Evaluation of Inj. Clonidine in Maintaining Haemodynamics During Laparoscopic Operative Procedures

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ABSTRACT

Pneumoperitoneum usually with CO2 insufflations created during laparoscopic operative procedures affects several homeostatic systems leading to adverse effects on cardiovascular and pulmonary physiology and produces stress response. There is increase in pulse rate, systolic blood pressure and decrease in cardiac output and increase in systemic vascular resistance. Clonidine an α2 agonist with its central sympathetic action attenuates the cardiovascular adverse effects and provide intraoperative as well as postoperative analgesia. In the present study, 60 ASA grade I and II of either sex between age range of 18–60 years and weight range of 45–70 kg were divided into 2 equal groups of 30 each. Group A served as control group A, received inj. Midazolam 0.03 mg/kg and inj. Pentazocine 0.3 mg/kg as premedication 15 minutes prior to induction of anaesthesia and group B received inj. Clonidine 1 µgm/kg as premedication before induction of anaesthesia. Anaesthesia was induced with inj. Thiopentone 5 mg/kg and inj. Vecuronium 0.1 mg/kg in all patients. All patients were maintained on oxygen, nitrous oxide and inj. Propofol infusion on IPPV. Pneumoperitoneum was created with CO2 and intra-abdominal pressure was maintained on 15 mm Hg. All patients were observed for changes in pulse rate, systolic blood pressure, ETCO2 throughout intraoperative period. Normocapnia was maintained. It was observed that Clonidine group provided statistically significant cardiovascular stability with less increase in pulse rate and systolic blood pressure. The requirement of additional analgesic drugs was minimum in Clonidine group with minimal sedation. Thus, it was concluded that premedication with inj. Clonidine in dose of 1 µgm/kg prior to induction of anaesthesia provides effective cardiovascular stability and attenuates the increase in pulse rate, systolic blood pressure, decrease in cardiac output and increase in systemic vascular resistance secondarily to sympathetic stimulation secondary to pneumoperitoneum during laparoscopic surgeries.

KEYWORDS


INTRODUCTION

New techniques, use of new drugs and research in medical fraternity is key to successful outcome in any field. Adaptation of new surgical skills require corresponding developments in anaesthesia techniques. Both fields go hand-in-hand for recent advances.

Chronic cholecystitis is usually treated by open exploratory laparotomy under routine balanced anaesthesia technique. The surgical procedure ought to be prolonged one with considerable stress and strain of anaesthesia and surgery. Due to prolonged operative anaesthesia, there were chances of postoperative complications and delayed hospital stay. Laparoscopic intervention has revolutionized tremendous ease in the procedure. To fulfil this, the anaesthesiologist has to adopt new techniques and use newer drugs in anaesthesia with minimum morbidity and mortality. Laparoscopic cholecystectomy has now become the gold standard for chronic cholecystitis. For ease of surgical procedure, creation of pneumoperitoneum is mandatory.

Usually pneumoperitoneum affects several homeostatic systems leading to alteration in acid base balance, cardiovascular and respiratory physiology and stress response. Under cardiovascular there were changes as increased pulse rate, increase in mean arterial pressure, decrease in cardiac output and increase in systemic vascular resistance which in turn compromises tissue perfusion. Various pharmacological agents are being tried to prevent haemodynamic changes associated with pneumoperitoneum. Nitroglycerin was found to correct reduction in cardiac output associated with increased pulmonary occlusion pressure and systemic vascular resistance. Beta blockers decrease the adverse effects of CO2 pneumoperitoneum. α2 agonist, Clonidine has centrally acting sympathetic activity which in turn decreases cardiovascular adverse effects of CO2 pneumoperitoneum and provide intraoperative and postoperative analgesia. Clonidine reduces the release of catecholamines and almost blocks the release of norepinephrine. Thus, it reduces systemic vascular resistance and offers haemodynamic stability.

The present study was undertaken to implement and evaluate efficacy of Clonidine in laparoscopic cholecystectomy procedures with its effects on pressor response, haemodynamic changes and postoperative analgesia.

MATERIAL AND METHODS

Prospective placebo controlled study was undertaken in 60 patients requiring laparoscopic surgeries under general...
anaesthesia. Written informed consent was obtained from each patient. These 60 patients were divided in 2 groups as –

Group A-30 patients – received inj. Midazolam 0.03 mg/kg and inj. Pentazocine 0.3 mg/kg 15 minutes before induction of anaesthesia.

Group B- 30 patients – received inj. Clonidine 1 µgm/kg before induction of anaesthesia.

No sedation and analgesic in these patients.

ASA Grade I and II between age range of 18-60 years of either sex and between 45-70 kg weight range posted for laparoscopic abdominal surgery were selected. The patients with hypertension, ischemic heart disease, obstructive airway disease, severe renal and hepatic disease and diabetes mellitus were excluded from the study. The patients on beta blockers, benzodiazepines, MAO inhibitors were also excluded. All patients were pre-anaesthetically evaluated for fitness of anaesthesia. On the operation table after checking monitoring devices, IV infusion was set up. All patients were induced with inj. Thiopentone sodium 5 mg/kg and Inj. Vecuronium 0.1 mg/g with priming principle. After endotracheal intubation, all patients were maintained on Oxygen, nitrous oxide on IPPV with inj. Propofol infusion. Pneumoperitoneum was created by insufflations of CO₂ in 15° reverse Trendelenburg position. Intra-abdominal pressure was not allowed to exceed 15 mmHg throughout surgical procedure. All patients were maintained normocapnia by end tidal CO₂ on capnography. Mean EtCO₂ in control group was 31.94±0.78 and in Clonidine group was 31.91±0.55 mmHg. There was no significant difference in two groups. (Mention how you measured CO₂). At the end of operative procedure, reversal was carried out with inj. Glycopyrrolate 1 µgm/kg and inj. Neostigmine .04 mg/kg diluted in saline. Intraoperatively pulse rate, blood pressure, SpO₂ and ECG were noted as pre-induction, post-induction and post-intubation.

Pulse rate, systolic blood pressure and SpO₂ were monitored prior to induction, after intubation for every 5 minutes up to 15 minutes, every 15 minutes till end of surgery and 15 minutes postoperatively. ETCO₂ was noted. Postoperative sedation was noted as sedation score as 1 – awake and agitated, 2 – awake and comfortable, 3 – asleep but arousalable and 4 – asleep with sluggish response. Postoperative analgesic requirement was also noted by using Visual analogue scale. All observations were statistically analysed by Chi-square test or Fisher analysis and unpaired t test.

**OBSERVATIONS**

60 patients were divided into 2 groups. The demographic data was as shown in Table No. I.

There were 27 male and 33 female patients in 2 groups. There was no significant difference in mean age range in control and Clonidine group. Preoperative investigations were within normal limits in all patients.

Mean pulse rate and systolic blood pressure were noted preoperatively, intraoperatively and postoperatively as shown in Table No. II.

Preoperatively, mean pulse rate and blood pressure were comparable in both groups. Intraoperatively, mean pulse rate and systolic blood pressure were significantly on lower side in Clonidine group as compared to control group. The difference was statistically significant. Postoperatively, also there was statistically significant difference in mean pulse rate and systolic blood pressure in Clonidine group as compared to control group.

Intraoperative EtCO₂ was 31.94±0.78 mmHg in control group and 31.91±0.55 mmHg in Clonidine group thus showing normocapnia.

The time required for rescue analgesia was as shown in Table No. III.

Significantly, longer time for rescue analgesia was noted in Clonidine group as compared to control group.

Postoperative sedation was 36±1 5 minutes in control group and 35.3±5.07 minutes in Clonidine, which was comparable in both groups.

**RESULTS**

**Table I: Showing Demographic Characteristics**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group A Control</th>
<th>Group B Clonidine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age in years</td>
<td>48.38±11.58</td>
<td>45.77±16.59</td>
</tr>
<tr>
<td>Male/Female ratio</td>
<td>15/15</td>
<td>12/18</td>
</tr>
<tr>
<td>Mean weight in kg</td>
<td>57.16±5.53</td>
<td>55.0±11.24</td>
</tr>
<tr>
<td>Total Patients</td>
<td>30</td>
<td>30</td>
</tr>
</tbody>
</table>

The difference in mean pulse rate and systolic blood pressure was statistically significant. Postoperatively, also there was statistically significant difference in mean pulse rate and systolic blood pressure in Clonidine group as compared to control group.

**Table II: Showing Vital Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean Pulse Rate</th>
<th>Mean Systolic BP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A-Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preoperative</td>
<td>78.03±6.76</td>
<td>132.71±4.28</td>
</tr>
<tr>
<td>Intraoperative</td>
<td>90.82±4.81</td>
<td>137.87±4.89</td>
</tr>
<tr>
<td>Postoperative</td>
<td>92.67±5.74</td>
<td>139.08±2.63</td>
</tr>
<tr>
<td>Group B-Clonidine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preoperative</td>
<td>80.76±7.89</td>
<td>128.76±8.59</td>
</tr>
<tr>
<td>Intraoperative</td>
<td>74.76±9.86</td>
<td>125.79±6.44</td>
</tr>
<tr>
<td>Postoperative</td>
<td>78.03±6.97</td>
<td>128.88±5.82</td>
</tr>
</tbody>
</table>

**DISCUSSION**

In recent past, laparoscopy has established its own position in surgical procedures. For performing these laparoscopic procedures, many times anaesthesiologist has to face new challenges and adopt new techniques of anaesthesia. Various gases as air, nitrous oxide, CO₂ have been used to create pneumoperitoneum for laparoscopic surgeries. Recently, air or CO₂ are usually used according to the availability of CO₂ gas. Pneumoperitoneum during laparoscopy produces significant haemodynamic changes such as increase in mean arterial pressure, increase in pulse rate, decrease in cardiac output and increase in systemic vascular resistance which in turn compromises tissue perfusion dreadful in elderly and haemodynamically unstable patients (Dhoste k et al 1996). Clonidine is imidazoline derivative, a selective α₂ adrenergic agonist. It produces decrease in elevated pulse rate and systemic vascular resistance with decrease in systemic vascular resistance and cardiac output.

anaesthesia in their patients posted for laparoscopic surgical procedures. Melek et al (1999),5 used 150 µgm of inj. Clonidine infusion, while Sung et al (2000),6 and Yu et al (2003),7 used 150 µgm of oral Clonidine as premedication for maintenance of haemodynamic stability due to pneumoperitoneum. They noted that Clonidine prevented adverse effects of pneumoperitoneum and provided significant cardiovascular stability as changes in pulse rate and systolic blood pressure.

In the present study, we used inj. Clonidine in dose 1 µgm/kg as like above authors as premedication before induction of anaesthesia. During intraoperative and immediate postoperatively there was significant decrease in pulse rate and systolic blood pressure in Clonidine group as compared to control group at all-time intervals. Thus premedication with Clonidine decreased incidence and ill effects of laparoscopic haemodynamic after creation of pneumoperitoneum. Normocapnia was maintained in both groups intraoperatively. Postoperative sedation was comparable in both groups. Clonidine also provided postoperative analgesia as compared to control group for considerable time interval. Our observations coincide with Hsieh CH (2003), Koivusalo AM et al (1998), Hirvonen EA et al (2000), Joris et al (1995), Goyagi T et al (1996), Melek et al (1999), Sung et al (2000) and Yu et al (2003).7

Thus, Clonidine was found to be relatively safe, effective for providing stable haemodynamic status in laparoscopic operative procedures under general anaesthesia. It protects the patient from stress response triggered by pneumoperitoneum undergoing laparoscopic cholecystectomy. It also provides intraoperative and postoperative analgesia with minimal sedation.

CONCLUSIONS
Clonidine is α2 agonist, is centrally acting sympatholytic agent which reduces adverse effects of CO2 pneumoperitoneum and provide intraoperative and postoperative analgesia. From the present study, it can be concluded that premedication with inj. Clonidine in dose of 1 µgm/kg prior to induction of anaesthesia can provide haemodynamic stability in the form of stable heart rate, systolic blood pressure, minimal postoperative sedation and good postoperative analgesia.

REFERENCES