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Original Research

A Comparison Among Different Doses Of Dexmedetomidine In Attenuating Extubation Response In Patients Undergoing Open Cholecystectomy

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ABSTRACT

Introduction: Open cholecystectomy surgery is performed in those patients where laparoscopic surgery is not possible. In few patients, the surgeon opted to switch to an open surgery when it seems that laparoscopic surgery cannot be successfully performed.
Aims and Objectives: To study effect of various doses of Dexmedetomidine and their comparison on heart rate, systolic/diastolic blood pressure and SpO_2 in patients of open cholecystectomy.
Material and Methods: Present prospective comparative study was carried out in the Department of Anaesthesiology and Critical Care, World College of Medical Sciences & Research Hospital Girawar, Jhajjar, Haryana (India). A total of 50 patients were included who were further sub-divided into two groups of 25 each with age range of 20-75 years. Patients were graded according to ASA I-II who underwent open cholecystectomy.
Results: Mean age of the patients in Group I was 40.12±10.28 and in Group II, it was 39.17±9.12 years ($p > 0.05$). 16 patients were male and 9 were female in Group I& in Group II, 18 were male and 7 female ($p > 0.05$). Mean body mass index in Group I was 24.45±4.58 and in Group II, it was 26.15±6.18 (kg/m^2) ($p > 0.05$). A total of 14 patients in Group I and 16 in Group II had ASA grade I ($p > 0.05$). Mean duration of surgery was 58.45±7.95 in Group I and 60.12±8.19 minutes in Group II ($p > 0.05$). Mean interval difference between start of dexmedetomidine and extubation showed that it was 8.12±0.52 in Group I and 8.25±0.63 in Group II ($p > 0.05$). 10 (40%) patients had no coughing and 15(60%) had minimal coughing in Group I. In Group II, 12(48%) patients had no coughing and 13(52%) had minimal coughing ($p < 0.05$). Mean duration of first rescue analgesia after extubation in Group I was 41.11±12.52 minutes and 48.19±11.13 minutes in Group II ($p < 0.05$). Mean number of rescue analgesia used in Group I was 2.17±0.34 and in Group II, it was slightly higher i.e. 2.25±0.39 ($p > 0.05$).
Conclusion: We concluded that administration of Dexmedetomidine($0.5\mu g.kg^{-1}.h^{-1}$) found to be a better anesthetic adjuvant in patients who underwent open cholecystectomy. Present study also concluded that dose of$0.5\mu g.kg^{-1}.h^{-1}$ is the good option to use in patients who underwent open cholecystectomy for better extubation response as compared to 0.75 $\mu g.kg^{-1}.h^{-1}$.
Keywords: Doses, Extubation, Dexmedetomidine, Open Cholecystectomy, Tracheal Extubation

INTRODUCTION

Open cholecystectomy is the most common surgical procedure which is performed throughout the world for the treatment of cholelithiasis. When the cystic duct found to be obstructed by gallstone followed by gallbladder distension and inflammation observed. It commonly observed by pain in right upper quadrant followed by nausea, vomiting & fever.[1] It's the treatment of choice e.g. open cholecystectomy or laparoscopic cholecystectomy which is in the recent era, found to be the best option in the treatment for gallstone and reported as gold standard modality.[2,3]

There are various reasons for removing the gallbladder by open surgery e.g. unexpected bleeding during the laparoscopic surgery, obesity, inflammation of the pancreas, third trimester pregnancy, severe liver issues etc. Various other risks of anesthesia and surgery associated which are adverse reactions to drugs, breathing issues, bleeding, clots and infection etc. Some other risks related to open cholecystectomy are damage to blood vessels, common bile duct injuries, injuries to small or large intestine etc.

Various benefits of laparoscopic cholecystectomy are: less postoperative pain, small incisions, shorter stay in hospital, fast postoperative recovery etc. as compared to open laparoscopy cholecystectomy.

Any type of laparoscopic surgery either its open cholecystectomy, always carries a great challenge for satisfactorily management of anaesthesia due to its significant changes in hemodynamic parameters, pneumoperitoneum effects, positioning of patient and hypercapnia.

Extubation, a term which is used when disconnection of an artificial airway indicates its proper placement such as airway obstruction/protection, suctioning, ventilator failure and hypoxemia no longer found. Bucking and coughing also found to be occur during Extubation.[4,5]

Various type of respiratory complications after tracheal Extubation found to be thrice as compared to various complications which occurred during the process of tracheal intubation and anaesthesia induction (4.6% vs 12.6%).[6] American Society of Anesthesiologists database reported that deaths due to brain damage after induction of anaeshesia decreased from 62% of perioperative claims in 1985–1992 to 35% in 1993–1999.[7]

Dexmedetomidine is a Food and Drug Administration of US (FDA) approved α2-adrenoreceptor agonist having distribution rate i.e. half-life of 6 minutes.[8] Dexmedetomidine activates receptors in the medullary vasomotor center, decreasing norepinephrine turnover, central sympathetic outflow followed by decrease in heart rate and blood pressure. It is found to be a important useful agents which attenuates the response to Extubation due to its sedation and stability in various hemodynamic parameters. It is also used for various other reasons viz. successful attenuation and hypertensive tachycardiac response to tracheal Extubation.

Keeping in view the above mentioned facts, the present prospective, randomized study was conducted to compare the different doses of Dexmedetomidine in attenuating Extubation response in patients undergoing open Cholecystectomy followed by its effects on heart, blood pressure, oxygen saturation, depth of anaesthesia, quality of extubation, time period of post-operative analgesia and need of post-operative analgesics and any other side effects.

MATERIAL AND METHODS

The present prospective comparative study was carried out in the Department of Anaesthesiology and Critical Care, World College of Medical Sciences & Research Hospital Girawar, Jhajjar, Haryana (India). A total of 50 patients were included who were further sub-divided into two groups of 25 each with age range of 20-75 years. Study was conducted from 15th May 2021 to 15th November, 2021. After obtaining approval from the institutional ethical committee, 50 patients in the age group of 20 to 75 years were included. Patients were graded according to ASA I-II who were enrolled for open cholecystectomy. Finally, a total of 50 patients who fulfilled inclusion and exclusion criteria were included in the study.

Group I (n=25) 0.5µg /kg of Dexmedetomidine in normal saline (10ml Vol.)
Group II (n=25) 0.75µg/kg of Dexmedetomidine in normal saline (10 ml Vol.)

Inclusion criteria

* Patients having age between 20-75
* ASA grading I-II
* Body mass index ranged between 18.5-29.9
* Patients willing to undergo surgery for open cholecystectomy

Exclusion criteria

* Refusal to sign informed consent
* Ischemic heart disease or any other cardiac disease
* Patients taking any type of beta blockers, anticonvulsant or psychotropic drugs
* Patients who were not extubated within 10 minutes of starting Dexmedetomidine
* Patients with HR < 50/min or having hypotension during study

Methodology

The present study was carried out after obtaining approval from institutional ethics committee and written informed patient consent was obtained from all the patients. The anesthetic procedure was clearly explained to all the patients in their own / local language followed by written consent. Before start of anaesthetic procedure, a clinical patient's information proforma filled. All patients were instructed to kept themselves fast for a minimum of 8 hours before the start of surgical procedure. Before start of anaesthetic procedure, initially Tab. Alprazolam with a dose of 0.50mg and Tab. Ranitidine with 150mg were given early morning i.e. day of surgery. Five lead electrocardiogram, non-invasive blood pressure, SpO2 and various other baseline parameters were recorded. Anesthesia given with 5 mg/kg thiopentone and 2 µg/kg fentanyl and tracheal intubation was carried out with a dose of Atracurium IV (0.5 mg/kg). Blood pressure was noted immediate before start of induction of anesthesia and followed by every 10 minutes. In all the patients, muscle relaxation was used by intermittent boluses of atracurium (0.02 mg/kg). Initially, after closure of rectus sheath, isoflurane was stopped and Dexmedetomidine 0.5mcg/kg was infused over 10 minutes in patients of Group I. Similarly, in patients of Group IIDexmedetomidine 0.75µg/kg was infused over 10 minutes. Nitrous oxide stopped before Extubation. Muscle relaxation was reversed by using neostigmine with a dose of 0.05 mg/kg and

glycopyrolate 0.01 mg/kg IV. All the patients were extubated if there was any indications of such as head lift, hand grip, leg lift for 5 seconds, (ii) sustained 'tongue depressor test and (iii) inspiratory pressure between 40 to 50 cm H2O or more. Various baseline parameters such as pulse rate (PR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), oxygen saturation (SpO_2) were recorded at a interval of 10 minutes during surgery, every 30 seconds after start of infusion till extubation and thereafter every 30 seconds to 5 minutes and every 15 minutes to 2 hours. Extubation time was noted and Extubation quality was rated using Extubation quality 5-point scale. Sedation was evaluated by using Ramsay Sedation Scale.[9] Visual analogue scale was used to assess the pain.[10]

Statistical analysis

At the end of the study, data was collected and analysed statistically. For qualitative data, Chi-square test was used. For mean comparison between two groups, independent t-test was used. A p value of <0.05 was considered as statistically significant.

RESULTS

The present prospective study was carried out in in the Department of Anaesthesiology and Critical Care, World College of Medical Sciences & Research Hospital Girawar, Jhajjar, Haryana (India) after obtaining approval from institutional ethical committee. Informed written consent was obtained from all the patients before inclusion into the study. The enrolled patients who fulfilled the inclusion and exclusion criteria were further subdivided into two groups (n=25) in each group.

Table: 1 .Demographic parameters of the study population

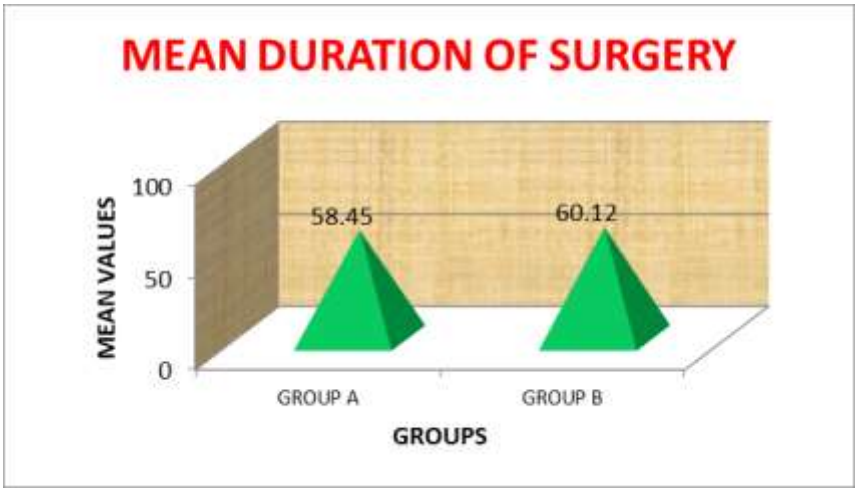
Parameters	Group I (n=25)	Group II (n=25)	Statistical significance
Age	40.12±10.28	39.17±9.12	0.7311 (p>0.05 NS)
Sex (Male/Female)	16/9	18/7	0.367 (p>0.05 NS)
Body mass index (kg/m^2)	24.45±4.58	26.15±6.18	0.274 (p>0.05 NS)
ASA (I/II)	14/11 (56%/44%)	16/9 (64%/36%)	0.333 (p>0.05 NS)
Heart rate (bpm)	75.81±3.74	78.11±3.17	0.191 (>.05 NS)
SBP (mmHg)	124.32±10.85	129.12±12.80	0.159 (>0.05 NS)
DBP (mmHg)	76.95±4.63	79.15±4.93	0.110 (>0.05 NS)

In the present study, mean age of the patients in Group I was 40.12±10.28 and in Group II, it was 39.17±9.12 years. A total of 16 patients were male and 9 were female in Group I. Similarly, in Group II, we found 18 male and 7 female. Mean body mass index in Group I was 24.45±4.58 and in Group II, it was 26.15±6.18 (kg/m^2). A total of 14 patients in Group I and 16 in Group II had ASA grade I. Similarly, ASA grade II was observed in 11 patients of Group I and 9 patients of Group II. All these parameters among both the groups found to be statistically comparable and insignificant (p >0.05).

Table; 2.Mean duration of surgery (minutes)

	Group I (n=25) Mean±SD	Group II (n=25) Mean±SD	Statistical significance
Mean duration	58.45±7.95	60.12±8.19	0.468

Table 2 illustrates mean duration of surgery. It was 58.45±7.95 in Group I and 60.12±8.19 minutes in Group II. On statistical analysis, the difference among both the groups found to be comparable and thus statistically insignificant (p >0.05).



Table; 3.Mean interval difference between start of dexmedetomidine and extubation

	Group I (n=25) Mean±SD	Group II (n=25) Mean±SD	Statistical significance
Mean duration	8.12±0.52	8.25±0.63	0.430 (p >0.05 NS)

Table 3 depicts mean interval difference between start of dexmedetomidine and extubation showed that it was 8.12±0.52 in Group I and 8.25±0.63 in Group II. On statistical analysis, the difference among both the groups found to be statistically insignificant (p >0.05).

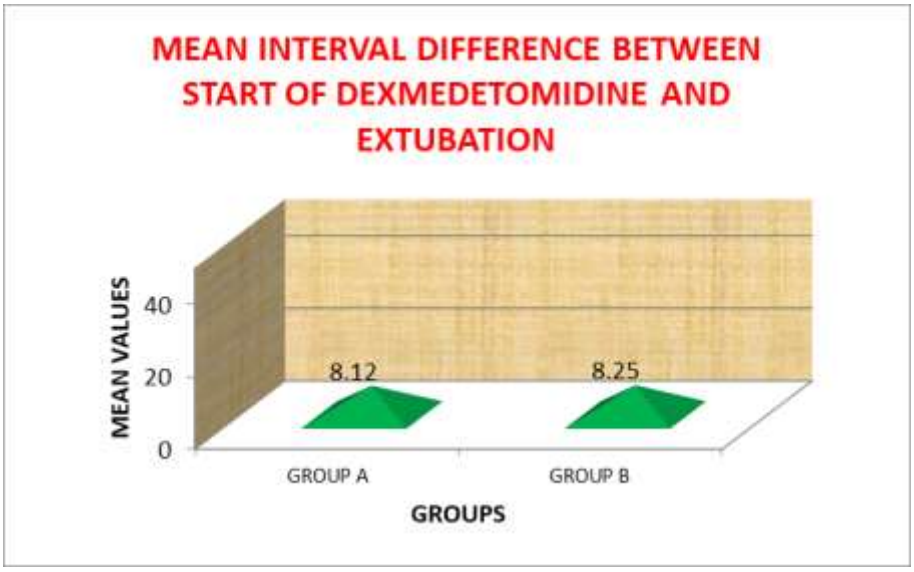


Table: 4. Distribution of patients according to quality of extubation

Parameters	Group I (n=25) n(%)	Group II (n=25) n(%)	Statistical significance
No coughing	10 (40%)	12 (48%)	0.324 (p >0.05 NS)
Minimal coughing	15 (60%)	13 (52%)	

Table 4 demonstrates that in 10 (40%) patients had no coughing and 15(60%) had minimal coughing. Similarly, in Group II, 12(48%) patients had no coughing and 13(52%) had minimal coughing. On statistical analysis, the difference among both the groups found to be significant (p <0.05).

Table: 5. Mean time of Ist rescue analgesia after extubation (minutes)

	Group I (n=25) Mean±SD	Group II (n=25) Mean±SD	Statistical significance
Mean duration	41.11±12.52	48.19±11.13	0.0398 (Significant)
Total no. of rescue analgesia used	2.17±0.34	2.25±0.39	0.443

Table 5 shows mean time of first rescue analgesia after extubation. Mean duration in Group I was 41.11±12.52 minutes and 48.19±11.13 minutes in Group II. Statistical analysis showed significant difference among two groups ($p < 0.05$). Mean number of rescue analgesia used in Group I was 2.17±0.34 and in Group II, it was slightly higher i.e. 2.25±0.39 ($p > 0.05$, NS).

Table: 6.Postoperative adverse reactions

	Group I (n=25)	Group II (n=25)	Statistical significance
Shoulder pain	5(20%)	11(44%)	0.06
Hypotension	4(16%)	9(36%)	0.106
Bradycardia	8(32%)	14(56%)	0.08
Sleepiness	6(24%)	13(52%)	0.04
Dizziness	2(8%)	8(32%)	0.03
Hoarseness	3(12%)	7(28%)	0.157

Table 6 shows various postoperative adverse reactions observed in both the groups. Shoulder pain was observed in 5(20%) patients of Group I and 11(44%) of Group II. Hypotension reported in in 4(16%) and 9(36%) of Group I and B, respectively. Similarly, bradycardia was reported in 8(32%) and 14(56%) patients, sleepiness in 6(24%) and 13(52%), dizziness in 2(8%) and 8(32%) and hoarseness in 3(12%) and 7(28%) patients of Group I and B, respectively.

DISCUSSION

Every anesthesiologist is always concerned about various complications or problems which are associated with extubation followed by good recovery. It is reported in the literature problems related to extubation found to be more common as compared to problems related to intubation. Tracheal Extubation found to be associated approx. 10% to 30% increase in arterial pressure and heart rate which lasts for 5 minutes to 15 min. Various type of complications related to respiration are associated with tracheal extubation found to be thrice as compared to complications which occurred during tracheal intubation and anaesthesia induction (4.6% vs. 12.6%).[6]

So, therefore, the present prospective and comparative study was conducted among different doses of dexmedetomidine in attenuating extubation response in patients undergoing open cholecystectomy.

During the literature survey, we found that various type of pharmacological agents used for the attenuation of intubation and extubation response such as diltiazem, lignocaine, labetalol, nicardipine and opioids as most common.[11,12] Dexmedetomidine is a drug in the recent times, found to be most commonly used and reported as the best for attenuation of both intubation and Extubation response. It is a highly selective alpha 2 agonist having sedative, analgesic and anaesthetic sparing effects which reported a dose dependent decrease in arterial blood pressure and heart rate followed by decrease in serum norepinephrine concentration.

In most studies Dexmedetomidine has been compared with other pharmacological agents in dose of 0.5 to 1 μg/kg.[11,12] Limited data found which compared different doses of Dexmedetomidine in attenuation of Extubation response. Therefore, the present prospective and comparative study was conducted to the minimum effective dose of Dexmedetomidine for attenuation of Extubation response with minimum side effects. Our study randomly divided the patients into two groups of 25 patients each with Group I receiving 0.5μg /kg of Dexmedetomidine in NS and Group II receiving 0.75μg /kg of Dexmedetomidine in NS.

In the present study, mean age of the patients in Group I was 40.12±10.28 and in Group II, it was 39.17±9.12 years. A total of 16 patients were male and 9 were female in Group I. Similarly, in Group II, we found 18 male and 7 female. Mean body mass index in Group I was 24.45±4.58 and in Group II, it was 26.15±6.18 (kg/m^2). A total of 14 patients in Group I and 16 in Group II had ASA grade I. Similarly, ASA grade II was observed in 11 patients of Group I and 9 patients of Group II. All these parameters among both the groups found to be statistically comparable and insignificant ($p > 0.05$). Mean heart rate in Group I was 75.81±3.74 bpm and 78.11±3.17 bpm in Group II ($p > 0.05$, NS). Mean systolic blood pressure was 124.32±10.85 and 129.12±12.80, diastolic blood pressure was 76.95±4.63 and 79.15±4.93 mmHg in Group I and B, respectively.

Similar study as compared to our study reported by Güler et al found increase in blood pressure and heart rate during the Extubation decreased and Extubation quality also reported to be increased by the use of Dexmedetomidine.[13]

Another study also reported by Jaakola et al showed decrease in HR/SBP significantly by the use of 0.5µg.kg[1] Dexmedetomidine.[14]

In the present study, mean duration of surgery was 58.45±7.95 in Group I and 60.12±8.19 minutes in Group II (p>0.05). Mean interval difference between start of dexmedetomidine and extubation showed that it was 8.12±0.52 in Group I and 8.25±0.63 in Group II(p >0.05). In our study, 10 (40%) patients had no coughing and 15(60%) had minimal coughing. Similarly, in Group II, 12(48%) patients had no coughing and 13(52%) had minimal coughing (p<0.05). Mean time of first rescue analgesia after extubationin Group I was 41.11±12.52 minutes and 48.19±11.13 minutes in Group II (p <0.05). Mean number of rescue analgesia used in Group I was 2.17±0.34 and in Group II, it was slightly higher i.e. 2.25±0.39 (p >0.05, NS). Various postoperative adverse reactions observed in both the groups in the present study. Shoulder pain was observed in 5(20%) patients of Group I and 11(44%) of Group II. Hypotension reported in in 4(16%) and 9(36%) of Group I and B, respectively. Similarly, bradycardia was reported in 8(32%) and 14(56%) patients, sleepiness in 6(24%) and 13(52%), dizziness in 2(8%) and 8(32%) and hoarseness in 3(12%) and 7(28%) patients of Group I and B, respectively.

A study reported by Bindu et al[15] found that use of Dexmedetomidine infusion 0.75 mcg/kg given fifteen minutes before start of Extubation and concluded that it stabilized hemodynamics parameters which facilitates smooth Extubation. In their study, bradycardia in 13 patients out of 25 patients was observed. Another study by Aksu et al[16] showed comparison of use Dexmedetomidine (0.5 mcg/kg) and fentanyl (1 mcg/kg) in patients who underwent rhinoplasty and found it more effective and satisfactory in attenuating airway reflex responses to tracheal extubation which maintained haemodynamic stability as compared to fentanyl. They further reported that in their study bradycardia was found in in 2 patients (out of 20 patients).

In a similar study reported by Awasthi et al, concluded that number of rescue analgesics found to be comparable in which they included three groups which included dose of 0.5 µg/kg, 0.75µg/kg and 1 µg/kg.[17]

Thus, we can say that attenuation of Extubation response was almost similar with a dose of 0.5 µg/kg and 0.75µg/kg but increased dose of 0.75µg/kg we found more side effects i.e. bradycardia etc.

CONCLUSION

Present study concluded that Dexmedetomidine effectively attenuates the Extubation success rate with the use of 0.5µg/kg. We observed that after increasing the dose to 0.75µg/kg, some side effects was found such as bradycardia, sleepiness, dizziness, shoulder pain etc. Quality of Extubation was also found to be much better while using 0.5µg/kg as compared to dose of 0.75µg/kg). So present study concluded that 0.5µg/kg is the good option to use for attenuation of Extubation response.

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