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Dexmedetomidine Infusion in Patients Undergoing Elective Laparoscopic Cholecystectomy under General Anesthesia: Postoperative Analgesia and Complications

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Abstract

LC combines the benefit of complete removal ofgall bladder with the advantage of limited abdominal incisions, early recovery, shorter hospital stay and less postoperative complication. Laparoscopic cholecystectomy can be associated with severe complications in the form of arrhythmias,sudden intraoperative cardiovascular collapse, severe pulmonary edema and postoperative thromboembolic phenomenon. All patients underwent a thorough preanaesthetic check-up. Written informed consent was obtained from each patient after explaining the procedure in a language that the patient understood. Patients were randomly allocated into 2 groups of 40 each. Mean time to first analgesic in Group D was 4.38 ± 0.86 hrs and in Group C was 2.50 ± 0.68 hrs. On comparing, time to first analgesia was significantly longer in Group D both statistically and clinically. Nausea and Vomiting was noted in 5 patients in Group D and 14 patients in Group C. This incidence though statistically not significant was clinically significant.

Keywords: Dexmedetomidine, postoperative analgesia, elective laparoscopic cholecystectomy

Introduction

Laparoscopic Cholecystectomy (LC) technique was first described in France by PhillippeMourete in 1989.LC combines the benefit of complete removal ofgall bladder with the advantage of limited abdominal incisions, early recovery, shorter hospital stay and less postoperative complication[1].

Laparoscopic cholecystectomy can be associated with severe complications in the form of arrhythmias,sudden intraoperative cardiovascular collapse, severe pulmonary edema and postoperative thromboembolic phenomenon[2].

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All types of arrhythmias have been reported during laparoscopic surgeries ranging from tachyarrhythmias to bradyarrhythmias and even cardiac arrest.
Hypercarbia itself can lead to all types of arrhythmias, such as A-V dissociation, nodal rhythms and sinus bradycardia and sinus tachycardia either due to direct myocardial depression or due to increased sympathetic activation. Dexmedetomidine belongs to the imidazole subclass of α_2 receptor agonists, similar to clonidine[3].It is pharmacologically active dextro isomer of medetomidine and was introduced in clinical practice in 1999 and approved by the FDA as short term (<24 hours) sedative for mechanically ventilated adult ICU patients.
In clinical doses, it does not produce much adverse reactions. On CVS, there may be hypotension or hypertension and bradycardia. AF has also been reported. It causes nausea, dry mouth, vomiting, increased thirst and oliguria. Anaemia and leukocytosis has been reported in ICU patients when used for long term sedation.
In 2006, Yildiz*et al*., conducted a study in 50 patients, to determine the effect of dexmedetomidine on haemodynamic responses to laryngoscopy and intubation, need for anaesthetic agents and perioperative haemodynamic stability, in patients undergoing elective minor surgeries (varicocoele, hydrocele, tendon injuries, debridement, arthroscopy).They were divided into two groups of 25 each. Anaesthesia was induced with fentanyl 1µg/kg and thiopentone 25 mg at 15 sec interval (enough to suppress the eyelid reflex) and vecuronium (0.1 mg/kg) for intubation. Anaesthesia was maintained with O_2:N_2O (50:50). Haemodynamic parameters (SBP, DBP, HR) were observed every minute for the period of the infusion and at 1, 5, 10 and 15 mins after infusion. Specific measurements were noted at induction, intubation and skin incision and at 5 mins intervals during operation and at extubation.After extubation, the Steward awakening score was applied at 5 and 10 minutes. They found that preoperative administration of a single dose of dexmedetomidine resulted in progressive increase in sedation, blunting of haemodynamic responses during laryngoscopy, and reduced opioid and anaesthetic requirements. Furthermore, dexmedetomidine decreased SBP and HR as well as the recovery time after the operation[4].

Methodology

Study design

Randomized controlled study.

Sample size

Based on inclusion and exclusion criteria, on an average three LC/week, suited the study conditions. Hence, a convenient sample of 40 patients in each group was taken.

Study subjects

Adult patients undergoing elective laparoscopic cholecystectomy.

Inclusion criteria

- Age 20 – 60 years.
- ASA I and II.
- Both male and female.

Exclusion criteria

- H/O allergy to drugs.

- ASA III and IV.
- MPG III and IV.
- Patient with Heart Block/Pacemaker/HR<60.
- Coagulation defects.
- Previous abdominal surgery.
- Patient refusal.
- Conversion to open cholecystectomy.
- Surgery lasting for more than 120 minutes.

All patients underwent a thorough preanaesthetic check-up. Written informed consent was obtained from each patient after explaining the procedure in a language that the patient understood. Patients were randomly allocated into 2 groups of 40 each.
Study group (Group D) received IV Dexmed infusion.
Control group (Group C) received NS infusion.

Results

Table 1: Age Distribution (years)

Age Interval	Group D		Group C	
	n	%	n	%
20 - 30	6	15.00%	17	42.50%
30 - 40	11	27.50%	11	27.50%
40 - 50	21	52.50%	4	10.00%
50 - 60	2	5.00%	8	20.00%
TOTAL	40	100%	40	100%
Mean ± SD	37.73 ± 7.24		35.63 ± 12.61	
p-value	0.182			

Table 2: Mean Body Weight (Kgs)

Weight	Group D	Group C	p-value
Mean ± SD	56.75 ± 4.99	53.30 ± 8.62	0.016

The weight of the patients ranged between 48 to 70 kg in Group D and 41 to 74 kg in Group C.
The mean weight in Group D was 56.75 ± 4.99 kg and in Group C was 53.30 ± 8.62 kg and was comparable.

Table 3: Sex Distribution

Gender	Group D		Group C		p-value
	n	%	n	%	
Male	6	15.00%	13	32.50%	0.033
Female	34	85.00%	27	67.50%	
Total	40	100%	40	100%	

The male female ratio was 3: 17 in Group D and 32.5: 67.5 in Group C and was comparable.
85% patients in Group D and 68% patients in Group C were females.

Table 4: Mean Age, Weight, M:F

	Age (yrs)	Weight (kgs)	Sex ratio (M:F)
Group D	37.73 ± 7.24	56.75 ± 4.99	6.34
Group C	35.63 ± 12.61	53.30 ± 8.62	13.27

p-value	0.182	0.016	0.33

The mean ages in Group D and group C were 37.73 ± 7.24 yrsand 35.63 ± 12.61 yrsrespectively and were comparable.
The mean weights in Group D and Group C were 56.75 ± 4.99 kgs and 53.30 ± 8.62 kgs respectively and were comparable.
Sexdistribution was 6.34 and 13.27 in Group D and Group C respectively.
The mean age,weight and sex distribution in the two groups was comparable.

Table 5: VAS Score and Time to First Analgesia (Hrs)

	Time to VAS 5 (hrs)	**Time To First Analgesic (hrs)**
Group D	4.33 ± 0.86	4.33 ± 0.86
Group C	2.50 ± 0.68	2.50 ± 0.68
p-value	0.000	0.000

All patients received Fentanyl 1 µg/kg at induction and 66% N_2O, inhalational agent (sevoflurane) throughout the period of surgery.Inj. Diclofenac (1.5 mg/kg) was given to all patients at the end of surgery. Postoperative pain status of the patient was determined by using Visual Analogue Scale (0 – 10). Analgesics were given when patient complained of pain (VAS score of 5). Mean time to reach VAS score of 5, in Group D was 4.33 ± 0.86 hrs and in Group C was 2.50 ± 0.68 hrs.On comparing, the mean time to reach VAS score of 5 was more in Group D and the difference was very highly significant.
Mean time to first analgesic in Group D was 4.38 ± 0.86 hrs and in Group C was 2.50 ± 0.68 hrs. On comparing, time to first analgesia was significantly longer in Group D both statistically and clinically.

Table 6: Complications

	Nausea, Vomiting	**Shivering**	**Shoulder pain**
Group D	12.5% (5)	0	0
Group C	35.00% (14)	0	0
p-value	0.009	-	-

Nausea and Vomiting was noted in 5 patients in Group D and 14 patients in Group C. This incidence though statistically not significant was clinically significant. There was no incidence of shivering or shoulder pain in any patient in the postoperative period.

Discussion

In our study, all patients in both the groups received Diclofenac (1.5 mg/kg) at the end of surgery for postoperative analgesia.
Postoperative pain status of the patient was determined by using Visual analogue scale. It is a subjective score in which patients were asked to score the pain on a scale of 0 to 10, where 0 depicts no pain, 4-5 depicts moderate pain and 10 depicts worst possible pain. First analgesia was given when VAS score reached 5.
Mean time to first analgesic requirement in Group D was 4.38 ± 0.74 hrs and in Group C it was 2.50 ± 0.68 hrs and the difference was very highly significant (p-0.000).
In 2007, Bakhameese*t al*., studied the effects of dexmedetomidine on anaesthetic requirements during surgery, morphine use in the post-operative period in patients undergoing laparoscopic gastric bypass surgery. At the end of surgery, subjective pain scores were obtained with a scale from 0 to 10 with 0= no pain and 10= worst pain, at 1 and 2 hours. Patient controlled analgesia (PCA) using morphine for pain control was started in post op

period once patient became alert. They found pain scores at 1 hr (3 vs 6) and 2 hr (2 vs 5) were significantly lower in the Dexmed group when compared with placebo group. The total amount of PCA morphine at 2 hrs (5 ± 1.4 vs 10.2 ± 1.3 mg) and POD 1 (35.4 ± 6.4 vs 47.8 ± 8 mg) were significantly lower in Dexmed group when compared with placebo group[4].

In 2012, Park *et al*., conducted a study in patients to show whether dexmedetomidine reduces postoperative pain following laparoscopic cholecystectomy with multimodal analgesia using ketorolac, tramadol and fentanyl.Before surgery, patients were instructed to use a visual analogue scale (VAS 0-10, where 0 = no pain, 10=worst possible pain) for pain measurement and assessed at 15, 30 minutes and at 1, 2, 4, 8, 12 and 24 hr intervals after operation. If VAS was higher than 4, ketorolac 30 mg IV given. If patient still had pain after 30 mins, then tramadol 50mg bolus given. 30 minutes later if patient still complained of pain then fentanyl 20 µg was given and repeated until VAS became less than 4. None of the patients in Dexmed Group needed opioid analgesics whereas 2 patients in placebo group required opioids for pain. They found, there were significant differences of VAS between the two groups until 1 hr after LC. They also found that the amount of ketorolac (43.5 ± 18 vs 66 ± 39.6 mg) required during the 24 hours after the operation was significantly less in Dexmed group as compared to Control group.They concluded that dexmedetomidine might be helpful for the postoperative pain after laparoscopic cholecstectomy with multimodal analgesia[5].

Peritoneal stretch due to CO_2 pneumoperitoneum produces an intense noxious stimulus, and involvement of phrenic nerves, carry them to the central nervous system which causes severe shoulder pain.

In our study postoperative untoward events like nausea, vomiting, shoulder pain, shivering were noted. Vomiting was present in 5 patients in Group D and in 14 patients in Group C. There were no incidences of any other untoward events in neither of the Groups.

All patients in our study received Inj.Ondansetron (0.1 mg/kg) at the end of surgery for post-operative nausea and vomiting.

In 2008 there was a study, conducted by Tufanogullari*et al*., in patients undergoing laparoscopic bariatric surgery for the effect of different doses of dexmedetomidine on early and late recovery profiles using propofol and rocuronium for intubation. In the preoperative area, patients used 11 point verbal rating scales (VRS) to assess their baseline nausea levels, with 0=none to 10=maximum. Ondansetron, 4 mg IV was given for post-operative nausea and vomiting when the laparoscope was withdrawn. VRS nausea scores and episodes of emesis, as well as the need for rescue antiemetic were recorded at 30 mins interval until PACU discharge. Patients with a VRS score of >3 on two consecutive evaluations were administered promethazine 6.25 mg IV. They found, the overall incidences of postoperative emetic symptoms during the first 24hr after surgery were reduced in the Dex 0.2, 0.4, 0.8 groups compared with the control group (25,30,45 Vs 65%). The VRS nausea scores on arrival in the PACU and at 30 min were also significantly lower in Dexmedetomidine groups compared with the control groups. Also the need for rescue anti emetic drugs in the PACU was significantly reduced with Dexmedetomidine groups. They concluded that intraoperative Dexmedetomidine infusion decreased opioid use, antiemetic therapy[7].

Techanivate A *et al*., (2012), studied the effect of low dose Dexmed for postop analgesia, anti-emetic, anti-shivering effects in 40 patients undergoing diagnostic laparoscopy. One group received Dexmed 0.5 µg/kg and other group recieved Fentanyl 0.5 µg/kg over 10 minutes. They found that, there is lesser incidence of postoperative nausea in Dexmed group (5% vs 25%) as compared to the fentanyl group[8].

Conclusion

- Laparoscopic Cholecystectomy is a major advancement in patients with symptomatic gall bladder disease. The technique is less invasive, so there is lesser postoperative pain and quicker recovery, requiring shorter hospital stay.

- Dexmedetomidine potentiates and prolongs the effect of analgesics (NSAIDS) used. Moreover with Dexmed there are less sympathetic responses, absence of shoulder pain, better recovery from anaesthesia (shorter extubation time and early postoperative recovery) and better quality of postoperative analgesia.

References

1. Beebe DS, McNevin MP, Crain JM, Letourneau JG, Belani KG, Abrams JA *etal*.: Evidence of venous stasis after abdominal insufflation for laparoscopic cholecystectomy. SurgGynecol Obstet 1993;176(5):443-7.
2. Ido K1, Suzuki T, Kimura K, Taniguchi Y, Kawamoto C, Isoda N *etal*. Lower extremity venous stasis during laparoscopic cholecystectomy as assessed using color doppler ultrasound. Surg. Endosc1995;9:310-13.
3. Marco AP, Yeo CJ, Rock P. Anaesthesia for a patient undergoing laparoscopic cholecystectomy. Anaesthesiology 1990;73(6):1268-70.
4. Barnett RB, Clement GS, Drizin GS, Josselson AS, Prince DS. Pulmonary changes after laparoscopic cholecystectomy. Surg. LaparoscEndosc1992;2(2):125-7.
5. Hassan S Bakhamees, Yasser M El-Halafawy, Hala M El-Kerdawy, Nevien M Gouda, Sultan Altemyatt. Effects of Dexmedetomidine in morbidly obese patients undergoing laparoscopic gastric bypass. M.E.JAnesth 2007;19(3):537-51.
6. Jung-Kyu Park, Soon Hocheong, Kun Moo Lee, Se Hun Lim, Jeong Han Lee, Kwangrae Cho*et al*., Does Dexmedetomidine reduce postoperative pain after laparoscopic cholecystectomy with multimodal analgesia? Korean J Anesthesiol 2012;63(5):436-40.
7. BurcuTufanogullari, Paul F White, Mariana P Peixoto, Daniel Kianpour, Thomas Lacour, James Griffin *et al*., Dexmedetomidine Infusion During Laparoscopic Bariatric Surgery: The effect on Recovery Outcome Variables. AnesthAnalg2008;106(6):1741-48.
8. Techanivate A, Dusitkasem S, Anuwattanavit C. Dexmedetomidine compare with fentanyl for postoperative analgesia in outpatient gynecologic laparoscopy: a randomized controlled trial. J Med Assoc Thai 2012;95(3):383-90.