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ORIGINAL ARTICLE

DEXMEDETOMIDINE DECREASES PROPOFOL DOSE REQUIREMENT FOR INDUCTION OF ANAESTHESIA: A COMPARATIVE STUDY CONDUCTED ON PATIENTS UNDERGOING LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT: Dexmedetomidine is a highly selective α-2 agonist with properties of sedation, analgesia and anxiolysis. We conducted this study on dexmedetomidine to evaluate its effect in reducing dose of propofol for induction of anaesthesia. A prospective, double blind, placebo controlled study was conducted on 100 patients of ASA I and II status of both sexes in the age group of 20-60 years. Patients were randomly allocated to two groups: Group A(n=50) that received dexmedetomidine loading dose of 1μg/kg wt.(50ml) over 10 minutes that was given 15 minutes prior to induction of anaesthesia and Group B(n=50) received same volume (50 ml) of 0.9% normal saline(NS) as placebo. Dose requirement of propofol was calculated at induction maintaining BIS of 40-60. It was observed that mean requirement of propofol for induction of anaesthesia was reduced to 50.6% in group A patients as compared to group B patients. **CONCLUSION:** Induction dose of propofol is significantly decreased after administration of dexmedetomidine.

KEYWORDS: Dexmedetomidine, Propofol, BIS, Laparoscopic cholecystectomy.

INTRODUCTION: Laparoscopic cholecystectomy has rapidly become the procedure of choice for routine gall bladder removal and is currently the most commonly performed major abdominal procedure in western countries.[1] These surgeries are performed using standard general anaesthesia technique. Various studies had found that dexmedetomine decreases the requirement of thiopentone.[2,3] and volatile agents in perioperative period.[4,5,6] Dexmedetomidine is a well-known potent sedative agent besides having analgesic and anxiolytic properties. The pharmacologic profile preferred potential effects decrease in need for other anaesthetic and analgesic drugs.[7,8,9,10] Our study was designed to evaluate the effect of dexmedetomidine on decreasing the dose of propofol for induction of anaesthesia in patients undergoing laparoscopic cholecystectomy.

MATERIAL AND METHODS: This prospective, randomizes, double blind study was conducted in the department of anaesthesiology and critical care GMC Srinagar.100 patients of ASA I and II status of both sexes in the age group of 20-60years scheduled for laparoscopic cholecystectomy were selected for the study.

Exclusion criteria for these patients were:

- Obstructive sleep apnoea.
- Higher degree AV block.
- Morbid obesity.
- Patients on chronic tricyclic antidepressants, opioid analgesics and monoamine oxidase inhibitors and clonidine.
- Age greater than 60 years.

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Patients were randomly allocated to two groups of 50 patients each. The drug to be given to group A patients was prepared by dissolving 200µg of dexmedetomidine in NS to make a solution of 50ml to yield concentration of 4µg/ml. Dexmedetomidine was given at 1µg/ml iv(at the rate of 1.5ml/minute) over a period of 10 minutes,15 minutes prior to induction of anaesthesia. For group B patients, 50ml of 0.9% NS was given.

The observer remained blinded from the content of both the solutions. Throughout the procedure patents were monitored with ECG, oximetery, end tidal CO2, blood pressure, BIS and temperature. Comparison of MAP and HR were done in two groups – baseline (Before receiving study/control solution – MAP1, HR1), at pre-induction (After completion of study/control solution – MAP2, HR2), at induction (1 min after administration of induction agent – MAP3, HR3), after intubation (1 min after laryngoscopy and intubation–MAP4, HR4).

The anaesthesia technique was standardized. Inj. fentanyl 2µg/kg wt. IV was given 3 minutes before induction of anaesthesia. Anaesthesia was induced with inj. Propofol IV until loss of response to verbal commands and BIS of 40-60. Endotracheal intubation was done following adequate muscle relaxation with inj. atracurium 0.5mg/kg wt. Anaesthesia was maintained with Nitrous Oxide 66% in oxygen and isoflurane maintaining a BIS of 40-60 intraoperative. After completion of surgery, patients were extubated after reversing neuromuscular blockade with inj. Neostigmine 0.05mg/kg wt. and Inj. atropine 0.02mg/kg wt. IV.

RESULTS: In our study, there was no statistically significant difference regarding the demographic profile of patients.

Parameter	Group A	Group B	P-Value
Age	43.12±11.9	40.12±10.07	0.190
Male : Female	28:22	26:24	0.980
Weight(kg)	64.58±9.20	63.12±8.92	0.582
ASA I: ASA II	26:24	28:22	0.791
Duration of surgery	35.12±11.50	36.08±9.45	0.139

Table 1: Demographic profile of the patients

ASA - American Society of Anaesthesiologists.

It was observed that there was a significant difference regarding induction dose of propofol among the two groups. Mean induction dose of propofol was found to be 67±13.67 mg In group A when compared to group B 126±14.73 mg shown in table 2 i.e. statistically significant(p=<0.05%). Overall the induction dose of propofol in group A [dexmedetomidine] was 50.6% lesser than group B [NS]

Group	Dose (Mean±SD) mg	
A (dexmedetomidine)	67±13.67	**P Value<0.001**
B (NS)	126±14.73	

Table 2: Shows induction dose (Mean) of propofol requirement in two groups

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The patients remained hemodynamically stable throughout the procedure and none of them required treatment during the study period. MAP and HR were significantly decreased in Group B after administration of loading dose of dexmedetomidine. i.e., MAP2 and HR2 in Group B were significantly lower when compared with MAP1 and HR1 ($P<0.001$). In both groups, MAP and HR declined significantly after induction with propofol. Although this haemodynamic perturbation was significant statistically, but was not of clinical significance. MAP and HR after laryngoscopy and intubation rose in both groups, but the rise was less in Group B [Figures 1 and 2].

Figure 1: Comparison of haemodynamic parameter (Mean arterial pressure) at various points of time (Pre-operative, pre-induction, 1 min after induction, 1 min after laryngoscopy and intubation).

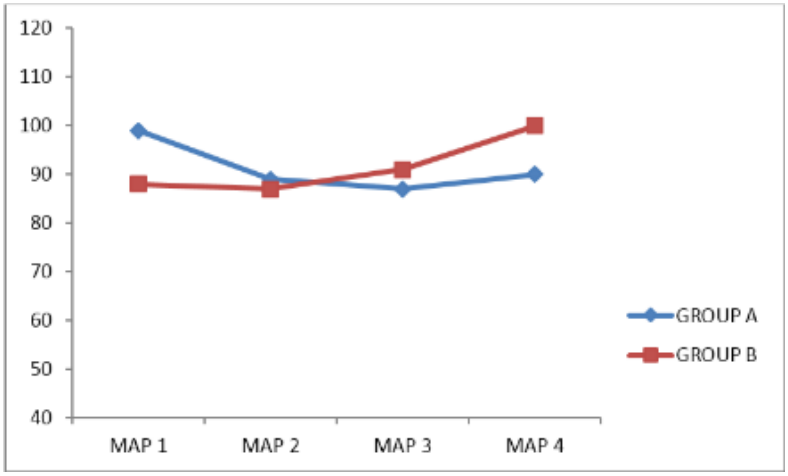

Fig. 1

Figure 2: Comparison of haemodynamic parameter (Heart rate) at various points of time (Pre-operative, pre-induction, 1 min after induction, 1 min after laryngoscopy and intubation).

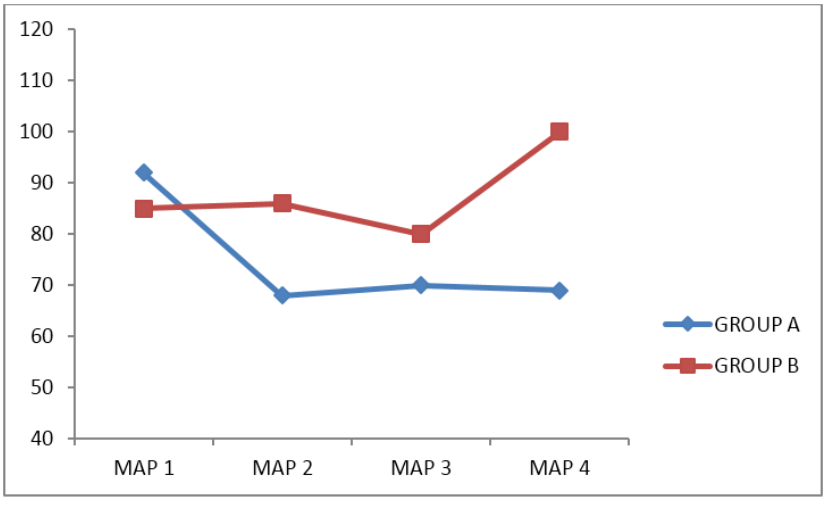

Fig. 2

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DISCUSSION: Dexmedetomidine has recently been added to the anaesthesia armamentarium.it is an imidazole compound that displays specific and selective α2 adrenergic receptor agonism.[11] The major sedative and antinociceptive properties of dexmedetomidine are attributable to its stimulation of α2 A subtype located in locus coreuleus.[12] Dexmedetomidine has been found to reduce anaesthetic drug requirements in the intraoperative period.[13] Dutta S et al have shown a definite role of dexmedetomidine in reducing dose requirement of propofol for induction and during maintenance of anaesthesia in healthy patients.[14] Similarly, Ngwenyama etal have found effects of dexmedetomidine in decreasing propofol and remifentanil infusion rates during TIVA for spine surgery in adolescents.[15]

A study done by Suvadeep Sen et al have shown a 48.08%dose reduction of propofol induction dose in patients who received dexmedetomidine before induction of anaesthesia.[16] Our results have shown a 50.6% reduction in propofol dose for induction after receiving dexmedetomidine infusion. In our study, it was found that mean induction dose of propofol was significantly lower in group A 67±13.67mg as compared to group B 126±14.73 mg that is statistically significant [p<0.05%]. Our results are in accordance with the above mentioned studies.

Dexmedetomidine is a good anaesthetic adjuvant that decreases the requirement of anaesthetics, however its use is limited because the drug is somewhat costly [1 ampoule containing 200μg of drug costs 600 rupees].

CONCLUSION: From our study it can be concluded that dexmedetomidine decreases induction dose of propofol significantly when given prior to induction of anaesthesia.

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