Section: Anesthesia

Original Research Article

COMPARATIVE STUDY OF DEXMEDETOMIDINE ADMINISTRATION WITH PLACEBO ON POST OPERATIVE BLOOD GLUCOSE LEVELS IN DIABETES MELLITUS PATIENTS UNDERGOING GENERAL ANAESTHESIA

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ABSTRACT

Background: Blood glucose control in peri-operative and postoperative period is very important for the diabetic patient's smooth recovery from anaesthesia and wound healing. The diabetic patients admitted for surgery will have infection, stress which leads to high blood sugar level delaying wound healing. Dexmedetomidine infusion helps in maintenance of blood sugar in diabetic patients undergoing general anesthesia. Aim: To prove the effect of dexmedetomidine administration on postoperative blood glucose levels in diabetes mellitus patients undergoing general anesthesia.

Materials and Methods: The study was conducted in the Department of Anesthesia, Government Medical College and ESI Hospital, Coimbatore. It is a Randomized control study design. The study period was one year. The data was collected using a predesigned and pretested questionnaire. Informed consent and pre anesthetic assessment one day prior to surgery. The collected data will be entered in the MS excel sheet Windows 10.The analysis was done using SPSS 23.

Results: The mean age of the study participants was found to be 51.70 in Group A and 53.65 in Group B .Male were more in Group A whereas females were more in Group B. Mean intraoperative blood glucose levels in both the groups showed statistically significant .Mean postoperative blood glucose levels in both the group at one hour, 3rd hour, 6th hour,12th hr and 24th hr was found to be significant.

Conclusion: Intraoperative DEXMEDETOMIDINE infusion maintained constant blood glucose levels in the intra operative period and first 24 hours postoperatively in diabetic patients undergoing GENERAL anesthesia and the frequency of was also less compared to control group.

Keywords: Diabetic, infection, stress, wound healing, dexmedetomidine.

INTRODUCTION

Surgical stress increases the secretion of catecholamines, cortisol, and glucagon by inducing various metabolic responses, causing a reduction in insulin secretion and insulin resistance, thereby altering glucose levels. Dexmedetomidine acts on Alpha 2 adrenergic receptors to induce sedation without respiratory depression and used to maintain adequate perioperative sedation. It has been reported that intraoperative infusion of Dexmedetomidine blunts the stress response. Glucose control is important in diabetic patient undergoing surgery. Dexmedetomidine infusion helps in maintenance of blood sugar in diabetic patients undergoing general anesthesia. The diabetic patients admitted for surgery will have infection, stress which leads to high blood sugar level delaying wound healing.

Blood glucose control in peri-operative and postoperative period is very important for the diabetic patient's smooth recovery from anaesthesia and wound healing. Stress hormones and increased anxiety leads to hyper glycaemia which delays recovery from anaesthesia.[1,2,3]

Aim of the Study

To prove the effect of dexmedetomidine administration on postoperative blood glucose levels in diabetes mellitus patients undergoing general anesthesia.

Objectives

To find out the Intra operative blood glucose, Haemodynamic changes, Post-operative VAS score and Post-operative analgesic requirement in diabetic patients undergoing general anesthesia on receiving the dexmedetomidine.

MATERIALS AND METHODS

Study Design: Randomized clinical trial source of study

The study population includes adult patients diagnosed with diabetes mellitus coming for major surgeries in general surgery department in Government medical college and ESI hospital, Coimbatore.

Sample Size: Based on the inclusion and exclusion criteria the study participants were recruited and the final sample size is 40.

GROUP A - 20 Cases with dexmedetomidine (0.5 mcg/kg/hr) administration.

GROUP B- 20 Cases with similar volume of saline administration

Duration of Study

1 year (2023-2024)

Inclusion Criteria

- Adult patients diagnosed with diabetes mellitus
- ASA I and ASA II
- Elective surgeries

Exclusion Criteria

- ASA III and ASA IV
- Severe cardiovascular disease.
- Steroid use.
- Pregnancy.
- Mental retardation.
- Preoperative hypotension and hypovolemia.

Methodology

Informed consent and pre anesthetic assessment one day prior to surgery.

Materials Required

Monitors- ECG, NIBP, SPO2, EtCo2,Drugs: Injection Dexmedetomidine , Injection Fentanyl, Emergency drugs, Normal Saline, Airway devices : Mactintosh Laryngoscope, Guedel's Oral Airway, Gum elastic Bougie, Boyles anaesthesia machine, Glucometer.

Procedure

Patient admitted to operating room without premedication and Moniters connected .Base line vitals are noted.

Group A – Intravenous dexmedetomidine at 0.5 mcg/kg/hr (without loading dose) and oxygen at 5l/min. through a mask.

Group B - Similar volume of Intravenous Saline and oxygen administered

Preoperative blood glucose level measured by Glucometer. Venous blood sample taken to check authenticity of capillary blood glucose. After intubation intraoperative blood glucose level measured. After extubation blood glucose level measured at 1,3,6,12 and 24 hrs post operatively. Patients were given Inj. Fentanyl 0.5mcg/kg intravenously when the VAS score was >3, which was repeated until the pain subsided. VAS scoring was recorded.

In this study, 40 patients of either ASA I or II who were scheduled to undergo elective surgery under general anaesthesia were randomized into 2 groups to receive either dexmedetomidine or normal Saline. They were compared in view of hemodynamic changes and blood glucose levels preop,intraop and at 1,3,6,12,24 hours post operative period.

Statistical Analysis

The collected data was analysed using SPSS (STATISTICAL PACKAGE FOR SOCIAL SCIENCES) statistics software 23.0 Version. Categorical data was expressed in numbers and percentages.Continuous variables are expressed in mean and standard deviation.Unpaired sample t-test was used for find the significant difference for continuous variables and Chi-square test used to find test of significance in categorical data. p value of ≤ 0.05 was considered to be significant.

RESULTS

Table 1: Demographic characteristics

Demographic profile	Group A- (With Dexmedetomidine)	Group B-(with saline)	P value
Mean±Standard deviation	**51.70±11.211**	**53.65±11.838**	**.596**
Sex Male Female	 **11(55%)** **9(45%)**	 **9(45%)** **11(55%)**	**.527**

The mean age of the study participants was found to be 51.70 in Group A and 53.65 in Group B .Male were more in Group A whereas females were more in Group B.The difference was not statistically significant(P->0.05.

Table 2: Perioperative changes to blood glucose levels

Perioperative changes	Group A- (With Dexmedetomidine)	Group B-(with saline)	P value
Preoperative glucometer	108.40±6.142	107.35±5.050	.558
Preop Lab	109.10±5.004	108.9±4.518	0.895
Intraop Glucometer	108.80±5.996	113.00±6.241	.036*
Intraop Lab	110.65±4.945	113.40±6.549	0.142
1 Hr Glucometer	111.55±5.826	115.50±5.895	.037
1 Hr Lab	112.15±5.274	115.50±6.700	.087
3 Hr Glucometer	113.85±5.696	118.7±6.025	.012
3 Hr Lab	114.70±6.562	118.85±5.314	.034
6 Hr Glucometer	112.80±6.404	120.10±5.99	.001
6 Hr Lab	113.80±5.425	120.20±5.357	.001
12 Hr Glucometer	108.70±2.30	122.5±5.334	.015
12 Hr Lab	114.35±5.594	123.55±5.165	.001*
24 Hr Glucometer	125.90±8.372	134.50±8.556	.003*
24 Hr Lab	128.80±7.090	140.95±8.262	.001*

Mean Preoperative blood glucose levels in both the groups were comparable and were statistically not significant. Mean intraoperative blood glucose levels in both the groups showed statistically significant. Mean postoperative blood glucose levels in both the group at one hour, 3rd hour, 6th hour,12th hr and 24th hr were statistically significant.

Table 3: Intraoperative changes in Pulse Rate

Time	Group A- (With Dexmedetomidine)	Group B-(with saline)	P value
0 Minutes	86.35±5.779	86.35±5.779	1.00
10 minutes	85.65±6.467	85.65±6.467	1.00
20 minutes	85.25±8.334	85.25±8.334	1.00
30 minutes	84.50±7.366	84.50±7.366	1.00
40 minutes	85.20±8.050	85.20±8.050	1.00
50 minutes	85.60±7.563	85.60±7.563	1.00
60 minutes	87.55±7.112	87.55±7.112	1.00

The intraoperative changes in pulse rate between the two groups was not found to be statistically significant.

Table 4: Intraoperative changes in Systolic Blood pressure

Time	Group A- (With Dexmedetomidine)	Group B-(with saline)	P value
0 Minutes	136.00±6.806	135.00±9.459	0.703
10 minutes	131.50±9.333	138.50±.452	.013*
20 minutes	130.50±11.459	141.00±8.55	.002*
30 minutes	128.00±10.052	138±8.522	0.001*
40 minutes	125.50±12.344	135.50±6.863	.003*
50 minutes	124±11.877	131±9.119	0.043*
60 minutes	120.50±10.99	135±11.921	.001*

Mean Systolic blood pressure was found to be statistically significant at 10 mins, 20 mins, 30 mins,40 mins ,50 mins and 60 mins when comparing systolic blood pressure in both the groups.

Table 5: Intraoperative changes in Diastolic Blood pressure

Time	Group A- (With Dexmedetomidine)	Group B-(with saline)	P value
0 Minutes	81.00±7.182	81.00±7.182	1.00
10 minutes	79.50±7.592	79.50±7.592	1.00
20 minutes	80.50±6.048	80.50±6.048	1.00
30 minutes	82.00±6.156	82.00±6.156	1.00
40 minutes	83.50±6.708	83.50±6.708	1.00
50 minutes	80.50±7.592	80.50±7.592	1.00
60 minutes	79.0±7.182	81±8.522	0.427

Mean Diastolic blood pressure was found to be not statistically significant.

Table 6: VAS Score

Time	Group A- (With Dexmedetomidine)	Group B-(with saline)	P value
1 Hr	1.95±0.945	3.20±0.951	.001*
3 Hr	3.30±0.470	4.40±1.759	.001*
6 Hr	4.15±0.587	5.20±0.768	.001*
12 Hr	3.95±1.146	4.60±0.995	.001*
24 Hr	1.75±0.851	2.65±0.875	.063

The mean visual analog score was found to be statistically significant for 1hr,3 hrl,6 hr and 12 hr.The analgesic requirement was higher for placebo group than dexmedetomidine group.

DISCUSSION

Acute hyperglycemia is common in the perioperative period in patients undergoing surgery or with critical illness. In addition, a direct relationship between perioperative hyperglycemia and mortality has been established. Maintaining constant blood glucose levels in DM patients is a significant factor in reducing complications.[4,5,6] However, a stress stimulus, such as surgery or chronic pain, induces changes to glucose levels through the stimulation of an endogenous adrenal response.

It has been shown in previous studies that the use of an α2- adrenergic receptor agonist blunts this response but the activation of α2- adrenergic receptors inhibits insulin secretion.[7,8,9] It was shown by our study that in DEXMEDITOMIDINE group that the capillary glucose blood level was maintained at the baseline level during the perioperative period without the occurrence of hypoglycemia or hyperglycemia.

The glucose level was controlled within a mean range of 105 -130 mg/dL for 24 hours in the DEXMEDETOMIDINE group in our study.This was a study involving 40 patients. The insulin level itself was not evaluated. Thus, the effect of DEX on insulin secretion was unclear.

Therefore, an additional well designed study is required to clarify the mechanism by which glucose levels change following DEX infusion in DM patients. Such a study would need to include a planned diet and test dates involving a greater number of patients. In addition, a recommended continuous infusion dose without a loading dose was used in our study. However, the administration of DEX can cause hemodynamic instability owing to its sympatholytic effects. The initial loading dose can increase the risk of hemodynamic complications in elderly patients who are susceptible to blood pressure changes. Therefore, a continuous infusion protocol without a loading dose has been the focus in recent studies (35,36). It has been shown to be especially helpful in the recovery of patients with adequate pain control. As mentioned, it was difficult to conclude that the administration of DEXMEDETOMEDINE to DM patients affected insulin secretion. Therefore, it is our suggestion that the relief of pain and the stress response due to DEXMEDETOMIDINE could ensure that blood glucose levels remain stable in DM patients.

CONCLUSION

To conclude it was found in this study that an intraoperative DEXMEDETOMIDINE infusion maintained constant blood glucose levels in the intraoperativeperiod and first 24 hours postoperatively in diabetic patients undergoing GENERAL anesthesia. Furthermore, the frequency of hyperglycemia in the DEXMEDETOMIDINE group (group A) was also found to be lower than that in the control group (group B). It is important that a constant blood glucose level is maintained in patients with DM. Therefore, the administration of a DEXMEDETOMIDINE as a sedative agent is found to be helpful in maintaining blood glucose levels in diabetic patients during the post operative period.

Limitations: The sample size is small .The study is a single centre study so the results cannot be generalized.

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Competing Interest: There is no competing interest

Authors Contribution: All authors in our study contributed to the data collection of the patients

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