



## A Study on hemodynamic response to IV dexmedetomidine and IV clonidine in spine surgery under general anaesthesia

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### Abstract

**Aim:** To compare hemodynamic response to IV dexmedetomidine and IV clonidine in spine surgery under general anaesthesia.

**Material and method:** This prospective randomized comparative study of haemodynamic response of IV Dexmedetomidine and IV Clonidine in spine surgery under general anaesthesia was conducted in the Department of Anaesthesiology & Critical Care in Sher - i - Kashmir Institute of Medical Sciences. Study was approved by Institutional Medical Ethical Committee and written informed consent was obtained from all Patient participating in the study. 60 patients of either sex, between 18-55yrs of age of ASA Grade 1&2 undergoing spine surgery under general anaesthesia were enrolled in this study and patients were randomly assigned into two groups i.e. Group D (30) and Group C (30). Haemodynamic responses were compared in both groups by measuring HR, SBP, DBP, MAP, RR, SPO<sub>2</sub>.

**Results:** Fall in mean HR and MAP was more in group D than that of group C which was statistically highly significant. There was no significant changes in mean RR of Group D and also in Group C which was statistically not significant (P=0.348). Saturation was maintained to 100% throughout the procedure.

**Conclusion:** From this study it was concluded that intravenous dexmedetomidine causes better maintenance of haemodynamic parameter as when compared with clonidine.

**Keywords:** hemodynamic, ga, spine, surgery

### Introduction

Spine surgery includes variety of procedures ranging from micro discectomy (for herniated disc), reconstructive surgery [for spinal deformity], Decompression surgery (for canal stenosis), vertebral fracture fixation, debridement fixation and decompression (Koch's spine) etc. These surgeries require general anaesthesia and some specific anaesthetic considerations like intraoperative hemodynamic stability. The patients undergoing spine surgery have significant co-morbidities, surgery itself poses problems like intraoperative blood loss, major fluid shift, acute postoperative pain and hence an anaesthetist should opt for a technique which allows hemodynamic stability throughout the procedure [1]. Since sedation, anxiolysis and antisialagogue are attractive attributes for premedication, administration of alpha<sub>2</sub> agonist agents prior to induction, suits the above purpose well [2].

Both clonidine and dexmedetomidine have action on both alpha<sub>1</sub> and alpha<sub>2</sub> receptor, but dexmedetomidine is highly specific and selective Alpha<sub>2</sub> adrenergic agonist. Its advantage in anaesthesia setting includes sedation, analgesia, anxiolysis and improved hemodynamic stability by activation of alpha<sub>2</sub> receptor located in postsynaptic terminal in central nervous system, which causes augmentation of vagal activity [3-6].

The present study was conducted to compare the effect of Dexmedetomidine IV and Clonidine IV on hemodynamic response in spine surgery performed under general

anaesthesia.

### Material and Method

This prospective randomized comparative study of haemodynamic response of IV Dexmedetomidine and IV Clonidine in spine surgery under general anaesthesia was conducted in the Department of Anaesthesiology & Critical Care in Sher - i - Kashmir Institute of Medical Sciences. Study was approved by Institutional Medical Ethical Committee and written informed consent was obtained from all Patient participating in the study. 60 patients of either sex, between 18-55yrs of age of ASA Grade 1&2 undergoing spine surgery under general anaesthesia were enrolled in this study according to the following inclusion and exclusion criteria:

#### Inclusion Criteria

1. Age 18-55yrs
2. ASA grade 1 and 2
3. Patient undergoing spine surgery.

#### Exclusion Criteria

1. Patient's own refusal for participation in study
2. Patient's with asthma and on  $\beta$ -Blocker
3. Patient's with history of MI in last 6 months
4. Patient's with Hepatic and Renal dysfunction
5. Allergy to any of the study drugs.
6. Pregnant and lactating mother.

Initially, we conducted a pre anaesthetic evaluation comprising of history of previous medical and surgical illnesses, previous anaesthesia exposures, drug allergies along with general, physical examination and complete neurological assessment, airway examination and baseline investigation of blood in form of Hb, CBC, LFT along with PT and INR, RFT, Sr.Electrolytes, Radiograph of Chest, baseline Electrocardiogram was performed. Depending upon basic investigations evaluation of certain detailed investigation like 2D echo and PFT were advised in few patients. MRI finding of spine were recorded too. A written informed consent was obtained from all patients included in this study just before surgery after adequate nil by mouth period and patients were randomly assigned into two groups i.e. Group D (30) and Group C (30). Group D: Patient were given Inj Dexmedetomidine 0.5ug/kg IV diluted in 10 ml normal saline and administered 10 minute before induction Group C: Patient were given intravenous Clonidine 0.5ug/kg IV diluted in 10 ml normal saline administered 10 min before induction. Patients were shifted to operation theatre and after starting I.V fluids, baseline parameters were recorded which included HR, SBP, DBP, MAP SPO2, RR Non-invasive monitoring like ECG, pulse oximeter, non-invasive blood pressure monitoring and after intubation, carbon dioxide monitoring along with agent analyzer were attached. All patients were given Inj Midazolam (0.03-0.05mg/kg) + Inj Pentazocine 0.5mg/kg + inj Glycopyrrolate 0.2mg + inj Ondansetron 4mg IV. as pre medication. Patient were induced with Inj Propofol 2 mg/kg IV. and Inj Succinylcholine 2mg/kg IV was given for intubation with appropriate sized cuffed endotracheal tube. Anaesthesia was maintained with oxygen 50% and nitrous oxide 50%, isoflurane and Inj Vecuronium 0.08mg/kg as intermittent doses and as and when required.

**Monitoring**

Haemodynamic responses were compared in both groups by measuring HR, SBP, DBP, MAP, RR, SPO2.

These parameters were measured using multipara monitor at following interval.

Before giving the test drug (Basal) value - T0

T1: after completion of drug

T2: at induction

T3: at intubation

After Intubation 2,5,10 mins interval, monitoring carried out till 110 mins. Inj. Paracetamol 10mg/kg iv was given in postoperative period to combat postoperative analgesia.

**Reversal and Extubation**

Patients were reversed with Inj. Neostigmine 0.05mg/kg and Inj. Glycopyrrolate 0.08mg/kg and were extubated when reversal was adequate.

**Statistical Analysis**

Data was expressed as MEAN +Standard deviation (SD) and analysed using SPSS version 24.

**Results**

In group D there were 16 male and 14 female while in group C there were 13 male and 17 female (table 1).

**Table 1:** Distribution of patients according to Gender in Groups

Gender	Group D		Group C	
	N	%	N	%
Male	16	53.3%	13	43.3%
Female	14	46.7%	17	56.7%
Total	30	100	30	100
Age-Group	Group D		Group C	
	N	%	N	%
≤30	08	26.7%	09	30.0%
31-40	10	33.3%	13	43.3%
41-50	12	40.0%	08	26.7%
Total	30	100	30	100
Mean ± SD	38.63± 7.87		36.47 ± 7.52	
t-value	1.09			
P-value	P=0.281 NS			

**Table 2:** Comparison of Mean Heart Rate in Group D & Group C

	Group D Mean ± SD	Group C Mean ± SD	t-value	P-value
Baseline	92.30±5.43	90.66±7.26	0.943	P=0.349 NS
After Study Drug	93.63 ±5.68	93.63 ±6.69	3.45	P=0.001 S
At Induction	84.83±5.66	95.26±4.43	7.94	P<0.0001 S
At Intubation	81.60±4.95	94.20±4.49	10.37	P<0.0001 S
2 Min After Intubation	78.10±5.65	92.50±4.81	10.52	P<0.0001 S
5 Min After Intubation	76.20±5.80	93.26±5.48	11.69	P<0.0001 S
10 Min After Intubation	76.56±5.92	92.06±5.56	10.44	P<0.0001 S
25 Min After Intubation	73.33±5.71	91.56±5.95	12.04	P<0.0001 S
40 Min After Intubation	71.93±4.79	90.73±6.25	13.06	P<0.0001 S
65 Min After Intubation	69.60±5.39	90.53±6.25	17.01	P<0.0001 S
80 Min After Intubation	67.56±4.81	90.86±5.31	17.86	P<0.0001 S
95 Min After Intubation	66.46±4.62	91.10±6.42	17.04	P<0.0001 S
110 Min After Intubation	64.96±4.38	90.40±6.66	17.46	P<0.0001 S

In Group D baseline mean HR was 92.30±5.43 which showed transient increase after 10 min of infusion of Dexmedetomidine i.e. 93.63±5.68. Then the mean HR gradually decreased to 64.96±4.38 at the end of 110 min. In Group C baseline mean HR was 90.66±7.26. It increased to

93.63±6.69 after 10 min. of infusion of Clonidine. Then the mean gradually increased to 90.40±6.66 at the end of 110 min. Table 2 shows fall in mean HR was more in group D than that of group C which was statistically highly significant.

**Table 3:** Comparison of Mean MAP in Group D & Group C

MAP	Group D Mean ± SD	Group C Mean ± SD	t-value	P-value
Baseline	90.23±4.36	89.36±4.60	0.794	P=0.475 NS
After Study Drug	85.27±2.71	92.20±4.54	7.17	P<0.0001 S
At Induction	82.13±4.57	90.70±4.97	6.94	P<0.0001 S
At Intubation	79.33±5.67	91.83±4.02	9.83	P<0.0001 S
2 Min After Intubation	76.30±4.15	90.84±4.06	13.70	P<0.0001 S
5 Min After Intubation	73.93±3.90	89.33±3.08	16.94	P<0.0001 S
10 Min After Intubation	71.73±2.82	89.96±4.78	17.78	P<0.0001 S
25 Min After Intubation	70.80±2.60	92.10±3.76	25.49	P<0.0001 S
40 Min After Intubation	69.47±3.38	91.56±4.72	20.83	P<0.0001 S
65 Min After Intubation	67.80±6.59	89.53±3.72	15.70	P<0.0001 S
80 Min After Intubation	67.33±3.09	91.40±3.96	26.20	P<0.0001 S
95 Min After Intubation	67.32±3.31	90.43±4.60	23.09	P<0.0001 S
110 Min After Intubation	66.93±3.03	88.43±3.31	21.23	P<0.0001 S

Table 3 shows that fall in mean MAP was more in Group D than

That in Group C which was statistically highly significant (P<0.0001).

**Table 4:** Comparison of Mean Respiratory Rate in Group D & Group C

RR	Group D Mean ± SD	Group C Mean ± SD	t-value	P-value
Baseline	15.46±2.02	14.67±1.68	1.66	P=0.102 NS
After Study Drug	14.26±1.87	15.00±1.80	1.54	P=0.128 NS
At Induction	14.26±1.68	14.00±1.28	0.701	P=0.486 NS
At Intubation	14.40±1.99	13.66±1.29	1.69	P=0.096 NS
2 Min After Intubation	14.50±2.01	13.90±1.62	1.27	P=0.209 NS
5 Min After Intubation	14.60±1.90	14.66±1.68	0.143	P=0.886 NS
10 Min After Intubation	14.70±1.80	15.0±1.55	0.690	P=0.493 NS
25 Min After Intubation	14.93±1.72	15.33±1.97	0.850	P=0.399 NS
40 Min After Intubation	14.60±1.90	15.16±1.74	1.20	P=0.234 NS
65 Min After Intubation	15.06±1.72	14.93±1.94	0.28	P=0.781 NS
80 Min After Intubation	14.33±1.89	15.33±1.60	1.23	P=0.132 NS
95 Min After Intubation	14.20±1.60	14.97±1.71	0.609	P=0.545 NS
110 Min After Intubation	14.97±1.71	15.40±1.83	0.947	P=0.348 NS

Table 4 shows no significant changes in mean RR of Group D and also in Group C which was statistically not significant(P=0.348).

**Table 5:** Comparison of Mean SPO2 in Group D & Group C

SPO2	Group D Mean ± SD	Group C Mean ± SD
Baseline	100.0±0.0	100.0±0.0
After Study Drug	100.0±0.0	100.0±0.0
At Induction	100.0±0.0	100.0±0.0
At Intubation	100.0±0.0	100.0±0.0
2 Min After Intubation	100.0±0.0	100.0±0.0
5 Min After Intubation	100.0±0.0	100.0±0.0
10 Min After Intubation	100.0±0.0	100.0±0.0
25 Min After Intubation	100.0±0.0	100.0±0.0
40 Min After Intubation	100.0±0.0	100.0±0.0
65 Min After Intubation	100.0±0.0	100.0±0.0
80 Min After Intubation	100.0±0.0	100.0±0.0
95 Min After Intubation	100.0±0.0	100.0±0.0
110 Min After Intubation	100.0±0.0	100.0±0.0

Table 5 showed no significant changes in SpO2 among both group D and C, as saturation was maintained to 100% throughout the procedure.

**Discussion**

In this prospective double blind study we have randomly allocated two groups of 30 each of either sex and age group 18-55 yrs. All patients of ASA I and II posted for spine

surgery were selected, After thorough preoperative evaluation and investigations, patients were shifted to operation theatre and were preloaded with IV Ringer Lactate 10ml/Kg.Baseline HR, SBP, DBP, MAP,SpO2 and RR were noted. Patients in Group D received Inj Dexmedetomidine 0.5 µg/Kg IV diluted in 10 ml normal saline and administered 10 min. before induction.In the same way Inj Clonidine was given 0.5µg/Kg IV to other group Group C.

In our study, all patients were comparable with respect to demographic parameters like age, weight, sex.

In our study we found rise in HR after 10 minutes of infusion of study drug in both groups C & D. Group D (93.63± 5.68) and group C (93.63 ± 6.69), which was statistically significant but in group D mean HR was 84.83±5.6 and in group C mean HR was 95.26±4.43 after induction. This was highly significant (P < 0.0001). At intubation mean HR was 81.60±4.95 in group D and 94.20 ± 4.49 in group C which was also highly significant. (P< 0.0001). Intraoperative readings were observed till 110 minutes in both groups. In Group D, at the end of 110 minutes mean HR was 64.96 ± 4.38 and in group C mean HR was 90.40 ± 6.66, P< 0.0001. It was also highly significant. Earlier studies have demonstrated transient increase in HR within 3-5 minutes of dexmedetomidine infusion which is followed by decrease in HR and is probably due to vasoconstriction effect of dexmedetomidine appearing earlier than central sympathetic action. Our results are similar with that of Sameer Arora *et al* [7] and

Shirsendu *et al* <sup>[8]</sup>. Sukhminder Jit sing *et al* (2015) <sup>[9]</sup> studied the attenuation of pressor response and dose sparing of opioid and anaesthetic requirement with preoperative administration of dexmedetomidine 1 µg/kg compared with Fentanyl 2µg/kg.

Patients schedule for general surgery were randomised into two groups D & F (n = 50 in each group). Group D received 1 µg/kg of dexmedetomidine. Group F received 2 µg/kg of fentanyl preoperatively.

In our study, mean MAP in group D after 10min infusion of Dexmedetomidine was 85.27 ± 2.71 compared with baseline mean MAP of 90.23 ± 4.36 and in group C mean MAP at baseline was 89.36 ± 4.60 and after 10 minutes of infusion of clonidine was found to be 92.20 ± 4.54. Similarly at induction in Group D -82.13±4.57, at intubation - 79.33±5.6, and at 110 min - 66.93±3.03 whereas in Group C at induction- 90.70±4.97, at intubation - 91.83±4.02 and at 110 min- 88.43±3.31. The difference was highly significant statistically. (P< 0.0001).

In our study the drug administered was in low dose to cause respiratory depression. This was evident from early recovery of our patients in the postoperative period. Similar results were found by Shirsendu *et al* <sup>[8]</sup>. He concluded that there is no respiratory depression or decrease in SpO<sub>2</sub> with dexmedetomidine.

Hence we finally concluded that α<sub>2</sub> agonists, Clonidine & Dexmedetomidine decrease the central sympathetic out flow and modify intraoperative cardiovascular and endocrine response, to surgical stimuli and laryngoscopy.<sup>76</sup> However better haemodynamic control was observed with Dexmedetomidine than Clonidine.

Dexmedetomidine, a central α<sub>2</sub> adrenergic agonist is increasingly gaining popularity in anaesthesia as it has been successfully used as sedative, anaesthetic agent and analgesic agent in number of surgical, endoscopic and radiological procedures with minimum adverse effects as it acts through α<sub>2</sub> receptor in locus ceruleus and its analgesic property is due to the receptor stimulation of spinal dorsal horn <sup>[10]</sup>

Postoperative rescue analgesic requirement was decreased in dexmedetomidine group as compared to clonidine in our study. Similar results were found by Ozkose Z *et al* <sup>[11]</sup>. He emphasized that postoperative analgesic requirement is less with the use of dexmedetomidine in spine surgeries <sup>[12]</sup>

## Conclusion

From this study it was concluded that intravenous dexmedetomidine causes better maintenance of haemodynamic parameter as when compared with clonidine. In our study, IV dexmedetomidine 0.5 µg/kg maintained heart rate, SBP, DBP, MAP below baseline value and prevented the pressor response better than clonidine. There were no any adverse effects found with I.V. dexmedetomidine or I.V. clonidine. However, more studies are needed to focus on its effects on patients.

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