ORIGINAL RESEARCH

Study of effect of intraoperative low dose continuous dexmedetomidine infusion on hemodynamic parameters and depth of anaesthesia in patients undergoing renal transplantation

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ABSTRACT

Background: The incidence of Chronic Kidney Disease Stage-V and dialysis population requiring renal transplantation is increasing globally. Present study was aimed to evaluate the efficacy and safety of low dose continuous infusion of dexmedetomidine on hemodynamic changes, sedation and analgesic requirement intraoperatively and immediate postoperatively in patients undergoing for renal transplantation.

Material and Methods: Present study was single-center, Randomized, prospective, double blind, placebo-controlled study, conducted patients, age between 18-60 years undergoing renal transplantation, ASA grade 2 and 3. Patients were assigned into 2 groups, as study Group (continuous infusion of dexmedetomidine at rate of 0.2 mcg/kg/h) & control Group.

Results: Among both groups, distribution of age, gender, weight, Mallampatti grades, comorbidities, mean duration of surgery, mean duration of anaesthesia were comparable & no statistically significant difference was observed (p> 0.05). Mean heart rate was lower in study group as compared to the control group and significant differences were found at all-time points of the study period ($p < 0.05$). SBP & DBP after 15 minutes of induction decreased significantly from the base line value in study group, and this lasted throughout the intraoperative period till the end of surgery, the difference being statistically significant ($p < 0.05$) Postoperatively, SBP & DBP in the study group were less than the SBP & DBP in control group at all the time points & difference being statistically significant ($p < 0.05$).

Conclusion: Intra-operative administration of low dose continuous infusion of dexmedetomidine reduces requirement of fentanyl, maintains hemodynamic stability without significant cardiovascular complications and provides effective pain relief.

Keywords: dexmedetomidine, fentanyl, hemodynamic stability, renal transplantation.

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INTRODUCTION

The incidence of Chronic Kidney Disease Stage-V (CKD-V)) and dialysis population in the elderly continues to increase globally. The mortality due to CKD in various surgical procedures is substantially increased. So early detection and timely management of CKD is very important.[1] Different modalities exist for renal replacement therapy e.g., hemodialysis, peritoneal dialysis and continuous ambulatory peritoneal dialysis (CAPD), but the definitive treatment is renal transplantation.[2,3]

Fentanyl is considered comparatively safe in CRF patients but few studies have shown that fentanyl clearance is decreased in patients with moderate to severe uraemia (BUN >60mg/dl) and may cause respiratory depression. Fentanyl has high protein binding and is non-dialyzable or least dialysable.[4]

So, we need an adjuvant drug with good analgesic property that will help to decrease the required dose and side-effects of fentanyl and also should be safe in CKD-V patients.[5] Present study was aimed to evaluate the efficacy and safety of low dose continuous infusion of dexmedetomidine on hemodynamic changes, sedation and analgesic requirement intraoperatively and immediate postoperatively in patients scheduled for renal transplantation.

MATERIAL AND METHODS

Present study was single-center, Randomized, prospective, double blind, placebo-controlled study, conducted in department of anaesthesiology, at Sir Ganga Ram Hospital, New Delhi, India. Study duration was of 2 years (January 2016—October 2017). This study was approved by the Departmental Review Board and Institutional Ethics Committee and was registered in the Clinical Trials Registry India (CTRI).

Inclusion criteria

- Patients, Age between 18-60 years undergoing renal transplantation, ASA grade 2 and 3 & willing to participate in present study

Exclusion criteria

- Patients undergoing combined Liver-Kidney transplant, Patients with hepatic pathology, Patients with associated cardiac pathology, Patients with poorly controlled psychosis
- Patients with hypersensitivity to the study drug

Study was explained to patients in local language & written consent was taken for participation & study. A thorough pre-anaesthetic evaluation was done for all patients including a detailed history and physical examination. Reports of all the investigations as per the requirement of the case, were reviewed. Hemodialysis was done a day before surgery. Post-dialysis investigations were done and reviewed. All the patients were instructed to fast for 8 hours before surgery. Premedication comprised of tab. alprazolam 0.25 mg & tab. pantoprazole 40 mg given the night before and morning (6AM) of surgery

Patients were assigned into 2 groups, via a computer-generated random number sequence. All the patients received general anaesthesia as per the Standard Operating Procedure for that case. The study included 50 patients: 25 patients in each group (control and study group).

- Study Group (Group A) – Patients received general anaesthesia + fentanyl + continuous infusion of dexmedetomidine at rate of 0.2 mcg/kg/h
- Control Group (Group B) – Patients received general anaesthesia + fentanyl + volume matched saline infusion to maintain the double-blind nature of study.

In the operation theatre, anaesthesia monitoring was done using electrocardiography (ECG), pulse oximetry (SpO_2), non-invasive blood pressure (NIBP), end tidal CO_2 ($EtCO_2$), central venous pressure and bispectral index (BIS) till the end of surgery. A peripheral vein was cannulated in hand having no AV fistula and standard general anaesthesia protocol was followed for conduct of anaesthesia.

An anaesthesiologist who was not one of the study participants prepared syringes containing either dexmedetomidine or 0.9% saline. Both syringes were labelled as "study drug" and continuous infusion of low dose 'study drug' was started @ 0.2 mcg/kg/h 10 mins before the induction of anaesthesia. After preoxygenation for 3 mins, all patients received midazolam 0.01 mg/kg and fentanyl citrate 1 mcg/kg. Anaesthesia was induced with thiopentone to reach sleep dose and at the same time eye-lash reflex was checked. Following this atracurium 0.5mg/kg intravenously was administered to facilitate intubation. Anaesthesia was maintained with isoflurane, O_2 and air, using a closed circuit. Under all aseptic precautions, arterial and central venous canulations were performed. Invasive blood pressure (IBP) and central venous pressure (CVP) were monitored.

Fentanyl iv was administered if mean arterial pressure (MAP) rises to more than 20% above the baseline value while decreases in MAP of a similar magnitude was treated with mephentermine sulphate 3-6 mg iv. All the patients were monitored with electrocardiogram (ECG), oxygen saturation (SpO_2), end-tidal carbon dioxide ($EtCO_2$) and bispectral index (BIS) at several time points like preinduction (baseline), before intubation, during laryngoscopy and intubation, immediately after intubation and then every 15 minutes till the end of surgery and was continued during extubation and postextubation period. Invasive blood pressure (IBP) and Central venous pressure (CVP) were also monitored after canulation of radial artery and central vein at every 15 minutes interval throughout the duration of surgery.

All patients were transferred to PACU and postoperative monitoring included heart rate, oxygen saturation (SpO_2), invasive blood pressure (IBP), oxygen saturation (SpO_2), visual analogue Scale (VAS), Ramsay Sedation Score (RSS), incidence of postoperative nausea and vomiting (PONV) and any other side effect was recorded on arrival in PACU and every 15 mins till 2 hours postoperatively. These parameters were recorded on arrival by nurses unaware of the study.

Statistical testing was conducted with the statistical package for the social science system version SPSS 17.0. Continuous variables have been presented as mean±SD or median if the data was unevenly distributed. Categorical variables have been expressed as frequencies and percentages. The comparison of normally distributed continuous variables between the groups were performed using Student's t test. Nominal categorical data between the groups were compared using Chi-squared test or Fisher's exact test as appropriate. Non-normal distribution continuous variables were compared using Mann Whitney U test. For all statistical tests, a p value less than 0.05 has been taken to indicate a significant difference.

RESULTS

The study included 50 patients: 25 patients in each group (control and study group). Among both groups, distribution of age, gender, weight, Mallampatti grades, comorbidities, mean duration of surgery, mean duration of anaesthesia were comparable & no statistically significant difference was observed ($p > 0.05$).

Table 1: General characteristics

Characteristics	**Group A (Frequency/ Mean ± SD)**	**Group B (Frequency/ Mean ± SD)**	**p values**
Age (yrs)	41.64 ± 11.15	41.12 ± 13.22	0.881
Gender			0.609

Male	22 (88 %)	24 (96 %)	
Female	3 (12 %)	1 (4 %)	
Weight (kg)	66.48 ± 10.49	63.36 ± 11.48	0.610
Mallampati Grades			0.822
I	8 (32 %)	9 (36 %)	
II	15 (60 %)	15 (60 %)	
III	2 (8 %)	1 (4 %)	
Comorbidity			
Hypertension	24 (96 %)	21 (84 %)	0.208
Diabetes mellites	9 (36 %)	4 (16 %)	0.349
Hypothyroid	4 (16 %)	2 (8 %)	0.384
Mean duration (minutes)			
Surgery	183.48 ± 23.44	173.64 ± 25.70	0.164
Anaesthesia	208.2 ± 23.44	201 ± 25.98	0.309

In the intra operative period, a significant reduction in heart rate (78.72 ± 11.24 vs. 94.4 ± 13.51 bpm) as compared to the baseline was noted in the dexmedetomidine group 15 min after induction and this lasted throughout the intraoperative period till the end of surgery. Mean heart rate was lower in study group as compared to the control group and significant differences were found at all-time points of the study period ($p < 0.05$).

Table 2: Intra-operative Heart Rate (beats/min)

Time	**Group A**	**Group B**	**p values**
	Mean ± SD (beats/min)	**Mean ± SD (beats/min)**	
Baseline	97.40± 11.91	94.48± 12.97	0.411
Induction	88.28± 13.93	93.92± 14.76	0.171
Intubation	91.40± 14.76	97.96± 13.63	0.109
15 min after induction	78.72 ±11.24	94.4±13.51	0.001
30 min	78.28±11.32	93.04±11.88	0.001
45 min	75.52±9.40	92.20±11.42	0.001
60min	74.60±9.19	93.76±12.11	0.001
75 min	74.56± 10.16	91.28±12.17	0.001
90 min	74.96± 9.22	91.64± 12.01	0.001
105 min	75.08± 9.40	92.16± 10.85	0.001
120 min	75.52±9.54	93.00± 12.26	0.001
135 min	75.96±9.39	94.00± 14.03	0.001
150 min	77.40±10.60	95.8± 12.98	0.001
165min	77.58±9.39	96.75± 13.35	0.001
180 min	77.61±8.23	94.86± 10.86	0.012
195min	80.50±7.19	93.62± 10.34	0.005
210 min	78.71±7.29	98.58± 13.72	0.006
225 min	80.50±7.26	94.71± 10.65	0.022
240 min	74.00±2.00	96.50± 8.06	0.035

In the postoperative period, in post anaesthesia care unit, a significant reduction in heart rate as (79.32 ± 6.44 vs 92.08 ± 9.51) compared to the baseline was noted in the dexmedetomidine group and this lasted throughout the observation period ($p < 0.05$).

Table 3: Post-operative Heart Rate (beats/min) in PACU

Time	Group A	Group B	p values
	Mean ± SD (beats/min)	Mean ± SD (beats/min)	
0 min	95.20±7.14	91.04±9.13	0.080
15 min	79.32±6.44	92.08±9.51	0.001
30 min	75.32±8.75	91.64±9.66	0.001
45 min	74.84±9.22±	92.12±8.47	0.001
60min	75.04±8.95	91.28±9.75	0.001
75 min	73.24±8.89	92.00±7.67	0.001
90 min	74.32±9.41	92.48±7.16	0.001
105 min	74.52±8.40	91.96±8.76	0.001
120 min	74.72±8.82	92.36±8.92	0.001

Comparing the two groups, SBP after 15 minutes of induction decreased significantly from the base line value in study group, and this lasted throughout the intraoperative period till the end of surgery, the difference being statistically significant ($p < 0.05$)

Table 4: Intra-operative systolic blood pressure (mmHg)

Time	Group A	Group B	p values
	Mean ± SD (mmHg)	Mean ± SD (mmHg)	
Baseline	160.08 ±21.55	157.80 ±19.46	0.699
Induction	135.32 ±19.86	134.72 ±23.34	0.922
Intubation	153.32 ±24.09	152.08 ±27.13	0.943
15 min after induction	131.20 ±17.35	158.76 ±21.00	0.001
30 min	131.84 ±19.13	160.04 ±20.07	0.002
45 min	128.96 ±20.12	159.00 ±21.94	0.001
60min	136.04 ±16.87	157.68 ±15.95	0.001
75 min	132.16 ±18.85	157.88 ±19.09	0.001
90 min	135.44 ±15.99	154.04 ±17.65	0.001
105 min	132.68 ±16.82	161.64 ±17.01	0.001
120 min	133.32 ±15.97	157.20 ±16.23	0.002
135 min	135.56 ±15.54	162.68 ±18.20	0.032
150 min	138.84 ±16.36	164.88 ±16.21	0.002
165min	141.38 ± 15.90	169.04 ± 20.07	0.003
180 min	141.74 ±15.58	165.55 ±17.02	0.031
195min	139.75 ±11.76	160.12 ±19.88	0.002
210 min	138.47 ±16.65	162.17 ±19.33	0.015
225 min	135.50 ±16.05	152.86 ±25.12	0.002
240 min	143.67 ±14.84	166.25 ±33.43	0.025

Postoperatively in PACU, SBP in the study group was less than the SBP in control group at all the time points & difference being statistically significant ($p < 0.05$).

Table 5: Postoperative systolic blood pressure (mmHg) in PACU

Time	Group A	Group B	p values
	Mean ± SD (mmHg)	Mean ± SD (mmHg)	
0 min	142.04±16.01	157.64±19.87	0.010
15 min	148.36±15.64	161.00±20.93	0.042
30 min	147.12±15.15	159.64±21.64	0.045
45 min	148.80±16.97	159.32±21.673	0.024

60min	150.00±18.75	159.92±23.48	0.017
75 min	148.73±17.36	159.92±20.149	0.050
90 min	146.96±16.47	160.16±20.86	0.017
105 min	147.20±16.42	159.64±22.80	0.012
120 min	146.76±16.37	158.20±19.74	0.032

Comparing the two groups, DBP after 15 minutes of induction decreased significantly from the base line value in study group, and this lasted throughout the intraoperative period till the end of surgery, the difference being statistically significant ($p < 0.05$)

Table 6: Intra-operative diastolic blood pressures (mmHg).

Time	**Group A**	**Group B**	**p values**
	Mean ± SD (mmHg)	**Mean ± SD (mmHg)**	
Baseline	90.16±14.65	87.96±11.45	0.577
Induction	83.24±16.13	83.76±12.48	0.899
Intubation	89.88±18.65	91.24±15.99	0.783
15 min after induction	74.32±11.54	89.68±10.55	0.003
30 min	71.48±11.34	91.84±11.88	0.023
45 min	69.36±13.42	89.24±9.86	0.001
60min	72.80±12.30	89.52±9.27	0.001
75 min	71.16±11.65	88.60±10.32	0.001
90 min	71.96±10.30	84.32±8.56	0.001
105 min	70.76±9.22	87.80±11.10	0.001
120 min	70.28± 10.04	85.00± 10.85	0.001
135 min	71.20±9.65	85.84±10.37	0.001
150 min	73.20±10.71	86.56±10.46	0.001
165min	73.17±10.07	88.33±10.25	0.001
180 min	74.13±11.14	88.59±11.12	0.002
195min	74.30±9.52	84.25±9.02	0.003
210 min	71.18±10.78	85.67±11.62	0.011
225 min	71.00±11.24	79.43±10.11	0.001
240 min	64.33±8.02	84.25±16.78	0.025

Postoperatively in PACU, SBP in the study group was less than the SBP in control group at all the time points & difference being statistically significant ($p < 0.05$).

Table 7: Postoperative diastolic blood pressures (mmHg) in PACU.

Time	**Group A**	**Group B**	**p values**
	Mean ± SD (mmHg)	**Mean ± SD (mmHg)**	
0 min	76.44±7.86	81.52±9.31	0.001
15 min	75.64±9.78	82.60±10.32	0.025
30 min	76.60±9.96	82.68±10.05	0.018
45 min	77.16±9.45	83.28±10.24	0.033
60min	78.16±9.81	82.00±9.38	0.011
75 min	76.28±11.53	83.16±9.41	0.036
90 min	75.44±9.25	82.76±10.28	0.025
105 min	78.84±10.22	82.64±10.77	0.036
120 min	76.68±9.70	82.64±9.82	0.011

During intra-operative period, BIS values were comparable among both the groups at all time points, there was no statistically significant difference between two groups at all time points measured ($p > 0.05$).

Table 8: Comparison of Bispectral Index (BIS) values intra-operatively

Time	Group A	Group B	p values
	Mean ± SD	Mean ± SD	
Baseline	93.64±2.871	93.96±3.089	0.706
Induction	47.64±5.090	46.92±2.798	0.538
Intubation	49.96±3.769	50.00±3.329	0.968
15 min after induction	48.96±4.296	47.00±3.082	0.070
30 min	48.04±4.641	48.68±3.859	0.598
45 min	49.16±4.776	47.92±4.281	0.339
60min	48.72±4.287	47.92±4.838	0.539
75 min	48.12±4.352	47.16±3.532	0.396
90 min	48.00±4.113	47.84±3.793	0.887
105 min	47.52±3.743	49.12±3.800	0.140
120 min	48.16±4.337	49.12±3.833	0.411
135 min	48.20±6.325	48.96±5.216	0.645
150 min	51.84±10.629	51.56±9.696	0.923
165min	51.75±9.157	57.04±11.863	0.090
180 min	57.96±16.235	65.38±16.051	0.135
195min	59.53±15.049	65.93±14.888	0.225
210 min	72.71±14.636	72.17±17.456	0.929
225 min	83.80±9.908	77.29±7.952	0.170
240 min	89.67±2.887	89.75±1.708	0.963

Mean Visual Analogue Score (VAS) of patients in study group was 2.05 ± 1.02 and that in control group was 2.96 ± 1.13. Mean Ramsay Sedation Score (RSS) of patients in study group was 2.28 ± 0.678 and that in control group was 1.72 ± 0.614. Thus, we found statistically significant difference in VAS & mean Ramsay sedation score of patients between two groups in our study.

Table 9: Comparison of Visual Analogue Score (VAS) between two groups post-operatively

	Group A	Group B	p values
	Mean ± SD	Mean ± SD	
Visual Analogue Score	2.05 ± 1.02	2.96 ± 1.13	0.007
Ramsay Sedation Score	2.28 ± 0.678	1.72 ± 0.614	0.004

During intra-operative period, fentanyl requirement in group A was 86.8 ±39.9 mcg and that in group B was 98.6 ± 30.15 mcg. We found statistically significant difference ($p = 0.041$) between two groups. We also observed statistically significant difference ($p = 0.000$) in fentanyl requirement among both groups postoperatively. Fentanyl requirement in group A was 27.36 ± 40.62 mcg and that in group B was 49.08 ± 21.85 mcg during postoperative period. Total fentanyl requirement during intraoperative and upto 2 hours postoperative period were 114.16 ± 56.38 mcg in group A and 147.68 ± 40.78 mcg in group B respectively.

Table 10: Total fentanyl requirement (mcg)

Fentanyl Requirement	Group A	Group B	p values
	Mean ± SD (mcg)	Mean ± SD (mcg)	
Intraoperative	86.8 ±39.9	98.6 ± 30.15	0.061

Postoperative	27.36 ± 40.62	49.08 ± 21.85	0.000
Total	114.16 ± 56.38	147.68 ± 40.78	0.006

DISCUSSION

In present study, there was no statistically significant difference between both groups with regards to age, gender distribution, weight and comorbidities like hypertension, diabetes and hypothyroidism ($p > 0.05$). This helped us to judge the clinical significance of our study as the distribution, metabolism, excretion and action of drug are undoubtedly varied in different age and weight groups. Therefore, clinically insignificant variation in age and weight simply helped to alleviate these confounding factors. Other factors like ASA grade distribution, duration of surgery and that of anaesthesia were also comparable in both groups ($p > 0.05$). The mean baseline hemodynamic parameters (Heart Rate, SBP, DBP) before induction of anaesthesia were comparable in both the groups.

We administered dexmedetomidine infusion at the rate of 0.2 mcg/kg/h 10 minutes before induction of anaesthesia. End stage renal disease (ESRD) patients have exaggerated responses to induction, laryngoscopy and intubation. We observed increase in heart rate in response to intubation in both study group and control group. But in study group, increase in heart was slightly less than that of control group. Aho M et al.,[6] studied the effects of two bolus doses (0.3 mcg/kg and 0.6 mcg/kg) of dexmedetomidine in comparison with bolus normal saline on hemodynamic response to intubation in patients undergoing abdominal hysterectomy. They found that increase in heart rate in response to intubation in patients who received 0.6 mcg/kg bolus dose of dexmedetomidine was significantly less.

We also observed that increase in heart rate in response to intubation in study group did not differ much from that of control group. This may be because we also administered low dose infusion (0.2 mcg/kg/h) of the dexmedetomidine. After intubation, significant reduction in heart rate from baseline value was noted in patients of study group as compared to control group which lasted throughout the intraoperative period at all-time points measured after intubation. However, no patient who received dexmedetomidine in our study developed clinically significant bradycardia.

Jalonen J et al.,[7] studied the effect of dexmedetomidine in dose of 3 mcg/kg/h for 30 minutes before induction followed by 0.4 mcg/kg/h infusion intraoperatively in patients for elective coronary artery bypass grafting. They found that dexmedetomidine attenuates the tachycardia response to intubation but increases propensity for hypotension. This may be because of administration of higher doses of dexmedetomidine.

Anaesthesia was maintained with isoflurane and oxygen-air mixture. We maintained the bispectral index between 40 to 60 by titrating isoflurane concentration in both the groups in our study. Ventilation was controlled such that end tidal CO_2 concentration remained between 35 to 45 mmHg. We avoided both hyperventilation as well as hypoventilation in both the groups. There was no incidence of desaturation in either of the groups in intra-operative period.

Keniya VM.,[8] et al also studied the efficacy of dexmedetomidine to reduce the intra-operative fentanyl and isoflurane requirement. They administered dexmedetomidine infusion in the dose of 1 mcg/kg over 10 minutes before induction of anaesthesia and continued in the dose of 0.2-0.7 mcg/kg/h intra-operatively till skin closure. They found that need for isoflurane was decreased by 32%. Fentanyl requirement was 100±10 mcg in control group and 60±10 mcg in dexmedetomidine group intra-operatively. Thus, they observed difference in fentanyl requirement by 40 mcg between two groups. We also observed the same results but the difference in fentanyl requirement between two groups was less.

Gurbet A et al.,[9] studied effect of dexmedetomidine in loading dose @ 1 mcg/kg followed by maintenance dose of @ 0.5 mcg/kg/h compared with saline group on perioperative analgesic

requirement. They found as secondary outcome in their study that there was no fall in the oxygen saturation in group D who received dexmedetomidine postoperatively. Patel A et al.,[10] used comparatively higher dose of dexmedetomidine at loading dose @ 2 mcg/kg over 10 min followed by maintenance dose of @ 0.7 mcg/kg/h. None of the patients in both groups experienced any respiratory depression during postoperative period. This might be because we used only small rescue doses of fentanyl and as far as dexmedetomidine is concerned, respiratory depression is not known feature of this drug.

Cicek M et al.,[11] studied dexmedetomidine in comparison with normal saline in patients undergoing septorhinoplasty. They administered loading dose of 1 mcg/kg over 10 minutes followed by maintenance dose of 0.2 mcg/kg/h intra-operatively. They demonstrated that the sedation scores were higher in DEX group than in control group at 30 min after starting patient-controlled analgesia ($p < 0.05$).

Cho J et al.,[12] studied effect of dexmedetomidine in patients of gastrectomy. They administered loading dose of 0.5 mcg/kg over 10 minutes followed by infusion at a rate of 0.4 mcg/kg/h. In their study, they found that the numeric rating pain score (NRS) was 3.8 ± 1.3 in dexmedetomidine group as compared to 4.7 ± 1.1 in control group during postoperative period ($p = 0.001$).

Patel CR et al.,[13] studied the effect of infusion of dexmedetomidine in comparison to fentanyl on postoperative recovery in 60 patients. They administered dexmedetomidine 1 mcg/kg loading dose followed by infusion at the rate of 0.2-0.8 mcg/kg/h versus 2mcg/kg bolus dose of fentanyl. They assessed postoperative pain by VAS and found mean score of 5.70 ±0.60 in dexmedetomidine group versus 8.13 ±0.70 in fentanyl group ($p = 0.001$). We also observed the same results at lower infusion dose of dexmedetomidine.

We observed no adverse effects in patients of both groups. The trend of more common incidence of postoperative nausea, vomiting and itching is expected in fentanyl treated groups but our study was underpowered for these secondary objectives. Limitations of present study were, dexmedetomidine preferably used at low fixed dose of 0.2 mcg/kg/h infusion, we could not establish the analgesic dose equivalence between fentanyl and dexmedetomidine, serial serum creatinine levels were not monitored. Our study has been limited to single medical center, so to generalize the outcome of this study, multicenter study with large population size is required.

CONCLUSION

In conclusion, we found that intra-operative administration of low dose continuous infusion of dexmedetomidine reduces requirement of fentanyl, maintains hemodynamic stability without significant cardiovascular complications and provides effective pain relief, during intra-operative as well as postoperative period & reduces fentanyl requirement (rescue doses as well as total dose) in patients undergoing renal transplantation.

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