

Dexmedetomidine versus MgSo₄ in Hemodynamic Stability in Laparoscopic Cholecystectomy Cases

Pinu Ranawat¹, Naresh Kumar Tyagi², Arvind Kumar Gupta³, Amit Jangir⁴

Author's Affiliation: ¹⁻⁴Assistant Professor, Department of Anesthesia, Pacific Institute of Medical Sciences, Udaipur, Rajasthan, 313015, India.

Corresponding Author: Naresh Kumar Tyagi, Assistant Professor, Department of Anesthesia, Pacific Institute of Medical Sciences, Udaipur, Rajasthan, 313015, India.

E-mail: drnareshtyagi1982@gmail.com

How to cite this article:

Pinu Ranawat, Naresh Kumar Tyagi, Arvind Kumar Gupta, et al. Dexmedetomidine versus Mgso₄ in Hemodynamic Stability in Laparoscopic Cholecystectomy Cases. Indian J Anesth Analg. 2020;7(6):1305-1307.

Abstract

Laparoscopic surgery is associated with an elevation of cardiac parameters as well an elevation in blood pressure due to effects of catecholamine activity and vaso constriction. Due to the widespread use of laparoscopic techniques in modern day surgical practice it has become imperative for the anaesthetist to maintain a stable hemodynamic environment in the patient in the operative and post operative period. The use of dexmedetomidine and magnesium sulphate has been done with successfully in practice. The present study aimed to ascertain whether the comparative efficacy of both these drugs is equal or different. The study employed a subject pool of 60 subjects. The study found that there were no statistically significant differences between the two drugs when used in the corresponding sample population.

Keywords: Dexmedetomidine versus Mgso₄; Laparoscopic Cholecystectomy.

Introduction

The applicability of laproscopic surgery has increased due to the numerous advantages of the procedure over conventional surgery. The advantages include the reduced pain, cosmetic advantage, early discharge and rapid recovery. The conduct of laparoscopic surgery has been instrumental in better patient prognosis. The procedure of laparoscopic cholecystectomy has been a commonplace for quite some time and is routinely conducted in multiple centres across the country. Despite its advantages, the procedure does have the disadvantage of being prone to hemodynamic disturbances especially an elevation of BP and Tachycardia. The modality has been subjected to various drugs that are aimed at alleviating the sympathetic response and providing for a optimal intra-operative and post operative period.¹

A drug commonly used is dexmedetomidine which is an alpha 2 receptor agonist which provides a reduction in sympathetic activity and aids in sedation as well as providing with a analgesic cover. The drug has known to be effective in reducing requirements of opioid analgesics after surgery as well as providing a stable hemodynamic state in the intra-operative period without any concomitant respiratory depression.²

Another commonly used compound is magnesium sulphate. It is known to provide a reduction in levels of circulating catecholamines as well as inhibit production of the same from the adrenergic glands. It also has a role in providing a vasodilatory effect on all major blood vessels thus reducing the systolic blood pressure as well as regulating heart rate.³

We conducted a study to ascertain if the efficacy of these two drugs is comparable in case



of laparoscopic cholecystectomy and what may be the differences between them. The study aimed to ascertain the effects on hemodynamic changes in a population sample undergoing cholecystectomy and being administered intravenous doses of dexmedetomidine and magnesium sulphate in the operative period.

Material and Methods

The present study was conducted in the operative and recovery wards of Pacific Institute of Medical Sciences, Udaipur, which is a tertiary teaching hospital. Institutional ethical clearance was obtained for the study prior to commencement. All subjects were counselled and explained the need for the study. Written informed consent was obtained from all subjects with a reaffirmation that they can opt out of the study at any point of time. The patient pool comprised of 60 subjects who were divided in three groups of 20 each. The first group was administered normal saline. The second group was administered dexmedetomidine, while the third group received magnesium sulphate.

Pre anaesthetic investigations and preparations were similar for all cases. The subjects falling in ASA I and II were selected for the study. The Group A, was given 20 ml normal saline as a IV infusion, Group B was administered dexmedetomidine 1microgram/kg in 20 ml normal saline, while Group C received magnesium sulphate 2g in 20 ml normal saline. The hemodynamic parameters such as blood pressure, HR, Mean Arterial Pressure were calculated at various intervals such as Prior to Intubation (T_1), After Insufflation (T_2), After deflation (T_3), After Extubation (T_4) and after shifting in recovery ward (T_5). The data collected was entered in a MS excel sheet and subjected to statistical analysis.

Results

The present study comprised of 60 subjects comprising of 43 males and 17 females. The mean age of the group was 45 ± 7.3 years. 18 of the subjects had previous co morbidities such as hypertension, but had stable BP in pre-operative period. 42 subjects were ASA I while 18 subjects were ASA II. The study sample showed no significant differences in terms of age, weight etc. The mean HR recorded among the three groups is displayed in Fig. 1. The statistical analysis revealed that a significant difference existed in mean HR values between

Group A and Group B and C ($p < 0.05$). This shows that after intubation (T_2), there was a slight elevation in HR values of normal saline group subjects as compared to Dexmedetomidine and magnesium sulphate groups. Analysis of dexmedetomidine and magnesium sulphate revealed a significant difference in favour of dexmedetomidine. In terms of mean blood pressure and mean arterial pressure values, as depicted in Fig. 2, the values of mean BP were similarly elevated in Group A as compared to Group B and C. Statistical analysis showed a significant difference ($P < 0.05$) between Group A and Groups B and C. There were no statistical differences between BP as recorded between Groups B and C. The mean arterial pressure also showed no significant difference between group B and C, however the Group A had significantly elevated values as compared to dexmedetomidine and magnesium sulphate groups.

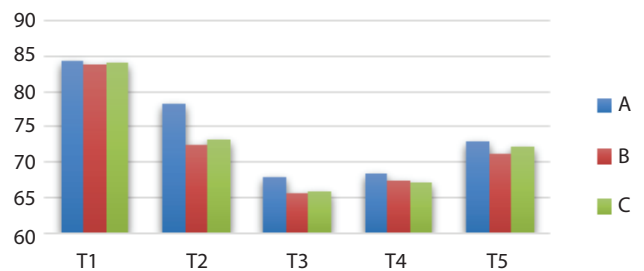


Fig. 1: Mean HR

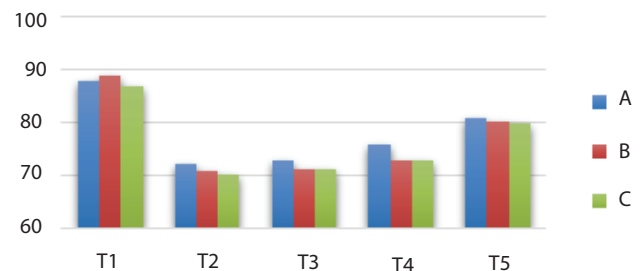


Fig. 2: Mean BP

None of the subjects had any intraoperative or post operative complications. Recovery was uneventful and no complaints on follow up were received.

Discussion

The present study had a sample of 60 subjects divided in three groups of 20 each who were administered normal saline, dexmedetomidine and magnesium sulphate respectively to record if any changes in hemodynamic stability is recorded and whether these changes differ in the groups. Literature has provided us with evidence that CO₂ insufflation is

associated with hemodynamic disturbances that can lead to adverse outcomes in the intra operative period in laparoscopic surgery cases. The advent of newer medications had lead to a rapid fall in such adverse outcomes. In the present study, the authors observed that the subjects with dexmedetomidine and magnesium sulphate administration done in the pre operative period yielded a lower mean heart rate than cases where normal saline was administered. This is in concurrence with studies by J. Afonso and F. Reis ; R. Y. Klinger et al and M. C. Smania et al^{2,4,5} wherein the authors stated that dexmedetomidine is an effective agent in stabilizing heart rate. The similar conclusion was obtained by an article by Zarif P et al wherein the authors stated that they observed a similar trend.⁶ Our study showed a mildly significant difference between dexmedetomidine and magnesium sulphate group. The group administered dexmedetomidine had a marginally lower mean heart rate, this is also similar in findings by Zarif P et al.

There were significantly similar differences seen in mean blood pressure and mean arterial pressure. This is in concurrence with findings by Lang B et al, Tan W et al, Zarif P et al and R. Bryskin and B. C. Weldon⁶⁻⁹ wherein the authors supported the notion that using magnesium sulphate or dexmedetomidine is an effective route in providing a stable hypotensive status in laparoscopic cases. There was no statistically significant difference in values of BP and MAP in dexmedetomidine and magnesium sulphate groups. This is similar to findings by Zarif P et al and R Bryskin and B C Weldon^{6,9} wherein they conducted an comparative assessment ruling out any significant difference between the two drugs in terms of efficacy of hemodynamic stabilization.

Conclusion

The authors conclude that using dexmedetomidine and magnesium sulphate proved equally effective in maintaining a favourable range of blood pressure and mean arterial pressure in the selected population sample. The use of dexmedetomidine was slightly better in mean heart rate maintenance as compared to magnesium sulphate but the significance was marginal. The authors conclude that using either magnesium sulphate or dexmedetomidine as an adjuvant is a feasible and safe option.

Limitations: The study is limited by the lack of a larger sample size.

Conflict of Interest: Nil

Source of Funding: Self Funded.

References

1. S M Meftahuzzaman, M M Islam, K K Chowdhury et al, "Haemodynamic and end tidal CO₂ changes during laparoscopic cholecystectomy under general anaesthesia," Mymensingh Medical Journal, vol. 22, no. 3, pp. 473-477, 2013.
2. J Afonso and F Reis, "Dexmedetomidine: current role in anesthesia and intensive care," Revista Brasileira de Anestesiologia, vol. 62, no. 1, pp. 118-133, 2012.
3. S. Herroeder, M. E. Schönherr, S G De Hert, and M W Hollmann, "Magnesium—essentials for anesthesiologists," Anesthesiology, vol. 114, no. 4, pp. 971-993, 2011.
4. R Y Klinger, W D White, B Hale, A S Habib, and E Bennett-Guerrero, "Hemodynamic impact of dexmedetomidine administration in 15,656 noncardiac surgical cases," Journal of Clinical Anesthesia, vol. 24, no. 3, pp. 212-220, 2012.
5. M C Smania, J P Piva, and P C R Garcia, "Dexmedetomidine in anesthesia of children submitted to videolaparoscopic appendectomy: a double-blind, randomized and placebo-controlled study," Revista da Associação Médica Brasileira, vol. 54, no. 4, pp. 308-313, 2008.
6. Zarif P, Abdelaal Ahmed Mahmoud A, Abdelhaq MM, Mikhail H, Farag A. Dexmedetomidine versus magnesium sulfate as adjunct during anesthesia for laparoscopic colectomy. Anesthesiology Research and Practice. 2016 Jan 1;2016.
7. Lang B, Zhang L, Lin Y, Zhang W, Li FS, Chen S. Comparison of effects and safety in providing controlled hypotension during surgery between dexmedetomidine and magnesium sulphate: A meta-analysis of randomized controlled trials. PloS one. 2020 Jan 8;15(1):e0227410.
8. Tan W, Qian DC, Zheng MM, Lu X, Han Y, Qi DY. Effects of different doses of magnesium sulfate on pneumoperitoneum-related hemodynamic changes in patients undergoing gastrointestinal laparoscopy: a randomized, double-blind, controlled trial. BMC anesthesiology. 2019 Dec 1;19(1):237.
9. R Bryskin and B C Weldon, "Dexmedetomidine and magnesium sulfate in the perioperative management of a child undergoing laparoscopic resection of bilateral pheochromocytomas," Journal of Clinical Anesthesia, vol. 22, no. 2, pp. 126-129, 2010.