

A Prospective Randomized Comparative Study of Anaesthetic and Analgesic Advantages of Dexmedetomidine Versus Saline Infusion for Spine Surgery in Prone Position Under General Anaesthesia

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Conflict of interest: Nil

Abstract

Background: In this study, we wanted to evaluate the anaesthetic and analgesic advantages of dexmedetomidine with that of saline infusion for spine surgery in prone position under general anaesthesia.

Methods: This was a hospital based randomized prospective comparative study conducted among 60 patients who presented with thoracic spine surgeries of duration 3-4 hours under general anaesthesia, in the Department of General Anaesthesia in Seth G S Medical College, KEM Hospital, Mumbai from 2013 to 2014 after obtaining clearance from Institutional Ethics Committee and written informed consent from the study participants.

Results: The sex distribution in both the groups was analysed using Pearson chi square test and the difference was not statistically significant. The mean isoflurane requirement in group D was 0.89 ± 0.14 whereas that in group C was 1.04 ± 0.11 . The difference in mean was statistically significant with p value < 0.001 . This shows that dexmedetomidine infusion in group D decreases the isoflurane requirement. Inj. vecuronium in group D patient was 12 ± 1.64 mg and that in group C patients was 13.66 ± 1.21 mg. There was statistically significant difference in the requirement of Inj. vecuronium between two groups. Less requirement of Inj. vecuronium in group D patients indicated that dexmedetomidine infusion decreases the requirement of Inj. vecuronium. The mean requirement of injection fentanyl in group D patients was 140.33 ± 17.90 μ gm where in as that in group C patients was 117.50 ± 29.07 μ gm. There was statistically significant difference in fentanyl requirement between both the groups with p value < 0.001 . Decrease in the requirement of Inj. fentanyl in group D patients was because of analgesic action of dexmedetomidine infusion. No difference was seen with regard to requirement of Inj. atropine between two groups. Inj. Ephedrine requirement was compared between group D and group C using Chi square test. There was no significant difference in the requirement of Inj. Ephedrine.

Conclusion: Dexmedetomidine attenuates the pressure response to laryngoscopy, incision and extubation. Dexmedetomidine's hypotensive effect reduces the bleeding at surgical site. We can conclude that dexmedetomidine infusion is good anaesthetic adjuvant in spine surgery under general anaesthesia in view of its hemodynamic stability, anaesthetic and analgesic sparing effect.

Keywords: Saline Infusion, Spine Surgery, Prone Position, General Anaesthesia

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Introduction

Spine surgery is one among those surgeries in which without keeping the operative field clear, it is difficult for the surgeon to visualize the structure. Use of propofol for maintenance causes profound fall in blood pressure as compared to isoflurane.[1] Decreasing the bleeding is very important in maintaining patient's haemodynamic stability and it also improves the surgical field. In spine surgery, improving the surgical field is especially important due to the presence of major and easily traumatizable neurological structures. Improving the surgical field helps the surgeon to decrease the operative time which further decreases the bleeding and improves the overall surgical outcome.[1] Various agents have been used to provide controlled hypotension like directly acting vasodilators (sodium nitroprusside, nitroglycerine), beta adrenergic blockers (Esmolol), calcium channel blockers, alpha 2 agonists (clonidine and dexmedetomidine), volatile anaesthetic agents and magnesium sulphate. Ideal hypotensive anaesthetic agent is one which is easy to administer, has rapid onset of action, has effect that disappears quickly after the infusion is discontinued, eliminates rapidly without producing toxic metabolites, has negligible effect on vital organs, has predictable and dose dependent side effects. [1] Dexmedetomidine is highly selective alpha2 adrenergic agonist. It acts on central nervous system and produces sedative and analgesic action without respiratory depression. The

sedative and hypnotic effects of dexmedetomidine have been well documented in various clinical and experimental studies [2] Because of all these properties, Dexmedetomidine decreases intra-operative anaesthetic and analgesic requirements. Ease of administration, absence of toxic metabolites, maintaining adequate perfusion of vital organs makes Dexmedetomidine a near-ideal hypotensive agent. [1]

Aims and Objectives

- To compare intra-operative anaesthetic requirement between the above two groups.
- To compare the extubation response between the above two groups.

Methods

This was a hospital based randomized prospective comparative study conducted among 60 patients who presented with thoracic spine surgeries of duration 3 - 4 hours under general anaesthesia, to the Department of General Anaesthesia in Seth G S Medical College, KEM Hospital Mumbai from 2013 to 2014 after obtaining clearance from Institutional Ethics Committee and written informed consent from the study participants.

Inclusion Criteria

- Age > 20 & < 65 years.
- ASA grade I.

Exclusion Criteria

- Age < 20 & > 65 years.

- Patients undergoing cervical spine surgery.
- Pregnant patients.
- Obese patients.
- Pre-operative heart rate less than 50 beats/min.

Statistical Methods

Data was entered in MS Excel and analysed using Statistical Package for Social Sciences (SPSS) software. Results were presented as tables.

Results

Table 1

Sex	Group n (%)		Total
	Group D	Group C	
Male	21 (70.0)	21 (70.0)	42 (70.0)
Female	9 (30.0)	9 (30.0)	18 (30.0)
Total	30 (100.0)	30 (100.0)	60 (100.0)
<i>Comparison of Distribution of Sex between Group D and Group C</i>			
Demographic Distribution			

The sex distribution in both the groups was analysed using Pearson’s chi square test and the difference was not statistically significant.

Table 2

Study Parameter	Group D				Group C				Unpaired T test	p Value
	Mean	SD	Median	IQR	Mean	SD	Median	IQR		
Isoflurane mac in percent	0.89	0.14	1	0.20	1.04	1.00	1	0.20	-5.010	0.001
Total VEC in milligram	12.0	1.64	12	2.00	13.66	14.0	14	2.50	-4.548	0.001
Total Fentanyl in microgram	140.33	17.9	150	20.00	177.5	200	200	50.0	-6.013	0.001
<i>Comparison of Isoflurane, Vecuronium and Fentanyl Requirement between Group D and Group C</i>										

The mean isoflurane requirement in group D was 0.89 ± 0.14 whereas that in group C was 1.04 ± 0.11 . The difference in mean was statistically significant with p value < 0.001. This shows that dexmedetomidine infusion in group D decreases the isoflurane requirement. Inj. vecuronium in group D patient was 12 ± 1.64 mg and that in group C patients was 13.66 ± 1.21 mg. There was statistically significant difference in the requirement of Inj. vecuronium between two groups. Less requirement of Inj. vecuronium in group D patients indicated that dexmedetomidine

infusion decreases the requirement of Inj. vecuronium. The mean requirement of injection fentanyl in group D patients was 140.33 ± 17.90 µgm where in as that in group C patients was 117.50 ± 29.07 µgm. There was statistically significant difference in fentanyl requirement between both the groups with p value < 0.001. Decrease in the requirement of Inj. fentanyl in group D patients was because of analgesic action of dexmedetomidine infusion.

Table 3

	Group		Total
	Group D	Group C	
No	30 (100)	30 (100)	60 (100)
Total	30 (100)	30 (100)	60 (100)
<i>Comparison of Inj. Atropine Requirement between Group D and Group C</i>			
	Group		Total

	Group D	Group C	
Yes	1 (3.3)	0	1 (1.6)
No	29 (96.7)	30 (100.0)	59 (98.4)
Total	30 (100)	30 (100)	60 (100)
<i>Comparison of Inj. Ephedrine Requirement between Group D and Group C</i>			

It shows no difference on the requirement of Inj. atropine between two groups.

Inj. Ephedrine requirement was compared between group D and group C using Chi square test, there was no significant difference in the requirement of Inj. Ephedrine.

Discussion

The total intraoperative isoflurane requirement in group D was 0.89 ± 0.14 and that in group C was 1.04 ± 0.11 . As compared to group C, in group D the requirement was less and the difference in the mean was statistically significant with p value = 0.001. The total intraoperative requirement of injection vecuronium in group D was 12 ± 1.64 mg and that in group C was 13.6 ± 1.21 mg.

Ozkose Z, Demir, Pampal et al, [3] studied the hemodynamic, anaesthetic advantages of dexmedetomidine. 40 patients posted for elective spine surgery were randomly assigned into group DEX (n = 20) and group C (n = 20). Group D received desflurane, dexmedetomidine, opioid and vec and placebo group received placebo with desflurane, vec and opioid. They found that dexmedetomidine decreased the anaesthetic requirement.

The requirement of Inj. vecuronium in group D was less compared to group C and the difference in the mean is statistically significant with p value = 0.001. This observation of the present study is in concurrence with the above mentioned study [3] and it shows that dexmedetomidine has anaesthetic sparing effect.

The total requirement of injection fentanyl in group D was 140.33 ± 17.90 μ gm and that in group C was 177.50 ± 29.07 μ gm.

Requirement was less in group D compared to group C and the difference in mean was statistically significant with p value 0.001.

Yasser M El-Halafawy, Hala M El-kerdawy et al. [4] studied effects of dexmedetomidine in morbidly obese patients undergoing laparoscopic gastric bypass. In this study, 80 adult patients scheduled for elective laparoscopic roux en y gastric bypass surgery were randomly assigned to one of two study groups; Group D (40 patients) received dexmedetomidine (0.8 μ gm/kg bolus then infusion 0.4 μ gm/kg and group p patients received normal saline in the same volume and rate. They found that dexmedetomidine decreased the total amount of intraoperative fentanyl and propofol for maintenance of anaesthesia compared to placebo.

Keniya VM, Ladi S, Naphade R, et al. [5] studied that dexmedetomidine attenuates sympathoadrenal response to tracheal intubation and reduces perioperative anaesthetic requirement. 60 patients posted for elective surgery were randomly selected. Control group received isoflurane, opioid and study group received dexmedetomidine along with isoflurane and opioid. They found fentanyl requirement in study group is low compared to control group. Hence, dexmedetomidine has significant anaesthetic and analgesic sparing effect.

Yildiz et al. [3] studied the effects of dexmedetomidine on laryngoscopy and intubation; perioperative hemodynamic and anaesthetic requirements. 50 patients posted for minor surgery were randomly allocated into DEX (n = 25) and control (n = 25). During induction, the requirement

for thiopentone and fentanyl was reduced to 39% and 92% respectively. The fentanyl requirement during perioperative period was $74.20 \pm 10.53 \mu\text{gm}$ and that in group C was $84 \pm 27 \mu\text{gm}$. They concluded that preoperative single dose of dexmedetomidine reduced the requirement of opioid and anaesthetics.

In the present study also, the fentanyl requirement in group D was $140.33 \pm 17.90 \mu\text{gm}$ and that in group C was $177.50 \pm 29.07 \mu\text{gm}$. The difference was statistically significant with p value < 0.001 . So, the present study is in concurrence with above mentioned studies. [4,5] It shows that dexmedetomidine has opioid sparing effect. Not even a single patient in either group received atropine. One patient in group D received I v ephedrine. There was no significant difference between two groups for either iv atropine or iv ephedrine requirement.

Bekker et al. [6] neuroanesthesiology research report found that dexmedetomidine did not increase the incidence of bradycardia and hypotension.

P, E Transkanen et al. [7] found that only one patient in placebo group required atropine. There was no increased incidence of bradycardia associated with dexmedetomidine. [8]

The present study is in concurrence with above mentioned studies with no increased incidence of hypotension and bradycardia in dexmedetomidine group.

Conclusion

Dexmedetomidine has significant anaesthetic and opioid sparing effect. Dexmedetomidine attenuates the pressure response to laryngoscopy, incision and extubation. Dexmedetomidine hypotensive effect reduces the bleeding at surgical site. Dexmedetomidine infusion is good anaesthetic adjuvant in spine surgery under general anaesthesia in view of its hemodynamic stability, anaesthetic and analgesic sparing effect.

Contribution of authors

First author involved in data collection, design of the article, data analysis.

Second author involved in selection of study, study design, study editing.

Third author technical aspect, drafting the manuscript and corresponding author.

Fourth author involved in final editing and study statistics.

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