

Original Research Article

Effect of Dexmedetomidine as an adjuvant to General Anesthesia during abdominal surgeries

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Abstract: Dexmedetomidine is a α_2 -adrenoreceptor agonist with sedative, analgesic and anxiolytic properties it is known to be used as General Anesthetic adjuvant. It has useful action like minimal respiratory depression with Cardio protection, Neuroprotection and Renoprotection with added advantages like anesthetic and analgesic sparing actions. In the present we tried to evaluate the effect of dexmedetomidine as anesthetic adjuvant on variables and postoperative pain scores and need for rescue analgesics and anti-emetics and resumption of bowel function. The study was performed in CAIMS Karimnagar. 60 patients divided into three groups of 20 each were randomly selected and allotted. The patients were undergoing various abdominal surgical procedures like Laparoscopic Cholecystectomy, Hysterectomy and Appendectomy. The first group (Group I) was the control group they received IV saline 10ml, the second group (Group II) was the [Dex 0.5] group they received Dexmedetomidine 0.5 $\mu\text{g}/\text{Kg}/\text{hr}$ IV and third group (Group III) [Dex 1.0] received Dexmedetomidine 1 $\mu\text{g}/\text{Kg}/\text{hr}$ IV. Anesthesia was maintained with N_2O to O_2 mixture of 60:40. MAP values were maintained within 25% of the baseline values. Recovery times from tracheal extubation, modified Aldrete score, VAS scores, tolerating liquids, and passage of flatus were noted. Mean duration of surgery was 156 ± 25 , 140 ± 30 and 126 ± 45 in group I, Group II and Group III respectively. Time to suction catheter response was 7.31 ± 1.87 , 8.10 ± 2.29 and 8.56 ± 3.67 mins in the Group I, II, III and Modified Aldrete score of > 8 was achieved earliest by Group III with mean value of 5.9 ± 3.5 which was statistically significant. The VAS scores (0-10) were 6.8 ± 1.5 , 5.5 ± 1.0 and 5.2 ± 1.5 were recorded in the Group I, II and III. Dexmedetomidine is a useful adjunct to anesthesia because of its beneficial effects on postoperative analgesia and recovery. Dexmedetomidine was found to be useful in abdominal laparoscopic procedures where the duration of surgery is lesser. It also reduces the operative sevoflurane requirements without any adverse effects.

Keywords: Dexmedetomidine, Adjuvant, Abdominal Surgeries

INTRODUCTION

The α_2 receptors are located within the central nervous system and their activation leads to sedation, a reduction of tonic levels of sympathetic outflow, and an augmentation of cardiac–vagal activity [1, 2]. This can result in a decrease in heart rate (HR) and cardiac output (CO) [3, 4]. The use of α_2 agonists in the perioperative period has been associated with reduced anesthetic requirements and attenuated HR and blood pressure (BP) responses to stressful events [5, 6]. In addition, α_2 receptors within the spinal cord modulate pain pathways, thereby providing some degree of analgesia [7, 8]. Dexmedetomidine is a highly specific α_2 adrenoreceptor agonist having sedative, anxiolytic,

sympatholytic and analgesic properties without producing respiratory depression [9-11]. Dexmedetomidine has been used during anesthetic practices like sedation during mechanical ventilation, post-operative anxiolysis, and prevention of emergence agitation and treatments of substance withdrawal [12-14]. Several studies have reported the benefits of dexmedetomidine including neuroprotection, cardio protection and renoprotection [15]. Because of its central sympatholytic actions dexmedetomidine decreases the mean arterial blood pressure and heart rate by reducing nor-epinephrine release [16, 17]. It has effectively shown to reduce the requirements of both the anesthetic and opioid analgesic requirements during

the perioperative period. [18]. Laparoscopic surgeries under general anesthesia are associated with hemodynamic changes which includes increased systemic vascular resistance, leading to hypertension which may require use of vasodilators to tackle rising BP, dexmedetomidine because of its sympatholytic action effectively decreases the rise of BP [19]. Bradycardia and hypotension are the responses seen due to administration of dexmedetomidine. Bradycardia may be reflex response to reflex hypertension during initial part of infusion. Subsequent decrease in heart rate is due to decreased sympathetic out flow and Hypotension is due to decreased central sympathetic out flow. Optimal dose for attenuating pressor response seems to be 1µg/kg and lesser dose may not be effective [20]. An infusion continued during post-operative periods has been associated with lesser hemodynamic fluctuations and decrease in plasma catecholamines [11]. Gubert *et al.*; have shown that continuous IV dexmedetomidine administration during abdominal surgeries provide effective analgesia with reduced postoperative analgesic requirements without increasing side effects [18]. With this background we in the present tried to evaluate the effects of Dexmedetomidine when used as an adjuvant to Laparoscopic abdominal surgeries in selected patients.

MATERIALS AND METHODS

This study was performed in CAIMS; Karimnagar Institutional Ethical committee permission was obtained prior to the study. Informed consent was obtained from all the patients regarding the procedure. Sixty patients age ranging from (24-52 years) were included in the study. All the patients belong to American Society of Anesthesiologists physical status I or II were only involved in the study. Patients with history of Hypertension, Diabetes Mellitus, CV disorders, cerebrovascular disease or any other significant medical conditions were excluded in the study. 60 patients divided into three groups of 20 each were randomly selected and allotted. The patients were undergoing various abdominal surgical procedures like Laparoscopic Cholecystectomy, Hysterectomy and appendectomy. The first group (Group I) was the control group they received IV saline 10ml, the second group (Group II) was the [Dex 0.5] group they received Dexmedetomidine 0.5 µg/Kg/hr IV and third group (Group III) [Dex 1.0] received Dexmedetomidine 1.0 µg/Kg/hr IV. Glycopyrrolate 4µg/Kg, IM, Ondansetron

4mg IV was given prior to anesthesia. Standard monitors like ECG, Pulse oximetry, Non-Invasive Blood Pressure [NIBP] were used. Patients were blinded and received Normal saline 10ml control Group [CG]; Dexmedetomidine IV was given 10 mins prior to anesthetic induction. Propofol 2mg/Kg and Succinylcholine 1.5mg/Kg was administered IV to facilitate intubation. All patients were intubated with appropriate sized cuffed endotracheal tube passed orally and placement confirmed with auscultation and End tidal CO₂ concentration. Anesthesia was maintained with sevoflurane with O₂ (1.5 L/min) and N₂O (1.5 L/min). Anesthesia was maintained with N₂O to O₂ mixture of 60:40. Anesthetic depth was maintained to reach the target value of around 40 by manipulating sevoflurane vaporizer setting. Ventilation was controlled to maintain End Tidal CO₂ concentration of 30-35 mmHg. Hemodynamic values were recorded at the time of induction of anesthesia, at the 5 min of tracheal intubation, at skin incision and MAP values were maintained within 25% of the baseline values. Upon the completion of wound closure, sevoflurane was discontinued and the inspired oxygen flow rate was maintained to 5 L/min. The time from discontinuation of sevoflurane to eye opening, obeying commands were recorded. After emergence from anesthesia, patients were administered Fentanyl 25-20 g IV boluses to control post-operative acute pain. Finally, recovery times from tracheal extubation to ambulation without assistance, tolerating liquids, and passage of flatus were also noted.

RESULTS

A total of 60 patients were randomly divided into three groups of 20 each there were no significant differences among the three groups with respect to age, gender and ASA classification for laparoscopic surgery. Most of the cases included were of appendectomy as these are the commonest cases undergoing laparoscopic surgeries. The Mean duration of surgery in Group III receiving 1.0 µg/Kg IV dexmedetomidine was significantly lesser (p <0.05) as compared to the other two groups. (See table 1) The end tidal concentration of sevoflurane was significantly lower in (Dex 1.0) Group III during the surgery. After tracheal intubation MAP and HR were significantly increased in control group but remained unchanged in Group II and Group III.

Table 1: Profile of patients included in the study, with the type of surgery performed and durations of anesthesia and surgery

	Group I (n=20)	Group II (n=20)	Group III (n=20)
Age	35 ± 6	37 ± 8	36 ± 5
Gender male/Female	14 / 6	12 / 8	15 / 5
ASA I/II	7 / 13	6 / 14	9 / 11
Type of Surgery			
Appendectomy	13	13	15
Cholecystectomy	5	4	3
Hysterectomy	2	3	2
Mean Duration of surgery	156 ± 25	140 ± 30	126 ± 45*
Mean Duration of Anesthesia	190 ± 36	180 ± 25	160 ± 32
Mean duration of Infusion	170 ± 30	160 ± 29	145 ± 30*

Values in Mean ± SD, * significant p value

In this study we tried to assess the recovery profiles for which we measured the times taken to respond to suction catheter, to obey verbal commands and to complete tracheal extubation after turning off the vaporizer. In the recovery room the observation were made for time taken to reach modified Aldrete score [21] and the occurrence or post-operative nausea and vomiting [PNOV] and post-operative pain by visual analogue scale (VAS 0= no pain 10= worst possible pain). The parameters were recorded by independent observers unaware to which group the patient belongs.

Time to suction catheter response was significantly higher in the Group III the mean values were 8.56 ± 3.67 and the time to obey verbal commands was also higher in Group III compared to the two other groups however the p values were not significant. The modified Aldrete score on average was also scored better in Group III and the value was found to be significant. There were lesser incidences of Post-operative nausea and vomiting in the Group III as compared to the other two groups. See table 2.

Table 2: showing the recovery profiles with Aldrete Scores, VAS and PNOV

Recovery variables	Group I (Mean ± SD)	Group II (Mean ± SD)	Group III (Mean ± SD)
Time to suction catheter response (min)	7.31 ± 1.87	8.10 ± 2.29	8.56 ± 3.67*
Time to obey verbal commands (min)	6.06 ± 3.94	7.01 ± 4.04	7.20 ± 4.19
Time to tracheal extubation	13.01 ± 4.59	12.90 ± 3.99	12.89 ± 4.01
Modified Aldrete Score at recovery room > 8 (min)	24.8 ± 12.5	10.5 ± 4.2	5.9 ± 3.5*
PNOV	4	3	2
Visual Analogue Scale (0-10)	6.8 ± 1.5	5.5 ± 1.0*	5.2 ± 1.5*
Time for ambulation (hrs)	11.90 ± 5.9	10.0 ± 6.5	9.5 ± 5.0
Time for oral intake (hrs)	18.0 ± 6.0	19.10 ± 6.5	16.5 ± 5.50
Time for passing flatus (hrs)	35.0 ± 15	38.80 ± 8.9	39.5 ± 10.10

Values in Mean ± SD, * significant p value

DISCUSSION

In the current study we investigated the effects of Dexmedetomidine in concentrations of 0.5 µg/kg IV and 1.0 µg/kg IV as anesthetic adjuvant compared with controls who did not received Dexmedetomidine. The idea was to find the ideal concentration of Dexmedetomidine which would ensure best postoperative haemodynamic stability and fast recovery without respiratory depression. The results could reduce the requirement of volatile anesthetics and better post-operative care. Dexmedetomidine has a number of

properties that may prove to be useful in treatment for patients undergoing painful abdominal surgical procedures. Administration of such adjuvants has decreased the incidence of tachycardia and other adverse cardiovascular effects [22, 23]. Dexmedetomidine has been used in doses ranging from 0.25 to 1 µg/kg to blunt the intubation response [4, 11]. in this study we used the doses of 0.5 µg/kg and 1.0 µg/kg and we found that the cardiovascular and hemodynamic response to intubation by increased heart rate and blood pressure was better blunted by the Group

II receiving 0.5 µg/kg of Dexmedetomidine as compared to the control Group I. In a study by Gourishankar RM *et al.*; using low doses of dexmedetomidine in patients undergoing laparoscopic cholecystectomies found that a dose of 0.4 µg/kg was effective in attenuating the response to intubation [24]. Which confirms our findings other studies has also reported similar findings that critical incidences of laryngoscopy and intubation and extubation in patients with low doses of dexmedetomidine reduced fluctuation of MAP and HR [25]. Bradycardia and hypotension are major side effects observed following dexmedetomidine infusions. Bradycardia is a reflex response for transient hypertension during initial part of infusion following which decrease in heart rate is due to decreased central sympathetic discharge. Hypotension was due to decreased central sympathetic outflow however in low doses of up to 1µg/kg did not appreciably produced such response in this study probably these kind of response are dose related and usually found in higher doses 1-4 µg/kg [26].

In the present study we found that group III receiving 1 µg/kg dexmedetomidine the end tidal sevoflurane concentration and total consumption of sevoflurane was in group I 37.9 ml and Group II 29.6 ml and Group III it was 24.2 ml therefore a reduction of 21.9% was seen between group I and Group II and reduction of 36.15% was seen between Group I and Group III. Similar finding have been reported by Shin *et al.*; [27]. In the present study we found that modified Aldrete score of >8 at the postoperative anesthetic recovery room was achieved earlier and better in the Group III as compared to control. The possible reason for better recovery is due to analgesic and sedative effects of dexmedetomidine in the perioperative period. Similar findings have been shown by Chirag RP *et al.*; using dexmedetomidine 0.2-0.8 µg/kg anesthetic adjuvant with sevoflurane anesthesia [28]. In the present study it was shown that the visual analogue scale for pain was significantly better in the Group III although other variables were almost similar in all the three groups. It is shown that dexmedetomidine significantly lower the rates of post-operative delirium when compared to midazolam or propofol [29] and similarly some studies have also shown better postoperative analgesia with dexmedetomidine [18, 30].

CONCLUSION

Dexmedetomidine is a useful adjunct to anesthesia because of its beneficial effects on postoperative analgesia and recovery. These effects are concentration dependent with 1.0 µg/kg resulting is

better actions than 0.5 µg/kg. Dexmedetomidine was found to be useful in abdominal laparoscopic procedures where the duration of surgery is lesser. It also reduces the operative sevoflurane requirements without any adverse effects.

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