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To study the effect of intravenous dexmedetomidine and clonidine for attenuating hemodynamic response with proseal LMA in pneumoperitoneum

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Abstract

Background: 75 individuals in the age group between 18-50 years belonging to ASA class I and II undergoing laparoscopic upper and lower abdominal surgeries were selected. A detailed history, complete physical examination and baseline investigations were done for all patients.

Method: Data was collected in pretested proforma meeting the objectives of study. Preoperative assessment was done for each patient and written informed consent was taken. Proper nil per oral status was checked before proceeding for each case. No hypnotic medication was given on the evening before surgery. Patients were pre medicated with injection glycopyrrolate 0.2milligrams in the preoperative room.

Result: In the dexmedetomidine group, the mean pulse rate reduced at 0 min in comparison and continued its fall it 45 minutes, then showed a slight rise till end of the 180 minutes. In the clonidine group, the mean pulse rate keep on increasing till 25 minutes in comparison to the preoperative value, then slight reduction at 35 minutes, then increased at 45 min, then reduced at 60 min, then increased till 180 minutes

Conclusion: In our present study we found easy insertion of proseal laryngeal mask airway with no complications. We used dexmedetomidine and clonidine @ 1 mcg/kg body weight to attenuate hemodynamic response to pneumoperitoneum during laparoscopic surgery and we found better control of heart rate, systolic blood pressure, diastolic bloodpressure and mean arterial pressure with dexmedetomidine group than with clonidine group. In our present study we found no change in oxygen saturation and endtidal carbon dioxide.

Keywords: Intravenous, dexmedetomidine, clonidine, LMA, & pneumoperitoneum

Introduction

The effect of pneumoperitoneum leads to increase in systemic vascular resistance due to aortic and splanchnic compression which is due to humoral factors like catecholamines, prostaglandins and vasopressin along with hypercarbia and mechanical effect due to direct compression of aorta^[1].

There is increase in mean arterial pressure which is caused by increased sympathetic output from carbon dioxide absorption and neuroendocrine response to pneumoperitoneum. There is reduction in cardiac index due to decrease in venous return by compression of inferior vena cava and reverse trendelenberg position but paradoxically central venous pressure and pulmonary capillary wedge pressure increases due to result of central redistribution of blood or increased intrathoracic pressure. There is variable change in cardiac filling volume due to compression of intra abdominal organs^[2].

Use of PROSEAL LMA over endotracheal tube is preferred because the advantages offered by proseal LMA that is firstly response of laryngoscopy and endotracheal intubation is avoided, secondly positive pressure ventilation can be done if tidal volume and peak inspiratory pressures are kept low and thirdly use of intracuff pressure less than or equal to 60 cm of H₂O results in significant less postoperative sore throat, dysphagia and dysphonia^[3].

According to the Miller's supraglottic device classification proseal LMA comes under cuffed perilaryngeal sealers with directional sealing. proseal LMA forms a seal at the laryngeal inlet and the sealing pressure is improved means of directional sealing cuff^[4]. The proseal LMA is a double lumen supraglottic airway device which can be used for both spontaneous and controlled ventilation but is more suited to controlled ventilation. The elliptical cuff of the proseal LMA extends to the posterior or the pharyngeal side of the proseal LMA thus improving the seal pressure (dorsalcuff)^[5].

Material & Method

75 individuals in the age group between 18-50 years belonging to ASA class I and II undergoing laparoscopic upper and lower abdominal surgeries were selected. A detailed history, complete physical examination and baseline investigations were done for all patients.

This study includes seventy five patients of ASA physical status I & II aged between 18 to 50 years of either sex scheduled for elective laparoscopic abdominal surgeries were randomized into two groups (group C, group D) & study was conducted at SBLs Civil Hospital Jalandhar, Punjab from duration of October 2019 to February 2020.

Inclusion Criteria:

1. Age between 18 to 50 years.
2. ASA Physical status I & II.

Exclusion Criteria:

1. Patients with any degree of heart block, pre-existing essential hypertension, cardiovascular, hepatic or renal diseases.
2. Allergies to the drugs used.
3. Acute cholecystitis.
4. Patient concomitantly taking clonidine, methyldopa,
5. Beta blocking drugs, benzodiazepines, MAO inhibitors, patient in whom surgery cannot be completed laparoscopically and open cholecystectomy has to be performed is also excluded from the study. 75 Patients were taken as subject with written informed consent. Sample size was taken on the basis of work done on this topic in the past.

Procedure Planned

Data was collected in pretested proforma meeting the objectives of study. Preoperative assessment was done for each patient and written informed consent was taken. Proper nil per oral status was checked before proceeding for each case. No hypnotic medications was given on the evening before surgery.

Patients were pre medicated with injection glycopyrrolate 0.2milligrams in the preoperative room. Upon arrival in the operating room monitors were attached and baseline parameters example heart rate, NIBP, oxygen saturation and ECG were recorded. Immediately before induction patients were randomly divided into two groups.

Results

Table 1: Comparison of mean pulse rate between the two groups

Time interval	Dexmedetomidine Group		Clonidine Group		't' value	P value
	No.	[Mean±SD]	No.	[Mean±SD]		
Preop.	38	78.74±4.42	37	78.92±4.46	-0.177, df=73	0.860, NS
0 min	38	74.42±5.09	37	79.78±4.66	-4.751, df=73	0.000*
3 min	38	72.21±5.05	37	80.97±5.65	-7.088, df=73	0.000*
5 min	38	69.32±4.27	37	81.51±5.82	-10.370, df=73	0.000*
15 min	38	69.21±4.59	37	81.84±6.21	-10.034, df=73	0.000*
25 min	38	68.26±4.65	37	82.70±6.77	-10.789, df=73	0.000*
35 min	38	67.32±5.39	37	81.89±6.63	-10.459, df=73	0.000*
45 min	38	67.16±4.52	37	82.49±5.72	-12.887, df=73	0.000*
60 min	38	68.68±5.06	37	81.95±6.12	-10.243, df=73	0.000*
120 min	34	69.12±4.01	35	82.63±5.33	-11.875, df=67	0.000*
180 min	5	70.40±6.84	2	89.00±4.24	-3.470, df=5	0.018*

Unpaired 't' test applied. P value < 0.05 was taken as statistically significant

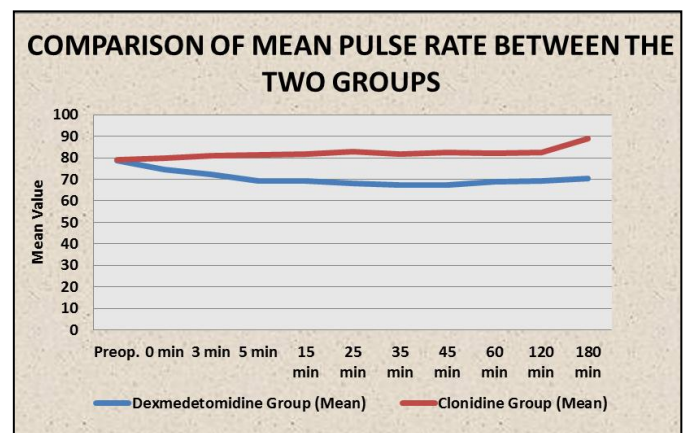
The above table shows the comparison of mean pulse rate between the two groups.

In the dexmedetomidine group, the mean pulse rate reduced at 0 min in comparison and continued its fall it 45 minutes, then showed a slight rise till end of the 180 minutes.

In the clonidine group, the mean pulse rate keep on increasing till 25 minutes in comparison to the preoperative value, then slight reduction at 35 minutes, then increased at 45 min, then reduced at 60 min, then increased till 180 minutes.

The difference of mean pulse between the two groups at preoperative level was statistically not significant (P>0.05), showing that the mean pulse rate was comparable at preoperative level.

The mean pulse rate was significantly higher in the clonidine group in comparison to the dexmedetomidine group at all the other time intervals (P<0.05).



Graph 1: Comparison of mean pulse rate between the two groups

Table 2: Comparison of mean SBP between the two groups

Time interval	Dexmedetomidine Group		Clonidine Group		't' value	P value
	No.	[Mean±SD]	No.	[Mean±SD]		
Preop.	38	110.32±3.49	37	132.16±6.15	-18.969, df=73	0.000*
0 min	38	103.16±5.93	37	136.97±4.71	-27.310, df=73	0.000*
3 min	38	100.84±5.36	37	141.84±3.54	-39.001, df=73	0.000*
5 min	38	100.68±5.16	37	145.19±3.28	-44.418, df=73	0.000*
15 min	38	102.00±4.99	37	147.30±4.19	-42.512, df=73	0.000*
25 min	38	100.74±4.93	37	145.84±4.12	-42.930, df=73	0.000*
35 min	38	101.42±4.21	37	146.76±3.72	-49.368, df=73	0.000*
45 min	38	101.79±3.91	37	146.76±4.09	-54.574, df=73	0.000*
60 min	38	102.00±3.75	37	146.32±4.09	-48.906, df=74	0.000*
120 min	33	104.55±3.17	35	144.57±4.10	-44.802, df=66	0.000*
180 min	6	105.00±2.76	3	137.33±8.08	-9.315, df=7	0.000*

Unpaired 't' test applied. P value < 0.05 was taken as statistically significant

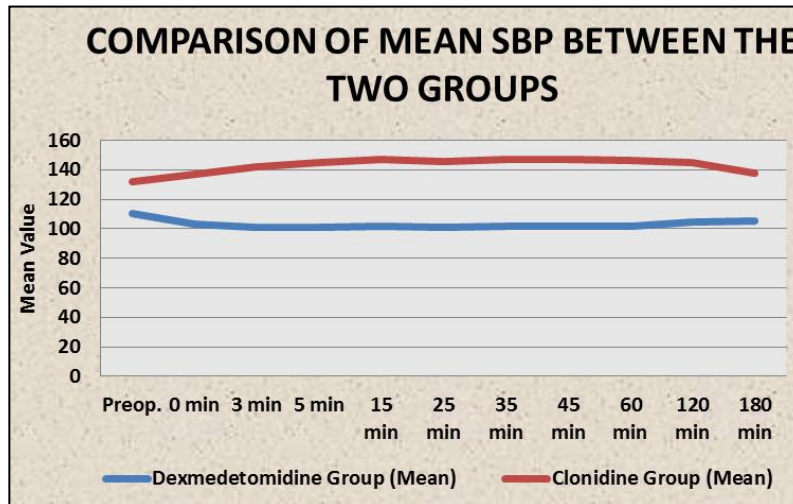
The above table shows the comparison of mean SBP between the two groups.

In the dexmedetomidine group, the mean SBP reduced continuously till 5 minutes in comparison to the preoperative level, then slightly increased at 15 minutes, the reduced slightly at 25 min, then slightly increased till the end of 180 minutes.

In the clonidine group, the mean SBP keep on increasing till 15 minutes, then reduced at 25 minutes, then slightly increased till 45 minutes, then continuously reduced till the

end of 180 minutes.
The mean SBP was significantly higher in the clonidine

group in comparison to the dexmedetomidine group at all the time intervals ($P < 0.05$).



Graph 2: Comparison of mean SBP between the two groups

Table 3: Comparison of mean DBP between the two groups

Time interval	Dexmedetomidine Group		Clonidine Group		't' value	P value
	No.	[Mean±SD]	No.	[Mean±SD]		
Preop.	38	70.53±2.01	37	83.19±4.93	-14.631, df=73	0.000*
0 min	38	68.11±3.15	37	87.62±6.05	-17.582, df=73	0.000*
3 min	38	67.21±4.73	37	92.86±6.99	-18.667, df=73	0.000*
5 min	38	66.63±3.69	37	94.81±7.08	-21.696, df=73	0.000*
15 min	38	66.53±4.43	37	94.86±8.05	-18.958, df=73	0.000*
25 min	38	66.05±4.17	37	94.32±7.95	-19.355, df=73	0.000*
35 min	38	66.21±4.28	37	95.89±7.21	-21.744, df=73	0.000*
45 min	38	66.19±3.79	37	94.97±7.84	-20.349, df=73	0.000*
60 min	38	66.89±3.38	37	95.62±7.82	-20.761, df=73	0.000*
120 min	33	67.52±3.54	35	95.71±7.91	-18.773, df=66	0.000*
180 min	5	69.20±3.03	2	91.00±15.56	-3.489, df=5	0.017*

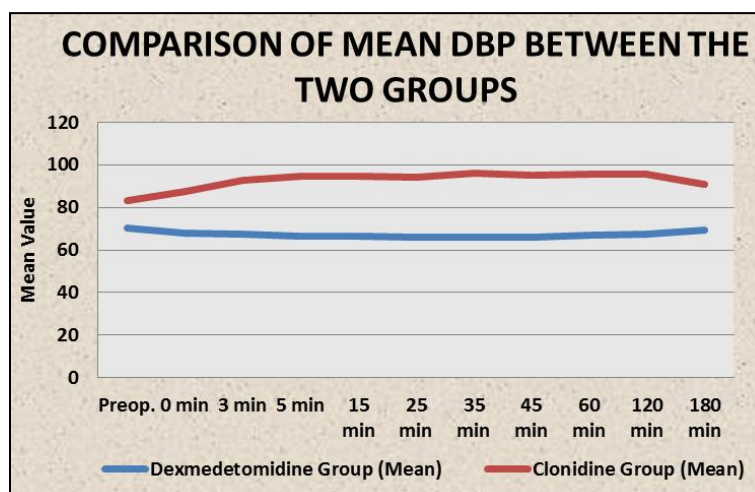
Unpaired 't' test applied. P value < 0.05 was taken as statistically significant

The above table shows the comparison of mean DBP between the two groups.

In the dexmedetomidine group, the mean DBP continuously reduced till 25 minutes in comparison to the preoperative level, then slightly increased at 35 minutes, then reduced at 45 minutes, then keep on increasing till the end of 180 minutes.

In the clonidine group, the mean DBP keep on increasing till 15 minutes in comparison to the preoperative level, then reduced at 25 minutes, then slightly increased at 35 minutes, then reduced at 45 minutes, then increased till 120 minutes and then a sudden reduction is seen at 180 minutes.

The mean DBP was significantly higher in the clonidine group in comparison to the dexmedetomidine group at all the time intervals ($P < 0.05$).



Graph 3: Comparison of mean DBP between the two groups

Statistical Analysis Plan

Comparisons amongst the same group is done using paired t test while intergroup comparisons will be done using student t test. Categorical data is compared using Chi square test. A p value less than or equal to 0.05 is considered as statistically significant.

Discussion

Our study confirms that intravenous dexmedetomidine and clonidine attenuates hemodynamic response with proseal LMA in laparoscopic surgery under general anesthesia.

Laparoscopic surgery is considered as a minimal invasive procedure. Hemodynamic changes with pneumoperitoneum were recognized in 1947. Pneumoperitoneum using CO₂ for laparoscopic surgery causes a rapid and immediate increase in plasma catecholamines and vasopressin possibly due to increase in intraperitoneal pressure and stimulation of the peritoneum by CO₂.

The hallmark of laparoscopy is the creation of pneumoperitoneum with carbon dioxide (CO₂). Pneumoperitoneum at the pressure of 15 mm Hg, Joris *et al.* [6] found 35% increase in mean arterial pressure (MAP), a 65% increase in systemic vascular resistance, 90 percent increase in pulmonary vascular resistance with little change in heart rate while decrease in 20% of cardiac output. Plasma concentration of renin also increases during laparoscopy [7].

The increase in catecholamines, renin and vasopressin induces a cardiovascular response characterized by abrupt elevation of mean arterial pressure, systemic vascular resistance and heart rate. The increase in these hemodynamic values significantly increases the incidence of myocardial ischemia, infarction and other complications [8].

Oropharyngeal seal pressures were measured and adequacy of ventilation for PLMA in 25 patients undergoing elective laparoscopic urological surgery in lateral position was assessed. Earlier studies have reported PLMA to be an effective airway device for laparoscopic surgeries [9].

Assessment of the position via fiberoptic bronchoscope through the drain tube was not done, as the gastric tube was passed easily in 1st attempt in all patients and this re-confirmed proper placement of the PLMA. Agro *et al.*, correlated the ease of Ryle's tube insertion through the drain tube with positioning of the airway over the larynx, assessed fibre optically and concluded that easy Ryle's tube passage indicates correct positioning; difficulty in passing a Ryle's tube suggests that the mask should be repositioned even if ventilation is satisfactory [10]. Brain AJ *et al.*, in their study found that at 60cm H₂O intra cuff pressure, the PLMA gave twice the seal pressure of the standard device (LMA Classic) ($p < 0.0001$) and permitted blind insertion of a gastric tube in all cases [11].

Conclusion

In our present study we found easy insertion of proseal laryngeal mask airway with no complications. We used dexmedetomidine and clonidine @ 1 mcg/kg body weight to attenuate hemodynamic response to pneumoperitoneum during laparoscopic surgery and we found better control of heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure with dexmedetomidine group than with clonidine group. In our present study we found no change in oxygen saturation and endtidal carbon dioxide.

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