Original Research Article

Evaluation of efficacy of dexmedetomidine in providing haemodynamic stability during intraoperative and postoperative period in patients undergoing Total laparoscopic hysterectomy

Rupali S.Patil[1*], Pravin Kumar Thakare[2]

[1]Assistant Professor, Department of Anesthesiology, SBHGMC, Dhule, Maharashtra, India

[2]Associate Professor, Department of Obstetrics and Gynecology, GMC Nandurabar, Maharashtra, India

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Abstract

Background: Laparoscopic surgery is a modern surgical technique involving insufflation of gas (usually Co2) into the peritoneal cavity under pressure to separate the organs from the abdominal cavity. This placebo controlled, double blind, prospective study is designed to evaluate the efficacy of dexmedetomidine in providing haemodynamic stability during perioperative period in patients undergoing laparoscopic hysterectomy. **Materials and methods**: It was a Prospective, randomized, double blind, clinical study was conducted during from January 2017 to Jan 2019, sixty patients scheduled to undergo elective laparoscopic hysterectomy. under general anaesthesia were enrolled in the study. **Results**: Comparison of mean recovery time in minutes- The mean duration of extubation time in Dexem group was 7.1 ± 0.58/mins and in control group it was 6.74±0.73 /mins. The mean duration of response to oral commands in Dexem group was 8.78±0.72/mins and in control group it was 8.66 ± 0.73 /mins. There was no statistically significant difference found in the extubation time and response to oral commands (P>0.05). **Conclusions**: We conclude from our study that, Dexmedetomidine iv infusion in the dose range of 0.2µg/kg/hr reduces the rise in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure associated with the creation and maintenance of pneumoperitoneum during the laparoscopic surgical procedures.

Keywords: laparoscopic hysterectomy, dexmedetomidine, haemodynamic stability.

Introduction

Laparoscopic surgery is a modern surgical technique involving insufflation of gas (usually Co_2) into the peritoneal cavity under pressure to separate the organs from the abdominal cavity[1]. Laparoscopic hysterectomy has revolutionised over the years and it has now become the gold standard for the treatment. Carbon dioxide is the gas used for creation of pneumoperitoneum because it is common to the human body, can be absorbed by tissue and removed by the respiratory system[2]. It is also non-flammable, which is important because electrosurgical devices are commonly used in laparoscopic procedures.

Both pneumoperitoneum and CO_2 causes adverse cardiovascular effects[3]. Some of these effects are related to increased intraabdominal pressure secondary to pneumoperitoneum and some are due to insufflation of CO_2gas into the peritoneal cavity.

Immediately after pneumoperitoneum, plasma level of norepinephrine, epinephrine and plasma renin activity increases[4]. The renin-angiotensin-aldosterone system is also activated by the increased catecholamine level. All these changes contribute to elevated arterial pressure, increased systemic and pulmonary vascular resistance and reduced cardiac output[5].

Apart from that, laparoscopic cholecystectomy is performed in reverse Trendelenburg position. This position leads to diminished venous return and there by further reduction in cardiac output. Hypercapnia due to CO_2 pneumoperitoneum also activates sympathetic nervous system leading to an increase in blood pressure, heart rate, myocardial contractibility and arrhythmias.

*Correspondence
Dr. Rupali S.Patil
Assistant Professor, Department of Anesthesiology, SBHGMC, Dhule, Maharashtra, India.
E-mail: drpravin30@gmail.com

It also sensitises the myocardium to catecholamines when volatile anaesthetic agents are used. The adverse effects due to hypercapnia in the intraoperative period is taken care of by adjusting the minute ventilation of the patient.

There are many class of drugs that can be used to blunt the haemodynamic response to laryngoscopy, intubation and creation of pneumoperitoneum during laparoscopic surgeries. Among these α_2-adrenergic agonists have been shown to improve haemodynamic stability during laparoscopic surgeries. Dexmedetomidine is a highly selective α_2 adrenergic agonist. It possesses hypnotic, sedative, anxiolytic, analgesic, sympatholyticproperties without producing significant respiratory depression. Activation of these receptors in the brain and spinal cord level inhibits neuronal firing, thereby causing hypotension, bradycardia, sedation and analgesia. Generally presynaptic activation of α_2 adrenergic receptors inhibits the release of norepinephrine and postsynaptic activation of α_2 adrenergic receptors in the central nervous system inhibits sympathetic activity and therefore can decrease blood pressure and heart rate.

This placebo controlled, double blind, prospective study is designed to evaluate the efficacy of dexmedetomidine in providing haemodynamic stability during perioperative period in patients undergoing laparoscopic hysterectomy.

Materials and methods

It was a Prospective, randomized, double blind, clinical study was conducted during from January 2017 to Jan 2019, sixty patients scheduled to undergo elective laparoscopic hysterectomy. under general anaesthesia were enrolled in the study in Goovernment medical college Dhule to evaluate the efficacy of dexmedetomidine to provide intraoperative and post operative haemodynamic stability in patients undergoing laparoscopic hysterectomy..

The study was approved by the institutional medical ethics committee and written informed consent was obtained from all patients to be included in the study.

Inclusion criteria
1. ASA I & II.
2. Age 18 to 65 years.
3. Weight 40 to 80 kgs.

Exclusion criteria
1. Unwilling for consent.
2. Age <18 yrs or > 65yrs.
3. Patients with ASA III and Above.
4. Morbid obesity.
5. Severe hepatic/renal/endocrine & cardiac dysfunction.
6. Pregnant patients.
7. Breastfeeding mothers.
8. Allergy to α_2 adrenergic agonist/sulfa drugs.
9. Hypertensive patients (on β Blocker & Calcium channel blockers).
10. Bradycardia (heart rate < 60/min).

Method

The study was carried out in sixty patients (45-65yrs) allocated in one of two parallel groups containing 30 patients each.

Dexem group: Dexmedetomidine iv infusion at 0.2µg/kg/hr.

Control Group - 0.9% normal saline iv infusion at 0.2µg/kg/hr.

A computer generated table of random numbers was prepared allotting equal number of patients in each group.

One day prior to surgery a careful history and a thorough general and systemic examination were carried out and patient's preliminary data with all relevant investigation were recorded. Patients who are fulfilling all inclusion and exclusion criteria were explained about the study and were invited to participate in the study. A written informed consent from patients to be included in the study was obtained and they were randomised to one of the two study groups using computer generated randomized chart.

On the day of surgery

In the preoperative holding area: Patients were re-evaluated, nil-by-mouth status was confirmed and baseline vital parameters were measured.

In the operation theatre: All patients were taken in the operation theatre on scheduled time and monitors were attached (ECG, SpO_2 and NIBP) followed by recording of vital parameters. Heart rate (HR), Systolic blood pressure (SBP), Diastolic blood pressure (DBP), Mean arterial pressure (MAP), SpO_2 will be recorded. An IV line is taken and IV fluid is started at 4-5 ml/kg/hr.

Premedication: All patients received Inj. Atropine0.01mg/kg IV in Ringer lactate pint, Inj. Ranitidine 1 mg/kg IV, Inj. Ondansetron 0.08 mg/kg IV and Inj. Midazolam 0.02 mg/kg IV. All patients received 6 litres of oxygen by Hudson's mask for 5 mins after premedication

Induction: An infusion of the study drug for that particular serial number as per the randomization chart was administered by investigator and is started 5 mins prior to induction, Patients were pre oxygenated with 100% oxygen. Induction was carried with Inj.fentanyl 2µg/kg and Inj.Propofol 2-2.5mg/kg IV in graded doses till loss of consciousness. After confirming adequacy of ventilation, Inj. Succinylcholine 1.5mg/kg was administered and after 60 seconds of IPPV, laryngoscopy was performed by an experienced anaesthesiologist (II year resident) and appropriate sized PVC cuffed endotracheal tube was inserted. A well lubricated nasogastric tube was inserted in all patients after tracheal intubation.

Maintainence: Anaesthesia was maintained with O_2:N_2O in 40:60 proportion with 0.8% isoflurane concentrationand muscle relaxation was maintained with Inj. Vecuronium bromide, loading dose of 0.1mg/kg and intermittent top-ups of 0.02 mg/kg as and when required. Patients were ventilated with an initial tidal volume of 6-8 ml/kg and a respiratory rate of 14 breaths/min which was later adjusted to keep the $EtC0_2$ within 35-40 mm of Hg. Intra-abdominal pressure was maintained below 14mmHg.

Fentanyl (0.5µg/kg) top ups were given to keep the mean arterial pressure within 20% of baseline. All patients received inj. diclofenac 75mg iv as analgesia intraoperatively. At the end of pneumoperitoneum, infusion of the study drug and isoflurane was stopped.

Emergence & extubation: At the end of surgery, complete reversal of neuromuscular blockade was achieved with Inj. Glycopyrrolate 0.008 mg/kg & Inj. Neostigmine 0.06 mg/kg & patients were extubated after establishment of spontaneous, regular & adequate respiration and good muscle power with appropriate response to verbal commands. The nasogastric tube was kept in situ.

Monitoring of parameters

Preoperative: Heart rate (HR), Systolic blood pressure (SBP), Diastolic blood pressure (DBP), Mean arterial pressure (MAP) & Oxygen saturation (SpO_2).

Intra-operative: HR, SBP, DBP, MAP, SpO_2, End tidal CO_2, Intraabdominal pressure (after pneumoperitoneum) and adverse events (hypotension, hypertension, tachycardia, bradycardia) were recorded every 15 mins till the end surgery. Patients having fluctuations in HR and BP > 20% of baseline value were recorded and treated accordingly.All parameters were monitored by a blinded observer, unaware of the study drug administered. Above parameters were monitored every 15mins after pneumoperitoneum till the end of surgery.The infusion of study drug and isoflurane were stopped at the end of pneumoperitoneum & number of patients requiring total fentanyl top-ups were recorded.

Time interval of following events was recorded after the stoppage of infusion
1. Time to tracheal extubation.
2. Time to respond to verbal command.

In the post operative anaesthesia care unit (PACU)

Post operatively the patient was shifted to the PACU, received oxygen under Hudson's mask & IV fluids. The following parameters were noted every 15 min thereafter for 2hrs.
1. HR.
2. SBP, DBP and MAP.
3. SpO_2

Post operative nausea and vomiting (PONV): Was noted as Yes or No & if present was treated with Inj. Ondansetron 0.1mg/kg IV.

Side effects: A provision was made for recording and treatment of following side effects.
1. **Hypotension** : Was defined as reduction in blood pressure by <20% MAP & was to be treated with fluid challenge in aliquots of 5-10ml/kg of Ringer's lactate & if there is no response to it, then Inj. Ephedrine 0.12mg/kg IV to be given & if still no response to it, then vasopressor like dopamine 5-10 µg/kg/min IV.
2. **Hypertension** : Will be diagnosed if there is >20% rise in MAP of baseline on 2 or more readings in 2-3 mins & would be tackled by deepening the level of anaesthesia, maintaining $ETCO_2$, SPO_2 and by NTG infusion if required .
3. **Bradycardia**: Was defined as reduction in heart rate by >20% & was to be treated with Inj. Atropine 0.01mg/kg IV.

Statistical analysis

The data was collected using standard, pre-validated, semi-structured case record proforma. The data was represented in the form of tables and charts for frequency analysis. Demographic data was analyzed by Pearson's chi-square test. Changes in the heart rate, systolic BP and diastolic BP were analyzed using unpaired't' test. 'P' value less than 0.05 was considered significant.

Observation and results

A Prospective, randomized, double blind, clinical study designed to evaluate the efficacy of dexmedetomidine to provide intraoperative and post operative haemodynamic stability in patients undergoing laparoscopic hysterectomy. For the purpose of this study sixty patients were randomly allocated in two groups of 30 each as follows:Dexem group - Dexmedetomidine iv infusion at 0.2µg/kg/hr, and Control Group -Normal saline 0.9% iv infusion at 0.2µg/kg/hr.

Table 1 Shows demographic data. Demographic characteristics were compared using student t test for age and weight. Sex and ASA class

were compared using Chi square test. Both the groups were comparable in demographic parameters. Statistically there is no significant difference.Table 1 shows the duration of Surgery and anaesthesia in minutes in dexmedetomidine group and control group. There was no statistically significant difference found between two groups with respect to mean duration of surgery and mean duration of anaesthesia (P>0.05).Hence both the groups were comparable.

Table 1: Demography and intraoperative of patients

Parameters	Dexem Group(n=30)	Control Group(n=30)	P value
	Mean ± SD	Mean ± SD	
Age (yrs)	45.70 ± 8.53	40.23 ± 8.61	0.269
Weight (kg)	59.67 ± 9.45	60.57 ± 10.49	0.728
ASA class (I/II)	23/7	21/9	0.559
Duration of Surgery(mins)	69.93 ± 4.09	67.90 ± 4.51	0.072
Duration of Anaesthesia(mins)	79.63 ± 4.0	77.77 ± 5.17	0.123

(P<0.05-Significant)

In dexmedetomidine group there was statistically significant decrease in SBP after 5 minutes of infusion, after intubation, after pneumoperitoneum and throughout the observation period till extubation as compared to baseline values. The maximum rise in SBP was 128.87±12.83mmHg which occurred immediately after pneumoperitoneum. In control group there was statistically significant increase in SBP after infusion, after intubation, after pneumoperitoneum and throughout the observation period till extubation as compared to baseline values. The maximum rise in SBP in control group was 154.40± 11.49mmHg which occurred immediately after pneumoperitoneum The difference was statistically significant when compared in both groups (p<0.05). (Table 2)

There is no statistically significant difference found in the baseline DBP and DBP after premedication between two groups. Hence both the groups were comparable (P>0.05). In dexmedetomidine group there was statistically significant decrease in DBP after 5 minutes of infusion, after intubationand throughout the observation period till extubation as compared to the baseline values except after pneumoperitoneum. The maximum rise in DBP of86.03±9.60 mmHg was noted immediately after pneumoperitoneum.(Table 2)

In control group there was statistically significant increase in DBP, after infusion, after intubation, after pneumoperitoneum and throughout the observation period till extubation as compared to baseline values. The maximum rise in DBP in control group was 99.80±4.71 mmHg which occurred immediately after pneumoperitoneum. The difference was statistically significant when compared in both groups (p < 0.05). (Table 2)

Table 2: Perioperative blood pressure

Blood pressure	SBP (mmHg)			DBP (mmHg)		
	Dexem (N=30)	Control (N=30)	P value	Dexem (N=30)	Control (N=30)	P value
	Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD	
Baseline	135.87 ± 11.35	132.60 ± 8.54	0.213	84.43 ± 6.97	87.40 ± 4.93	0.062
After premedication	132.50 ± 9.84	132.33 ± 7.41	0.941	84.87 ± 5.69	87.53 ± 4.72	0.052
5 mins after infusion	123.06 ± 7.60	133.27± 6.76	0.000	77.73 ± 6.06	88.60 ± 4.52	0.000
1 min after induction	111.52 ± 7.11	126.07± 7.02	0.000	72.13 ± 4.20	84.80 ± 4.41	0.000
1 min after intubation	126.60 ± 5.83	142.97± 9.42	0.000	80.37 ± 6.23	94.13 ± 4.42	0.000
skin incision	119.52 ± 11.36	143.37± 9.13	0.000	78.23 ± 6.12	94.13 ± 4.42	0.000
After Pneumoperitoneum	128.87 ± 12.83	154.40± 11.49	0.000	86.03 ± 9.60	99.80 ± 4.71	0.000
15 mins	124.40 ± 11.68	140.20± 7.92	0.000	80.63 ± 8.10	92.40 ± 4.71	0.000
30 mins	119.77 ± 8.88	138.00± 7.59	0.000	76.63 ± 6.60	89.53 ± 4.69	0.000
45 mins	121.77 ± 10.27	137.80± 5.29	0.000	78.10 ± 8.24	89.87 ± 3.28	0.000
60 mins	121.80 ± 9.09	138.00± 7.59	0.000	78.23 ± 7.26	92.87 ± 4.22	0.000
75 mins	121.63 ± 9.20	142.00± 7.30	0.000	78.03 ± 7.33	93.00 ± 4.06	0.000
End of Pneumoperitoneum	110.90 ± 9.20	124.07± 8.70	0.000	72.07 ± 5.27	82.20 ± 4.56	0.000
During Extubation	119.77 ± 8.88	137.80± 5.29	0.000	76.63 ± 6.60	89.87 ± 3.28	0.000
5 mins postextubation	120.03 ± 6.55	133.27± 6.76	0.000	77.37 ± 3.98	92.87 ± 4.22	0.000

(P<0.05-significant)

Heart rate

There is no statistically significant difference found in the baseline HR and HR after premedication between two groups. Both the groups were comparable(P>0.05).In dexmedetomidine there was statistically significant decrease in HR after 5 minutes of infusion, after intubation, after pneumoperitoneum and throughout the observation period till extubation as compared to baseline values. The maximum rise in HR was 86.87±7.25/min which occurred immediately after pneumoperitoneum.

In control group there was statistically significant increase in HR after infusion, after intubation, after pneumoperitoneum and throughout the observation period till extubation as compared to baseline values. The maximum rise in HR was 102.78±6.39/min which occurred immediately after pneumoperitoneum. The difference was statistically significant when compared in both groups (p < 0.05). (Table 3)

Mean arterial pressure

Table 3 shows intraoperative mean arterial pressure (MAP) .There is no statistically significant difference found in the baseline MAP and MAP after premedication between two groups. Hence both the groups were comparable (P>0.05).

In dexmedetomidine group there was statistically significant decrease in MAP after 5 minutes of infusion, after intubation, after pneumoperitoneum and throughout the observation period till extubation as compared to the baseline value. The lowest decrease in MAP was at the end of pneumoperitoneum (85.11±5.98 mmHg) as compared to MAP of 98.98±10.16mmHg recorded immediately after pneumoperitoneum. In control group there was statistically significant increase in MAP after infusion, after intubation, after pneumoperitoneum and throughout the observation period till extubation except at the end of pneumoperitoneum (97.21±5.81 mmHg) where there was decrease in MAP as compared to its baseline value. The maximum rise in MAP in control group was 118.54 ± 5.32 mmHg which occurred immediately after pneumoperitoneum. The difference was statistically significant when compared in both groups (P < 0.05).

Table 3: Perioperative mean heart rate& MAP

Time	Mean heart rate (per min)			MAP(mmHg)		
	Dexem (N=30)	Control(N=30)	P value	Dexem (N=30)	Control (N=30)	P value
	Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD	
Baseline	89.80 ± 6.40	93.07 ± 6.90	0.062	101.77 ± 7.73	102.47 ± 5.91	0.695
After premedication	89.23 ± 5.99	92.10 ± 5.75	0.063	100.28 ± 6.32	102.47 ± 5.29	0.151
5 mins after infusion	83.97 ± 6.20	91.87 ± 6.34	0.000	91.50 ± 5.98	103.49 ± 4.98	0.000
1 min after induction	78.50 ± 5.22	89.87 ± 6.23	0.000	85.58 ± 4.64	97.89 ± 5.04	0.000
1 min after intubation	86.83 ± 5.08	102.77 ± 7.30	0.000	95.78 ± 5.35	110.41 ± 5.32	0.000
skin incision	84.57 ± 5.91	99.73 ± 5.71	0.000	92.25 ± 7.14	110.36 ± 5.16	0.000
After Pneumoperitoneum	86.87 ± 7.25	107.78 ± 6.39	0.000	98.98 ± 10.16	118.54 ± 5.32	0.000
15 mins	82.83 ± 8.28	96.37 ± 5.31	0.000	95.22 ± 8.60	108.33 ± 5.13	0.000
30 mins	81.57 ± 7.59	98.70 ± 4.94	0.000	91.01 ± 6.75	105.52 ± 4.93	0.000
45 mins	80.93 ± 7.54	96.93 ± 4.67	0.000	92.66 ± 8.39	106.14 ± 3.95	0.000
60 mins	81.90 ± 5.38	98.07 ± 5.60	0.000	92.76 ± 7.46	107.91 ± 4.57	0.000
75 mins	82.40 ± 4.44	99.87 ± 5.49	0.000	92.57 ± 7.42	109.33 ± 4.46	0.000
End of Pneumoperitoneum	76.17 ± 3.45	89.60 ± 5.27	0.000	85.11± 5.98	97.21 ± 5.81	0.000
During Extubation	85.00 ± 4.76	101.96 ± 7.23	0.000	90.41± 6.01	106.13 ± 3.97	0.000
5 Mins post extubation	84.73 ± 4.74	97.83 ± 5.07	0.000	85.03± 4.94	106.37 ± 4.14	0.000

(P<0.05-significant)

Number of fentanyl top ups [0.5µg/kg] required.

In the control group more number of fentanyl top ups are required as compared to dexmedetomidine group ,when compared in both the groups, there was statistically significant difference was noted(P<0.05).

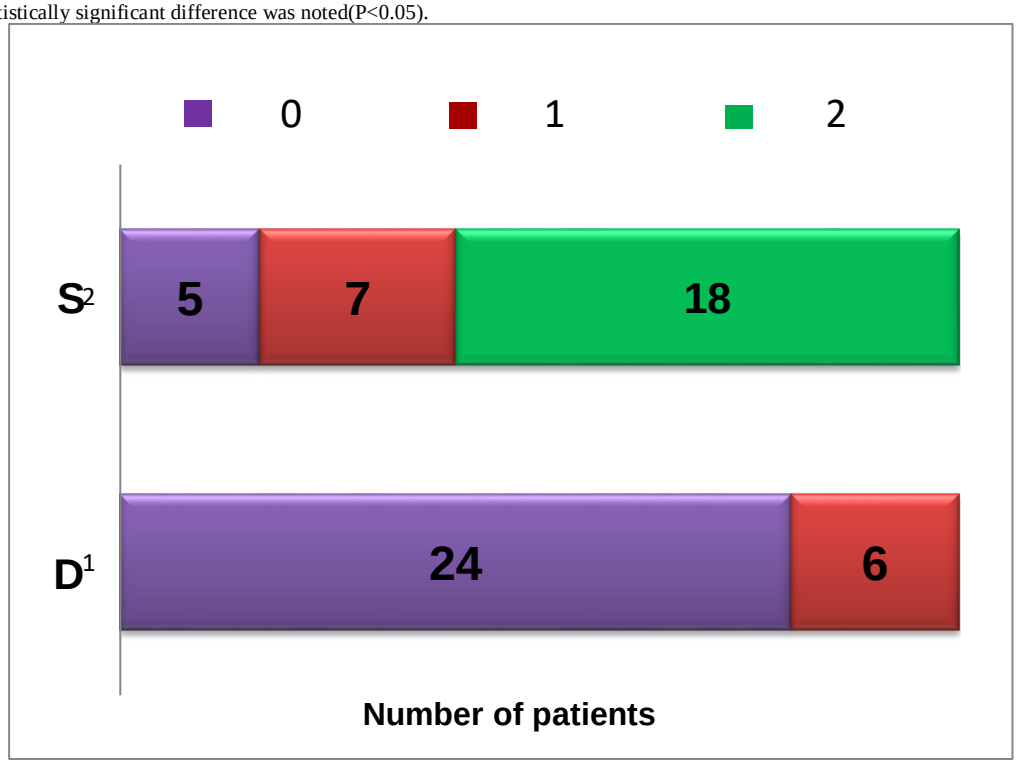

Fig. 1: Number of fentanyl top ups [0.5µg/kg] required.

Postoperative Hemodynamic parameters (HR, MAP, SBP & DBP)

Postoperative heart rate in both the groups- Postoperative heart rate were lower in dexem group than control group. Hence the data was statistically significant when compared in both the groups (P<0.05). Postoperative Mean arterial pressure readings were lower in Dexem group than control group. Hence the data was statistically significant when compared in both the groups (P<0.05).

Postoperative Systolic blood pressure in both the groups- Postoperative systolic blood pressurereadings were lower in Dexem group than control group. Hence the data was statistically significant when compared in both the groups (P<0.05).Postoperative diastolic blood pressure readings were lower in Dexem group than control group. When compared in both the groups, the data was statistically significant (P<0.05).Postoperative oxygen saturation(Spo_2) showed no fall in either groups. The data was statistically not significant (P>0.05).

Mean recovery time

Comparison of mean recovery time in minutes- The mean duration of extubation time in Dexem group was 7.1 ± 0.58/mins and in control group it was 6.74±0.73 /mins. The mean duration of response to oral commands in Dexem group was 8.78±0.72/mins and in control group it was 8.66 ± 0.73 /mins. There was no statistically significant difference found in the extubation time and response to oral commands (P>0.05).

The perioperative complications among both the groups -In dexmedetomidine group not a single patient had any complications where as in control group 13.3% patients had nausea / vomiting.

Discussion

Laparoscopic hysterectomy has revolutionised and it has now become the gold standard. Pneumoperitoneum is produced by administration of carbon dioxide during laparoscopic surgical procedures. Both pneumoperitoneum and carbon dioxide causes adverse cardiovascular effects. Some of these effects are related to CO2 and some are due to increased intra-abdominal pressure secondary to creation of pneumoperitoneum.

Immediately after pneumoperitoneum, plasma level of norepinephrine, epinephrine and plasma renin activity is increased. Increased catecholamine level activates theRenin-angiotensin-aldosterone-system (RAAS) leading to some characteristic haemodynamic alterations[4,5]. All these changes come together to contribute to elevated arterial pressure, increased systemic and pulmonary vascular resistance and reduced cardiac output.

In our study, we observed the effects of dexmedetomidine on haemodynamics during perioperative period in patients undergoing laparoscopic hysterectomy. Dexmedetomidine is a highly selective α_2 adrenergic agonist with sedative, anxiolytic, and analgesic, sympatholytic and antihypertensive effects. Activation of receptors in the brain and spinal cord level inhibits neuronal firing, thereby causing hypotension, bradycardia, sedation and analgesia. Generally presynaptic activation of α_2 adrenergic receptors inhibits the release of norepinephrine. Postsynaptic activation of α_2 adrenergic receptors in the central nervous system inhibits sympathetic activity and therefore can decrease blood pressure and heart rate. It also produces sedation and diminishes the intraoperative requirement of analgesics. Dexmedetomidine does not appear to have any direct effect on heart.

Demographic parameters

All the patients were comparable with respect to the demographic parameters: age, and weight. In dexmedetomidine group the mean age was 40.70 ± 8.53 years and in the control group it was 38.23 ± 8.61. The mean weight of the patients in the dexmedetomidine group was 59.67 ± 9.45 kg while 60.57 ± 10.49 kg in the control group. There was no statistically significant difference when both the groups were compared (P>0.05).Mean duration of surgery and mean duration of anaesthesia were also comparable in both the groups. Statistically there was no significant difference (P>0.05).

Heamodynamic parameters

In several study reports, dexmedetomidine infusion rates ranging from 0.1 to 10 µg/kg/hr have been used[6,7]. The studies with higher infusion rates had moreincidences of adverse effects like hypotension and bradycardia. Burcu Tufanogullari et al used dexmedetomidine in doses of 0.2, 0.4, 0.6 µg/kg/hr in 80 morbidly obese patients posted for laparoscopic bariatric surgery and they found that 0.2 µg/kg/hr caused lesser incidence of cardiovascular complications(hypotension and brady cardia). Hencein our study, we used dexmedetomidine in an infusion rate of 0.2µg/kg/hr.

In our study following observations were made in the perioperative period in patients undergoing laparoscopic hysterectomy.

1. The rise in the heart rate was significantly lower in the dexmedetomidine group than the control group.
2. The rise in the systolic blood pressure was significantly lower in the dexmedetomidine group than the control group.
3. The rise in the diastolic blood pressure was significantly lower in the dexmedetomidine group than the control group.
4. The rise in the mean arterial pressure was significantly lower in the dexmedetomidine group than the control group.
5. There was no prolongation in recovery time noted.
6. Intraoperatively more requirement of Inj.Fentanyl top-ups were noted in control group than Dexem group.
7. Also postoperative side effects were noted in control group.

Dhurjoti Prosad Bhattacharjee et al[8] studied the Effects of Dexmedetomidine on haemodynamics in patients Undergoing Laparoscopic Cholecystectomy. They gave dexmedetomidine infusion(0.2µg/kg/hr) in one group and normal saline(0.2µg/kg/hr) in control group. They concluded that dexmedetomidine infusion in the perioperative period in laparoscopic hysterectomy provides better intraoperative and postoperative haemodynamic stability.

Hassan S Bakhamees et al[9] studied the Effects of dexmedetomidine in morbidly obese patients undergoing laparoscopic gastric bypass. They gave dexmedetomidine infusion(0.4µg/kg/hr) in one group and normal saline infusion (0.4µg/kg/hr) in other group throughout the surgery and compared the haemodynamics. They found that patients who received dexmedetomidine showed significant decrease of intraoperative and postoperative mean blood pressure and heart rate. The observations made in both these studies are similar to our study findings in providing perioperative haemodynamic stability.

Burch Tufanogullari et al[11] studied the effect of dexmedetomidine on both early and late recovery after laparoscopic bariatric surgery. Eighty consenting ASA II–III morbidly obese patients were randomly assigned to 1 of 4 treatment groups: (1) control group received a saline infusion during surgery, (2) Dex 0.2 group received an infusion of 0.2µg/kg/hr (3) Dex 0.4 group received an infusion of 0.4µg/kg/hr and [4] Dex 0.8 group received an infusion of 0.8 µg/kg/hr IV. The intraoperative haemodynamic values were similar in the four groups, arterial blood pressure values were significantly reduced in the Dex 0.2, 0.4, and 0.8 groups compared with the control group on admission to the postanesthesia care unit (PACU).

Yildiz M, Tavlan A et al[10] used dexmedetomidine 1µg/kg as a single preinduction dose in one group and the other group received normal saline at same dose, scheduled for elective minor surgeries to see its effect on perioperative haemodynamics. Both groups received fentanyl 1µg/kg during induction .They found that dexmedetomidine group had decreased blood pressure and heart rate as well as the recovery time.

Extubation, emergence from anaesthesia and postoperative vitals

Emergence from anaesthetic effects and extubation are equally crucial as is laryngoscopy, intubation, and surgical period. Dexmedetomidine enables a smooth transition from the time of administration of reversal to the post-extubation phase by suppressing the CNS sympathetic activity, leading to high quality of extubation with minimum haemodynamic changes, as we observed in majority of our patients in dexmedetomidine group[12].

In our study, in dexmedetomidine group during extubation the mean HR(85.00 ± 4.76/mins), SBP(119.77±8.88mmHg), DBP(76.63±6.60 mmHg) and MAP(90.41± 6.01mmHg) were noted and compared with control group which were: the mean HR(101.96±7.23/min), SBP(137.80±5.29mmHg), DBP(89.87±3.28mmHg) and MAP(106.13±3.97mmHg) .

Above data suggests that haemodynamics were much more stable in dexmedetomidine group than control group during extubation. Statistically there was significant difference found when compared in both the groups (P<0.05).

Emergence from anaesthesia

We also observed the haemodynamics during emergence from anaesthesia i.e time for extubation and time to respond to oral commands and found that it was similar in both the groups. The mean duration of extubation time in Dexem group was 7.1±0.58 /mins and in control group it was 6.74±0.73/mins. The mean duration of response to oral commands in Dexem group was 8.78±0.72/mins and in control group it was 8.66±0.73/mins (P=0.525).There was no statistically significant difference found in the extubation time and response to oral commands when compared in both the groups (P>0.05) as dexmedetomidine does not seems to have significant respiratory depression property. There was no fall in Oxygen saturation parameter noticed in both the groups in our study finding.

Post extubation period

In the recovery room postoperative vitals (HR, SBP, DBP, MAP) were recorded every 15 mins for 2 hours. It was observed in our study that, those patients who received dexmedetomidine infusion in the

intraoperative period had HR, SBP, DBP and MAP on the lower side as compared to that of control group which received normal saline infusion in immediate postoperative period. The difference was statistically significant ($p< 0.05$).

Dhurjoti Prosad Bhattacharjee et al[13] compared infusion of dexmedetomidine 0.2g/kg/hr and normal saline 0.2g/kg/hr in patients undergoing laparoscopic cholecystectomy and found that there was no difference in extubation time and response to oral commands in both the groups and the haemodynamics were much more stable as compared to placebo group during extubation in dexmedetomidine group .These findings are similar to our study results.

Turgut N et al[14] used dexmedetomidine infusion in lumbar laminectomy patients. Group D received Dexmedetomidine 0.6µg/kg as bolus before induction and 0.2µg/kg/hr by infusion. They found that before and after extubation, MAP values in Group F(fentanyl) were significantly higher than those in Group D(dexmedetomidine). There was no statistical difference in heart rate between the groups. Extubation time and post anaesthesia care unit discharge time were similar in both groups. The fentanyl group patients required supplemental analgesia earlier than the dexmedetomidine group. Postoperative nausea and vomiting were significantly higher in Group F. In our study also, we have observed that there is more requirement of fentanyl top-ups in control group, which could have lead to postoperative nausea and vomiting incidences in control group (13.3%).There was not a single patient with postoperative nausea and vomiting in Dexem group.

Tanskanen et al[15] have used dexmedetomidine as an anaesthetic adjuvant to neurosurgical anaesthesia in patients scheduled for elective surgery of supratentorial brain tumor. Patients receiving dexmedetomidine had their tracheal tubes removed faster than those in the placebo group, indicating preserved respiratory function. This study was contradictory to our study. In our study we observed that there was no difference in both the group in extubation time and response to oral commands.

Turan et al[16] used dexmedetomidine 0.5µg/kg 5 mins before extubation in intracranial surgery. They found that without interfering in recovery time, dexmedetomidine 0.5µg/kg administered 5 min before the end of surgery stabilizes haemodynamics, allows easy extubation, provides a more comfortable recovery and early neurological examination following intracranial operations.Norimasa et al[17] studied the recovery profile from dexmedetomidine as a general anaesthetic adjuvant in patients undergoing lower abdominal surgery. They concluded that postoperative cognitive function was not affected by dexmedetomidine administration.

In our studyfentanyl top-ups of 0.5µg/kg were given intraoperatively whenever required to keep mean blood pressure within 20% of baseline value. In dexmedetomidine group - 20% patients (only 6) required single dose of fentanyl top up and 80% of the patient did not required any top up doses. In control group - 7 patients(23.3%) required single top up, 18 patients(60%) required 2 top ups and 5 patients(16.67%) did not require any top ups of fentanyl. Thus those patients who received dexmedetomidine infusion has lesser requirement of fentanyl and the haemodynamics were much more stable than control group.

Varshali M Keniya, et al[18] used dexmedetomidine infusion intraoperatively. They also used fentanyl in the increments of inj. fentanyl 0.5µg/kg to keep MAP within 20% of baseline values, they said that those patients receiving dexmedetomidine intraoperatively had 33% less fentanyl requirement and 32% less isoflurane requirement as compared to placebo group.

Feld et al[7] showed that dexmedetomidine could be used in place of fentanyl for intraoperative control of blood pressure and heart rate during open gastric bypass Surgery. Dexmedetomidine treatment required less desflurane than fentanyl to maintain anaesthesia.Similar findings were reported by M. Aho et al[19], Hassan s bakhamees et al[9].

Incidence of post operative nausea-vomiting

In our study, four patients (13.3%) in the control group had nausea and / vomiting in the post-operative period, while none of the patients who received dexmedetomidine had any such episode.

Turgut N et al[14] al used Propofol-dexmedetomidine and Propofol-fentanyl combination for maintenance of anaesthesia in patients undergoing spinal laminectomy and found that, Propofol-fentanyl medication causes frequent postoperative nausea and vomiting compared with propofol-dexmedetomedine.

Massad IM et al[20],reported that Combining dexmedetomidine to other anesthetic agents, resulted in more balanced anesthesia and a significant drop in the incidence of postoperative nausea and vomiting after laparoscopic gynecological surgeries.Burcu Tufanogullari et al[11] also found that those patients receiving dexmedetomidine had lesser incidence of postoperative nausea and vomiting.

The findings of our study are in agreement with the findings of various above mentioned investigators in that dexmedetomidine infusion intraoperatively is an effective agent to reduce the haemodynamic fluctuations associated with laparoscopic surgery. It also reduces the incidence of postoperative nausea / vomiting.

Conclusion

We conclude from our study that, Dexmedetomidineiv infusion in the dose range of 0.2µg/kg/hr reduces the rise in heart rate, systolic blood pressure, diastolic blood pressure and mean arterial pressure associated with the creation and maintenance of pneumoperitoneum during the laparoscopic surgical procedures.

Thus, it provides perioperative haemodynamic stability in ASA I/II class patients during laparoscopic hysterectomy because of their sedative, hypnotic, anxiolytic and sympatholytic properties.

Hence, Dexmedetomidine infusion of 0.2µg/kg/hr as an anaesthetic adjuvant is recommonded in laparoscopic hysterectomy to provide perioperative haemodynamic stability and to facilitate smooth emergence from anaesthesia. It also affords added advantage of reduction in post operative complications such as nausea-vomiting. However further study is required to evaluate its effect on haemodynamic parameters in high risk group patients with compromised cardio-respiratory function undergoing laparoscopic surgical procedures.

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