Journal of Applied Pharmaceutical Research
Volume 10 Issue 3, Year of Publication 2022, Page 18 – 27
DOI: 10.18231/j.joapr.2022.10.3.18.27

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Research Article

JOURNAL OF APPLIED PHARMACEUTICAL RESEARCH | ***JOAPR***
www.japtronline.com ***ISSN: 2348 – 0335***

EFFECTS OF DEXMEDETOMIDINE ON PERIOPERATIVE MONITORING PARAMETERS AND RECOVERY IN PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY IN A 300 BEDDED HOSPITAL, JAIPUR

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Article Information
Received: 22nd December 2021
Revised: 29th May 2022
Accepted: 16th June 2022
Published: 30th September 2022

Keywords
ASA grading, dexmedetomidine, Laparoscopic Cholecystectomy, Perioperative

ABSTRACT

Background: Laparoscopic cholecystectomy has emerged over the open cholecystectomy as gold standard for surgical treatment of symptomatic gall stones. Although pain after laparoscopic cholecystectomy is less intense, but many patients may experience considerable pain during first 24 hours in post-operative period. Intravenous (i.v.) use of dexmedetomidine in perioperative period lead to 90% decrease in the serum catecholamine levels, and further diminishing the haemodynamic response and sedating the patient and decrease analgesic requirements in the post-operative period. The efficacy of dexmedetomidine in providing hemodynamic stability during perioperative period and anesthesial recovery in patients undergoing laparoscopic cholecystectomy is studied. **Methods:** 60 patients of ASA grade I and II and of either sex (20–50 years) allocated in one of two parallel groups containing 30 patients each. In Group A- Dexmedetomidine (i.v.) bolus over 10min and continuous maintenance infusion 0.5µg/kg/h and in group B-0.9% normal saline i.v. bolus and continuous maintenance infusion was done. Parameters noted were heart rate, mean arterial pressure, oxygen saturation, post-operative pain were evaluated using VAS and analgesic requirement. **Results:** Both the groups were similar results in terms of age, sex, weight, ASA status, duration of surgery and hemodynamic parameters. SBP, DBP, MAP, $SpCO_2$, $EtCO_2$ values for both the groups were similar at all the intervals of time. No significant side effects were noted. **Conclusion:** Dexmedetomidine, pre-anaesthetic medication and its intraoperative infusion, further reducing the intraoperative anaesthetic requirement, sympathoadrenal response to intubation, maintains intraoperative cardiovascular stability, smooth extubation, sedation, and reduction in postoperative complications.

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INTRODUCTION

Cholecystectomy has been gold standard surgical treatment of cholelithiasis and cholecystitis. The first cholecystectomy was performed in 1882 by Carl Langenbuch, who believed in theory that the reason behind the removal of gall bladder was because it was "sick", not because it had gallstones [1]. The last therapeutic resort for symptomatic cholelithiasis before the advent of laparoscopy was Open surgery, whereas lithotripsy and cholecystostomy are less invasive alternatives [2]. In early 1970s, the diagnostic laparoscopic procedures were introduced, and the first laparoscopic cholecystectomy (LC) procedures was introduced in the late 1980s, and hence expanded impressively both in scope and volume [3]. In 1990, Professor Tehempton E Udwadia performed first laparoscopic cholecystectomy in India. Laparoscopic cholecystectomy has emerged over the open cholecystectomy as the gold standard for surgical treatment of symptomatic gall stones [4].

Major bile duct injuries led to morbidity rate of 0.3% to 0.5% in Laparoscopic cholecystectomy cases [5]. 34% to 49% of surgeons have encountered a major bile duct injury during their lifetime experience in United States [6]. Although pain after laparoscopic cholecystectomy is less intense, but many patients may experience considerable pain or discomfort during first 24 hours in post-operative period. Multimodal analgesia is now suggested to prevent and treat post-laparoscopy pain [7-9]. It always poses a challenge to its successful anesthetic management, mainly due to significant alteration of hemodynamics, resulting from the combined effects of pneumoperitoneum, patient position, anesthesia and hypercapnia from the absorbed CO_2 that is used to produce pneumoperitoneum. Pneumoperitoneum creation (increased intra-abdominal pressure) is immediately followed by an increase in plasma renin activity, norepinephrine and epinephrine levels [10].

Modern anaesthesia practices, by preventing sympathetic discharge, provide haemodynamic stability perioperatively. For achieve this objective, various opioid analgesics, benzodiazepines, beta blockers, calcium channel blockers and vasodilators have been used [11]. Recently in 1999, FDA approved and introduced Dexmedetomidine, a newer α_2 agonist, in Indian market [12]. Dexmedetomidine (Dex) was initially permitted to use in the Intensive Care Unit (ICU) sedation, but now it is commonly used as an anesthetic adjuvant due to its distinct properties [13]. Position of the patient during the laparoscopic surgery also adds up for these pathophysiological changes, further compromising the hemodynamics [14]. Intravenous (i.v.) use of dexmedetomidine in perioperative period lead to 90% decrease in the serum catecholamine levels, and further diminishing the haemodynamic response and sedating the patient and decrease analgesic requirements in the post-operative period [15-17]. So, the present study was conducted to study the effectiveness of Dexmedetomidine on patients undergoing laparoscopic cholecystectomy, as it keep patient hemodynamically stable and help in the smooth recovery of the patient.

MATERIAL AND METHODS

The present study is Prospective, randomized, double-blind, and clinical study. After institutional ethical committee approval the present study was conducted in the Department of Anaesthesia, Govt. RDBP Jaipuria Hospital (RUHS-CMS), Jaipur.

The patients of either sex, 30-60 years age, 40-80 Kg weight undergoing elective laparoscopic cholecystectomy under general anesthesia and were belonging to American Society of Anaesthesiologists (ASA) physical status I and II, was included in this study. The informed and written consent was obtained from each patient. While the patients excluded from the study were those who were not willing for consent, with ASA III and above, morbid obese, pregnant patients, breastfeeding mothers, allergy to α2 adrenergic agonist/sulfa drugs.

The sample size was calculated at alpha error 0.05 and study power 90% using the formula for hypothesis testing for two populations' mean. So, total 60 patients were allocated in one of two parallel groups containing 30 patients each. In group A, Dexmedetomidine intravenous (i.v.) bolus over 10min and continuous maintenance infusion 0.5µg/kg/hr was given. While in Group B i.e. Control group 0.9% normal saline i.v. bolus and continuous maintenance infusion was given. An i.v. infusion bolus of 1µg/kg body weight over a 10 min period, followed by a continuous i.v. infusion of 0.2-0.7µg/kg/hr was recommended dose of dexmedetomidine in this study.

On the day of surgery on arrival of patient in the operating room monitors was attached. The record of Heart rate (HR), systolic blood pressure (SBP), diastolic BP (DBP), mean arterial pressure (MAP), and SpO_2 was maintained. All patients would

receive 6L of oxygen by Hudson's mask for 5min. All patients would receive injection glycopyrrolate 0.004mg/kg, injection ondansetron 0.08 mg/kg and injection midazolam 0.02mg/kg intravenously.

The study medication [Dexmedetomidine 200µg (2ml) in 48ml of normal saline means 4µg/ml] was prepared. Normal saline was similarly prepared in similar prescribed format for standardization. An infusion of the drug for that particular serial number as per the randomization chart was administered by investigator and would be started 10min prior to induction. Initial bolus infusion of study medication (dex 1µg/kg) over 10min. Patients would be preoxygenated with 100% oxygen with facemask. Induction would be carried with injection fentanyl 2µg/kg and injection propofol 2–2.5mg/kg in graded doses until loss of consciousness. After confirming adequacy of ventilation, injection succinylcholine 1.5mg/kg would be administered and intubated with adequate size cuffed endotracheal tube.

Anesthesia would be maintained with O_2:N_2O in 40:60 proportion with sevoflurane to maintain the HR and BP within 20% of the baseline value. Muscle relaxation would be maintained with injection vecuronium bromide, loading dose of 0.08 mg/kg and intermittent top-ups of 0.02mg/kg as and when required. The patients in Group A, dexmedetomidine infusion at the dose of 0.5µg/kg/hr intraoperatively was given, while normal saline at the respectively comparable rate was given in patients of group B. Patients would be ventilated with an initial tidal volume of 6–8ml/kg and a respiratory rate of 14breaths/min, which would be later adjusted to keep the $EtCO_2$ within 35–40mm of Hg. Intra-abdominal pressure, would be maintained below 14 mmHg. Fentanyl (0.5µg/kg) top-ups would be given to keep the MAP within 20% of baseline. All patients received injection paracetamol 1gm i.v. infusion as analgesia intraoperatively. The infusion of sevoflurane in both the groups would be stopped, at the end of pneumoperitoneum.

The incision ports were injected with 0.125% bupivacaine, towards the end of surgery. Complete reversal of neuromuscular blockade would be achieved with injection glycopyrrolate 0.008mg/kg and injection neostigmine 0.04mg/kg and patients would be extubated after establishment of spontaneous, regular and adequate respiration and good muscle power with appropriate response to verbal commands. Patients having fluctuations in HR and BP > 20% of baseline value would be recorded and treated accordingly.

Immediately after extubation, recovery would be assessed by modified Aldrete's and sedation score. HR, BP, SpO_2 would be recorded continuously at predetermined time intervals as per the protocol. Number of patients requiring total fentanyl top-ups would be recorded. Time interval of time to tracheal extubation, time to respond to verbal command would be recorded after the stoppage of infusion.

After shifting to the postanesthesia care unit, patients were put on oxygen under Hudson's mask and i.v. fluids were given. Various hemodynamic parameters (HR, SBP, DBP, MAP, SpO_2, postoperative nausea and vomiting (PONV)) were noted every 15min, thereafter for 2hr and treated accordingly.

STATISTICAL ANALYSIS

The data pertaining to demographic and other clinical variables was entered in the form of data matrix in Microsoft® Excel ® and analyzed using IBM® SPSS® v 21.0.0. For comparing categorical data like age group, gender, ASA were expressed as frequency and percentage and were analyzed using chi square (x^2) test. Continuous variables were expressed as mean and standard deviation and were analyzed using independent sample t test.

RESULTS

Both the groups were proportionate in terms of age, sex, weight, ASA grading, time period of surgery and hemodynamic parameters. In Group A, majority patients (18) were 30-39yrs of age, while in Group B, 12 patients each were 30-39 and 40-49yrs of age. The results were not significant (p value = 0.202) (Table 1). There were 53 female patients out of which 27 were included in Group A and 26 in Group B. While males were 3 in Group A and 4 in Group B. Both groups were proportionate in terms of gender distribution (p value = 1.000, not significant) (Table 1).

In group A, 80% patients were having ASA Grade I and 20% were Grade II. In the Group B, 76.67% were Grade I and 23.3% were Grade II. The difference between the two groups was statistically in-significant (p value 1.000) (Table 1). The mean weight ± S.D. (Kg) for Group A was 51.73±7.65 and for Group B was 48.9±5.74. Results were statistically in-significant (p value 0.110) (Table 1).

Table1: Patient Characteristics

Parameter			Group A Dexmedetomidine	Group B Normal Saline	p value
Age (years)	30-39		18 (60.0%)	12 (40.0%)	Chi-square = 3.200 with 2 degrees of freedom p value 0.202 (Not significant).
	40-49		6 (20.0%)	12 (40.0%)	
	50-60		6 (20.0%)	6 (20.0%)	
Sex	Female		27 (90.0%)	26 (86.7%)	Chi-square = 0.000 with 1 degree of freedom; p value 1.000 (Not significant)
	Male		3 (10.0%)	4 (13.3%)	
ASA	GRADE I		24 (80.0%)	23 (76.67%)	Chi-square = 0.000 with 1 degree of freedom; p value 1.000 (Not significant).
	GRADE II		6 (20.0%)	7 (23.3%)	
Weight N (Mean ± SD)			30 (51.73 ± 7.65)	30 (48.9 ± 5.74)	0.110 (not significant)
Duration of completion of surgery after intubation		30 min	16	0	< 0.001 Significant (Chisquare test)
		45 min	12	23	
		60 min	2	7	

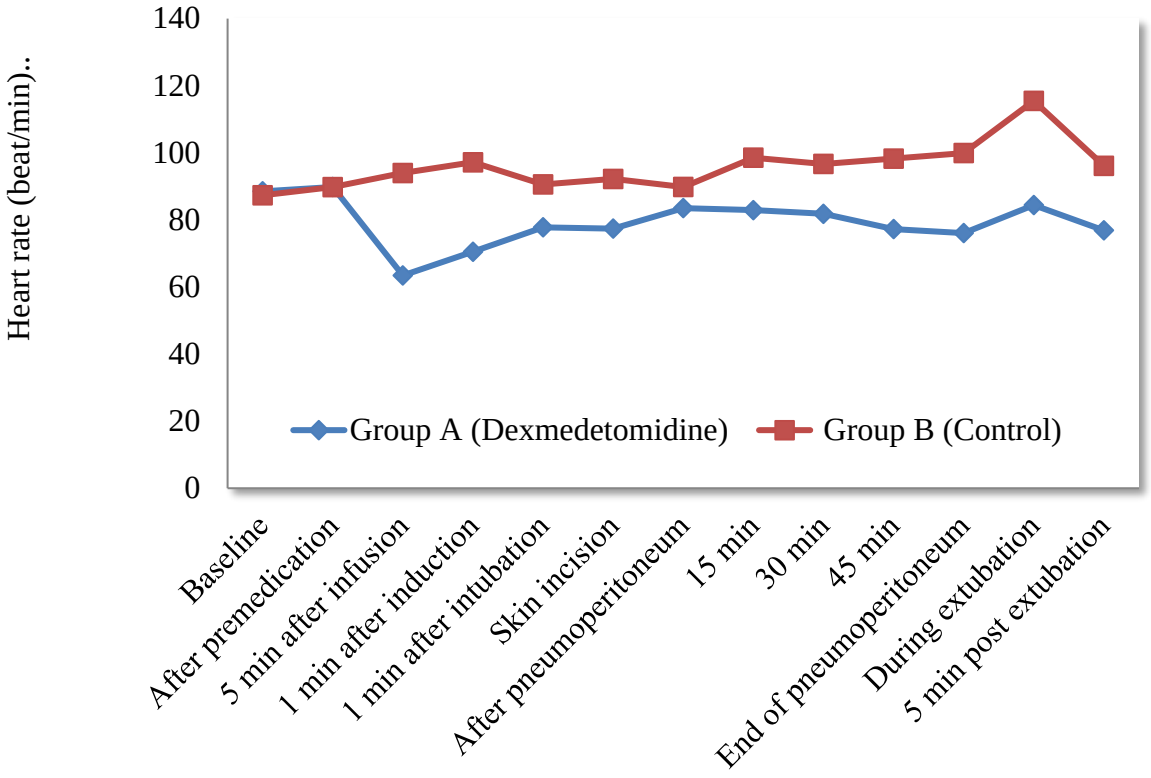

Figure 1: Comparison of Heart rate (beat/min) among study groups (n=60)

The maximum number of subjects (Group A) in which the duration of surgery was 30min, followed by 45min. While Group B had maximum number of subjects with completion of surgery was 45min followed by 60min (statistically significant - p value < 0.001) (Table 1).

HR, SBP, DBP, MAP, SpO2, and EtCO2 was comparable in two groups at all intervals and was shown in Figure1 and Table 2, 3. The figure 1 shows that heart rate was comparable in two groups at all intervals. It was found to be statistically significant at all intervals except baseline and just after premedication (p value 0.788 and 0.821 respectively).

Table 2: Comparison of SBP, DBP and MAP (mmHg) among study groups (n=60)

Time point	SBP			DBP			MAP		
	Group A	Group B	p value	Group A	Group B	p value	Group A	Group B	p value
Baseline	133.13 ± 8.78	133.2 ± 7.81	0.882	82.9 ± 5.28	80.43 ± 5.77	0.198	99.13 ± 5.84	98.17 ± 2.07	0.154
After premedication	135.93 ± 8.67	134 ± 5.78	0.788	83.47 ± 5.2	81.6 ± 4.8	0.154	100.83 ± 5.83	98.7 ± 6.06	0.225
5 min after infusion	133.83 ± 14.78	134.87 ± 3.79	0.811	83.1 ± 9	79.77 ± 2.22	0.054	99.3 ± 9.85	97.77 ± 5.27	0.422
1 min after induction	117.3 ± 13.46	115.53 ± 6.44	0.519	75.1 ± 8.66	70.23 ± 4.56	0.009 (S)	89.27 ± 10.21	83.97 ± 6.55	0.020 (S)
1 min after intubation	129.67 ± 10.58	141.87 ± 10.41	<0.001 (S)	79.77 ± 6.56	96.9 ± 2.59	<0.001 (S)	96.27 ± 7.19	111.73 ± 3.94	<0.001 (S)
Skin incision	122.4 ± 9.94	129.3 ± 6.19	0.002 (S)	79.93 ± 8.55	83.3 ± 4.45	0.061	94.17 ± 8.44	98.23 ± 4.6	0.024 (S)
After pneumoperitoneum	130.87 ± 12.54	133.4 ± 6.27	0.326	85.57 ± 12	87.77 ± 4.42	0.350	97.37 ± 20.38	102.67 ± 4.79	0.171
15 min	125.8 ± 10.79	130.33 ± 9.69	0.092	80.93 ± 10.36	87.6 ± 3.97	0.002 (S)	95.73 ± 10.7	102.63 ± 5.08	0.002 (S)
30 min	125.37 ± 9.03	125.13 ± 7.39	0.205	80.27 ± 9.86	84.67 ± 2.54	0.021 (S)	95.3 ± 9.19	98.37 ± 3.47	0.093
45 min	121.67 ± 6.27	126.37 ± 11.93	0.150	77 ± 7.52	86.73 ± 5.24	0.006 (S)	92 ± 7.63	100 ± 7.31	0.004 (S)
End of pneumoperitoneum	119.5 ± 9.83	122.7 ± 12.9	0.284	77.4 ± 9.84	81 ± 3.31	0.062	91.33 ± 8.36	94.7 ± 6.22	0.082
During extubation	131.27 ± 9.58	142.87 ± 18.2	0.003 (S)	83.5 ± 8.69	93.3 ± 5.52	<0.001 (S)	98.63 ± 7.1	109.3 ± 7.98	<0.001 (S)
5 min post extubation	119.23 ± 6.61	131.47 ± 12.81	<0.001 (S)	76.63 ± 5.8	82.73 ± 2.66	<0.001 (S)	90.6 ± 5.03	99.13 ± 5.4	<0.001 (S)

Table 3: Comparison of SPO_2 (%) and EtCO2 (%) among study groups (n=60)

Time point	SPO2			EtCO2		
	Group A	Group B	p value	Group A	Group B	p value
Baseline	99 ± 0.74	98.7 ± 1.44	0.315	25.97 ± 4.1	24.9 ± 2.98	0.253
After premedication	99.63 ± 0.61	99.07 ± 1.2	0.025 (S)	26.63 ± 4.69	26.7 ± 2.22	0.944
5 min after infusion	99.9 ± 0.31	99.77 ± 0.43	0.171	26.77 ± 5.04	26.63 ± 2.39	0.896
1 min after induction	99.97 ± 0.18	99.8 ± 0.48	0.083	29 ± 5.3	26.17 ± 2.07	0.008 (S)
1 min after intubation	99.97 ± 0.18	99.93 ± 0.25	0.561	30.93 ± 3.46	26.33 ± 3.03	<0.001 (S)
Skin incision	99.97 ± 0.18	99.9 ± 0.4	0.412	29.17 ± 4.26	25.77 ± 2.99	0.001 (S)
After pneumoperitoneum	99.97 ± 0.18	99.93 ± 0.25	0.561	30.4 ± 3.81	28.87 ± 2.15	0.060
15 min	100 ± 0	99.97 ± 0.18	0.321	29.97 ± 4.33	28.87 ± 2.15	0.217
30 min	100 ± 0	99.97 ± 0.18	0.321	30 ± 4.5	28.53 ± 2.57	0.126
45 min	100 ± 0	99.97 ± 0.18	0.338	29.79 ± 3.57	27.93 ± 2.26	0.021 (S)
End of pneumoperitoneum	100 ± 0	100 ± 0	-	29 ± 2.83	26.57 ± 4.34	0.013 (S)
During extubation	100 ± 0	99.97 ± 0.18	0.321	30.67 ± 4.47	28.93 ± 4.16	0.125
5 min post extubation	100 ± .00000	100 ± .00000	-	31.4 ± 3.72	28.57 ± 4.1	0.007 (S)

*S- Statistically significant

None of the groups exhibits PONV. 30% cases in Group A had experienced Bradycardia and only 2 patients had fall in BP and rise in BP was observed in both the groups (30%, 46.7% resp.) (Table 4).

Table 4: Frequency of intraoperative complications among study groups (n=60)

Intraoperative Complications	Group A Dexmedetomidine (n=30)	Group B Control (n=30)	p value
Nausea	0 (0%)	0 (0%)	-
Vomiting	0 (0%)	0 (0%)	-
Bradycardia	9 (30%)	0 (0%)	0.002 (S)
Hypotension	2 (6.7%)	0 (0%)	0.492
Hypertension	9 (30%)	14 (46.7%)	0.288

S- Statistically significant

The comparison of Modified Aldrete score and sedation score in recovery period among the study groups was shown in Table 5.

Table 5: Comparison of Modified Aldrete score and post-op Sedation score in recovery period among study groups (n=60)

Parameter		Number of subjects		p value
		GROUP A (Dexmedetomidine)	GROUP B (Normal Saline)	
Modified aldrete score	8	0	0	-
	9	30	30	
	10	0	0	
Sedation score	1	0	30	< 0.001 (Significant) Chisquare test
	2	30	0	
	3	0	0	

DISCUSSION

The increase in the systemic vascular resistance and blood pressure at the same time producing nociception during pneumoperitoneum led to intraoperative stress in Laparoscopic surgeries [18]. In our study, we observed the effects of dexmedetomidine on hemodynamics during perioperative period in laparoscopic cholecystectomy cases. Dexmedetomidine was better tolerated and no adverse reactions had been observed in this study. The two groups under study were analogous to each other with respect to age, gender, weight, duration of surgery and anesthesia. The present study showed that in the group A, 18 patients were 30-39yrs of age, while in group B, 12 patients each were 30-39 and 40-49yrs of age. The results were not significant (p value 0.202). This means that the drug was equally effective in the patients of 30-60yrs of age, i.e. age was not a factor contributing towards the variance in the effectiveness of this drug. Similar results were observed by Chilkoti et al [19].

In the present study, 27 females were included in Group A and 26 in Group B. while males were lesser in number as compared to females. Both groups were comparable in terms of gender distribution (p value 1.000, not significant). Similar results were observed by Ye et. al [20] who conducted study by dividing the subjects into four different groups (30 patients each). Although there are more females presenting for laparoscopic cholecystectomy as compared to males, the drug was equally effective on cases and controls as well as males and females.

The present study was conducted on both ASA I and II grade patients. The Group A, 24(80%) patients were having ASA Grade I and rest were Grade II. In the Group B, 23 subjects (76.67%) were Grade I and 7 subjects (23.3%) were Grade II. The difference between the two groups was statistically not significant (p value 1.000). Similar results were observed by Khare et al, group A had 17 patients with grade I and 3 grade II while Group B, grade I had 16 patients, grade II had 4 patients with p value > 0.05. So, the drug was effective in both study groups irrespective of ASA grading of the patient [21].

The other factor compared in the present study was the weight of the patients, as the patients were having 40-80Kg weight. The mean weight ± S.D. in Kg for Group A was 51.73 ± 7.65 and for Group B was 48.9 ± 5.74. Results were statistically not

significant (p value = 0.110). Similar results were observed by Khare et. al [21] So, again the weight of the patient didn't affect the effectiveness of the study drug. So, the ethnicity didn't affect the effectiveness of the testing drug.

The study was accomplished in maximum (16) number of subjects (Group A) in which the duration of surgery was 30min, followed by 45min (12). While Group B had maximum number of subjects with completion of surgery was 45min followed by 60min. The results were statistically significant (p value < 0.001). While the study conducted by Chavan et al, showed the mean time of completion of surgery in both the groups was 69.83±4.65 and 67.9±4.51 [22]. The results of our study showed that, in NS group, there was a significant rise in HR, SBP, DBP and MAP following laryngoscopy, intubation, pneumoperitoneum and after extubation.

HR is a major determinant of myocardial oxygen consumption. In our study, HR was decreased after giving i.v. dexmedetomidine. Following induction, there was rise in HR in both the groups but in dexmedetomidine group it remained below baseline till the time of incision and rises after that till 30min after intubation then again falls to below the baseline in our study. But in control group, maximum rise in HR was 1min after induction, which gets decreased to the baseline HR till skin incision was given. The decrease in pulse rate after dexmedetomidine administration was due to reduction in sympathetic outflow and simultaneous increase of parasympathetic tone of central origin. HR was comparable in two groups at all intervals. It was statistically significant at all intervals except baseline and just after premedication (p value 0.788 and 0.821 respectively).

While Ye et al observed that at T1, there were no differences in HR, SBP, DBP among all groups. Compared with T1, HR decreased at T2, T5 in all groups. Besides HR also decreased at T4, T6 in NS group and decreased at T4 in D1 and D2 groups. HR increased at T3 and T7 in NS and D1 groups, while it increased at T7 in D2 group (p value less than 0.05). Compared with NS group, HR had fallen in all the three groups at T4; T2–4, T7; T2–3, T7–9 respectively [20]

Keniya et al also concluded in their study that the increase in HR after intubation was 21% in placebo group as compared to 7% in group of dexmedetomidine 1µg/kg, implying a better hemodynamic response with the drug [23]

Intubation, pneumoperitoneum and extubation during general anesthesia are all harmful stimulus, which can cause a strong stress response. This can lead to increase in the concentration of catecholamines in the blood and leading to rise in HR and BP, which causes a series of complications such as myocardial ischemia, arrhythmia and cerebrovascular accident in patients with cardiocerebrovascular diseases [14, 24]. Intravenous application of dex in the perioperative period can inhibit the release of epinephrine and norepinephrine by activating the receptors in the medullary vasomotor center, thus reduce catecholamine level in the blood by more than 50%, which is beneficial to maintain intraoperative hemodynamic stability [25, 16]

In the present study, after giving the test drug, following induction and 15 min after pneumoperitoneum, there was fall in SBP in both the groups but it was found to be significant statistically at 1min after intubation, skin incision, during extubation and 5min post extubation (p value< 0.001, 0.002, 0.003, < 0.001 respectively). Similarly, DBP was comparable in two groups at all intervals. After giving the drug, following induction and 15min after pneumoperitoneum fall of DBP was seen in both the groups but it was statistically significant difference at 1min after induction, 1min after intubation, 15min after intubation, 30 min after intubation, 45min after intubation, during extubation and 5min post extubation (p value 0.009, <0.001, 0.002, 0.021, 0.006, < 0.001, < 0.001 respectively). The initial fall in BP can be explained by peripheral α-2B adrenoceptors stimulation of vascular smooth muscles. The initial response is followed by further fall in BP. Both these effects are caused by inhibition of central sympathetic outflow overriding the direct stimulant effects.

In the present study, after giving the test drug, following induction and 15min after pneumoperitoneum, decrease in MAP levels was observed in both groups but it was found to be statistically significant difference at 1min after induction, 1min after intubation, skin incision, 15min after intubation, 45 min after intubation, during extubation and 5min post extubation (p value 0.020, < 0.001, 0.024, 0.002, 0.004, < 0.001, < 0.001 respectively).

Emergence from anesthetic effects and extubation are equally crucial as 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 central nervous system sympathetic activity, leading to high quality of extubation with minimum hemodynamic changes, as we observed in majority of our patients in dexmedetomidine group. While a study conducted by Chavan et al, showed similar results to our study. It was observed that, those patients who received dexmedetomidine infusion in the intraoperative period had HR, 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 value < 0.05) [22].

Oxygen saturation values for both groups were above 99% and comparable at all the intervals of time. All the results are statistically insignificant except after premedication (p value=0.025). Similar results were observed in the study conducted by Chavan et al in which there was no fall in the saturation in both the groups and the data was found to be not significant (p value >0.05)[22].

EtCO2 values for both the groups were akin at all the intervals of time. The EtCO2 levels hiked above the baseline after premedication in both groups, remains so, till 5min post extubation. It was found to be statistically significant at 1min after induction, 1min after intubation, skin incision, 45min after intubation, end of pneumoperitoneum and 5min post extubation (p value 0.008, < 0.001, 0.001, 0.021, 0.013, 0.007 respectively). Dexmedetomidine does not produce respiratory depression even at high doses. It maintains sedation without cardiovascular instability or respiratory drive depression.

None of the groups exhibits nausea and vomiting as intraoperative complications. While bradycardia was exhibited by 30% cases in Group A, and the results were significant statistically (p value 0.002). The variance in BP was observed in both the groups. Fall in BP was observed in 2 cases and rise in BP was observed in 30% cases of Group A and 46.7% cases of Group B and results were found to be not significant (p value 0.492, 0.288 respectively).

A study conducted by Manne et. al showed that Tachycardia and hypertension were seen in more number of patients of Group NS, as compared to patients of group Dex 0.2. Hypotension was noted in 1 patient of group Dex 0.2 and bradycardia was seen in 1 patient of Dex 0.4 group [14]. In the present study, Dexmedetomidine was given i.v. bolus over 10min and continuous maintenance infusion 0.5µg/kg/hr. In another studies, dexmedetomidine infusion rates ranging from 0.1 to 10µg/kg/hr had been used. The studies with higher infusion rates had more incidences of adverse effects like hypotension and bradycardia [26]. Previous studies had showed that intravenous infusion of dexmedetomidine 1µg/kg before operation could reduce the overall incidence of PONV in patients undergoing LC [27].

The Modified Aldrete score was calculated in both the study groups and it was found to be 9 in both the groups. The reason might be that the subjects of Group A (dexmedetomidine) were arousable on calling while Group (control) are fully awake while that of circulation, group A (dexmedetomidine) were more hemodynamically stable as compared to control group. So, the subjects are fit to discharge if the score is ≥ 9. In our study, the subjects in Group A, sedation score 2 was observed while lesser score was observed in Group B and the results are statistically significant (p value<0.001).

The study conducted by Chavan et al observed that the time for extubation and time to respond to oral commands were found to be similar in the study groups [22]. The present study showed that the there was no significant respiratory depression property of the test drug. There was no significant change in oxygen saturation parameter in both the groups similar to our study findings. So, Dexmedetomidine, is a highly selective α_2 adrenergic agonist with sedative, anxiolytic, analgesic, sympatholytic and antihypertensive effects. Activation of α_2 adrenergic receptors inhibits neuronal firing leading to hypotension, bradycardia and sedoanalgesia in the brain and spinal cord. The presynaptic activation of α_2 adrenergic receptors inhibits the release of norepinephrine. Effects of hemodynamics changes are mediated by inhibition of central sympathetic system outflow.

Limitations of the present study:

1. The drug cannot be used in the patients with low HR, as it further promotes the fall in HR.
2. The study was not used for patients having ASA grade III-VI.

CONCLUSION

The intraoperative infusion of dexmedetomidine, decreases the requirement of intraoperative anaesthesia. It has remarkable opioid and anaesthetic sparing property and further, attenuates sympathoadrenal response to tracheal intubation. Along with continuous intraoperative administration of dexmedetomidine will maintain intraoperative cardiovascular stability. It also affords added advantage of smooth extubation, sedation, reduction in postoperative complications such as nausea-vomiting. The side effects like hypotension, hypertension and bradycardia are observed to be mild and not requiring any active intervention and have less effect on the spontaneous breathing time and extubation time.

FINANCIAL ASSISTANCE

Nil

CONFLICT OF INTEREST

The authors declare no conflict of interest

AUTHOR CONTRIBUTION

Mohit did thorough literature search, designed, performed the study and acquired data, wrote manuscript. Kumar interpreted the data thoroughly. Rajesh properly edited the manuscript. Varun and Vivek edited and reviewed the manuscript. Shaveta finally reviewed the manuscript and properly designed the manuscript according to the journal specifications.

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