DOI: https://doi.org/10.53350/pjmhs22165328

ORIGINAL ARTICLE

Intraoperative Deliberate Hypotension: Comparison of Dexmedetomidine Infusion Alone and in Combination with lignocaine

MAMOONA SHAIKH[1], KAUSER SHAIKH[2], FAYAZ AHMED MEMON[3], MUHAMMAD TAHIR[4], JAMIL AHMED KHANZADA[5], JAVERIA FAROOQ[6]

[1]*Senior Instructor, Department of Anaesthesia, Isra University Hospital Hyderabad, Sindh, Pakistan*
[2]*General Surgeon in Special Cadre, Department of Surgery, Bhittai Hospital Latifabad, Hyderabad, Sindh, Pakistan*
[3]*Professor, Department of Medicine, Muhammad Medical College, Mirpurkhas, Sindh, Pakistan*
[4]*Assistant Professor, Department of Pharmacology, Mekran Medical College Turbat, Balochistan*
[5]*Associate Professor, Department of Anaesthesia, Isra University Hospital Hyderabad, Sindh, Pakistan*
[6]*Assistant Professor, Department of Pharmacology, Muhammad Medical College, Mirpurkhas, Sindh, Pakistan*
Correspondence to: Mamoona Shaikh, Email: drmamoona@hotmail.com, Cell: 0333-2680634

ABSTRACT

Aim: To explore the effects of dexmedetomidine infusion combined with lignocaine on the intraoperative hemodynamic profile.
Study Design: randomized, double-blind study
Place and Duration of Study: Department of Anesthesia, Isra University Hospital, Hyderabad from 1st May 2021 to 31st October 2021.
Methodology: Sixty patients from the daily operation list were randomly assigned to group D (dexmedetomidine intravenous infusion only) and group LD (dexmedetomidine plus lignocaine intravenous infusion) using a sealed envelope system.
Results: The majority of the patients presented ASA status II (41.7%) were in the age group of 35-44 years (23.3%) and had BMI ranging from 25-34. Analysis of various clinical parameters showed a significant difference between group D and LD in terms of reduced heart rate, average mean arterial pressure, and need for transfusion. A higher number of patients receiving combination infusion had negligible blood loss with reference to patients maintained at dexmedetomidine alone. The satisfaction levels of the surgeon and attending anesthetist were significantly higher for surgical outcomes in the group receiving a combinative infusion of dexmedetomidine and lignocaine.
Conclusion: The hemodynamic profiles of patients undergoing different surgeries showed significant favor for the combination of dexmedetomidine and lignocaine infusion as compared to infusion of dexmedetomidine only.
Keywords: Deliberate hypotension, Intraoperative, Hemodynamic, Dexmedetomidine, Lignocaine

INTRODUCTION

Laryngoscopy and intubation are major processes in general anesthesia. These processes have the potential to intensify the concentrations of catecholamines in plasma during surgical intervention.[1] As a consequence, hemodynamic stress responses are triggered leading to myocardial infarction or other cerebrovascular problems[2] such as arrhythmia, tachycardia, and hypertension[1]. Numerous pharmacologic agents have been exploited to counter these undesired hemodynamic stress responses including propofol, fentanyl,and esmolol.

The interest in α-2-adrenoreceptoragonists is increasing for intensive care and anesthesia. These drugs are widely utilized for their sympatholytic properties, anesthetic-sparing effects, sedation, and analgesia.[3] In this category, clonidine is the most popular drug and provides long-lasting actions for regional anesthesia, sedation for intensive care, and in management of alcohol or opioid withdrawal syndrome.[4] However, the use of clonidine is often limited by rebound hypertension that occurs after its discontinuation.[3]

As compared to clonidine, dexmedetomidine is a more potent α-2-adrenergic blocker having selectivity higher than clonidine. The utilization of dexmedetomidinein anesthesia offers various potential advantages enhancing the quality of recovery[5,6], opioid-sparing[7] and reduction in catecholamine release.[8] It diminishes the concentration of norepinephrine and subsequently confers a sympatholytic activity. Moreover, the use of dexmedetomidineis also known to reduce blood pressure (BP) and heart rate (HR).[9]

Lignocaine is another agent utilized to suppress hemodynamic stress responses. In addition to the anesthetic effect, the infusion of lignocaine has also shown cardioprotective effect by reducing the risk of myocardial injury.[10] However, it has been also reported that suppression of hemodynamic stress responses was not sufficient to completely prevent the spikes in systolic bood pressure at one and three minutes after the intubation.[11]

Therefore, we hypothesized that a combined infusion of dexmedetomidine and lignocaine would provide better hemodynamic profiles for the patients undergoing different surgeries. For this purpose, a comparison between dexmedetomidine infusion alone and infusion of dexmedetomidine plus lignocaine was evaluated in the present study through a randomized double-blind clinical study.

MATERIALS AND METHODS

This double-blind, randomized, comparison trial was conducted over a period of one year at the operation theatre, department of anesthesia, Isra University Hospital, Hyderabad and ethical approval was received from the Ethical Review Committee. All patients of ASA status of I, II, and III, aged at least 16 years, surgery lasting for more than an hour and not receiving any kind of peripheral or central nerve block were included. All patient refusal, heart block, beta-blocker therapy, uncontrolled hypertensive and history or comorbidity of the cardiovascular accident, carotid atherosclerosis, ischemic heart diseases, chronic renal failure, peripheral vascular diseases, and severe anemia were excluded.

The patients were selected from the list of daily operations and their informed consent was obtained in writing and randomly assigned via a sealed envelope method to any of the two groups; patients receiving dexmedetomidine (group D) and patients receiving lignocaine plus dexmedetomidine (group LD). For the dexmedetomidine infusion group, dexmedetomidine was intravenously infused at a rate of 1 µg/kg of the patient's weight while 1 mg/kg of lignocaine in addition to dexmedetomidine (1 µg/kg) was administered intravenously to the patients in group LD. The saline bags of 100 mL containing either dexmedetomidine alone or in combination with lignocaine were prepared, documented, and labeled as study drugs by a person who was not involved in the conduction and assessment of the present study.

The experimental interventions were started upon receiving the patient in the operation theater and were continued till the surgical procedure was completed. In each group, analgesia of routine multimodal was followed comprising 30 mg ketorolac, 1 g paracetamol infusion, and 0.1 mg per kg nalbuphine.

The data was entered and analyzed through SPSS-24. The satisfaction of attending anesthetists and surgeons was determined through a Likert scale having options of not satisfied,

satisfied, and very satisfied. The difference between the two groups was considered significant with a value of p<0.005.

RESULTS

The majority of the patients belonged to the age group of 25-34 (41.7%) followed by the age group of 35-44 years (23.3%) in both interventional groups. Most of the patients (56.7%) had a BMI of 25-34 and were characterized having ASA status II (41.7%) [Table 1]. Table 2 summarizes intraoperative findings for patients receiving dexmedetomidine alone (group D) or lignocaine plus dexmedetomidine (group LD).

A significant difference in average heartrate (p=0.026), average MAP (p=0.026), and need for transfusion (p = 0.020), was found between the two group of patients. The majority of the patients with having a heart rate of fewer than 100 beats per minute belonged to group LD (96.7%, p<0.026). Similarly, there was only one patient for whose the heart rate was recorded as over 100 beats per minute in group LD as compared to seven patients (23.3%) who had a heart rate of more than 100 beats per minute in group D. The average MAP for all patients in group LD remained in between 75 mmHg to 100 mmHg whereas the MAP in group D could be managed below 100 mmHg for comparatively smaller proportions of the patients (83.3%) than that for patients in group LD (100.0 %).

Although the approximate blood loss was not significantly different between the two groups, there was a significant difference in the need for transfusion (p <0.020). The need for transfusion was identified for a higher number of patients in group D (40%) than for patients in group LD (13.3%). Moreover, the lowest approximate blood loss was observed in group LD. It can also be observed from data in Table 2 that frequencies for approximate blood loss exceeding 1000 mL were lower in group LD with reference to group D.

No patient in any group required the vasoactive agents. Additionally, no significant difference was observed between group D and group LD for the need for anticholinergics (p=0.246). These results suggested that hemodynamic profile in terms of tachycardia and hypertension was significantly improved in patients receiving lignocaine in combination with dexmedetomidine as compared to patients who were infused with dexmedetomidine only.

Table 1: Baseline Demographic and Clinical Characteristics (n=60)

Characteristics	Group D		Group LD	
	No.	%	No.	%
Age (years)				
16-24	3	10.0	10	33.3
25-34	11	36.7	14	46.7
35-44	10	33.3	4	13.3
45-54	6	20.0	2	6.7
Height (cm)				
135-144	5	16.7	4	13.3
145-154	11	36.7	10	33.3
155-164	10	33.3	15	50.0
164-175	4	13.3	1	3.3
Weight (Kg)				
35-44	-	-	1	3.3
45-54	5	16.7	6	20.0
55-64	12	40.0	14	46.7
65-74	11	36.7	8	26.7
75-84	2	6.7	1	3.3
BMI (kg/m^2)				
15-24	8	26.7	14	46.7
25-34	19	63.3	15	50.0
35-44	3	10.0	1	3.3
ASA status				
I	8	26.7	7	23.3
II	12	40.0	13	43.3
III	10	33.3	10	33.3

Both the surgeon and attending anesthetist's satisfaction levels differed significantly between the two groups with a p-value of less than 0.01. A higher proportion of the surgeons (90%) and attending anesthetists (83.3%) were “satisfied” with outcomes in the dexmedetomidine group. Contrarily, the majority of surgeons (63.3%) and attending anesthetists (83.3%) were “very satisfied” with clinical outcomes in the group receiving an infusion of dexmedetomidine plus lignocaine.

Table 2: Intraoperative findings for patients receiving dexmedetomidine alone (Group D) or lignocaine plus dexmedetomidine (Group LD)

Characteristics	Group D	Group LD	P value
Average Heart Rate (beats per/minute)			
≤100	23 (76.7%)	29 (96.7%)	0.026*
>100	7 (23.3%)	1 (3.3%)	
Average MAP (mmHg)			
>75 < 100	25 (83.3%)	30 (100%)	0.026*
>100	5 (16.7%)	-	
Approximate Blood Loss (mL)			
<100	9 (30%)	23 (76.7%)	0.08**
250-499	2 (6.7%)	-	
500-749	8 (26.7%)	2 (6.7%)	
750-999	4 (13.3%)	2 (6.7%)	
1000-1249	4 (13.3%)	3 (10%)	
1250-1500	3 (10%)	-	
Need for anticholinergic			
No	30 (100%)	28 (93.3%)	0.246*
Yes	-	2 (6.7%)	
Need for transfusion			
No	18 (60%)	26 (86.7%)	0.020*
Yes	12 (40%)	4 (13.3%)	
Surgeon satisfaction			
Not satisfied	2 (6.7%)	-	<0.01**
Satisfied	27 (90%)	11 (36.7%)	
Very Satisfied	1 (3.3%)	19 (63.3%)	
Attending anesthetist satisfaction			
Satisfied	25 (83.3%)	5 (16.7%)	<0.01**
Very Satisfied	5 (16.7%)	25 (83.3%)	

*Fisher’s Exact Test ** Pearson Chi-square

DISCUSSION

The results of the present study showed a significantly better impact of dexmedetomidine plus lignocaine infusion in terms of preventing intraoperative changes in hemodynamic parameters. Dexmedetomidine has been evaluated in various clinical studies against different comparisons. For instance, Chhabra et al[12] compared the efficacy of dexmedetomidine and magnesium sulfate in controlled hypotension during functional endoscopic sinus surgery. This study enrolled 68 patients and divided them into either of the treatment arms. The dexmedetomidine provided controlled hypotension and thereby demonstrated superiority over magnesium sulfate in obtaining target MAP with less time and lower dose. In another prospective, double-blind, randomized clinical trial, sevoflurane or propofol was combined with a loading dose of dexmedetomidine and the changes in hemodynamic profile were observed during anesthesia maintenance of 84 general surgeries.[13] The MAP was increased in 80% of patients who received either dexmedetomidine alone or propofol. On the other hand, the MAP was increased only in 5% of patients who received an infusion of dexmedetomidine in conjunction with sevoflurane. Similarly, the findings of this study further suggested that decreased heart rate can be accomplished by combining a loading dose of dexmedetomidine with propofol or sevoflurane.

The dexmedetomidine has also been examined in combination with lignocaine. Kim et al[14] reported significantly reduced levels of serum creatinine kinase-myocardial band in patients who underwent coronary artery bypass graft and received lignocaine either alone or in combination with dexmedetomidine. Wang et al[15] explored the effect of lignocaine-combined dexmedetomidine on the incidence of nausea and post-operative nausea and vomiting in 248 women who underwent an elective laparoscopic hysterectomy. The results of this study showed that a combined infusion of dexmedetomidine and lignocaine substantially decreased the frequency of nausea andpost-operative nausea and vomiting as compared to lignocaine alone.

Lignocaine infusion combined with dexmedetomidine infusion was also reported to have effectivity and safety for sedation in colonoscopy with fewer side effects.[16] The combination of dexmedetomidine and lignocaine greatly decreased fentanyl consumption and postoperative pain in 96 robotic abdominal hysterectomies.[17] Another study showed that post-intubation hemodynamic responses were better controlled with nebulized lignocaine combined with intravenous dexmedetomidine than any of these agents alone.[18]

The results of this study also indicate better controlled hemodynamic responses with combination instead of dexmedetomidine alone. The hemodynamic parameters are improved in terms of maintained BP, prevention of tachycardia, and diminished blood loss. Deliberate hypotension is induced to minimize the blood loss which results in impressively improved surgical dissection.[12] Therefore, the satisfaction levels of surgeons and attending anesthetists were higher with overall surgical outcomes. The results of the present study increase the knowledge regarding the benefits of lignocaine-combined dexmedetomidine infusion in anesthesia.

CONCLUSION

The hemodynamic profiles of patients undergoing different surgeries showed more controlled parameters in the group receiving dexmedetomidine along with lignocaine as compared to dexmedetomidine alone. There was a significant difference in heart rate, average blood pressure, and need for transfusion. The satisfaction levels of the surgeon and attending anesthetist were higher for the group receiving an infusion of dexmedetomidine in combination with lignocaine than that in the group infused with dexmedetomidine alone. Hence, the results suggested that in comparison to dexmedetomidine infusion only, the combinative infusion of dexmedetomidine and lignocaine led to a better hemodynamic profile during intraoperative deliberate hypotension in terms of less blood loss and enhanced satisfaction of surgeon and attending anesthetist

REFERENCES

1. Barak M, Ziser A, Greenberg A, Lischinsky S, Rosenberg B. Hemodynamic and catecholamine response to tracheal intubation: direct laryngoscopy compared with fiberoptic intubation. J Clin Anesthesia 2003;15(2):132-6.
2. Gunalan S, Venkatraman R, Sivarajan G, Sunder P. Comparative evaluation of bolus administration of dexmedetomidine and fentanyl for stress attenuation during laryngoscopy and endotracheal intubation. JCDR 2015;9(9):UC06.
3. Mantz J, Josserand J, Hamada S. Dexmedetomidine: new insights. Eur J Anaesthesiol 2011;28(1):3-6.
4. Gregoretti C, Moglia B, Pelosi P, Navalesi P. Clonidine in perioperative medicine and intensive care unit: more than an anti-hypertensive drug. Curr Drug Targets 2009; 10(8): 799-814.
5. Bekker A, Haile M, Kline R, Didehvar S, Babu R, Martiniuk F, et al. The effect of intraoperative infusion of dexmedetomidine on quality of recovery after major spinal surgery. J Neurosurg Anesthesiol 2013;25(1):16.
6. Shin HW, Yoo HN, Kim DH, Lee H, Shin HJ, Lee HW. Preanesthetic dexmedetomidine 1 μg/kg single infusion is a simple, easy, and economic adjuvant for general anesthesia. Korean J Anesthesiol 2013;65(2):114.
7. Peng K, Zhang J, Meng XW, Liu HY, Ji FH. Optimization of postoperative intravenous patient-controlled analgesia with opioid-dexmedetomidine combinations: an updated meta-analysis with trial sequential analysis of randomized controlled trials. Pain Physician 2017;20(7):569-96.
8. Chen Y, Feng X, Hu X, Sha J, Li B, Zhang H, et al. Dexmedetomidine ameliorates acute stress-induced kidney injury by attenuating oxidative stress and apoptosis through inhibition of the ROS/JNK signaling pathway. Oxidative Med Cellular Longevity 2018;2018.
9. Friesen RH, Nichols CS, Twite MD, Cardwell KA, Pan Z, Pietra B, et al. The hemodynamic response to dexmedetomidine loading dose in children with and without pulmonary hypertension. Anesthesia Analgesia 2013; 117(4).
10. Lee EH, Lee HM, Chung CH, Chin JH, Choi DK, Chung HJ, et al. Impact of intravenous lidocaine on myocardial injury after off-pump coronary artery surgery. Br J Anaesthesia 2011; 106(4): 487-93.
11. Wilson I, Meiklejohn B, Smith G. Intravenous lignocaine and sympathoadrenal responses to laryngoscopy and intubation: the effect of varying time of injection. Anaesthesia 1991; 46(3):177-80.
12. Chhabra A, Saini P, Sharma K, Chaudhary N, Singh A, Gupta S. Controlled hypotension for FESS: A randomised double-blinded comparison of magnesium sulphate and dexmedetomidine. Indian J Anaesthesia 2020; 64(1):24.
13. Han Y, Han L, Dong M, Sun Q, Ding K, Zhang Z, et al. Comparison of a loading dose of dexmedetomidine combined with propofol or sevoflurane for hemodynamic changes during anesthesia maintenance: a prospective, randomized, double-blind, controlled clinical trial. BMC Anesthesiol 2018;18(1):1-9.
14. Kim HJ, Kim WH, Kim G, Kim E, Park MH, Shin BS, et al. A comparison among infusion of lidocaine and dexmedetomidine alone and in combination in subjects undergoing coronary artery bypass graft: A randomized trial. Contemp Clin Trials 2014;39(2):303-9.
15. Xu S, Wang S, Hu S, Ju X, Li Q, Li Y. Effects of lidocaine, dexmedetomidine, and their combination infusion on postoperative nausea and vomiting following laparoscopic hysterectomy: a randomized controlled trial. BMC Anesthesiol 2021;21(1):199.
16. Ibrahim TH. Lidocaine and dexmedetomidine combined infusion as an alternative to propofol for sedation in colonoscopy. Ain-Shams J Anesthesiol 2021;13(1):42.
17. Sivaji P, Agrawal S, Kumar A, Bahadur A. Evaluation of lignocaine, dexmedetomidine, lignocaine-dexmedetomidine infusion on pain and quality of recovery for robotic abdominal hysterectomy: a prospective randomized controlled trial. Brazilian J Anesthesiol 2021.
18. Sriramka B, Warsi ZH, Sahoo J. Effects of adding dexmedetomidine to nebulized lidocaine on control of hemodynamic responses to laryngoscopy and intubation: A randomized clinical trial. J Anaesthesiol Clin Pharmacol 2022.