

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

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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 appendectomy 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 ± 12.67 vs 82.76 ± 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

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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, appendectomy 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 (SpO₂), 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 ≥ 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 SpO₂.

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 appendectomy 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 dexmedetomidine can be compared to paracetamol. Dexmedetomidine 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 find 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 al¹³ 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 al¹⁴ concluded in their study that dexmedetomidine when used to substitute for fentanyl during gastric bypass surgery provides postoperative analgesia.

Dholakia et al¹⁵ concluded in their 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 Cheung¹⁶ 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 study¹⁷ 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 al¹⁷ 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 α_2 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 $\mu\text{g}/\text{kg}$ 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 intraoperative 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 superior to Dexmedetomidine for analgesia in short surgical procedures and should form a part of multimodal analgesia.

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Conflict of Interest: None

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