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ORIGINAL ARTICLE

Identifying the Minimal Effective Dose of Dexmedetomidine Infusion for Post-Operative Pain Control in Laparoscopic Cholecystectomy Patients

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ABSTRACT

Objective: To compare the frequency of need of rescue analgesia and time of first rescue analgesia) of two different doses 0.2 µg/kg/h and 0.4 µg/kg/h of IV dexmedetomidine in patients undergoing laparoscopic cholecystectomy (LC).

Material and Methods: A total number of 68 patients planned for LC under general anesthesia were included from January-2020 to January-2021. The patients were randomly divided into two groups; group D1 patients received dexmedetomidine 0.2 µg/kg/h i.v and group D2: received dexmedetomidine0.4 µg/kg/h i.v. After shifting the patient in recovery unit, the need of rescue analgesia and time of first rescue analgesia was noted for each patient.

Results: Mean age of patients was 42.64±13.54 years. There were 47 (69.12%) females and 21 (30.88%) male patients. Rescue analgesia was needed by 16 patients (47.1 %) in group D1 and 07 patients (20.6 %) in group D2. The time of first rescue analgesia was 167.50±11.64 minutes in groups D1 and 263.44±19.03 minutes in group D2 (p-value of <0.001).

Conclusion: Dexmedetomidine in an infusion dosage of 0.4 µg/kg/hour is helpful in providing adequate postoperative analgesia.

Keywords: Rescue analgesia, dexmedetomidine, laparoscopic cholecystectomy.

INTRODUCTION

Surgery to remove the gallbladder by laparoscopic means has become more popular in recent years. LC is referred to be "patient friendly surgery" because of its well-known advantages, such as reduced post-operative discomfort, shorter hospitalization, and quicker functional recovery.[1,2] The stress of surgery and anesthesia is still there in LC, just as in any other procedure.

Post-operative discomfort is a common issue after surgery. LC is less painful than open cholecystectomy, however many patients report significant pain or discomfort in the first 24 hours after surgery.[3,4] Preventing and treating post-laparoscopy discomfort requires the use of many types of analgesics, and this is now generally accepted advice.[5,6]

Amnestic and opioid-sparing effects come from dexmedetomidine, which is a highly selective 2-receptor agonist.[7,8] Dexmedetomidine infusions of 0.2–0.7 g/kg/h have been utilized in the majority of trials investigating its usefulness in laparoscopic cholecystectomy with an IV dosage of 1 g/kg. Biphasic response might be expected at this dosage. 9 By skipping the bolus dosage, this may be avoided.[9] Laparoscopic cholecystectomy patients have recently investigated low-dose dexmedetomidine infusions in the 0.2 and 0.4 mg/kg/h range, which have been shown to be effective for obtundation of the haemodynamic response, but only rarely for postoperative analgesia.[10]

The aim of the present study is to determine the analgesic efficacy of two different low doses of IV dexmedetomidine in patients undergoing LC. As finding of lowest effective dose of medications is always a concern for anesthesiologists to prevent undesirable effects of medication. And very little literature is there regarding the minimal dose of dexmedetomidine as analgesic. So the results of the present study will help us to decide either we can reduce the dexmedetomidine dose more or we have to continue 0.4 µg/kg/h as the standard infusion dose.

MATERIAL AND METHODS

In this randomized controlled trial, conducted in department of anesthesiology of a tertiary care hospital we included 68 patients who were planned for LC under general anesthesia, having age 20-70 years and ASA status I-III. Patients allergic to dexmedetomidine, those with severe cardiac, renal or hepatic disease (diagnosed during clinical assessment or previous medical records) and those having diabetes were excluded. An informed consent was obtained before including patient's data in the study.

After including the patients in this study, detailed physical examination was done one day before surgery. Data regarding baseline demographics such as age, gender, and BMI was collected for each patient.

The patients who participated in the trial were randomly allocated to one of two treatment groups: Group D1 got dexmedetomidine 0.2 µg/kg/h intravenously, and Group D2 received dexmedetomidine 0.4 µg/kg/h intravenously. Analgesics and sedatives were not administered to the patients before to surgery (a period of 24 hours). The patient's dorsum of the hand was implanted with a 20-gauge cannula and linked to a Connector for medication delivery as soon as the patient arrived in the operating room. Fifteen minutes after starting the drug infusion, general anesthesia induction was done according to the standard hospital protocols.

After shifting the patient in recovery unit, the need of rescue analgesia and time of first rescue analgesia was noted for each patient. Rescue analgesia was given if the patients pain score became ≥4. VAS score was noted after every 10 minutes after shifting the patient from the operating room to the recovery room for 1 hour, then they were given Patient Controlled Analgesia (PCA) pumps in their rooms/wards to estimate the total analgesia requirement till patient discharge. Inj. Tramadol 50 mg bolus was given as rescue analgesic.

RESULTS

Mean age of patients was 42.64±13.54 years. There were 47 (69.12%) females and 21 (30.88%) male patients (Figure 1). ASA I status was found in 44 (64.71%), ASA II status in 22 (32.35%) and ASA III status in 02 (2.94%) patients (Figure 2).

Rescue analgesia was needed by 16 patients (47.1 %) in group D1 and 07 patients (20.6 %) in group D2 (p-value 0.02). Mean time of first rescue analgesia was 167.50±11.64 minutes in groups D1 and 263.44±19.03 minutes in group D2 (p-value <0.001) [Table 1].

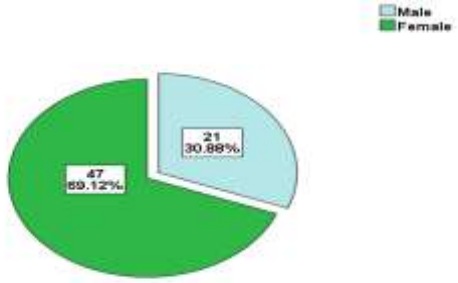

Figure 1: Frequency of gender.

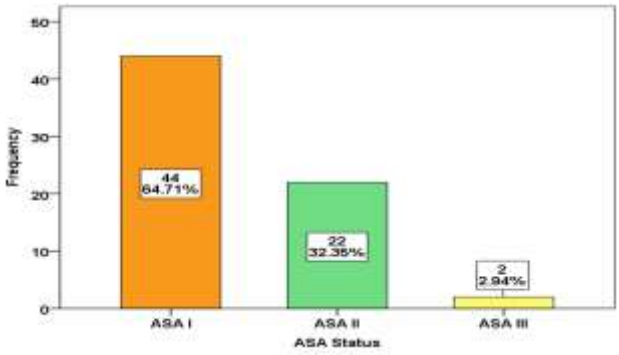

Figure 2: Frequency of ASA status.

Table 5: Comparison of Analgesic Outcomes.

		Groups		P-value
		D1	D2	
Need of Rescue Analgesia	Yes	16 (47.1%)	07 (20.6%)	0.02
	No	18 (52.9%)	27 (79.4%)	
Time of First Rescue Analgesia	Mean	167.50	263.44	<0.001
	S.D.	11.64	19.03	

DISCUSSION

Increased morbidity and complications, longer hospital stays, and the possibility of persistent postsurgical pain are all linked to poorly managed postoperative pain. 92 Even after minimally invasive and laparoscopic surgery, opioids are often utilized for post-operative analgesia, despite their considerable negative effects. Non-opioid analgesic techniques have been more significant over the last several decades in order to minimize opioid-related adverse effects and facilitate recovery from opioid use disorders.[11]

An increase in pain intensity and the need for more opioids might be caused by intraoperative use of opioids. A novel and effective therapy approach for reducing opioid-induced hyperalgesia may be intraoperative DEX infusion.[12] As premedication or anesthetic adjuvant, and postoperative pain management, patients have received extensive research on the alpha-adrenoceptor agonist dexmedetomidine.[13,14] Several writers have explored dexmedetomidine's anti-nociception activity in the context of laparoscopic cholecystectomy postoperative pain treatment. Postoperative analgesia in patients having laparoscopic cholecystectomy after intravenous dexmedetomidine administration has been investigated in just a few trials.[15,16]

In a study by Volkov et al., dexmedetomidine reduced the need for opioid analgesics.[17] Patients undergoing laryngoscopy under complete intravenous anesthesia who received a single IV dose of 0.5 g/kg dexmedetomidine before to the procedure required less propofol during the procedure and less analgesics afterward.[18] According to a randomized, double-blind trial, dexmedetomidine provides higher patient satisfaction and reduced opioid needs than placebo when used as an anesthetic adjuvant in a variety of surgical procedures.[19]

In present study, we determined the analgesic efficacy of low dose dexmedetomidine for control of post-operative pain in comparison to standard dexmedetomidine doses. We found that 0.4 µg/kg/h of dexmedetomidine is more effective than 0.2 µg/kg/h in terms of analgesic requirements. The time of first rescue analgesia in patients receiving 0.4 µg/kg/h dexmedetomidine was 263.44±19.03 minutes versus 167.50±11.64 minutes in patients receiving low dose dexmedetomidine of 0.2 µg/kg/h.

A recent study by Laxmi et al. compared the two different doses of dexmedetomidine to determine the ideal low infusion dose. The authors compared 0.2 µg/kg/h with 0.4 µg/kg/h. In their study, there were 19 (63.3%) patients in 0.2 group who required rescue analgesia and 8 (26.7%) in 0.4 group. While the mean time of first analgesia was 164.14±8.26 min in 0.2 µg/kg/h and 262.45±6.21 min in 0.4 µg/kg/h group.[20]

In short, Dexmedetomidine infusions at doses of 0.4 mg/kg/h were found to be the least toxic and most effective for the relief of post-operative pain in patients who had had laparoscopic cholecystectomy.

CONCLUSION

Dexmedetomidine in an infusion dosage of 0.4 µg/kg/hour is helpful in providing adequate postoperative analgesia.

REFERENCES

1. Evers L, Bouvy N, Branje D, Peeters A. Single-incision laparoscopic cholecystectomy versus conventional four-port laparoscopic cholecystectomy: a systematic review and meta-analysis. Surg endoscop. 2017;31(9):3437-48.
2. Komaei I, Navarra G, Currò G. Three-dimensional versus two-dimensional laparoscopic cholecystectomy: a systematic review. **J** Laparoendosc Adv Surg Tech. 2017;27(8):790-4.
3. Barazanchi AW, MacFater WS, Rahiri JL, Tutone S, Hill AG, Joshi GP, et al. Evidence-based management of pain after laparoscopic cholecystectomy: a PROSPECT review update. Brit J anaesth. 2018;121(4):787-803.
4. Muneeb MD, Baig MA, bin Khalid A, Mughal S. Size does matter: A randomized trial comparing postoperative pain using 10mm VS 5mm umbilical ports in laparoscopic cholecystectomy. Annals of King Edward Medical University. 2019;25(2):155-9.
5. Chilkoti GT, Karthik G, Rautela R. Evaluation of postoperative analgesic efficacy and perioperative hemodynamic changes with low dose intravenous dexmedetomidine infusion in patients undergoing laparoscopic cholecystectomy - A randomised, double-blinded, placebo-controlled trial. J Anaesthesiol Clin Pharmacol. 2020;36(1):72-7.
6. Panchgar V, Shetti AN, Sunitha HB, Dhulkhed VK, Nadkarni AV. The Effectiveness of Intravenous Dexmedetomidine on Perioperative Hemodynamics, Analgesic Requirement, and Side Effects Profile in Patients Undergoing Laparoscopic Surgery Under General Anesthesia. Anesth Essays Res. 2017;11(1):72-7.
7. Nguyen V, Tiemann D, Park E, Salehi A. Alpha-2 agonists. Anesthesiol Clin. 2017;35(2):233-45.
8. Gambling DR. Intravenous dexmedetomidine. International journal of obstetric anesthesia. 2019;39(1):148-9.
9. Chilkoti GT, Karthik G, Rautela R. Evaluation of postoperative analgesic efficacy and perioperative hemodynamic changes with low dose intravenous dexmedetomidine infusion in patients undergoing laparoscopic cholecystectomy – a randomised, double-blinded, placebo-controlled trial. J Anaesthesiol Clin Pharmacol. 2020;36(1):72-7.
10. Tang C, Xia Z. Dexmedetomidine in perioperative acute pain management: a non-opioid adjuvant analgesic. J Pain Res. 2017;10(17):1899–904.
11. Lee C, Kim YD, Kim JN. Antihyperalgesic effects of dexmedetomidine on high-dose remifentanil-induced hyperalgesia. Korean J Anesthesiol. 2013;64(4):301–7.
12. Khanduja S, Ohri A, Panwar M. Dexmedetomidine decreases requirement of thiopentone sodium and pentazocine followed with improved recovery in patients undergoing laparoscopic cholecystectomy. J Anaesthesiol Clin Pharmacol. 2014;30:208–12.
13. Wang G, Zhang L, Lou S, Chen Y, Cao Y, Wang R, et al. Effect of dexmedetomidine in preventing postoperative side effects for laparoscopic surgery: A metaanalysis of randomized controlled trials and trial sequential analysis (PRISMA) Medicine (Baltimore) 2016;95:e2927.
14. Bhattacharjee DP, Nayek SK, Dawn S, Bandopadhyay G, Gupta K. Effects of dexmeditomidine on haemodynamics in patients undergoing laparoscopic cholecystectomy – A comparative study. J Anaesth Clin Pharmacol. 2010;2(1):45–8.
15. Manne GR, Upadhyay MR, Swadia V. Effects low dose dexmedetomidine infusion on haemodynamic stress response, sedation and postoperative analgesia requirement in patients undergoing laparoscopic cholecystectomy. Indian J Anaesth. 2014;58(6):726–31.
16. Volkov PA, Churadze BT, Sevalkin SA, Volkova YN, Guryanov VA. Dexmedetomidine as a part of analgesic component of general anesthesia for laparoscopic operations. Anesteziol Reanimatol. 2015;60(1):4–8.
17. Mizrak A, Sanli M, Bozgeyik S, Gul R, Ganidagli S, Baysal E, et al. Dexmedetomidine use in direct laryngoscopic biopsy under TIVA. Middle East J Anaesthesiol. 2012;21(4):605–12.
18. Candiotti KA, Bergese SD, Bokesch PM, Feldman MA, Wisemandle W, Bekker AY. MAC study group. Monitored anesthesia care with dexmedetomidine: a prospective, randomized, double-blind, multicenter trial. Anesth Analg. 2010;110(1):47–56.
19. Park HY, Kim JY, Cho SH, Lee D, Kwak HJ. The effects of lowdose dexmedetomidine on hemodynamics and anesthetic requirements during bisspectral index guided total intravenous anesthesia. J Clin Monit Comput. 2015;11(1):429–35.
20. Laxmi NG, Murali CH, Srinivasa RB, Praveen KD, Sravan KG. Haemodynamic effects of low dose Dexmedetomidine infusion in patients undergoing laparoscopic cholecystectomy – a randomized study. Sch J App Med Sci. 2016;4(5D):1736-40.