Comparative Study of Intravenous Dexmedetomidine versus Paracetamol for Postoperative Pain Relief in Laparoscopic Surgery

Manjula Sarkar[1,*], Pushkar Desai[2], Shantaram Pawaskar[3], Shubhra Sarkar[4]

[1]Professor and Head, [2,3]Resident, Dept. of Cardiac Anesthesia, G.S Medical College, Mumbai
[4]III MBBS, Student, Loni Medical College, Maharashtra

***Corresponding Author:**
E-mail: drmanjusarkar@gmail.com

Abstract

Background: Acute pain in the perioperative setting is detrimental to post operative outcome and adequate analgesia leads to better outcome.

Methods: Sixty ASA I/II patients between 18- 65 years undergoing laparoscopic cholecystectomy and appendicectomy were included and randomly divided into 2 groups. ASA III/IV patients, previous opioid and alpha 2 agonist treatment and patients requiring extensive surgical dissection were excluded. Group D received IV Dexmedetomidine 1µg/kg over 10 min followed by 0.2-0.7 µg /kg/hr and Group P received IV Paracetamol 15 mg/kg prior to extubation. Patients were monitored for hemodynamics and VAS score was assessed after extubation till 24 hours. Rescue analgesia (IV tramadol 1 mg/kg) was given and the time interval till the requirement of first dose of rescue analgesia was recorded.

Results: In group D, 12 patients required rescue analgesia as compared to 4 Patients in group P (40% vs13.3%; P=0.02). VAS scores were similar in both groups with group P showing trend towards low score. Median time at which the first dose of rescue analgesia was administered in group P was longer (134.42 $\pm$ 12.67 vs 82.76 $\pm$ 9.38 min; P=0.001). Incidence of bradycardia and hypotension was higher in group D (20% vs 3.3%; P=0.04).

Conclusion: Paracetamol is a superior to Dexmedetomidine for analgesia in short surgical procedures and should form a part of multimodal analgesia.

Keywords: Dexmedetomidine, Paracetamol, Laparoscopic surgery, Analgesia

Access this article online	
Quick Response Code:	**Website:** www.innovativepublication.com
	DOI: 10.5958/2394-4994.2016.00010.X

Introduction

International Association for the Study of Pain (IASP) defines pain as "An unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.[1] Acute pain in the perioperative setting is defined as pain that is present in the surgical patient because of pre-existing disease, surgical procedure or a combination of these which is detrimental to post operative outcome. It increases sympathetic response of the body with subsequent rise in oxygen consumption of body, risk of deep vein thrombosis due to immobility and consequent pulmonary embolism. In addition, there can be widespread effects on gut and urinary tract motility, which may lead, in turn to postoperative ileus, nausea, vomiting and urinary retention.[2] As a result, adequate pain relief gets translated to better perioperative outcome, early recovery and reduced length of stay in hospital.

Routine use of strong opioids is undesirable because of adverse effects such as nausea, vomiting, pruritis and sedation. Studies have shown that under-treatment of acute postoperative pain occurs because there is an overestimation of the duration of action, strength of the opioid used and fear about respiratory depression, vomiting, sedation and dependence. [3,4]

Dexmedetomidine is a highly selective α2 adrenoceptor agonist that provides sedation, analgesia, and sympatholysis without causing respiratory depression. Previous studies report that intravenous dexmedetomidine has a definitive role in postoperative analgesia through the reduction of opioid consumption.[5] Paracetamol is a widely used and popular analgesic and antipyretic. So, we have planned this study to see the effect of Dexmedetomidine and Paracetamol on post operative pain relief, adverse effect, and hemodynamics in patients undergoing laparoscopic surgical procedures under general anaesthesia.

Methods & Materials

After obtaining institutional ethics committee approval and written informed consent from patients; this prospective, randomized, double-blind study included 60 ASA I/II patients between 18-60 years age undergoing elective laparoscopic cholecystectomy, appendicectomy under general anesthesia. Patients on previous opioid or alpha 2 agonist treatment were excluded. Cases involving extensive surgical dissection thereby prolonging the duration and needing drain tubing were also excluded. All patients were premedicated with oral alprazolam 0.25 mg at night and

received antacid prophylaxis in the morning of surgery. Patients were randomly and equally divided into two groups (n=30 each) by sealed envelope technique. Patients were monitored with cardioscope (ECG), digital pulse oximeter (SpO_2), and noninvasive blood pressure (NIBP). Patients were induced with IV propofol 2-3 mg/kg and vecuronium 0.1 mg/kg and maintained on oxygen: air: isoflurane. Inj. Fentanyl 2 µg/kg used to attenuate sympathetic response to trocar and port insertion. Patients were mechanically ventilated and normocapnia was maintained. Group D patients received inj. Dexmedetomidine IV 1µg/kg bolus over 10 min followed by 0.5 µg/kg/hr till 4 hours and Group P received IV paracetamol 15 mg/kg just prior to skin closure and repeated after 6 hours. Patients were reversed and extubated after ensuring adequate respiratory attempts and shifted to recovery room. Monitoring of heart rate (HR), mean arterial pressure (MAP), SPO2, VAS score was done two hourly till 12 hours post extubation and at 24 hours thereafter. Patient's pain was assessed by visual analogue scale (VAS) score [6] and rescue analgesic (IV tramadol 1 mg/kg) was provided at score $\geq$ 5. Time of first rescue analgesia requirement was recorded. Bradycardia and hypotension was considered as decrease by more than 20% from baseline but the treatment was given only if MAP<60mm Hg or HR <50 /min.

Statistical Analysis

Data was analyzed using SPSS-16 (IBM) software. Unpaired t test and Mann Whitney U tests were applied for qualitative data. Chi square test was used to compare proportions between two groups (Categorical data). Descriptive analysis for numerical data consists of mean with standard deviation (SD). P value less than 0.05 was considered significant.

Results

Table 1: Demographic characteristics

Parameter	Mean±SD		P value
	Gr D	Gr P	
Age(yrs)	35.9 ± 11.47	37.68 ± 7.92	0.067 (unpaired t test)
Weight (kg)	59.93 ± 5.24	58.90 ± 2.96	0.351
Sex(Male/female)%	60/40	64/36	0.816
ASA I/II (%)	60/40	63.3/36.7	0.79 *(Chi square test)*

All patients in the study were comparable with respect to age, sex, weight and ASA status (Table 1). Similar VAS scores were found in both groups but group P showed trend towards lower score suggestive of better analgesia (Table 2). In group D, 12 patients required rescue analgesia as compared to 4 in group P (40% vs13.3%; P=0.02). Mean time at which the first dose of rescue analgesia administered in group P was longer as compared to group D (134.42 ± 12.67 vs 82.76 ± 9.38 min; P=0.001). Incidence of hypotension was more in group D (20% vs 3.3%; P=0.04). Two patients in group D required Inj. Atropine to counter bradycardia. No significant difference was found in MAP and SpO_2.

Table 2: **Comparison of VAS score**

Interval	Group	Mean rank	Sum of ranks	P value
Extubation	D	30.27	908.00	0.89
	P	30.73	922.00	
2 hours	D	27.50	825.00	0.09
	P	33.50	1005.00	
4 hours	D	33.40	1002.00	0.16
	P	27.60	828.00	
6 hours	D	30.65	919.50	0.94
	P	30.35	910.50	
8 hours	D	32.37	971.00	0.36
	P	28.63	859.00	
10 hours	D	30.73	922.00	0.77
	P	30.27	908.00	
12 hours	D	31.10	933.00	0.90
	P	29.90	897.00	
24 hours	D	30.73	922.00	0.78
	P	30.27	908.00	

Discussion

Postoperative pain management is aimed towards reducing or eliminating discomfort with minimum side effects, in a cost effective manner. The choice of analgesic technique may be influenced by the site and duration of surgery. Equally, it may be influenced by drug availability and familiarity with different methods of analgesia. Effective and non-sedating pain relief in the postoperative period is essential to minimize the risk of delayed recovery and prolonged hospital stay.

We chose laparoscopic cholecystectomy and appendicectomy as our subsets because of short procedure time at our institute and minimal tissue handling which decreases intensity of postoperative pain and thus less potent analgesic like dexmeditomidine can be compared to paracetamol. Dexmeditomidine has been shown to reduce postoperative opioid requirement in many studies but its analgesic property is not addressed solely in comparison to other routine analgesics. Therefore we compared it to paracetamol which has been used for short-term management of postoperative pain.[7]

Though we did not found significant difference in VAS score; our results show that dexmedetomidine provides a modest analgesic effect in early post operative period, beneficial effect would appear to diminish because rescue analgesia requirement was more in dexmedetomidine group. Previous studies have found improved postoperative pain control with dexmedetomidine.[8-12] Effect of dexmedetomidine was prolonged due to continuous infusion in the postoperative period. On the other hand, paracetamol consistently showed less VAS score without requiring frequent rescue analgesia. Mean time at which the first dose of rescue analgesia administered in group P was much longer as compared to group D (134.42 + 12.67 vs 82.76 + 9.38 min; P=0.001).

Arain SR et al [13] studied efficacy of dexmedetomidine versus morphine and found that the administration of dexmedetomidine before the completion of major inpatient surgical procedures significantly reduced the early postoperative need for morphine by 66%.

Feld JM et al[14] concluded in their study that dexmedetomidine when used to substitute for fentanyl during gastric bypass surgery provides postoperative analgesia.

Dholakia et al[15] concluded in there retrospective study that dexmedetomidine provides postoperative analgesia compared to control group. However there are some studies which show that the use of dexmedetomidine for postoperative pain relief is insufficient. CW Cheung [16] studied role of dexmedetomidine on acute postoperative pain management and concluded that, compared with midazolam, dexmedetomidine does not provide better postoperative analgesia when used for third molar surgery with local anesthesia under conscious sedation. Our findings are concordant with other similar study [17] in which pain scores with dexmedetomidine and paracetamol were similar and though there were no differences regarding rescue analgesia; total morphine requirements were higher with dexmedetomidine in the 8-hour follow-up.

Regarding hemodynamics, we did not encounter any difference between two groups and mean arterial pressure, SpO2 were within acceptable limits throughout study period. But, incidence of bradycardia and hypotension was more in dexmedetomidine group probably due to loading dose. Although these effects were predictable, their high frequency suggests caution in its intraoperative use. It is possible that reducing the loading dose may decrease these adverse events. Maria et al [17] also found increased incidence of bradycardia and hypotension with dexmedetomidine. Dexmedetomidine can cause an increase in blood pressure and a decrease in heart rate with large concentrations or with rapid infusion rates. Activation of α2 adrenoceptors on vascular smooth muscle is thought to result in vasoconstriction, increased blood pressure and probable reflex decreased heart rate.[18] But, in our study, there was decreased heart rate and blood pressure during the bolus infusions suggesting that initial 1 μg/kg loading infusion for 10 min may not cause large blood concentrations of dexmedetomidine. More central effects, such as decrease in sympathetic outflow and circulating catecholamine might cause decreases in blood pressure and heart rate.

Overall, dexmedetomidine provided similar pain relief in our study but cautious use is advocated due to the higher incidence of bradycardia and hypotension.

Limitations

Our results cannot be applied to major extensive surgeries in which effects of dexmedetomidine need to be studied. Further, use of intraoperaive fentanyl may have also contributed better VAS score in the immediate postoperative period. Also, we did not do cost benefit analysis which is an important factor in developing countries.

Conclusion

Paracetamol is a superior to Dexmedetomidine for analgesia in short surgical procedures and should form a part of multimodal analgesia.

Acknowledgement

We would like to thank Dr A. Gvalani (Head of Department of General surgery, KEM Hospital) and Dr M. Garasia (Head of Department of Anaesthesia, KEM hospital) for their support in conducting this study.

Conflict of Interest: None
Source of Support: Nil

References:

1. Available from http://www.iasp-pain.org/Taxonomy
2. American Society of Anesthesiologists: Practice guidelines for acute pain management in the perioperative setting: A report by the American Society of Anesthesiologists Task Force on Pain Management, Acute Pain Section. Anesthesiology 1995; 82:1071.
3. Pre-emptive analgesia- why its effect is not always obvious. Anaesthesiology 1996; 84:1015.
4. Woolf CJ, Chong M: Pre-emptive analgesia- treating postoperative pain by preventing the establishment of central sensitization. Anaesth Analg 1993;77:362.
5. Tufanogullari B, White PF, Peixoto MP, Kianpour D, Lacour T, Griffin J, et al. Dexmedetomidine infusion during laparoscopic bariatric surgery: the effect on recovery outcome variables. Anesth Analg 2008; 106: 1741-8.
6. McCaffery M, Pasero C. Visual analogue scale. Pain: Clinical Manual, St. Louis, 1999, Mosby, Inc. pg.16.
7. Zhou TJ, Tang J, White PF. Propacetamol versus ketorolac for treatment of acute postoperative pain after total hip or knee replacement. Anesth Analg 2001;92:1569-75.
8. Aantaa R, Kanto J, Scheinin M, Kallio A, Scheinin H. Dexmedetomidine premedication for minor gynecologic surgery. Anesth Analg 1990;70:407-13.
9. Kamibayashi T, Maze M, Weiskopf RB, Todd MM. Clinical uses of α2-adrenergic agonists. Anesthesiology 2000;93:1345-9.
10. Aho MS, Erkola OA, Scheinin H, Lehtinen AM, Kortila T. Effect of intravenously administered dexmedetomidine on pain after laparoscopic tubal ligation. Anesth Analg 1991;73:112-8.
11. Arain SR, Ruehlow RM, Uhrich TD, Ebert T. The efficacy of dexmedetomidine versus morphine for postoperative analgesia after major inpatient surgery. Anesth Analg 2004;98:153-8.
12. Venn RM, Bradshaw CJ, Spencer R, et al. Preliminary UK experience of dexmedetomidine, a novel agent for postoperative sedation in the intensive care unit. Anaesthesia 1999;54:1136-42.
13. Arain SR, Ruehlow RM et al. The Efficacy of Dexmedetomidine versus Morphine for Postoperative Analgesia after Major Inpatient Surgery. Anesthesia and Analgesia. 2004; 98:153–8.
14. Feld JM, Hoffman WE, Stechert MM, Hoffman IW, Ananda RC. Fentanyl or dexmedetomidine combined with desflurane for bariatric surgery. *J Clin Anesth* 2006; 18: 24-8.
15. Dholakia C, Beverstein G, Garren M, Nemergut C, Boncyk J, Gould JC. The impact of perioperative dexmedetomidine infusion on postoperative narcotic use and duration of stay after laparoscopic bariatric surgery. *J Gastrointest Surg* 2007; 11: 1556-9.
16. CW Cheung, CLA Ying, WK Chiu, GTC Wong, MG Irwin. Comparison of intravenous sedation with dexmedetomidine and midazolam for unilateral third molar extraction under local anaesthesia. *Anaesthesia* 2007 Nov; 62(11): 1132-8.
17. Maria E. Gómez-Vázquez et al Clinical analgesic efficacy and side effects of
18. dexmedetomidine in the early postoperative period after arthroscopic knee surgery. Journal of Clinical Anesthesia 2007; (19), 576–582.
19. Bloor BC, Ward DS, Belleville JP, Maze M. Effects of intravenous dexmedetomidine in humans. II. Hemodynamic changes. Anesthesiology 1992;77: 1134-42.