Content available at: iponlinejournal.com

Indian Journal of Clinical Anaesthesia

Journal homepage: www.innovativepublication.com

Original Research Article

PUBL

A study to evaluate the efficacy of intrathecal dexmeditomedine in patients undergoing laparoscopic surgeries under conventional general anaesthesia

Bharathi B M¹, Tulsi T^{1,*}, Jaidev S Bagliker²

¹Dept. of Anesthesiology, Bangalore Medical College and Research Institute, Bengaluru, Karnataka, India ²Dept. of Anaesthesiology, Institute of Nephro Urology, Bangalore, Karnataka, India



ARTICLE INFO

Article history: Received 02-12-2019 Accepted 22-12-2019 Available online 03-06-2020

Keywords: Dexmeditomedine Intrathecal α2 agonist Laparoscopic surgery

ABSTRACT

Background and Aims: The advent of laparoscopic surgery has benefited the patient and surgeon; however creation of pneumoperitoneum for same has bearings during the perioperative period. These effects of pneumoperitoneum are associated with significant hemodynamic changes, increasing the morbidity of the patient. Dexmedetomidine, a new $\alpha 2$ agonist provides stable hemodynamic condition, good quality of intra operative analgesia and prolonged post-operative analgesia with minimal side effects.

Materials and Methods: A total of 74 patients of either sex, planned for laparoscopic cholecystectomy were included. The patients were randomly divided into two groups of 37 each. GROUP D received Injection Dexmeditomedine $5\mu g$ (0.05ml) is diluted in 0.5ml of cerebrospinal fluid and injected intrathecally. A 5minutes interval is given for recording of post injection hemodynamic parameters prior to general anaesthesia. Patients will be premedicated with Injection glycopyrrolate 0.04 mg/kg, Injection midazolam 0.02 mg/kg and Injection Fentanyl $2\mu g/kg$ intravenously. After adequate preoxygenation, conventional general anaesthesia will be given to the patients. GROUP 'E': Conventional general anaesthesia alone.

Measurements: Heart rate (HR), systolic blood pressure, diastolic blood pressure and mean arterial pressure (MAP), ETco2 were recorded preoperative, after study drug, after induction, after pneumoperitoneum at 5 min intervals, post pneumoperitoneum

Results: In group D, there was no statistically significant increase in HR and blood pressure after pneumoperitoneum at any time intervals and there was significant increase in time for first rescue analgesic, intraoperative fentanyl requirement, whereas in Group E, there was a statistical significant increase in MAP after pneumoperitoneum at 5, 10 and 15 min and HR during the whole pneumoperitoneum period.

Conclusion: Dexmedetomidine 5 μ g given intrathecally improves the hemodynamic stability, decreased intraoperative requirement of fentanyl and the duration of postoperative analgesia and also provides an analgesic sparing effect in patients undergoing laparoscopic abdominal surgery.

© 2020 Published by Innovative Publication. This is an open access article under the CC BY-NC license (https://creativecommons.org/licenses/by-nc/4.0/)

1. Introduction

Alpha $(\alpha)_2$ - adrenoreceptor agonists have been used as adjuvant to anaesthetic agents in peri-operative period for its several beneficial actions.¹ Dexmedetomidine, a new α_2 agonist provides stable hemodynamic condition, good quality of intra operative analgesia and prolonged post-operative analgesia with minimal side effects.² This effect

is due to sparing supraspinal CNS sites from excessive drug exposure, resulting in robust analgesia without heavy sedation. It produces dose dependent sedation, anxiolysis, and analgesia without respiratory depression.³

The analgesic effect of Dexmedetomidine is qualitatively different as compared to opioids in general anaesthesia.¹ The adverse effect of dexmedetomidine include hypotension, nausea, bradycardia, atrial fibrillation and hypoxia.³

* Corresponding author. E-mail address: doc.blossoms@gmail.com (Tulsi T). The development of minimally invasive surgery in the modern era has not only revolutionized surgery but this

process has also influenced the practice of anaesthesiology. Laparoscopic procedure is one among those which has the advantage of less pain, less trauma and shorter hospital stay in a cost-effective manner. However, laparoscopic surgeries are usually performed by insufflation of gases like carbon dioxide into the abdominal cavity.⁴ The creation of pneumoperitoneum along with change in patient positions result in marked pathophysiological alterations.⁵ The pneumoperitoneum causes stress hormone response leading to hemodynamicinstability.

To overcome these alterations, spinal anaesthesia has been tried for laparoscopic as the sympathectomy would counteract for the hemodynamic changes. But the pneumoperitoneum for a longer duration in an awake patient with compromised position resulted in discomfort.

Regional anesthesia in combination with general anesthesia can reduce the surgical stress response, hemodynamic changes and the need for sedatives and analgesics with quicker recovery.⁶ Dexmeditomedine is new highly selective alpha 2 receptor agonist.⁷ It decreases the sympathetic outflow from CNS thereby reducing hemodynamic stress from the central nervous system thereby reducing the hemodynamic stress response and anaesthetic requirements in a laparoscopic surgery. It prolongs the duration of analgesia when given intrathecally.^{8,9} There is less literature with intrathecal dexmeditomidine in laparoscopic surgeries under general anaesthesia. Hence, we hereby make an attempt in this study presuming that the stress attenuating properties of dexmeditomedine would counter the hemodynamic instability created in a laparoscopic surgery.

2. Materials and Methods

Following approval of the Institutional Ethics Committee, the study was conducted in 90 patients over a period of 4 months. The patients were selected and divided into two groups of 45 each by using computer generated randomization table.

Group 'D': Intrathecal Dexmeditomedine $5\mu g$ (0.05ml) diluted to 0.5ml with cerebrospinal fluid followed by conventional general anaesthesia: 45

Group 'E': Conventional general anaesthesia alone: 45

Pre-anaesthetic examination including detailed history and systemic examination as well as airway examination was conducted prior to enrolment of the patient for the study. Informed written consent was obtained from the patients after explanation of the anaesthesia technique. All patients received premedication with Tablet Ranitidine 150mg and Tablet Anxit 0.5mgthe night before surgery. The selected patients was kept fasting overnight for a period of 8hours.

2.1. Anaesthetic procedure

On shifting the patient to the operation theatre, an 18 gauge intravenous line was secured on to either of the upper limbs. Monitors including electrocardiogram, non-invasive blood pressure monitor and pulse oximeter was connected to the patient. Baseline hemodynamic parameters were measured.

Under aseptic precautions, a lumbar puncture was performed in the patients allotted to group D, in the left lateral position using 25 gauge Quincke type spinal needle at the L3-L4 inter vertebral space by midline approach to get a free flowing, clear cerebrospinal fluid.

Injection Dexmeditomedine $5\mu g$ (0.05ml) was diluted in 0.5ml of cerebrospinal fluid to total volume of 1ml and injected intrathecally. The patients were made supine immediately. At 5 minutes interval was given for recording of post injection hemodynamic parameters prior to general anaesthesia. Patients were premedicated with Injection glycopyrrolate 0.04 mg/kg, Injection midazolam 0.02 mg/kg and Injection Fentanyl 2µg/kg intravenously. After adequate preoxygenation, conventional general anaesthesia was given to the patients. Whereas the patients allotted to group C received conventional general anesthesia alone after adequate premedication and preoxygenation. The volatile inhalational agent was used in lowest possible concentration necessary to keep the mean arterial pressure and heart rate within 20 percentage of baseline and at the same time maintaining bispectral index between 40 and 60. At the end of the procedure, residual neuromuscular blockade was adequately reversed and extubated after adequate recovery.

Duration of surgery and quantity of volatile inhalational agent consumed was recorded at the end of surgery. Patients were shifted to post-operative ward and monitored for heart rate, blood pressure and oxygen saturation. Level of pain and sedation was assessed using VisualAnalogue scale and Ramsay sedation scores respectively. Time to the first rescue analgesic was noted and rescue analgesia was given with Injection Paracetamol 1gram intravenous infusion over 15 minutes. Post-operative nausea and vomiting was treated using Injection Ondansetron 0.08mg/kg intravenously.

2.2. Statistical analysis

Data was entered in Microsoft Excel and was exported into SPSS version 24.0. Data was analyzed by descriptive statistics, Student's t test was used to compare the significant difference between two means. Chi - square or Fisher's exact probability test was used for association of qualitative variables. p < 0.05 is considered statistically significant.

3. Results

There were no significant differences among groups in demographic data, clinical characteristics and duration of surgery (P > 0.05) (Table 1).

Table 1:

Variable	Group D (Intrathecal Dexmeditomedine 5µg given)(n=37) Mean(SD)	Control(n=37) Mean (SD)
Age(in years)	39(10.44)	40.27(10.07)
Weight(in kgs)	60.86(6.98)	63.57(6.24)
Height(in kgs)	154.54(3.66)	156.03(3.97)
Male/Female	9/28	16/21
ASA I/II	27/10	27/10
Duration of surgery(hour)	0.71(0.38)	0.57(0.21)

Table 2: Heart rate (Induction)

Heart rate	Group D (Intrathecal Dexmeditomedine 5µg Given)(N=37) Mean(SD)	Control(n=37) Mean(SD)	t-value	p-value
5 minutes	87.51(16.11)	80.32(9.39)	2.345	0.022*
10 minutes	88.08(14.05)	85.59(9.0)	0.907	0.368
15 minutes	89.78(12.94)	94.92(10.96)	-1.842	0.070
20 minutes	95.73(13.44)	105.62(13.98)	-3.09	0.003**
25 minutes	90.84(8.89)	112.27(12.26)	-8.61	0.001**
30 minutes	86.97(15.44)	116.81(13.87)	-8.74	0.001**
35 minutes	91.70(13.57)	120.08(14.29)	-8.76	0.001**
40 minutes	91.29(12.86)	119.65(13.54)	-9.10	0.001**

*significant **highly significant

Table 3: Heart rate (Insufflation time)

Heart rate	Group D (Intrathecal Dexmeditomedine 5µg Given)(n=37) Mean(SD)	Control(n=37) Mean(SD)	t-value	p-value
1 minute	91.49(16.64)	93.84(10.19)	-7.33	0.466
2 minutes	92.43(15.62)	103.19(12.78)	-3.241	0.002**
3 minutes	93.76(18.56)	112.68(12.91)	-5.091	0.001**
4 minutes	94.19(19.38)	119.27(9.97)	-7.00	0.001**
5 minutes	95.49(17.38)	112.16(9.47)	-8.199	0.001**
10 minutes	94.68(16.44)	123.03(11.87)	-8.505	0.001**
15 minutes	93.95(12.94)	120.27(13.08)	-8.704	0.001**
20 minutes	89.49(10.28)	113.46(11.73)	-9.348	0.001**

*significant

**highly significant

Table 4: SBP (Induction)

SBP	Group D (Intrathecal Dexmeditomedine 5µg given)(n=37) Mean(SD)	Control(n=3) Mean(SD)	t-value	p-value
5 minute	111.70(12.94)	124.08(17.70)	-3.41	0.001**
10 minutes	113.32(12.42)	128.30(11.91)	-5.29	0.001**
15minutes	115.35(19.210)	140.43(8.04)	-7.32	0.001**
20 minutes	121.05(16.29)	146.0(9.74)	-7.99	0.001**
25 minutes	122.81(12.62)	157.86(12.99)	-11.77	0.001**
30 minutes	130.43(15.59)	163.65(12.66)	-10.06	0.001**
35 minutes	129.84(10.75)	168.0(13.57)	-13.41	0.001**
40 minutes	131.29(11.53)	168.11(17.77)	-10.36	0.001**

**highly significant

Table 5: SBP (Insufflation time)

SBP	Group D (Intrathecal Dexmeditomedine 5µg Given) (n=37) Mean(SD)	Control(n=37) Mean(SD)	t-value	
1 minute	124.08(19.52)	143.97(16.16)	-4.77	0.001**
2 minutes	130.35(24.04)	150.43(17.86)	-4.08	0.001**
3 minutes	132.89(22.42)	158.14(14.86)	-5.71	0.001**
4 minutes	132(19.37)	164.03(12.04)	-8.54	0.001**
5 minutes	133.08(17.18)	168.76(12.85)	-10.11	0.001**
10 minutes	120.73(11.67)	171.84(14.90)	-13.86	0.001**
15 minutes	126.76(10.81)	165.35(15.59)	-12.37	0.001**
20 minutes	125.78(11.51)	153.38(13.44)	-9.49	0.001**

**highly significant

Table 6: DBP (Induction)

DBP	Group D (Intrathecal Dexmeditomedine 5µg given)(n=37) Mean(SD)	Control(n=37) Mean(SD)	t-value	p-value
5 minute	73.59(8.69)	77.57(8.97)	-1.93	0.057
10 minutes	71.05(9.35)	76.92(7.25)	-3.02	0.004**
15 minutes	74.62(14.67)	82.86(2.84)	-3.35	0.001**
20 minutes	82.03(13.15)	84.7(3.31)	-1.20	0.234
25 minutes	81.24(8.36)	89.92(10.09)	-4.03	0.001**
30 minutes	82.27(8.39)	90.11(7.91)	-4.13	0.001**
35 minutes	84.38(7.51)	89.95(5.34)	-3.68	0.001**
40 minutes	84.66(7.004)	89.46(4.72)	-3.43	0.001**

**highly significant

Table 7: DBP (Insufflation time)

DBP	Group D (Intrathecal Dexmeditomedine 5µg Given)(n=37) Mean(SD)	Control(n=37) Mean(SD)	t-value	
1 minute	82.73(11.99)	84.86(11.24)	-0.79	0.432
2 minutes	87.73(15.82)	86.05(8.55)	-0.57	0.573
3 minutes	87.89(12.61)	88.05(8.18)	-0.07	0.948
4 minutes	86.59(10.74)	89.08(8.16)	-1.121	0.266
5 minutes	85.76(9.46)	90.92(7.66)	-2.58	0.012*
10 minutes	85.22(6.19)	90.62(3.53)	-4.61	0.001**
15 minutes	81.62(5.49)	89.03(2.89)	-7.26	0.001**
20 minutes	81.19(5.36)	86.08(2.38)	-5.07	0.001**

*significant **highly significant

Table 8: Mean Arterial Pressure (Induction)

Mean Arterial Pressure	Group D (Intrathecal Dexmeditomedine 5µg Given)(n=37) Mean(SD)	Control(n=37) Mean(SD)	t-value	p-value
5 minute	85.97(9.92)	90.49(5.63)	-2.35	0.022
10 minutes	84.69(10.62)	94.57(9.45)	-4.19	0.001**
15minutes	88.19(16.56)	102.08(3.77)	-4.97	0.001**
20 minutes	95.06(14.04)	105.03(4.64)	-4.09	0.001
25 minutes	94.22(9.74)	112.62(10.49)	-7.76	0.001**
30 minutes	97.72(10.19)	114.54(8.33)	-7.73	0.001**
35 minutes	99.58(9.11)	116.08(7.39)	-8.51	0.001**
40 minutes	100(8.80)	115.32(7.82)	-7.77	0.001**
45 minutes	96.18(9.54)	98.57(35.19)	-0.35	0.73

**highly significant

Fable 9: Mean Arterial Pre	ssure (Insufflation time)
----------------------------	---------------------------

Mean Arterial Pressure	Group D (Intrathecal Dexmeditomedine 5µg given)(n=37) Mean(SD)	Control(n=37) Mean(SD)	t-value	
1 minute	94.81(11.87)	105.29(12.61)	-3.01	0.001
2 minutes	98.83(14.96)	102.38(27.37)	-0.68	0.496
3 minutes	101.33(13.44)	111.86(10.88)	-3.62	0.001
4 minutes	99.72(11.47)	114.66(8.08)	-6.33	0.001
5 minutes	100.97(10.60)	110.68(27.85)	-1.96	0.054
10 minutes	100.28(7.86)	117.46(4.15)	-11.47	0.001**
15 minutes	95.89(5.73)	115.17(5.12)	-14.94	0.001**
20 minutes	96.11(5.88)	102.97(25.43)	-1.58	0.119

*significant

**highly significant

Regarding hemodynamic variables measured during the intraoperative period, there was a significant reduction in pulse rate during induction starting at 20 minutes until 40 minutes in the group D [Table 2] and there was significant reduction in pulse rate during insuffulation time starting at 2 mins to 20 mins in group D in comparison to the control group (P <0.05)[Table 3]. Systolic blood pressure showed a significant reduction during induction starting at 5 minutes until 40 minutes in group in comparison to the control group (P < 0.05)[Table 4]. Systolic blood pressure showed a significant reduction during insufflation starting at 5 minutes until 40 minutes in group in comparison to the control group(P < 0.05)[Table 5]. There was a significant reduction in diastolic blood pressure during induction starting at 5 minutes until 20 minutes in group D in comparison to the control group (P < 0.05) [Table 6]. There was a significant reduction in diastolic blood pressure during insufflation starting at 10 minutes until 40 minutes in group D in comparison to the control group (P <0.05)[Table 7]. Mean arterial pressure showed a significant reduction during induction starting at 10 minutes until 40 minutes in group in comparison to the control group (P <0.05)[Table 8]. Mean arterial pressure showed a significant reduction during insufflation starting at 10 minutes until 20 minutes in group in comparison to the control group(P < 0.05)[Table 9]. There was decrease in consumption of inhaltional agents in dexmedetomidine group. There were no significant differences between groups in hemodynamic variables measured during the postoperative period.

4. Discussion

In a study conducted by Vinith K Srivastava et al, in 2015, a total of 60 patients were included. The patients were divided into three groups of 30 each. Group D received intravenous dexmedetomidine, group E received intravenous esmolol, group C received normal saline. They observed that in group D, there was no significant increase in HR and BP after pneumoperitoneum at any time intervals. Hence, Dexmedetomidine is more effective than esmolol for

attenuating hemodynamic response to pneumoperitoneum in laparoscopic surgeries. $^{10}\,$

In a Randomised, double blinded study conducted by Ashraf Amin Mohammed et al in 2012, 90 patients were randomly assigned to receive intrathecally either 0.5% bupivacaine with $5\mu g$ dexmedetomidine alone or dexmedetomidine with fentanyl along with bupivacaine. They found that dexmedetomidine given intrathecally improves the quality and the duration of post-operative analgesia and also provides analgesic sparing effect in patients undergoing major surgeries.³

In a study done by Rajini Gupta et al in 2011, 60 patients classified in American Society of Anaesthesiologists classes I and II scheduled for lower abdominal surgeries were studied. Patients were randomly allocated to receive Bupivacaine plus dexmedetomidine and bupivacaine plus fentanyl. They observed that Patients in dexmedetomidine. Group had a significantly longer sensory motor block than fentanyl group. Hence dexmedetomidine maintains hemodynamic stability, and reduced demand for rescue analgesics.¹¹

In our study, we have compared between 2 groups, one group received 5 micrograms of intrathecal dexmeditomedine in addition to general anaesthesia in patients undergoing laparoscopic surgeries and the other group received only conventional general anaesthesia. We found that the hemodynamic variables like heart rate, SBP, DBP and MAP were more stable in group D compared to group E during induction, intubation and creation of pneumoperitonium as well as decreases the requirement of rescue analgesics. Hence we can conclude that use of intrathecal dexmeditomedine will decrease the hemodynamic response to intubation, insufflation. It will also decrease the requirement of intra operative opioid consumption and post-operative rescue analgesia

5. Conclusion

Dexmedetomidine 5 μ g given intrathecally improves the hemodynamic stability, decreased intraoperative require-

ment of fentanyl, inhalational agents and the duration of postoperative analgesia and also provides an analgesic sparing effect in patients undergoing laparoscopic abdominal surgeries.

6. Source of Funding

None.

7. Conflict of Interest

None.

References

- Patel CR, Smitha R, Madhu S. The Effect of dexmedetomidine continuous infusion as an adjuvant to general anaesthesia on sevoflurane requirements: A study based on entropy analysis. J Anaesth Clin Pharmacol. 2013;29(3):318–22.
- El-lakany SAAMH. Intrathecal dexmedetomidine: Useful or not? J Anesth Clin Res. 2013;04(09):351.
- Mohammed AA, Fares M, Mohammed K, A S. Efficacy of intrathecally administered Dexmedetomidine versus dexmedetomidie with fentanyl in patients undergoing major abdominal cancer surgery. *Pin Physician*. 2012;15:339–48.
- Kavanagh BP, Hedenstierna G. Respiratory physiology and pathophysiology. In: Miller RD, editor. Miller's Anesthesia. 8th ed. vol. 1. Churchill Livingstone Elsevier Inc; 2015. p. 470–1. doi:Philadelphia.
- Gutt CN, Oniu T, Mehrabi A, Schemmer P, Kashfi A, Kraus T, et al. Circulatory and Respiratory Complications of Carbon Dioxide Insufflation. *Dig Surg.* 2004;21:95–105.
- Mazdisnian F, Palmieri A, Hakakha B, Hakakha M, Cambridge C, Lauria B. Office microlaparoscopy for female sterilization under local

anesthesia. A cost and clinical analysis. *J Reprod Med*. 2002;47:97–100.

- Elsharkawy H, Naguib MA. Centrally acting non opioid analgesics. In: Flood P, Rathmell JP, Shafer S, editors. Stoelting's pharmacology and physiology in anesthetic practice. 5th ed. New Delhi: Wolters Kluwer; 2016. p. 257–58.
- Ansermino M, Basu R, Vandebeek C, Montgomery C. Nonopioid additives to local anaesthetics for caudal blockade in children: a systematic review. *Pediatr Anesth.* 2003;13:561–73.
- Constant I, Gall O, Gouyet L, Chauvin M, Murat I. Addition of clonidine or fentanyl to local anaesthetics prolongs the duration of surgical analgesia after single shot caudal block in children. Br J Anaesth. 1998;80:294–8.
- Srivastava VK, Nagle V, Kedia S. Comparative evaluation of dexmedetomidine and esmolol on hemodynamic responses during laparoscopic cholecystectomy. *J Clin Diagn Res.* 2015;9(3):1–05.
- Gupta R, Verma R, Kushwaha JK. A comparative study of intrathecaldexmedetomidine and fentanyl as adjuvants to bupivacaine. *J Anaesth Clin Pharmacol.* 2011;27(3):339–43.

Author biography

Bharathi B M Assistant Professor

Tulsi T Assistant Professor

Jaidev S Bagliker Senior Resident

Cite this article: Bharathi B M, Tulsi T, Bagliker JS. A study to evaluate the efficacy of intrathecal dexmeditomedine in patients undergoing laparoscopic surgeries under conventional general anaesthesia. *Indian J Clin Anaesth* 2020;7(2):302-307.