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Original Article

Anaesthesia Section

Postoperative Analgesic Efficacy of Low Dose Intravenous Dexmedetomidine and Intraperitoneal Dexmedetomidine with Bupivacaine in Patients undergoing Laparoscopic Cholecystectomy: A Randomised Prospective Study

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ABSTRACT

Introduction: Providing a better analgesia in the postoperative period improves the overall outcome in any surgical procedure in terms of better patient satisfaction, early recovery and shorter hospital stay. Multimodal analgesia using α 2 agonists like clonidine and dexmedetomidine along with local anaesthetics via intraperitoneal route had been proved to provide better analgesia in laparoscopic cholecystectomy.

Aim: To evaluate the postoperative analgesic efficacy of low dose 0.5 µg/kg dexmedetomidine via intravenous (i.v.) and intraperitoneal (IP) route in laparoscopic cholecystectomy.

Materials and Methods: This was a randomised prospective study carried out at the Department of Anaesthesiology, BLDE (Deemed to be University) Shri BM Patil Medical College, Hospital, and Research Centre, Vijayapura, Karnataka, India from December 2020 to September 2022. The study comprised of 99 patients of either gender, with American Society of Anaesthesiologists (ASA) Grade-I or II, were randomly allocated into three groups using computer generated randomised slips with 33 in each group (Group IV, Group IP, Group C). Group C (Control) patients received 30 mL of Normal Saline (NS) i.v. and 40 mL of 0.25% bupivacaine IP, Group IV patients received 0.5 µg/kg dexmedetomidine infusion i.v. in 30 mL NS over 10 minutes and 40 mL of 0.25% bupivacaine, IP. Group IP patients received 30 mL NS IV and 0.5 µg/kg dexmedetomidine in 40 mL of 0.25% bupivacaine IP. The time of rescue analgesia, total consumption of diclofenac in 24 hours, Visual Analogue Scale (VAS) pain score at 0.5, 1, 2, 4, 6, 12, 24 hours was compared among the three groups. Side-effects of the study drugs especially hypotension and bradycardia were monitored. All the data was analysed using statistical tests (Independent t-test, Kruskal-Wallis test, Chi-square test). The p-value was found to be statistically significant ($p<0.005$).

Results: The VAS score was found to be consistently high in control group at all given time intervals, and significantly low in both i.v. and IP groups which were comparable. The Group IV had the longest mean time for rescue analgesia (180.91±41.617 minutes), followed by the Group IP (106.06±8.269 minutes), and the Group C (55.00±6.960 minutes). The consumption of total rescue analgesic (diclofenac) was determined to be highest in the Group C (241.82±30.767 mg) and lowest in the Group IP (115.30± 30.896 mg).

Conclusion: The total consumption of diclofenac and VAS score was less in intraperitoneal dexmedetomidine was found to be effective in producing postoperative analgesia and can be considered as an effective alternative.

Keywords: Adrenergic α-2 receptor agonists, Opioids, Visual analog scale

INTRODUCTION

In recent times, laparoscopic cholecystectomy has surpassed open operation in terms of popularity, as a result of the numerous benefits that it offers. Despite the fact that it offered a number of benefits, postoperative discomfort had been a major cause for concern, not only for the operating surgeon but also for the patient, in terms of a slow recovery, poor patient satisfaction and an extended stay in the hospital [1]. Not only does anaesthesia management involve intraoperative patient care, but it also involves improved postoperative patient care, which makes the recovery phase pain-free and more propitious for the patient [1,2]. In order to accomplish this goal, a wide variety of multimodal analgesia approaches were utilised in the study.

Dexmedetomidine is a highly selective α-2 receptor agonist with opioid-sparing, analgesic, sedative, amnestic and sympatholytic properties [3-5]. Recent studies have investigated the use of dexmedetomidine infusions in low dose in laparoscopic cholecystectomy, ranging between 0.2-0.4 µg/kg/hour. In these investigations, the reduction of postoperative pain was considered as a secondary objective to the primary focus, which was dampening of haemodynamic response. It was established that IP instillation of α 2 agonists such as dexmedetomidine/clonidine and local anaesthetics like bupivacaine/ropivacaine was successful in giving superior postsurgical analgesia after being tried in a large number of patients [1-4]. The efficacy of dexmedetomidine in postoperative analgesia had been successfully demonstrated in other surgical procedures like gynecological laparoscopy [6] postcesarean sections [7], in paravertebral blocks for modified radical mastectomy procedures [8].

The main aim of the study was to compare the postoperative analgesic efficacy of a combination of either a low dose i.v. dexmedetomidine (0.5 µg/kg) with IP bupivacaine, or an IP dexmedetomidine (0.5 µg/kg) with bupivacaine with IP bupivacaine alone in patients undergoing laparoscopic cholecystectomy.

MATERIALS AND METHODS

This randomised prospective study was conducted at the Department of Anaesthesiology, BLDE (deemed to be University) Shri BM Patil Medical College, Hospital, and Research Centre, Vijayapura, Karnataka, India from December 2020 to September 2022. The study comprised of a total of 99 patients posted for laparoscopic cholecystectomy. A written informed consent was obtained from all subjects after obtaining approval from the Institutional Ethical Committee (IEC) (IEC/NO-09/2021). This study had been registered with Clinical Trials Registry-India (CTRI/2022/04/041648).

Inclusion criteria: Patients who had been scheduled for laparoscopic cholecystectomy with ASA Grade-I or II, between the age of 18 to 60 years were included in the study.

Exclusion criteria: Patients with impaired kidney or liver functions, neurological and mental illness, heart blocks, Body Mass Index (BMI) >30 kg/m^2, patients who were using antihypertensive medication such as α2 agonists like clonidine. If the surgical procedure ends in an open cholecystectomy, such cases were excluded from the study.

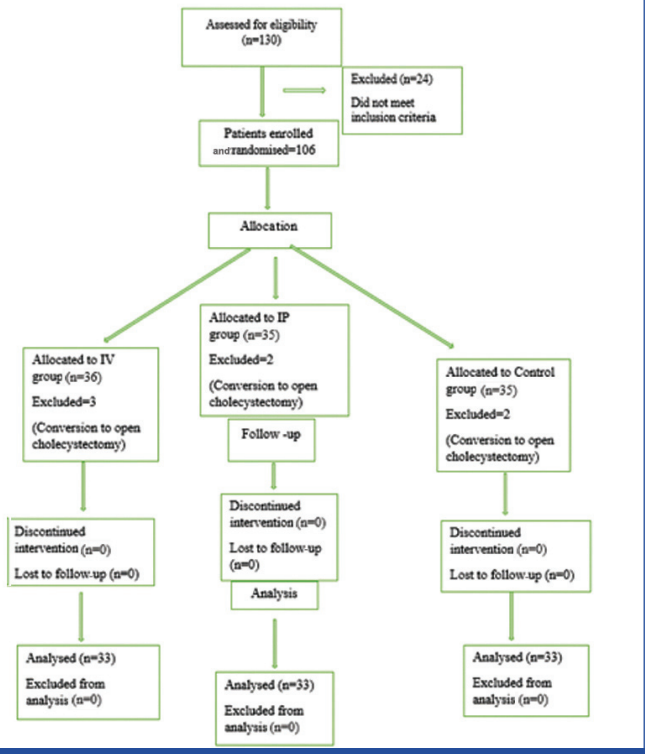
Sample size calculation: The formula used to calculate the sample size was

$$N=2\left[\frac{(z_{\alpha}+z_{\beta})*s}{d}\right]^2$$

where Z_{α}=95% which is level of significance,

z_{β}=80% which is power of the study,=clinically significant difference between two parameters, SD=common standard deviation [1]. The anticipated Mean±SD of VAS score at 0.5 hour of time interval in the control group was 4.36±2.08 and Group IV was 2.56±1.64, respectively [1]. The required minimum sample size was 33 per group (i.e., a total sample size of 99, assuming equal group sizes) to achieve a power of 80% and a level of significance of 1% (two-sided) for detecting a true difference in means between two groups.

Out of 130 patients included in the study based on the inclusion criteria, 106 patients were enrolled and 24 patients who have not met the inclusion criteria were excluded from the study. Out of 106 patients three patients in Group IV, two patients each in Group IP and Group C, since the procedure had been converted to open cholecystectomy were excluded from the study and 99 patients were included with 33 patients in each group [Table/Fig-1].

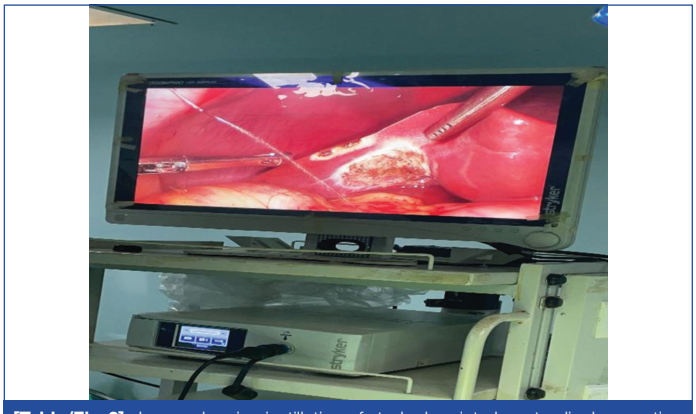


[Table/Fig-1]: Consort flow diagram.

Procedure [1]

Comprehensive patient history, a thorough physical examination, and the patient's vitals were checked during the preoperative appointment. Inquiries were made regarding the presence of any serious illnesses in the patient's past. Concerns pertaining to the airway, the respiratory system, and the cardiovascular system were examined thoroughly. A 0.25 milligrams (mg) of alprazolam was given orally the night before surgery to ease the anxiety of the patients. Patients were instructed on how to utilise the VAS during their preanaesthetic evaluation (VAS score 0: none, 1-3: mild pain, 4-6: moderate pain, 7-10: severe pain). All patients were kept nil per oral as per ASA guidelines for six hours prior to the procedure and were explained about its need to be followed-up for atleast 24 hours after surgery. Ninety nine patients recruited for the study were randomly allocated by computer-generated slips into three groups of 33 patients in each group. An i.v. cannula of 18/20 gauge was secured preferably on the right arm or forearm.

After shifting the patient on to operation table, a multi-parameter monitor was attached to record the patient's Electrocardiogram (ECG), Non Invasive Blood Pressure (NIBP), pulse rate, respiratory rate and oxygen saturation (SpO_2) levels. An i.v. infusion of Ringer's lactate solution at a rate of 10 ml/kg/hour was initiated. Premedication was given using inj. glycopyrrolate 5 µg/kg, inj. ondansetron 0.15 mg/kg, inj. midazolam 0.025 mg/kg and fentanyl 2 µg/kg. Following preoxygenation with 100% oxygen, the patients were induced with propofol 2 mg/kg and to facilitate endotracheal intubation inj. atracurium 0.5 mg/kg was administered. Anaesthesia was maintained with oxygen (O_2) 50%, nitrous oxide (N_2O) 50%, isoflurane 0.8-1% and bolus doses of atracurium 0.1 mg/kg was administered on an intermittent basis thereafter. Monitoring of the patient's vitals was performed three minutes after intubation, immediately after the creation of pneumoperitoneum and at regular intervals of 10 minutes thereafter. After the gall bladder was removed, the study solution was administered intravenously and intraperitoneally in respective groups gradually over a period of 10 minutes. In Group C, patients had received 30 mL of NS i.v. and 40 mL of 0.25% bupivacaine IP. Group IV patients were given 0.5 µg/kg dexmedetomidine i.v. and 40 mL of 0.25% bupivacaine IP. In Group IP, patients received 30 mL of NS i.v.route and 0.5 µg/kg dexmedetomidine in 40 mL of 0.25% bupivacaine IP [Table/Fig-2].



[Table/Fig-2]: Image showing instillation of study drug into hepato-diaphragmatic space, on to the gall bladder fossa.

At every 5-minute interval until tracheal extubation, intraoperative monitoring for haemodynamic parameters like pulse rate, Mean Arterial Blood Pressure (MAP), saturation (SpO_2) and End Tidal Carbon Dioxide ($ETCO_2$) were done.

Before the removal of the trocar in Trendelenburg's position, the respective study solution to be given was injected into the hepato-diaphragmatic space, on the gall bladder bed, near and above the hepatoduodenal ligament. CO_2 was evacuated by manual abdomen compression at the end of surgery with open trocars. Patients were

extubated after adequate reversal of muscle relaxation with i.v. neostigmine 0.05 mg/kg and glycopyrrolate 0.01 mg/kg.

Any changes in the haemodynamic parameters during intraoperative period, such as hypotension were managed with bolus doses of inj. mephentermine (3-6 mg) i.v. or ringer lactate solution (100 mL) and incidences of bradycardia were treated with inj. atropine 0.6 mg i.v. The occurrence of any unwanted side-effects, such as nausea, vomiting, pruritis, urine retention was recorded and handled appropriately. Patients were shifted to the post anaesthesia care facility following surgery. Assessment of severity of pain at 0.5, 2, 4, 6,12 and 24 hours was done using VAS score following surgery. When patients complained of pain or VAS ≥4 for the first time after surgery, inj. diclofenac 2 mg/kg was administered as a rescue analgesic. The duration of analgesia and total rescue analgesic usage for the first 24 hours was recorded.

STATISTICAL ANALYSIS

Statistical Package for the Social Sciences (SPSS) version 20.0 was used for the statistical analysis. The data was presented as mean, standard deviation, number, and percentage (%). The post-hoc analysis approach was used to analyse the data. Tukey's test was used to calculate the intergroup p-value, and Analysis of Variance (ANOVA) was used to calculate the cumulative p-value. Normally distributed data was analysed using an unpaired Student's t-test. The Chi-square test was used to compare non parametric data, with a p-value provided at 95% confidence level. A p-value <0.05 was regarded as statistically significant.

RESULTS

Upon analysis, all three groups were found to be comparable with respect to the demographic data and the findings were statistically not significant [Table/Fig-3].

The mean time to first rescue analgesia was found to be highest in the Group IV (180.91±41.617) followed by Group IP (106.06±8.269). Upon doing intergroup analysis, this difference was found to be statistically significant between Group C and Group IV and between Group IV and Group IP [Table/Fig-4]. The mean diclofenac consumption in 24 hours was found to be lowest in Group IP (115.30±30.896) followed closely by Group IV (119.24±40.372).

In the postoperative period, at 0.5 hours, one hour, six hours, 12 hours and 24 hours the VAS score was found to be significantly low in Group IP (3.48±0.508) and Group IV (4.21±0.696) as compared to the Group C (3.79±0.415). However, at two hours the VAS score was comparable between Group IV and Group IP (3.52±0.508) and at four hours it was slightly high in Group IP (3.58±0.502) than in Group IV (3.36±0.489) [Table/Fig-5a,b]. Upon comparing the intraoperative vital parameters, soon after the removal of gallbladder at an interval of five minutes, thereafter till the release of pneumoperitoneum and after giving study drug, the results were found to be statistically insignificant [Table/Fig-6-9]. With respect to intraoperative haemodynamic parameters Group IV had shown better results, followed closely by IP group.

Two patients in the Group IV had an episode of bradycardia during the intraoperative period which was treated accordingly. No episodes of hypotension, bradycardia, nausea and vomiting were observed in Group IP or Group C.

DISCUSSION

Intraperitoneal instillation of drugs had been in practice for quite some time in laparoscopic surgeries. Most of the studies had emphasised on the role of dexmedetomidine as an i.v. agent but very few literature is available on IP dexmedetomidine. Patients who have had laparoscopic cholecystectomy have more than one mechanism at play when it comes to the production of nociception after the procedure. There are several possible causes, such as trauma from abdominal incisions that destroy somatic free nerve endings, parietal peritoneal distention, disturbance of visceral nerve endings in the gallbladder bed, discharge of endogenous pro-inflammatory molecules, discomfort of the phrenic nerve, irritation of the peritoneum brought on by blood, bile spillage, or carbon-dioxide, and somatoform or psychogenic causes [9,10]. The primary benefits of local instillation may be their rapid nociceptive suppression of free nerve endings injured in the gallbladder bed, their progressive peritoneal uptake into the systemic circulation,

Parameters	Group IV (i.v. dexmedetomidine)		Group IP (IP dexmedetomidine)		Group C (Normal saline)		p-test Value	P cumulative
	Mean±SD	Range	Mean±SD	Range	Mean SD	Range		
Age years	42.42±9.824	23-57	42.55±8.927	29-58	43.45±8.588	25-59	0.278	0.870
Weight (Kg)	62.64±7.004	50-73	61.79±7.227	50-75	62.33±7.825	50-75	0.300	0.861
Height (cm)	165.82±5.720	156-175	162.36±6.020	155-175	162.58±6.083	155-175	7.395	0.025
BMI (kg/m^2)	22.84±2.914	18.71-27.78	23.60±2.80	16.65-28.84	23.64±3.16	17.78-28.93	1.555	0.460

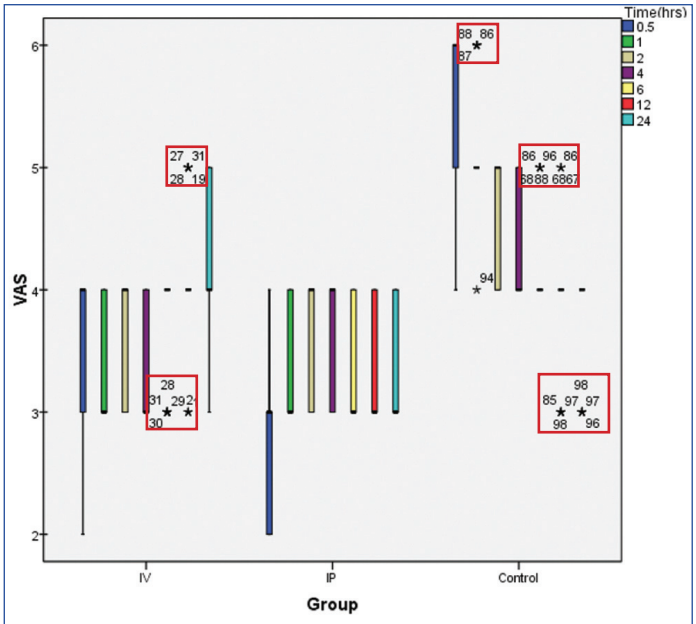
[Table/Fig-3]: Demographic characteristics.
Test applied: Kruskal-Wallis test

Parameters	Group IV	Group IP	Group C	Kruskal Wallis test	p-value
	Mean±SD	Mean±SD	Mean±SD		
Time for rescue analgesia (min)	180.91± 41.617	106.06± 8.269	55.00± 6.960	84.346	0.0001
Total diclofenac consumption in 24 h (mg)	119.24± 40.372	115.30± 30.896	241.82± 30.767	65.389	0.0001

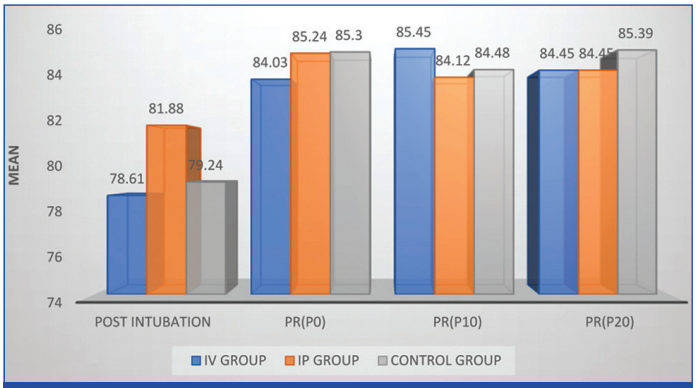
[Table/Fig-4]: Time for rescue analgesia and total Diclofenac consumption in 24 hours.

VAS score (hours)	IV group	IP group	Control group	Kruskal Wallis test	p-value	p-values (post-hoc test-Tukey's test)		
	Mean±SD	Mean±SD	Mean±SD			i.v. vs IP	IP vs C	i.v. vs C
VAS score (0.5)	3.39±0.704	2.58±0.561	5.52±0.619	74.781	0.0001	0.0001	0.0001	0.0001
VAS score (1)	3.39±0.496	3.36±0.489	5.15±0.442	71.553	0.0001	0.963	0.0001	0.0001
VAS score (2)	3.52±0.508	3.52±0.508	4.67±0.479	52.038	0.0001	1.000	0.0001	0.0001
VAS score (4)	3.36±0.489	3.58±0.502	4.45±0.506	45.401	0.0001	0.306	0.0001	0.0001
VAS score (6)	3.76±0.435	3.36±0.489	4.15±0.364	35.879	0.0001	0.003	0.0001	0.0001
VAS score (12)	4.09±0.522	3.39±0.496	3.91±0.522	25.611	0.0001	0.0001	0.001	0.475
VAS score (24)	4.21±0.696	3.48±0.508	3.79±0.415	21.149	0.0001	0.0001	0.128	0.015

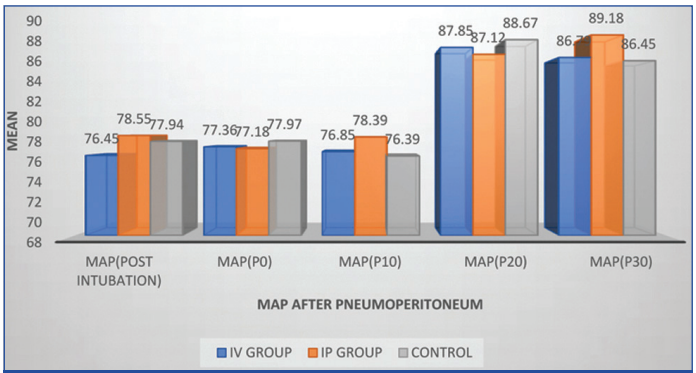
[Table/Fig-5a]: VAS score comparison in the postoperative period
VAS scores at 0.5, 1, 2, 4, 6, 12, 24 hours were found to be statistically significant



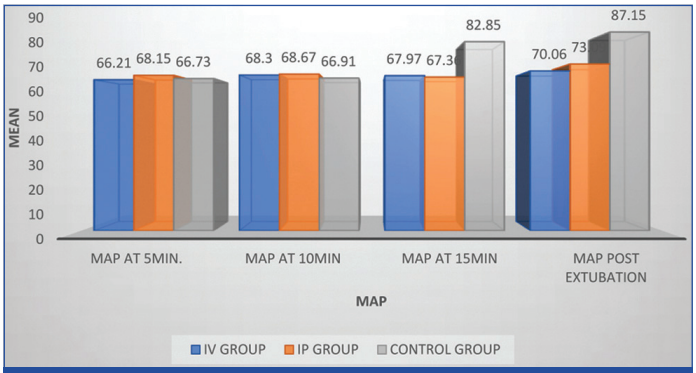
[Table/Fig-5b]: Box and Whisker Plot of VAS Score.
X-axis denotes Groups Y-axis denotes VAS scores at respective time intervals; The numbers in the box and whisker plot denotes the outliers of the study



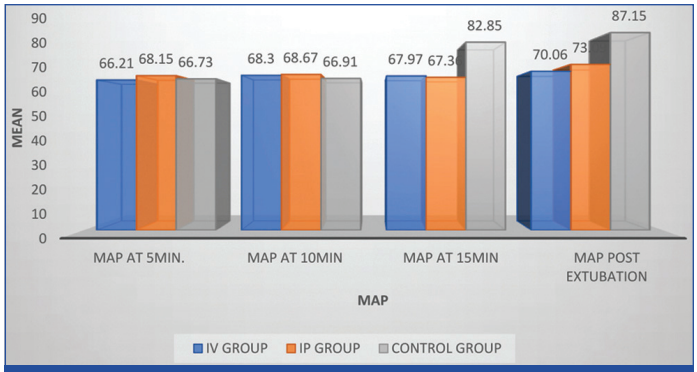
[Table/Fig-6]: Mean value of baseline pulse rate among all the three groups.
P0: Pulse rate at 0 min, P10: Pulse rate at 10 min, P20: Pulse rate at 20 min



[Table/Fig-7]: Mean value of baseline Mean arterial pressure (MAP) among all the three groups.
MAP (P0)- MAP at 0 min; MAP (P10)- MAP at 10 min; MAP (P20)- MAP at 20 min



[Table/Fig-8]: Pulse rate comparison after giving study drug.



[Table/Fig-9]: MAP comparison after giving study drug.

and their lack of systemic toxicities associated with direct systemic administration. All these factors combine to produce the preference for local instillation over targeted systemic administration [11-14].

Dexmedetomidine when used at low dose infusions is effective in reducing the requirements of both i.v. induction agents and inhalational agents [2]. It helps in a better postoperative cognitive function in the postoperative period especially in the elderly [3]. Park HY et al., and Bhattacharjee DP et al., in their study found that i.v. dexmedetomidine at modest doses of 0.3 and 0.2 μg/kg/hour respectively had better haemodynamics throughout the pneumoperitoneum phase [12,13]. However, neither study assessed the analgesic effectiveness of dexmedetomidine. Swaika S et al., compared the same using IP paracetamol with dexmedetomidine and found better intraoperative haemodynamics and postoperative sedation with dexmedetomidine group [15]. In this study, the intraoperative haemodynamic variables such as pulse rate, blood pressure, SpO_2 were found to be statistically insignificant among all the three study groups. The major activity of Alpha2-Adrenergic Receptors (α2AR) agonist effect of dexmedetomidine in the heart is a reduction in tachycardia (through inhibiting cardioaccelerator nerve) and bradycardia (via α2A-AR) (through a vagomimetic action). There is sympatholysis-mediated vasodilation and smooth muscle cell receptor-mediated vasoconstriction in the peripheral vasculature [16].

Chilkoti GT et al., study they used a similar dose (0.5 μg/kg) of dexmedetomidine as used in this study and found that IP dexmedetomidine is equally efficacious as i.v. with no incidence of side-effects like nausea, vomiting, bradycardia or hypotension [1]. Current study also had equivalent findings. In similar research by Ahmed B et al., meperidine was compared with dexmedetomidine IP in conjunction with bupivacaine and concluded that not only better analgesia but there was decrease incidence in shoulder tip pain in dexmedetomidine group which was not assessed in present study [17].

Dexmedetomidine when used IP induces local analgesia by enhancing hyperpolarisation-activated cation channels, preventing the neuron from recovering to resting membrane potential [7]. The considerable benefit of using local anaesthetics and α 2 agonists, like dexmedetomidine, is that they don't have the negative side-effects of opioids, which include postoperative nausea, drowsiness, a slow recovery of gastrointestinal motility, and pruritis which can prolong the patient's recovery and ability to leave the hospital and they aid in early resumption of normal bowel function [9].

In an analysis, Vijayaraghavalu S and Sekar EB they gave bupivacaine and NS IP injections to two separate groups of individuals [18]. They discovered that patients who received IP bupivacaine after surgery experienced significantly less postoperative pain for the first six hours (p-value=0.04); additionally, it took longer for patients to request rescue analgesia (p-value=0.04), with considerably less shoulder pain (p-value=0.04) than the other group, however side-effects such as nausea and vomiting were comparable across the two groups (p-value=0.1 and p-value=0.09, respectively). In the present study,

participants in control group who received only IP bupivacaine did not experience considerable postoperative analgesia.

The sedative activity of dexmedetomidine is mediated by the locus ceruleus of the brain stem, while the analgesic action is mediated by the spinal cord, both of which work via α2A-Adrenergic Receptors (α2AR). The intergroup analysis revealed that the Group IP had a statistically significant lower VAS pain score than Group C. Mean VAS scores were comparable between Group IV and Group IP at all given time intervals. Chilkoti GT et al., however could not find a particular trend in VAS scores between IP and control group in their study [1].

The mean rescue analgesic consumption in 24 hours in this study was comparable to that of Fares KM et al., who employed IP dexmedetomidine at a twofold dose (1 μg/kg) [19]. Similarly, Shukla U et al., concluded that cumulative rescue analgesia in 24 hours was shown to be significantly lower in the IP dexmedetomidine group when compared to the IP tramadol or control groups in patients following laparoscopic cholecystectomy [20].

The current study demonstrated the efficacy of IP instillation of dexmedetomidine in providing analgesia during the first 24 postoperative hours, as evidenced by reduced diclofenac consumption and a relatively low VAS score.

Limitation(s)

Postoperative pain is subjective hence, it is difficult to quantify the accurate pain in study subjects. As this was single-centre research, multicentric investigations are required.

CONCLUSION(S)

According to the findings of the current research, dexmedetomidine when administered in a low dose of 0.5 μg/kg together with bupivacaine through IP route, was found to be successful in reducing the postoperative VAS score, and the analgesic demand, and can be considered as an effective and safe alternative for postoperative analgesia. Additionally, it helps to attenuate the haemodynamic changes that are involved with having a laparoscopic procedure done. Hence, IP dexmedetomidine can be used as an effective method for postoperative analgesia with the least possible side-effects.

REFERENCES

[1] Chilkoti GT, Kumar M, Mohta M, Saxena AK, Sharma N, Singh J. Comparison of postoperative analgesic efficacy of low-dose bolus intravenous dexmedetomidine and intraperitoneal dexmedetomidine with bupivacaine in patients undergoing laparoscopic cholecystectomy: A randomised, controlled trial. Indian J Anaesth. 2019;63(2):106.

[2] 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(2):208.

[3] Khan ZP, Munday IT, Jones RM, Thornton C, Mant TG, Amin D. Effects of dexmedetomidine on isoflurane requirements in healthy volunteers. 1: Pharmacodynamic and pharmacokinetic interactions. Br J Anaesth. 1999;83(3):372-80.

[4] Ngwenyama NE, Anderson J, Hoernschemeyer DG, Tobias JD. Effects of dexmedetomidine on propofol and remifentanil infusion rates during total intravenous anaesthesia for spine surgery in adolescents. Pediat Anaesth. 2008;18(12):1190-95.

[5] Dutta S, Karol MD, Cohen T, Jones RM, Mant T. Effect of dexmedetomidine on propofol requirements in healthy subjects. J Pharma Sci. 2001;90(2):172-81.

[6] Srivastava VK, Shree P, Agrawal S, Pandey A, Babbar K, Manju K. Comparison of intraperitoneal dexamethasone, dexmedetomidine, and dexamethasone-dexmedetomidine combination on postoperative nausea, vomiting, and analgesics requirement after gynecological laparoscopy: A randomized clinical trial. Bali J Anaesthesiol. 2022;6(4):225.

[7] Mazy A, Gad M, Bedairy M. Preperitoneal postcesarean section bupivacaine analgesia: Comparison between dexamethasone and dexmedetomidine as adjuvants. Saudi J Anaesth. 2018;12(2):183.

[8] Pani N, Sahu P, Swain D, Biswal C, Pradhan A, Routray SS. Effects of fentanyl and dexmedetomidine as adjuvants to bupivacaine in paravertebral block for postoperative analgesia in patients undergoing modified radical mastectomy: A prospective randomised double-blind study. Indian J Anaesth. 2022;66(Suppl 4):S193.

[9] Kandil TS, Hefnawy EE. Shoulder pain following laparoscopic cholecystectomy: factors affecting the incidence and severity. J Laparoendosc Adv Surg Tech. 2010;20(8):677-82.

[10] Bisgaard T, Kehlet H, Rosenberg J. Pain and convalescence after laparoscopic cholecystectomy. Euro J Surg. 2001;167(2):84-96.

[11] Chen J, Yan J, Han X. Dexmedetomidine may benefit cognitive function after laparoscopic cholecystectomy in elderly patients. Exp Ther Med. 2013;5(2):489-94.

[12] Park HY, Kim JY, Cho SH, Lee D, Kwak HJ. The effect of low-dose dexmedetomidine on hemodynamics and anaesthetic requirement during bis-spectral index-guided total intravenous anaesthesia. J Clin Monit Comput. 2016;30:429-35.

[13] Bhattacharjee DP, Nayek SK, Dawn S, Bandopadhyay G, Gupta K. Effects of dexmedetomidine on haemodynamics in patients undergoing laparoscopic cholecystectomy-A comparative study. J Anaesthesiol Clin Pharmacol. 2010;26(1):45-48.

[14] Suma S, Vikranth Suresh N, Nikhil M, Sreeramulu PN. Intraperitoneal bupivacaine instillation for postoperative pain relief after laparoscopic cholecystectomy: A prospective study. Int J Contemp Surg. 2019;7(2):2321-1024.

[15] Swaika S, Parta N, Chattopadhyay S, Bisui B, Banarjee SS, Chattarjee S. A comparative study of the efficacy of intravenous paracetamol and dexmedetomidine on peri-operative hemodynamics and postoperative analgesia for patients undergoing laparoscopic cholecystectomy. Anesth Essays Res. 2013;7(3):331.

[16] Kaur M, Singh PM. Current role of dexmedetomidine in clinical anaesthesia and intensive care. Anesth Essays Res. 2011;5(2):128.

[17] Ahmed B, Elmawgoud AA, Doaa R. Antinociceptive effect of (a2-adrenoceptor agonist) dexmedetomedine vs meperidine, topically, after laparoscopic gynaecologic surgery. J Med Sci. 2008;8(4):400.

[18] Vijayaraghavalu S, Sekar EB. A comparative study on the postoperative analgesic effects of the intraperitoneal instillation of bupivacaine versus normal saline following laparoscopic cholecystectomy. Cureus. 2021;13(3):e14151.

[19] Fares KM, Mohamed SA, Abd El-Rahman AM, Mohamed AA, Amin AT. Efficacy and safety of intraperitoneal dexmedetomidine with bupivacaine in laparoscopic colorectal cancer surgery, A randomized trial. Pain Med. 2015;16(6):1186-94.

[20] Shukla U, Prabhakar T, Malhotra K, Srivastava D, Malhotra K. Intraperitoneal bupivacaine alone or with dexmedetomidine or tramadol for postoperative analgesia following laparoscopic cholecystectomy: A comparative evaluation. Indian J Anaesth. 2015;59(4):234.

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