visual analogue scale (VAS) > 3 in the postoperative period.

Heart rate (HR) and Mean arterial pressure (MAP) were monitored every 5 minutes and recorded at an interval of 5, 10, 15, 30, 60 minutes and at the end of surgery. Hypotension and bradycardia was defined as 20% reduction from base line values and was treated with injection ephedrine. Approx. blood loss (ml) was calculated by measuring loss in suction, number of sponges soaked in blood and by recording the pre and immediate postoperative hemoglobin and hematocrit values. Anaesthesia time was calculated from start of anaesthesia to extubation in group G or end of surgery in group C. Operative time was calculated from skin incision to skin closure. Surgeon's satisfaction with the anaesthesia technique in relation to muscle relaxation and blood loss and patient's satisfaction with the anaesthesia procedure in terms of pain relief, comfort and acceptance as a choice for future were recorded. Quality of pain relief immediately in recovery was judged by VAS between 0 and 10 (0=no pain, 10=most severe pain).Time to first rescue analgesia and total dose of bupivacaine (in mg) in 24 hours postoperatively via epidural catheter in both the groups was observed. Intraoperative supplementation if any through epidural (in mg) and any conversion to GA in CSE group was noted.

***Statistical analysis*:** The data obtained was compiled and analysed using SPSS (Statistical package for social sciences) version 20, Sample size was calculated as 10% of, total number of, total abdominal hysterectomies done in our institute, in three consecutive years. Qualitative data was analysed using Yates corrected Chi square test and Fisher exact test and Quantitative data was analysed using students paired t and unpaired t-test and Mann Whitney test. All clinical data were presented as Mean±SD, median and number of patients. P value < 0.05 was considered significant.

Results:
Data of all 60 patients enrolled in the study were included in the analysis. The mean age, weight, height and BMI of the subjects were comparable in both groups [Table 1]. Hemodynamic parameters HR and MAP are shown in Tables 2 and 3 and represented graphically in Figures 1 and 2. Mean HR in group G showed statistically significant increase immediately after anaesthesia and at end of surgery as compared to group C. Mean MAP was lower in group C at all-time intervals till the end of study as compared to group G and was statistically significant ($p<0.05$). None of the patients in either group had SpO2 less than 90%.

Average blood loss in group G and C was 225.3± 84.3 and 150± 67.3 respectively. This difference in blood loss was significant ($p<0.05$). The change in mean hemoglobin concentration and hematocrit of two groups was assessed and shown in table 4. Two patients in group G was transfused 1 unit of packed blood cells intra-operatively due to increased blood loss while none of patient in group C received any blood transfusion. However this difference of blood transfusion was comparable ($p =0.49$).

Side-effects pertaining to the groups (Fig 3), mean anaesthesia time and operative time (table 5) were other parameters recorded. Surgeon's satisfaction was judged on three criteria (Table 6) and patient's satisfaction was assessed on four parameters (table 7). All these observation were comparable statistically for both the groups.

Pain relief was better in group C as there was only one patient (3%) with VAS > 3 as compared to four patients (13%) in group G. This difference was comparable between the two groups ($p=0.35$). Three patients in group C received intraoperative epidural supplementation, because of prolonged duration of surgery (>2hours) in two and inadequate level of block in one patient. The mean time to rescue analgesia was 36.0±17.6 minutes and 121.3±41.8 minutes in group G and group C respectively. The mean time to rescue analgesia was significantly more in group C as compared to group G ($p<0.05$). In group G mean dose of bupivacaine in 24 hours postoperatively via epidural catheter was 94.1±21.4 mg while in group C it was 76.7±26.9 mg.

Discussion:
Among the various regional anaesthesia techniques used for total abdominal hysterectomy combined spinal epidural anaesthesia has gained popularity over years and has become a popular technique for various gynaecological surgeries.[4] Various advantages of CSEA reported over other regional techniques like spinal and epidural are, it provides fast and reliable segmental anaesthesia with minimal risk for toxicity followed by excellent analgesia in the postoperative period. [5] In our study, we compared the effect of general and combined spinal epidural anaesthesia on intraoperative hemodynamic changes, blood loss, patient's and surgeon's satisfaction, complication and 24 hour analgesic consumption.

In our study, both groups were comparable regarding age, weight and height distribution. In the present study, baseline hemodynamic parameters HR and MAP were comparable in both groups but group C patients showed better hemodynamic profile, HR remained near baseline, till the end of study period while in group G there is slight rise in above parameters following induction of anaesthesia. The rise can be due to stress response associated with laryngoscopy and intubation.[6] Similar but sustained pattern is seen MAP in the group G. Abdallah et al[7] in their comparative study of GA versus CSEA on patients undergoing cesar-

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ean section observed the similar results. Our results are similar to what Nakano et al[8] reported. However, study by Hadimioglu et al [9] conducted in patients undergoing renal transplant did not show any difference in hemodynamics in two groups. It could be because their patients were having chronic kidney disease (CKD) associated with various metabolic changes.[10]

The biggest advantage, for which regional anaesthesia (RA) is used more frequently, is that, it provides hypotensive anaesthesia by decreasing MAP and hence decreases the blood loss.[11] Nakano et al[8] and Wodlin et al.[12]documented significantly less blood loss in CSEA group.

Decreased intraoperative blood loss had been reported in RA as compared to GA. Kuzgunbay et al[13] and Tangpaitoon et al[14] in their studies done in patients undergoing PCNL observed that haemoglobin and hematocrit values although decrease significantly from preoperative levels in both the groups. However, when compared, in between the groups statistically this change was comparable. We also observed the similar observation in patients undergoing abdominal hysterectomy.

Most of the complication seen in our study are inherent to anaesthesia technique used like hypertension (7%), tachycardia (7%), laryngospasm (3%) seen only in group G. Stress, as already stated is a well-known entity associated with GA.[6] Laryngospasm is also known to occur in 0.75% to 5% of cases as reported by Mevorach.[15] Regional anaesthesia is devoid of all the above complications, but it bears its own side effects of Hypotension and bradycardia. Bradycardia is attributed to fall in right atrial filling, which decreases outflow from intrinsic chronotropic stretch receptors, located in the right atrium and great veins, decrease venous return and can also result from blockade of the cardioaccelerator fibers arising from T1 to T4.[16] We also observed hypotension and bradycardia in group G, which could be because of increased blood loss[17] or stretch on viscera[18] or effect of anaesthetic agents used in GA.[19] Similar pattern of bradycardia and hypotension was seen in the studies of Hadimioglu et al[9] and Karacaler et al.[20] In our study there are more patients with complaint of nausea and vomiting in group C (20% in group C versus 13% in group G). Wodlin et al[12] hypothesized that nausea and vomiting might be triggered by empty stomach during the surgery or by the gastric paralysis after intra-abdominal surgery. Conventionally, GA causes more postoperative nausea and vomiting, as also reported by Callesen et al.[21]

There is great variability in operative time in literature, Wodlin et al[12] reported 75 and 70 minutes in GA and RA group respectively. Callesen et al[21] documented this time as 85 minutes in GA and 92 minutes in CSEA group. However, anaesthesia time in TAH patients was 124 and 115 minutes in GA and RA group respectively as noted by Wodlin et al[12] which was similar to the pattern seen in our study. Difference between anaesthesia and operative time in groups of our study it is more in the group G (15.2±3.6 minutes) as compared to group C (6.0±1.8 minutes). In between groups, when compared, this difference is statistically significant ($p<0.05$). It is expected that time taken for the anaesthesia or surgery will also depend upon the skill of anaesthesiologist and surgeon, along with the nature of surgery and type of anaesthesia used. Although in our study, operative time is similar in both the groups. This difference is mainly due to anaesthesia time which could be because of additional time taken for reversal and extubation in the GA group.

Surgeon's satisfaction in our study is more in group G but on one parameter i.e. bleeding, there is full consensus (100%) for group C. But statistically results are inconclusive. In the study of Karacalar et al[20] done in PCNL patient's, surgeon's satisfaction was good, in 100% of patients in GA group and 98.8% in spinal-epidural group with no significant difference. Ours, is the first study, to comment on surgeon's satisfaction in total abdominal hysterectomy while comparing CSEA with GA. We observed that CSEA can be a good alternative to general anaesthesia in patients undergoing TAH.

Patient's satisfaction is better in the group C, in our study. There is no statistical difference in between the two groups. Our results are in contrast to the study of Karacalar et al[20] and Tangpaitoon et al[14] who observed significantly better patient's satisfaction in CSEA group in patient undergoing PCNL. It may be because, the type of pain encountered in PCNL surgery, is different from the pain being experienced in total abdominal hysterectomy cases and prone position may add on to patient discomfort.

Postoperative opioid consumption and pain scores, are reported to be higher in GA group as compared to spinal anaesthesia group.[1,14]The mean time to first rescue analgesia is greatly increased in group C as compared to group G and this difference was statistically significant ($p<0.05$). Regional anaesthesia is known for its opioid sparing action[22] comparing bupivacaine requirement, in postoperative period which is proved by fact that the Patients in group C of our study required significantly less bupivacaine as compared to group G.

We conclude that both CSEA and general anaesthesia can be used safely in patients undergoing total abdominal hysterectomy. But combined spinal epidural anaesthesia provides good hemodynamic stability, less blood loss and more patient satisfaction in terms of pain relief. But large multicentric trials are needed to arrive a definite conclusion.

Legend of table

Table 1: Distribution of age, weight, height, BMI

	Group G (n = 30)	Group C (n = 30)	p-value in between groups
Age (years)	45.4±6.76	46.8±6.0	0.38
Weight (kg)	58.1±7.32	56.9±10.1	0.60
Height (cm)	154.3±5.0	153.8±5.0	0.74
BMI (kg/m^2)	24.4±3.2	24.4±4.5	1.0

Table 2: Heart rate variations at various time intervals in two groups

Time intervals	Group G	Group C	p-value in between groups
T_0	92.7±10.0	89.7±11.2	0.27
T_1	94.0±11.0	86.2±12.5	<0.05
T_2	88.7±10.9	83.7±12.3	0.10
T_3	84.4±11.3	82.6±13.3	0.57
T_4	84.5±9.2	80.8±16.0	0.28
T_5	82.6±7.7	82.2±12.7	0.88
T_6	82.1±9.0	80.1±9.9	0.41
T_7	85.5±7.9	80.6±10.1	<0.05

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Table 3: MAP variations at various time intervals in two groups

Time intervals	Group G	Group C	p-value in between groups
T_0	92.0±10.7	87.1±10.3	0.07
T_1	97.7±16.7	84.7±11.0	<0.05
T_2	92.7±11.6	84.5±11.8	<0.05
T_3	91.3±12.2	79.0±10.4	<0.05
T_4	92.5±9.6	79.3±9.9	<0.05
T_5	92.2±11.1	79.5±9.8	<0.05
T_6	91.3±11.0	82.0±8.7	<0.05
T_7	96.1±9.0	83.9±10.7	<0.05

Table 4: Change in Hb and Hct

		Preop	Postop	Change	p-value within the group
Hb (gm %)	Group G	10.7±1.1	10.0±0.8	0.7±0.7	<0.05
	Group C	10.6±1.1	10.2±1.0	0.4±0.5	<0.05
	p-value in between groups	0.74	0.34	0.07	------
Hct (%)	Group G	31.5±1.8	30.3±1.4	1.7±1.4	<0.05
	Group C	31.5±2.4	29.7±2.1	1.1±1.2	<0.05
	p-value in between groups	1.0	0.20	0.09	-------

Table 5: Anaesthesia time and operative time

	Group G	Group C	p-value in between groups
Anaesthesia time (minutes)	94.2±26.1	87.7±28.6	0.36
Operative time (minutes)	79.0±26.0	81.7±28.9	0.69
Difference (minutes)	15.2±3.6	6.0±1.8	<0.05

Table 6: Surgeon's satisfaction

	Group G (n=30)	Group C (n=30)	p-value
Acceptable bleeding [n (%)]	28(93%)	30(100%)	0.15
Acceptable muscle relaxation [n (%)]	28(93%)	27(90%)	0.64
Overall satisfaction [n (%)]	28(93%)	27(90%)	0.64

Table 7: Patient's satisfaction

	Group G (n=30)	Group C (n=30)	p-value in between groups
Pain relief [n (%)]	26(87%)	29(97%)	0.87
Comfort [n (%)]	26(87%)	27(90%)	0.68
Acceptance for future [n (%)]	26(87%)	26(87%)	1.0
Overall satisfaction [n (%)]	26(87%)	27(90%)	0.68

Legends of figure

Figure 1: graph showing Heart rate variations at various time intervals in two groups

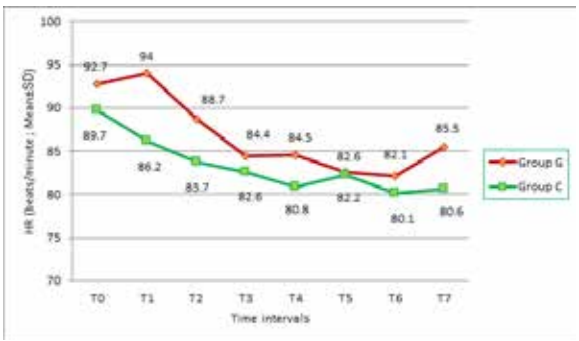


Figure 2: graph representing MAP variation at various time intervals in two groups

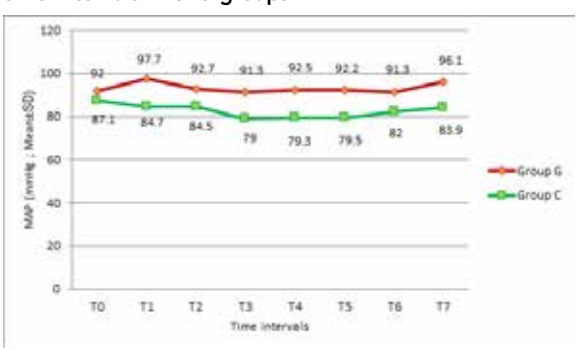
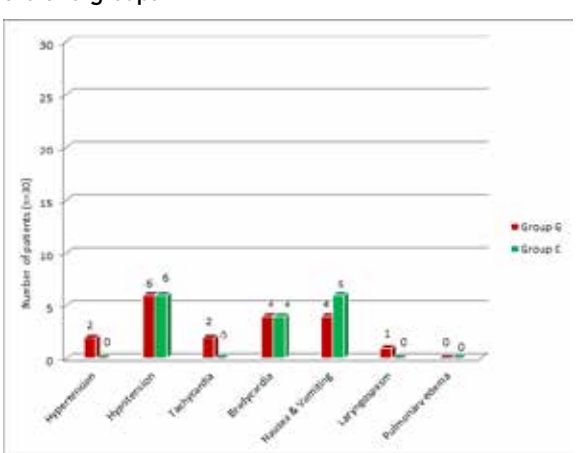


Figure 3: graph showing Distribution of complications in the two groups



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