

# Efficacy of Combined Epidural General Anaesthesia for Attenuating Haemodynamic Responses in Gynaecological Laparoscopic Surgery

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## ABSTRACT

**Introduction:** General anaesthesia is preferred technique for Laparoscopic surgeries, but laparoscopy itself associated with significant haemodynamics stress response which may impose a challenge to anaesthesiologist. Epidural anaesthesia along with general anaesthesia can have added advantage to provide stable haemodynamics in such situations. The present study aimed to evaluate the efficacy of epidural anaesthesia in combination with general anaesthesia for maintaining stable haemodynamics and better operative field in laparoscopic gynaecological surgeries.

**Material and Methods:** Fifty patients of American society of anaesthesiologist status I and II, aged between 18-60 years, underwent elective laparoscopic gynaecologic surgeries, were randomly allocated into two equal groups of 25 each. Control Group received plain GA (GA) while Study Group received combined GA with Epidural anaesthesia (CEGA). Haemodynamics were compared at various stages (at preinduction, post induction, insufflation, desufflation and extubation). Surgeons satisfaction about operating conditions in form of poor, good and excellent were also noted. Statistical analyses were performed using unpaired t-test. A  $p < 0.05$  was considered as significant.

**Results:** Systolic and diastolic pressures were successfully attenuated in CEGA group while heart rate didn't change significantly. There was significant rise in heart rate, systolic blood pressure, and diastolic blood pressure in plain GA group. Operating conditions subjectively assessed by surgeons, which was excellent in CEGA group, and not good in plain GA group.

**Conclusion:** Combined epidural and general anaesthesia technique can be used in laparoscopic surgery, where we want to avoid stress response, maintain better haemodynamics without hypotension and bradycardia with better surgical field due to bowel contractions.

**Keywords:** Combined epidural and general anaesthesia, gynaecological laparoscopic surgery, haemodynamics, stress response

## INTRODUCTION

Laparoscopy is becoming one of the most common surgical procedures performed in gynaecological surgeries as well as in general surgeries. General anaesthesia, epidural anaesthesia and combined general plus epidural anaesthesia are the options available for such surgeries.<sup>1</sup> Anaesthesiologists have to compensate for haemodynamic and respiratory changes, majority of which are due to CO<sub>2</sub> pneumoinflation and various positions given for surgery.<sup>2,3</sup> Adding epidural to general anaesthesia can attenuate the haemodynamic changes associated with pneumoinflation by decreasing systemic vascular resistance (SVR), decreasing mean arterial blood pressure (MAP) and maintaining cardiac index as

well as it will decrease the requirements of various anesthetic agents.<sup>2,4</sup> It may provide better haemodynamic stability when combined with general anaesthesia during laparoscopic surgery. It also improves surgical field by contraction of bowels due to sympathetic blockade.<sup>4-6</sup> Epidural analgesia in the postoperative period may improve respiratory function, decrease perioperative cardiac complications, improve well being of the patients and facilitate early ambulation as well as return of bowel function.<sup>3,6</sup> Thus we decided to study the comparison of haemodynamic effects of general anaesthesia plus epidural anaesthesia versus general anaesthesia for gynaecological laparoscopic surgery.

## MATERIAL AND METHODS

A prospective randomized study titled, "Efficacy of Combined Epidural General Anaesthesia for attenuating Haemodynamic responses in Gynaecological Laparoscopic Surgery" was carried out in 50 patients after Institutional Ethics Committee approval, who were divided into 2 groups with 25 patients in each group according to computer generated random digits. Sample was based on inclusion exclusion criteria. Group I (GA) Patients received plain GA and Group II (CEGA) - Patient received GA and epidural anaesthesia. Patients, aged 18-60 years, of American Society of Anaesthesiologists (ASA) I and II scheduled for elective gynaecological laparoscopic surgery lasting for 2-4 hours were selected. Exclusion Criteria were patient's refusal, pregnant patients, having allergy to propofol / local anaesthetic, contraindication to epidural anaesthesia (e.g. local site infection, increase ICT etc.) and surgeries converted into open surgery. Our aim was to compare following parameters in combined general and epidural anaesthesia versus general anaesthesia given for laparoscopic surgeries. Haemodynamic responses which include heart rate (HR), systolic blood pressure (SBP) and diastolic blood pressure (DBP), surgical field and side effects / complications.

After written informed consent was obtained, all patients were preloaded with 8-10 ml kg<sup>-1</sup> Ringer Lactate. Standard monitoring including HR, electrocardiogram (ECG), non-invasive blood pressure (NIBP), oxygen saturation (SpO<sub>2</sub>),

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and endtidal carbondioxide (EtCO<sub>2</sub>) was done in both the groups. CEGA group received lumbar epidural (L<sub>2-3</sub> / L<sub>3-4</sub>) in sitting position under all aseptic precautions. Catheter was fixed with 5 cm length in epidural space and test dose of 2% adrenalised lignocaine was administered to rule out intravascular or intrathecal catheter placement. After 5 min, patient received premedication with intravenous (iv) glycopyrrolate (0.002mgkg<sup>-1</sup>), ranitidine (1mgkg<sup>-1</sup>), ondansetron (0.08mgkg<sup>-1</sup>), midazolam (0.03mgkg<sup>-1</sup>) and fentanyl (2µgkg<sup>-1</sup>).

Standard general anesthesia technique was used in both groups. After preoxygenation with 100% oxygen for 3 minutes, Induction was done with propofol and endotracheal intubation facilitated by iv succinylcholine. Maintenance was done with O<sub>2</sub>+N<sub>2</sub>O (FiO<sub>2</sub> 0.4) and propofol infusion along with intermittent dose of vecuronium. After induction 4cc bolus 0.25% epidural bupivacaine was given in CEGA group. 20min after the bolus, 0.25% bupivacaine continuous epidural infusion 4ml/hr was started. Intraabdominal pressure was maintained below 15 mm Hg. Propofol and epidural infusion were stopped after desufflation and total pneumoperitoneum time was noted. Any incidence of hypotension and bradycardia was noted. Hypotension defined as SBP < 90mmHG or >20% reduction in preoperative SBP and bradycardia defined as pulse rate (PR) < 50/min.

Monitoring of HR, SBP, DBP, SpO<sub>2</sub>, and EtCO<sub>2</sub> was done every 5 min. and at specific stages like pre-operative, after premeditation, after induction, after trendelenberg position, after insufflation, after desufflation, reversal and every 10 min in postoperative period. Blood loss, surgical field were noted. Surgeon's opinion was taken regarding field of surgery with respect to bowel contraction and blood loss and asked them to grade as excellent, good or poor. Reversal was with i.v. atropine 0.02mg/kg and i.v. neostigmine 0.05mg/

kg. and extubation was carried out after standard criteria's were achieved.

Postoperative haemodynamics monitoring, SpO<sub>2</sub>, and respiratory rate (RR) for both groups was done for one hour. For postoperative pain relief iv tramadol 1mg/kg for GA group and epidural tramadol 1mg/kg for CEGA group with iv ondansetron was administered. Patients were observed for any post operative complications.

## STATISTICAL ANALYSIS

Continuous data are presented as mean±{standard deviation, (S.D.)}. Study was analyzed by using unpaired t test for intergroup and paired t test for intragroup variables. p-value <0.05 was considered as statistically significant.

## RESULTS

Both groups were comparable with respect to age, sex, weight, height and baseline haemodynamics parameters. Following induction in CEGA group HR, SBP, DBP were 80±10, 116.64 ± 11.83, and 78.36 ± 6.04 respectively and in GA group HR-83±12, SBP-126.56±8.02, DBP-84.84±7 (Figure 1,2,3). In CEGA group increase in SBP and DBP were successfully attenuated (P<0.05) while no statistically significant change in heart rate was observed. However; in GA group SBP and DBP increased by 10.6% and 10.9% respectively which was statistically significant (P < 0.05).

At the stage of pneumoinsufflation, in CEGA group the HR, SBP, DBP were 83±11, 113±11, 73±7 respectively and in GA group HR, SBP, DBP: 94±9, 131±14, 83±8, respectively. As evident from figure 1,2,3 in CEGA group combined epidural and general anaesthesia successfully attenuated stress response to pneumoperitoneum while in GA group plain GA failed to attenuate stress response to pneumoperitoneum as

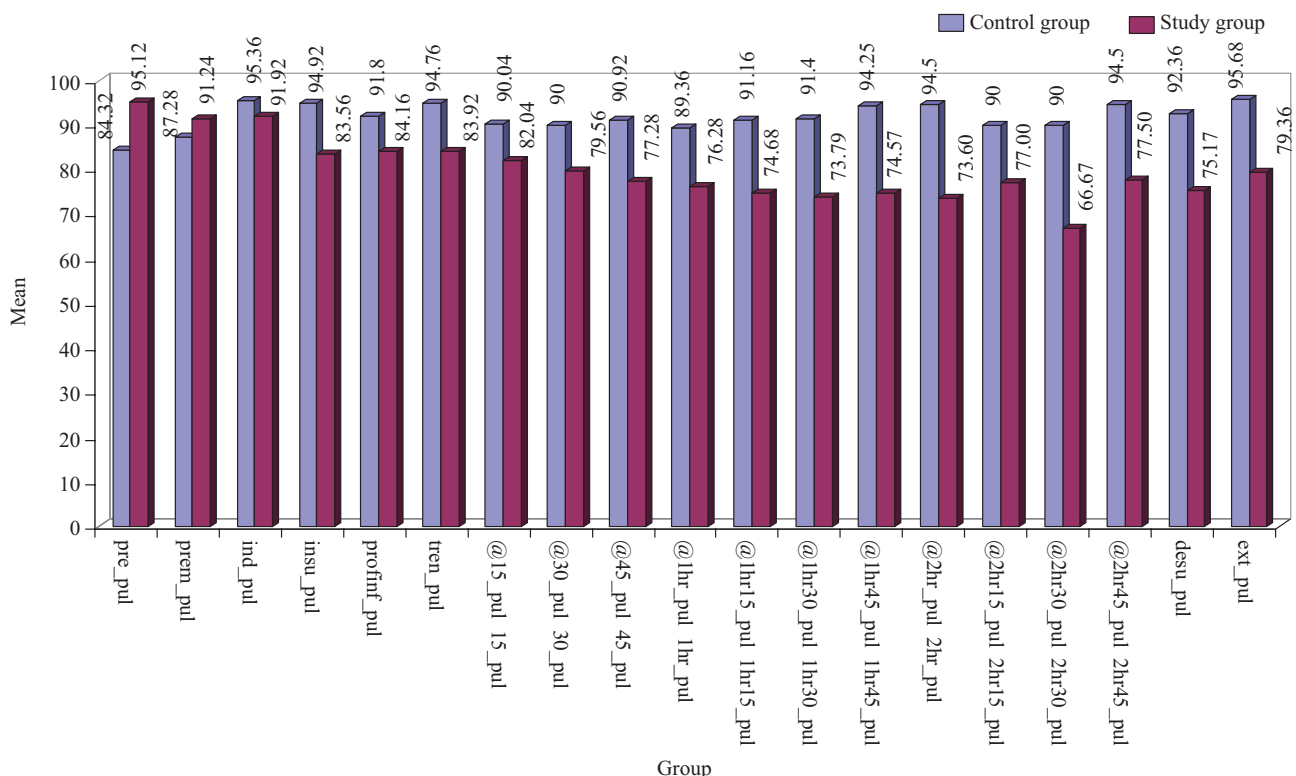


Figure-1: Comparison of mean of pulse (/min) of study(CEGA) and control group (GA)

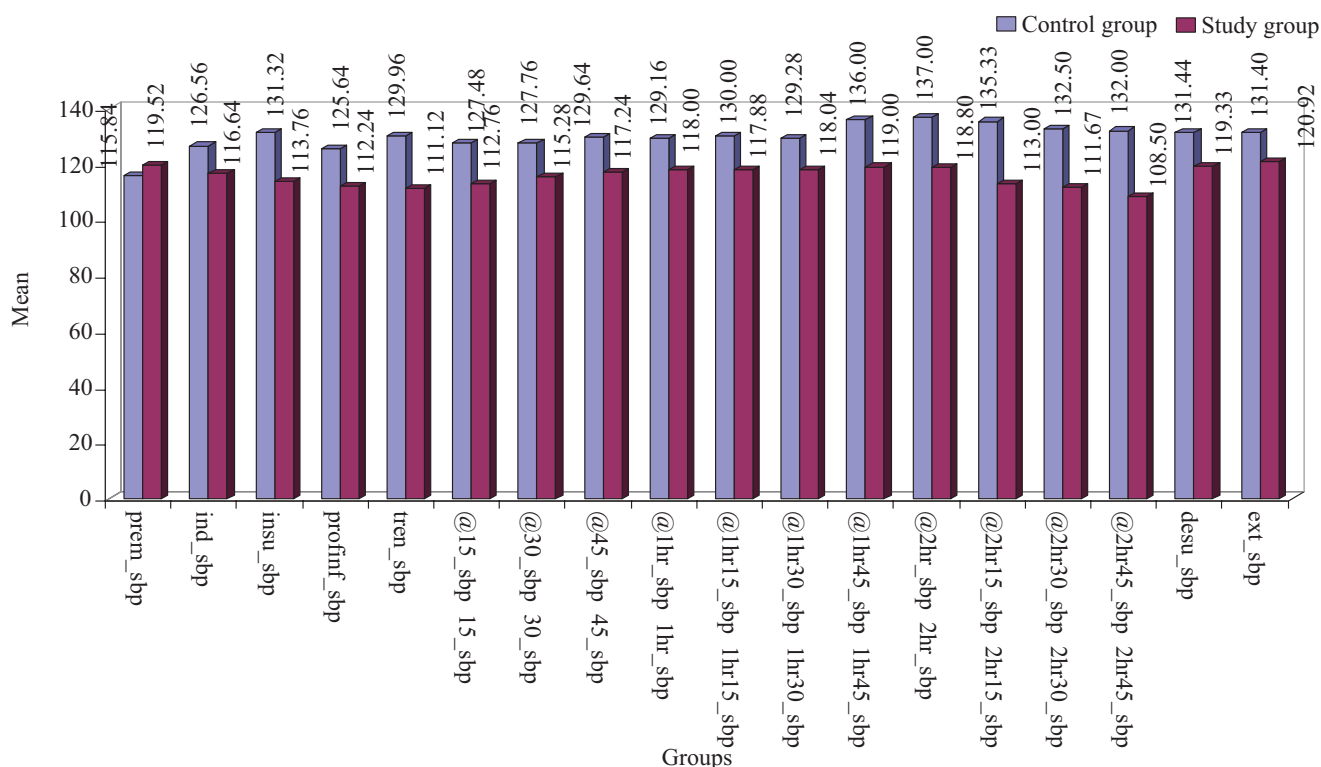


Figure-2: Comparison of mean of systolic blood pressure (in mm Hg) of study (CEGA) and control group(GA)

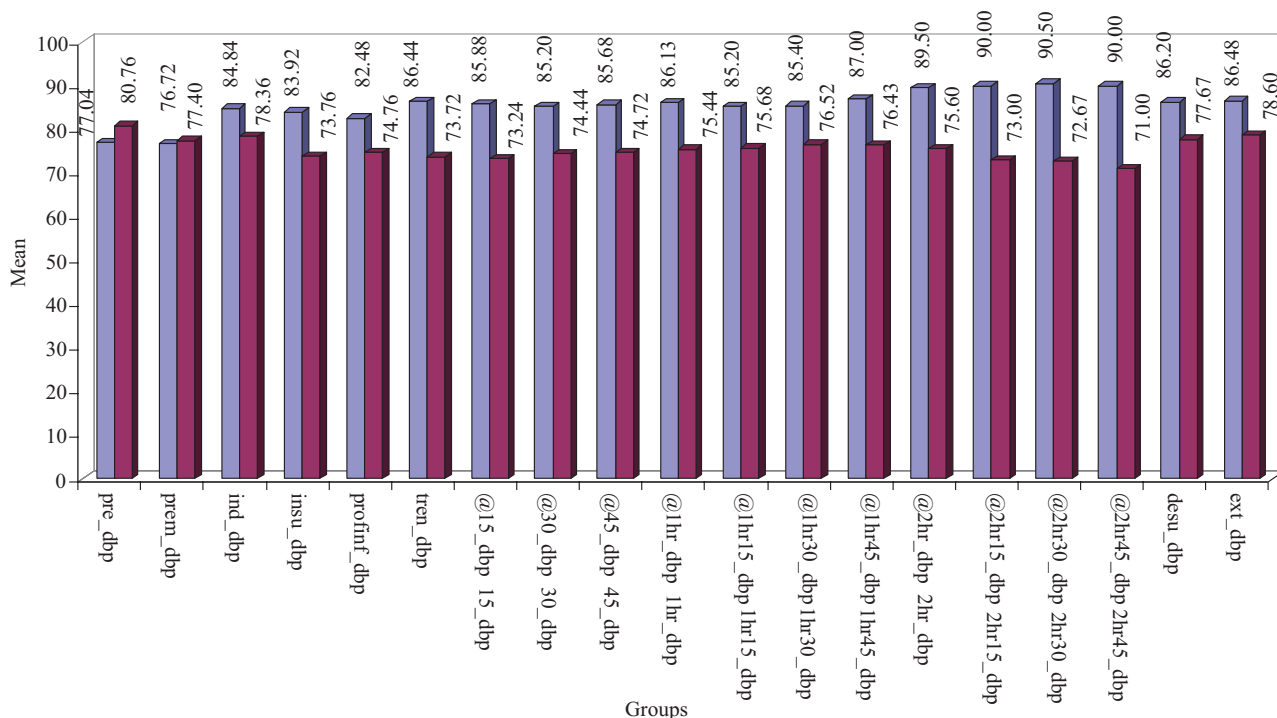


Figure-3: Comparison of mean of diastolic blood pressure (in mmHg) of study (CEGA) and control group (GA)

HR, SBP, DBP ↑ by 12%, 11%, 12% respectively which was statistically very significant with P value <0.03. Similarly, intraoperative at various stages, general anaesthesia with epidural anaesthesia was better in maintaining haemodynamic parameters while in plain GA group general anaesthesia failed to attenuate the stress response associated with pneumoinsufflation, Trendelenberg position, desufflation and extubation with P< 0.05 which was statistically significant. In both groups no complications like hypotension,

bradycardia or any other side effects were observed. In our study operating conditions assessed subjectively by surgeons were better in the CEGA group. In CEGA group it was “excellent” in 18 cases i.e.72%, “good” in 6 i.e. 24% and in one case (4%) it was poor. In GA group it was “good” in 17cases (68%) and “poor” in 8 (32%) cases (Table 1).

**DISCUSSION**

Laparoscopy is a minimally invasive procedure allowing en-

Operating Condition	Excellent	Good	Poor
Group I (control)	0 cases (0%)	17cases (68%)	8 cases (32%)
Group II (Study)	18 cases (72%)	6 cases (24%)	1case (4%)

**Table-1:** Comparison of Operating conditions in study(CEGA) and control group (GA)

doscopic access to the peritoneal cavity after insufflation of a gas (CO<sub>2</sub>) to create space between the anterior abdominal wall and the viscera. This space is necessary for the safe manipulation of instrument and organs. The three major forces that uniquely alter patient's physiology during laparoscopy are; the increase in intra abdominal pressure and volume which are transmitted to the thorax, the effects of patient positioning Trendelenberg, reverse Trendelenberg and lateral position and Carbon dioxide pneumoinsufflation which is not inert. It may have profound effects at local tissue level. These three forces separately or in combination have profound effects on the patients' haemodynamic, respiratory and metabolic functions.<sup>7,8</sup>

Pharmacological and interventional methods have been used to attenuate the haemodynamic stress response during laparoscopic surgery in various studies.<sup>9-14</sup> Novak JV et al<sup>9</sup> used clonidine successfully as epidural for blunting the stress response. Maharjan SK<sup>10</sup> concluded in his study that propranolol a beta blocker effectively blunts the stress response during laparoscopic cholecystectomy. Regional techniques also being used to blunts the stress response in combination with general anaesthesia for laparoscopic surgeries.<sup>11-14</sup>

In our study, at the time of premedication HR, SBP, DBP were comparable in both the groups. Following induction and at the stage of pneumoinsufflation in CEGA group, increase in haemodynamics was successfully attenuated and remained stable throughout the procedure while in GA group, plain GA failed to attenuate stress response. Calvo et al<sup>12</sup> observed post pneumoperitoneum in GE group SBP and DBP were reduced to 6-8% from base line and stable throughout the surgery. Pan YS<sup>15</sup> et al had observed that intraoperatively MAP was significantly lower in the GE group than that in the G group and the difference was statistically significant ( $P < 0.05$ ). Intraoperatively, HR in the GE group was reduced compared with that of the G group. At all time points, the MAC concentration of isoflurane inhaled was significantly lower in the GE group than that of the G group.<sup>15</sup> Tekelioğlu UY et<sup>16</sup> studied haemodynamics responses in gynaecological laparoscopic surgery under plain GA and found that MAP and HR were significantly increased from 69.7±1.55 to 82.9±3.05 ( $p < 0.05$ ) and 76.9±9.43 to 95.2±12.1 ( $p < 0.05$ ) respectively during pneumoperitoneum. Therefore, we can state that EA helps to provide stable haemodynamics in laparoscopic surgeries along with GA. Even the surgeries which are not laparoscopically done but epidural anaesthesia has proved its effectivity in maintaining stable haemodynamics when combined with GA such as Funayama T et al<sup>17</sup> found that MAP was depressed significantly in study group (combined general anaesthesia and thoracic epidural anaesthesia) ( $P < 0.05$ ) without depressing CO and pulmonary haemodynamics and they concluded that combined thoracic epidural and general anaesthesia maintained systemic haemodynamics well without depressing pulmonary haemodynamic in thoracic surgery.

In the present study at different stages of laparoscopic surgery e.g. at Pneumoinsufflation, Trendelenberg position, desufflation, extubation in CEGA Group systemic haemodynamic changes were attenuated and vital parameters were maintained stable ( $P < 0.05$ ) without any complications like hypotension and bradycardia. Luchetti M. et al<sup>18</sup> showed CEGA can control pain due to CO<sub>2</sub> induced peritoneal irritation, providing intra and postoperative analgesia in laparoscopic cholecystectomy. Hence, apart from maintaining stable haemodynamics one of the added advantages of epidural anaesthesia is providing intraoperative and prolonged postoperative analgesia if required. Yun-song et al<sup>19</sup> used epidural anaesthesia as preemptive analgesia in retroperitoneal laparoscopic adrenalectomy and they found decreased in requirement of anaesthetic agents and other vasoactive drugs to blunt the stress response.

The epidural anaesthesia can effectively block the nerve conduction pathway of noxious stimulations.<sup>12,20</sup> Thus, general anaesthesia combined with preemptive epidural analgesia can provide a good surgical environment and a lighter stress status for retroperitoneal laparoscopic surgeries. Q DM<sup>21</sup> et al and Vera Von Dossow, et al<sup>22</sup> showed that combined general anaesthesia and epidural anaesthesia blunt the stress response during thoracic surgery. Q DM<sup>21</sup> et al also reported that the cortisol concentration in CEGA group was significantly lower as compare to in plain GA group and it is the main steroid hormone responsible for stress response.

In presence of epidural anaesthesia as requirement of anaesthetic drugs is decreased thus resulting in quick awakening and extubation at the end of surgery. The use of other vasoactive drugs is also reduced in presence of epidural anaesthesia such as esmolol, metoprolol, nicardipin for attenuating the stress response. Calvo et al<sup>12</sup> compared the efficacy of both regional techniques, combined general epidural anaesthesia and spinal anaesthesia in laparoscopic surgeries and found the results were comparable in both groups in blunting the stress response during pneumoperitoneum. Ghodki PS et al<sup>14</sup>, Studied the effectivity of combined spinal and general anaesthesia (SGA) for laparoscopic surgery and found that the average requirement of isoflurane and metoprolol during pneumoperitoneum was significantly higher in group GA as compared to group SGA ( $P < 0.001$ ). However; the Use of spinal anaesthesia in combination with GA may result into exaggerated and uncontrolled hypotension while CEGA provides effective control over haemodynamics.

De Canniere D<sup>23</sup> et al showed that combination of lumbar epidural with general anaesthesia for colon surgery maintained contracted bowel and excellent field of surgery due to its preponderance of the parasympathetic nervous system allowing the release of hormones with intestinal tropism. In our study operating conditions were excellent in the group CEGA. It was graded by surgeons as "excellent"; "good"; "poor". It was "excellent" in 18 cases i.e.72% in CEGA

group, “good” in 6 i.e.24% and in one case (4%) it was poor in CEGA group. It was “good” in 17cases (68%) and “poor” in 8 (32%) cases in GA group.

## CONCLUSION

In conclusion, a combined epidural and general anaesthesia technique attenuated systemic haemodynamic changes due to stress response and maintained stable vital parameters at different stages of laparoscopic surgery without any complications like hypotension and bradycardia. In addition, excellent surgical field due to bowel contraction makes it acceptable amongst surgeons. Thus this technique can be used in all patients including hypertensive patients and patients with cardiac disease undergoing laparoscopic surgeries for attenuating stress response and maintaining stable haemodynamic parameters.

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