ORIGINAL ARTICLE

COMPARATIVE STUDY OF IV DEXMEDETOMIDINE AND IV PROPOFOL FOR SHORT SURGICAL PROCEDURES

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ABSTRACT:
Back ground: The growing importance of ambulatory surgery during the past decade has led to the development of efficient anaesthetic techniques in terms of quality and safety of both anaesthesia and recovery. **Materials and methods:** The study was conducted for a period of 1 year on 60 patients Age groups 20-50 years both males and females, belonging to ASA I and II, undergoing short surgical procedures. Patients divided in two groups. Group-1 received Inj. fentanyl and Inj. Dexmedetomidine, In Group-2 received Inj. fentanyl and Inj. Propofol . Following Parameters were noted as Heart rate (HR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Mean blood pressure (MAP), Oxygen saturation (spo2) and Respiratory Rate (RR). They were recorded before premedication, and for every 2 mins upto 20 min and there after every 5 min till the end of the surgery. **Results:** The time required from the start of infusion to achieve adequate levels of sedation was significantly longer in the dexmedetomidine group than in the propofol group However, there was no significant difference in the Ramsay sedation score levels throughout the sedation period in both groups. In the recovery room, it was found that the time to achieve an Aldrete score of 10 was similar in both groups. **Conclusion:** Dexmedetomidine can be a useful adjuvant rather than the single sedative analgesic during short surgeries and can be a alternative to propofol in moderate sedation haemdynamic stablility with minimal side effects.
Key words: Dexmedetomidine, Propofol, Fentanyl.

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INTRODUCTION

With the advent of newer intravenous anaesthetic agents and increasing awareness of environmental pollution, total intravenous anaesthesia has become the need of the hour. Although inhalational agents have remained the routine choice for maintenance of anaesthesia because of sophisticated delivery systems concern has been expressed over theatre as well as global pollution[1]. For example nitrous oxide contributes to both ozone depletion and green house effect. In such situations total intravenous anaesthesia is a boon. Prompt and "street fit" recovery after daycare surgery has become a necessity in modern anesthesia practice. Propofol has been reported to be satisfactory for short surgical procedures under total intravenous anaesthesia. Dexmedetomidine, a selective alpha - 2 agonist with analgesic and sedative properties is the "star" or welcome drug in the armamentarium of anesthetic practice. Dexmedetomidine is an imidazole derivative. It is 8 times more specific for alpha-2 adrenoreceptors than clonidine (ratios of alpha 2: alpha 1 activity, 1620:1 for dexmedetomidine, 220:1 for clonidine).[2]

Dexmedetomidine has sedative, analgesic, sympatholytic and anxiolytic effects that blunt many of the cardiovascular responses in the peri operative period. It reduces the requirements of volatile anesthetics, sedatives and analgesics

without causing significant respiratory depression.[3,4] Dexmedetomidine has been successfully tried for decreasing the dose as well as potentiating the analgesic effect of local anesthetics, intrathecally for vaginal hysterectomy and lower abdominal surgeries, for sedation purpose in ICU setup, for i.v sedation during Dental surgery, for conscious sedation in Endoscopies.[5-7] Present study is undertaken to evaluate and compare the hemodynamic, respiratory effects, the recovery profile, with Dexmedetomidine and Fentanyl with those of Propofol and Fentanyl sedation in patients undergoing short surgical procedure.

MATERIAL AND METHODS

The study was conducted in Gandhi Hospital, Secunderabad after obtaining approval from institutional Ethical committee and written informed consent was obtained from each patient. Study was done from Jan 2013 to January 2014. Sixty patients were included in the study.

Inclusion criteria: Age groups 20-50 years both males and females, belonging to ASA I and II, undergoing short surgical procedures were included in the study.

Exclusion criteria: Use of any opioid or sedative medication in the week prior to surgery, alcohol or drug abuse, known allergy to either dexmedetomidine or propofol and cardiovascular, respiratory, neurological, psychological, hepatic or renal disease. Every patient was assessed properly and in detail one day prior to surgery. Routine investigations were performed in each case and whenever required, specific tests like X-ray ECG, LFT etc were asked for. Patients were interviewed for drug history and past history of anesthesia are related complications. Patients were instructed to undergo overnight fasting before surgery. Using a computerized random generation table, the patients were randomly divided in to two groups of 30 patients each. On arrival in operating room, standard monitoring such as NIBP, pulse oximeter and ECG leads were attached to the patients. Supplemental Oxygen was given throughout the procedure at 4 L/min with Hudson's mask. Intravenous access was established using an 18G cannula and Ringer Lactate 10 ml/kg was infused. Preoperative pulse rate, systolic and diastolic blood pressure, respiratory rate and oxygen saturation were recorded. In Group-1 received Inj.fentanyl 1 µg/kg was given 5 min before surgery and Inj. Dexmedetomidine 100 µg was added to 100ml of normal saline and made to a concentration of 1 µg/kg. This solution was administered at a rate of 10 ml/min to a total dose of 1 µg/kg of dexmedetomidine followed by continuous infusion of Dexmedetomidine 0.2- 0.6 µg/kg/hr. In Group-2 received Inj.fentanyl 1 µg/kg was given 5 min before surgery. Inj. Propofol 0.7mg/kg Body weight initially over a period of 10 minutes and followed by maintenance infusion of 0.5- 2 mg/kg/hr. Following Parameters were notedas Heart rate (HR), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP), Mean blood pressure (MAP), Oxygen saturation (spo2) and Respiratory Rate (RR). They were recorded before premedication, and for every 2 mins upto 20 min and there after every 5 min till the end of the surgery. Vasopressor requirements will be noted as Hypotension (defined by a decrease in MAP below 20% of baseline or systolic pressure <90 mm Hg) was treated with intravenous fluids and intravenous ephedrine 5mg increments. Bradycardia (Heart rate less than 50 beats per minute) was treated with intravenous atropine 0.5 mg. The sedation was evaluated using Ramsay sedation score for every 5 mins up to end of surgery. Excessive sedation was defined as a score greater than 4/6.

Ramsay Sedation Score

1=anxious and agitated;
2=cooperative and tranquil
3=drowsy but responsive to command
4=asleep but responsive to a glabellar tap
5=asleep with a sluggish response to tactile stimulation
6=asleep and no response

Recovery was evaluated using ALDRET'S recovery score every 5min until discharged. Patients were deemed ready for discharge when they will achieve an Aldred score of 9-10 and the time taken to recovery was noted.

MODIFIED ALDRETE SCORING SYSTEM		
Criterion		**Score Maximum Score: 10**
Source: Aldrete, 1998.		
Consciousness	Fully awake	2
	Aroused by verbal stimulus	1
	Not aroused by verbal stimulus	0
Breathing	Takes full breaths and can cough	2
	Takes only shallow breaths or has dyspnea	1
	Cannot breath without assistance (apnea)	0
Blood Pressure	Within 20 mm Hg of pre-op value	2
	20 to 50 mm Hg different from pre-op value	1
	≥50 mm Hg different from pre-op value	0
Oxygenation	>92% blood oxygen saturation (SpO_2) on room air	2
	Needs supplemental O_2 to maintain SpO_2>90%	1
	SpO_2 ≤90% on supplemental O_2	0
Motor Function	Can move all 4 extremities on request	2
	Can move 2 extremities on request	1
	Cannot move any extremities on request	0

RESULTS

Present study was done for a period of 1 year at our hospital and results are analysed. The mean ages in both the groups were comparable and group 1 (Dexmedetomidine) registered 36.07 years, where as in group 2 (Propofol) mean age was 33.8 years. Mean body weight in group 1 was 57.6 kg and in group 2 59.13 kg. In order to find out the equality of mean age, mean weight Student's 't' test was applied and it was found not significant. The gender distribution in the study population for the two groups is depicted in table 2. As there were no statistical difference (P>0.05) between two groups, the distribution of sex groups included in this study were comparable.

Table 1: Comparison of age & weight between the two study groups

Parameters	Group	Mean	± SD	t value	P value
Age (years)	Dexmedetomidine	36.07	10.089	-0.926	P>0.05
	Propofol	33.80	8.822		
Weight (kg)	Dexmedetomidine	57.60	9.579	-0.680	P>0.05
	Propofol	59.13	7.807		

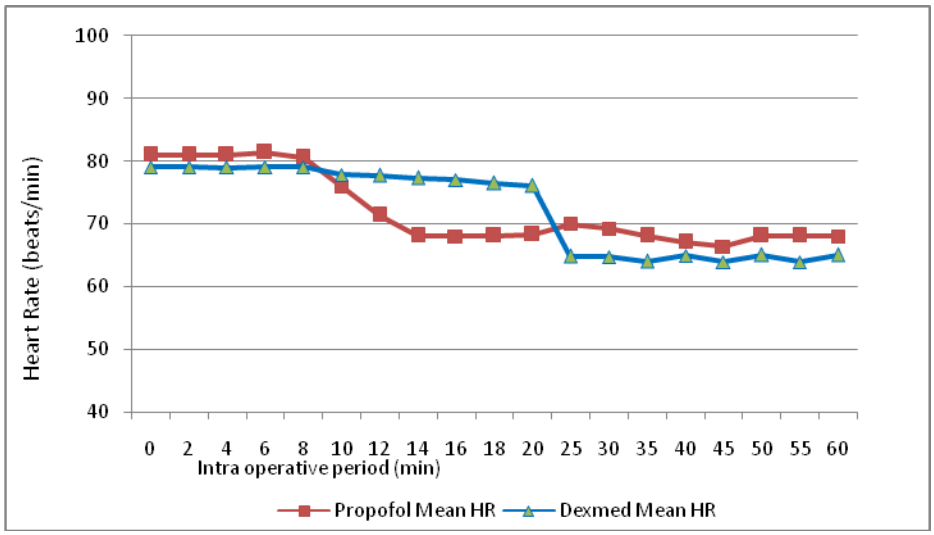
*P- value<0.05 is significant

Table 2: Distribution of gender in two study groups

Gender	Group		Total
	Dexmedetomidine	**Propofol**	
Male	13	14	27
	43.30%	46.70%	45%
Female	17	16	33
	56.70%	53.30%	55%
Total	30	30	60
Chi Square: 0.067; P > 0.05			

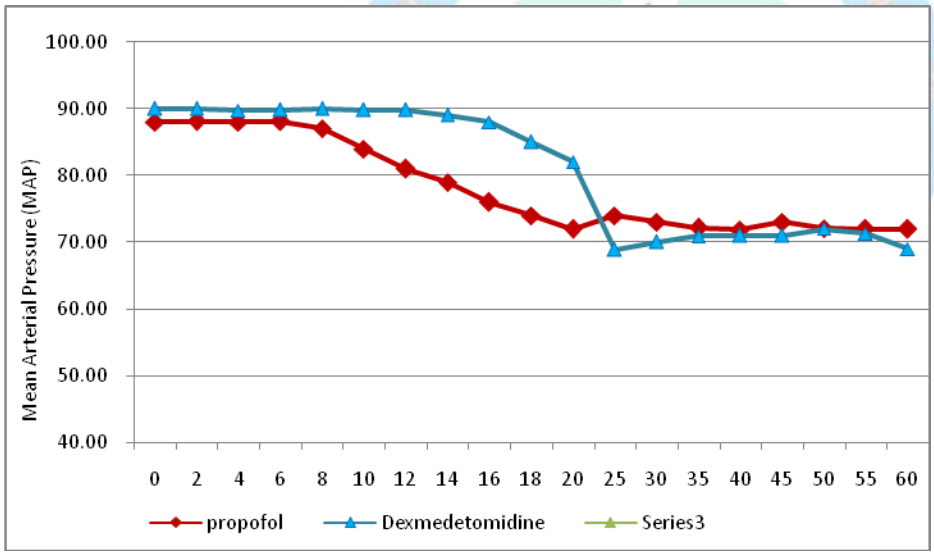
*P- value<0.05 is significant

Figure 1: Mean heart rate in two groups during different time periods



In both groups, there was a similar significant reduction in heart rate compared with base line values. p value >0.05

Figure 2: Mean arterial pressure (MAP) between two study groups



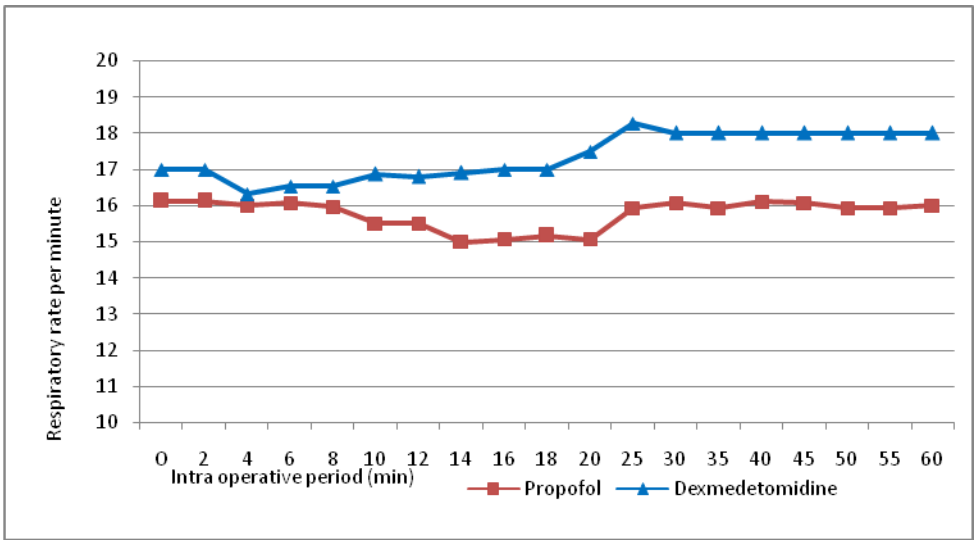
In both groups, there was a similar significant reduction in the Mean Arterial Pressure compared with base line values P>0.05. P- value<0.05 is significant .

Table 3: Showing mean time to achieve Ramsay Sedation score of 4

Group	Mean	±SD	P value
Dexmedetomidine	26.8	6.90	<0.01*
Propofol	16.17	6.90	

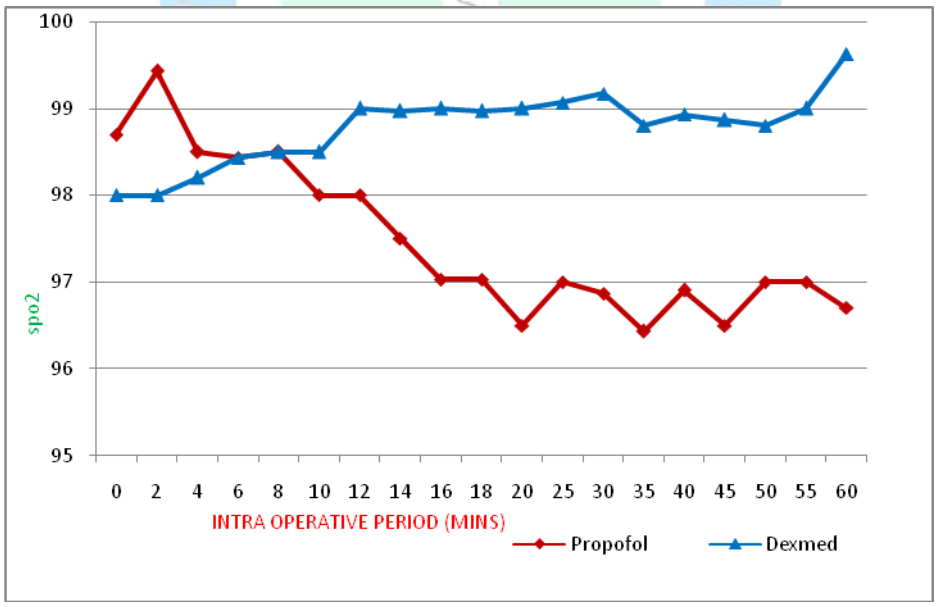
*P- value<0.05 is significant

Figure 3: Showing comparison of Respiratory rate per minute intraoperative period between groups



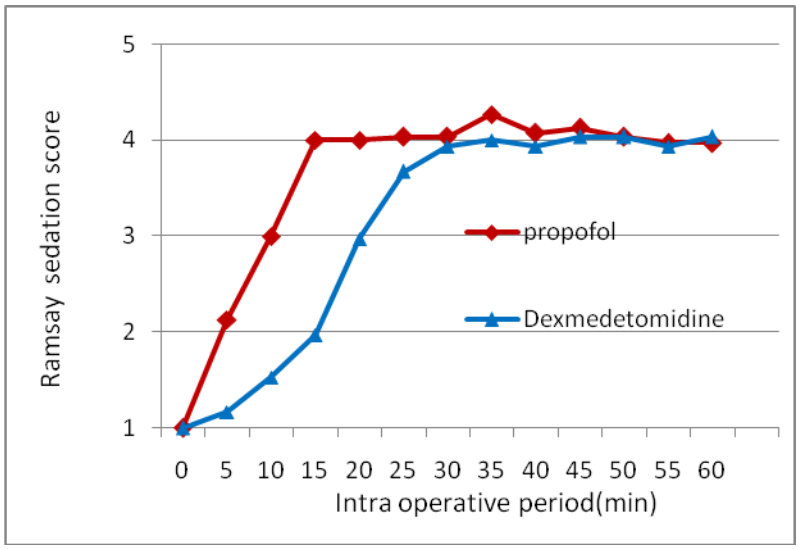
The Respiratory rate value in the dexmedetomidine group were significantly increase (P value<0.05) compared with base line values while there was a significant reduction in the respiratory rate in the propofol group (P value<0.05) compared with base line values. Respiratory rate values in the dexmedetomidine group were significantly higher than those in the propofol group during the sedation period (P Value<0.05).

Figure 3: Showing Comparison of Mean SpO_2 values between two study groups



The SpO_2 values in the dexmedetomidine group did not change from base line, while there was significant reduction in the SpO2 in the Propofol group(P value<0.05) compared with base line values. SpO2 values in the Dexmedetomidine group were significantly higher than those in the Propofol group during the sedation period. (P value<0.05)

Figure 4: Showing Comparison of Ramsay sedation score between two study groups



The time required from the start of infusion of study drugs to achieve adequate levels of sedation was significantly longer in the dexmedetomidine group (26.80 ± 6.90 min) than in the Propofol group (16.17 ± 6.90 min) P value <0.01. However, there was no significant difference in the Ramsay Sedation Score.

Table 4: Time to achieve an Aldrete score of 10

Group	Mean	±SD	P value
Dexmedetomidine	40.833	50884	>0.05
Propofol	40.666	4.096	

*P- value<0.05 is significant

Time to achieve Aldrete Score of 10 was similar in both gruops p>0.05

DISCUSSION

The primary aim of the study was to compare the hemodynamic and respiratory effects in both study groups. At similar sedative doses, Dexmedetomidine and Propofol resulted in a similar significant reduction in Heart rate and Mean Arterial Pressure compared to base line values. The same results were reported by Kaygusuzet al[8]. Previous studies had demonstrated a powerful inhibitory effect of propofol on sympathetic outflow.[9] Dexmedetomidine is also known to decrease sympathetic outflow and circulating catecholamine levels and would therefore be expected to cause decrease of Mean arterial pressure similar to that of propofol.[10] The decrease in heart rate might be attributed to the sympatholytic effects and in part because of a vagomimitic effect.[11] Furthermore, the interesting finding in the study was that the dexmedetomodine sedation maintained an adequate respiratory function as compared to Propofol sedation. The respiratory SpO_2 values of the dexmedetomidine group were significantly higher than those in the propofol group during the sedation period. Hsu et al.[12] reported similar effects on respiratory functions during dexmedetomidine sedation. They explained that by the increase in minute ventilation coincided with arousal phenomenon. Such arousal phenomenon, secondary

to hypercapnia stimulation has been described during natural sleep. Dexmedetomidine converges on the natural sleep pathway to exert its sedative effects. In addition, De Sarroet al.[13] has reported that α- 2 receptors are located at multiple places in the central nervous system. Hypercapnia activates the locus ceruleus which is associated with increased apprehension and which leads to stimulation of respiratory centers. Ebert et al.[9] also reported similar results with dexmedetomidine sedation. On the other hand, Arain and Ebert[14] reported similar respirtory end points between dexmedetomidine and propofol groups while Kaygusuz et al.,[8] reported that the respiratory rate values were significantly lower and the SpO_2 values were significantly higher in the dexmedetomidine group compared with propofol group. This discrepancy in the results could be resulted from the difference in the reigmen of drug infusion or the combination of narcotics. The time required from the start of infusion to achieve adequate levels of sedation was significantly longer in the dexmedetomidine group than in the propofol group. However, there was no significant difference in the Ramsay sedation score[15] levels throughout the sedation period in both groups.In the recovery room, it was found that the time to achieve and Aldrete[16] score of 10 was similar in both groups.

CONCLUSION: Dexmedetomidine at similar sedation levels of Ramsay sedation score with propofol was associated with equivalent hemodynamic effects, maintaining an adequate respiratory function, similar time to achieve an Aldrete recovery score of 10.

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