

Original article

Study of effect of dexmedetomidine on blood sugar levels and serum insulin levels

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Abstract

Introduction: There is increase in the number of diabetic patients nowadays, due to lifestyle modification. Tight glycemic control is becoming increasingly recognized as a perioperative goal in surgical patients. However, there is still no overall consensus on the optimal perioperative management of the diabetic patient.

Material and methods: A hospital based double blind study was undertaken with 100 patients to evaluate the effect of dexmedetomidine infusion on post-operative blood sugar levels and insulin levels in patients undergoing lower limb surgeries under spinal anesthesia.

Results: It was observed in the present study that the pre-op (11.32 ± 0.74 uU/ml vs. 11.40 ± 0.83 uU/ml; $p=0.408$), post-op 12 hours (11.26 ± 0.63 uU/ml vs. 11.31 ± 0.73 uU/ml; $p=0.412$) and post-op 24 hours insulin levels (11.20 ± 0.67 uU/ml vs. 11.22 ± 0.73 uU/ml; $p=0.415$) was comparable and statistically not significant as per Student t-test

Conclusion: Dexmedetomidine infusion intraoperatively maintained constant blood glucose levels relative to baseline within 24 hours post-operatively in diabetic patients. Administration of Dexmedetomidine also maintained constant insulin levels.

Keywords: spinal anesthesia , dexmedetomidine infusion

Introduction:

There is increase in the number of diabetic patients nowadays, due to lifestyle modification. Tight glycemic control is becoming increasingly recognized as a perioperative goal in surgical patients.¹ However, there is still no overall consensus on the optimal perioperative management of the diabetic patient.²

Various drugs and treatment modalities are available for peri-operative control of blood

sugar level, still the post-operative control of blood sugar levels is challenging due to intra-operative stress response to surgery. There are less studies available on the effect of dexmedetomidine on blood sugar levels and serum insulin levels. Hence the present study was done at our tertiary care centre to evaluate the effect of intravenous Dexmedetomidine in diabetic patients undergoing lower limb surgeries under spinal anaesthesia.³

Material and methods:

A hospital based double blind study was undertaken with 100 patients to evaluate the effect of dexmedetomidine infusion on post-operative blood sugar levels and insulin levels in patients undergoing lower limb surgeries under spinal anaesthesia. The patients were distributed by computer generated random number into following two groups:

- **Group A** – 50 patients were infused with Inj. Dexmedetomidine at a dose of 0.5 mcg/kg/hour
- **Group B** – 50 patients were infused with the same volume of 0.9 % normal saline.

Study design: A hospital based Double Blind study

Study Duration: 2 years

Study population: All patients of age between 18-65 years, diabetics with ASA grading II, undergoing lower limb surgeries under spinal anaesthesia who fulfilled the inclusion criteria.

Sample size: 100 patients

Inclusion criteria:

1. Age between 18-65 years
2. Diabetic patients controlled on Oral Hypoglycemic Agents and well-optimized before surgery.
3. ASA grading II
4. Either sex male or female
5. Patients undergoing lower limb surgeries under spinal anaesthesia

Exclusion criteria:

1. Age less than 18 years and more than 65 years
2. Myocardial Infarction
3. Cerebrovascular accident in last 3 months
4. Hypertensive disorders
5. Patients on beta blockers
6. Patients on insulin
7. Patients with endocrinological disorders apart from diabetes.
8. Severe Renal, pulmonary and hepatic disorders

9. Raised intracranial pressure
10. Pregnancy
11. Known allergy to dexmedetomidine

The study was done at our tertiary care center in the Department of Anesthesiology, after due permission from the Institutional Ethics Committee and Review Board and after taking Written Informed Consent from the patients.

Once the patients were enrolled for the study, a thorough history and physical examination was done as per proforma. An informed consent was taken in written from patients or patient's attendant.

Results:

A hospital based double blind study was undertaken with 100 patients to evaluate the effect of dexmedetomidine on post-operative blood sugar levels and insulin levels in lower limb surgeries under spinal anesthesia. The patients were distributed by computer generated random number into following two groups:

- **Group A** -50 patients were infused with Inj. Dexmedetomidine at a dose of 0.5 mcg/kg /hour (at the rate of 20-50ml/hour)
- **Group B** – 50 patients were infused with 0.9% normal saline (at the rate of 20- 50ml/hour)

There were 29 (58%) male and 21 (42%) female patients in Group A while Group B had 28 (56%) male and 22 (44%) female patients respectively. Majority of the patients in both the groups were males and the difference was statistically not significant as per Chi-square test ($p=0.784$).

The mean duration of surgery was comparable in Group A and Group B (108.60 ± 8.37 mins vs. 110.78 ± 8.64 mins) and statistically not significant as per Student t-test ($p=0.685$)

Comparison of Blood Glucose Levels between groups :

The pre-op (142.96 ± 8.35 mg/dl vs. 145.78 ± 9.88 mg/dl; $p=0.527$) and post-op 1 hour (137.48 ± 8.08 mg/dl vs. 140.52 ± 8.68 mg/dl; $p=0.531$) blood glucose level between groups was comparable while there was significant decrease in blood glucose level in Group A in post-op 3 hours (126.24 ± 10.10 mg/dl vs. 144.44 ± 9.18 mg/dl; $p=0.001$) and post-op 6 hours (129.02 ± 9.73 mg/dl vs. 141.84 ± 8.02 mg/dl; $p=0.001$) compared to Group B as per Student t-test. The post-op 12 hours (134.26 ± 6.45 mg/dl vs. 135.48 ± 6.32 mg/dl; $p=0.518$) and post-op 24 hours (139.56 ± 7.88 mg/dl vs. 140.92 ± 7.17 mg/dl; $p=0.526$) blood glucose levels was comparable between the groups as per Student t-test.

Table 1: Comparison of Blood Glucose Levels between groups

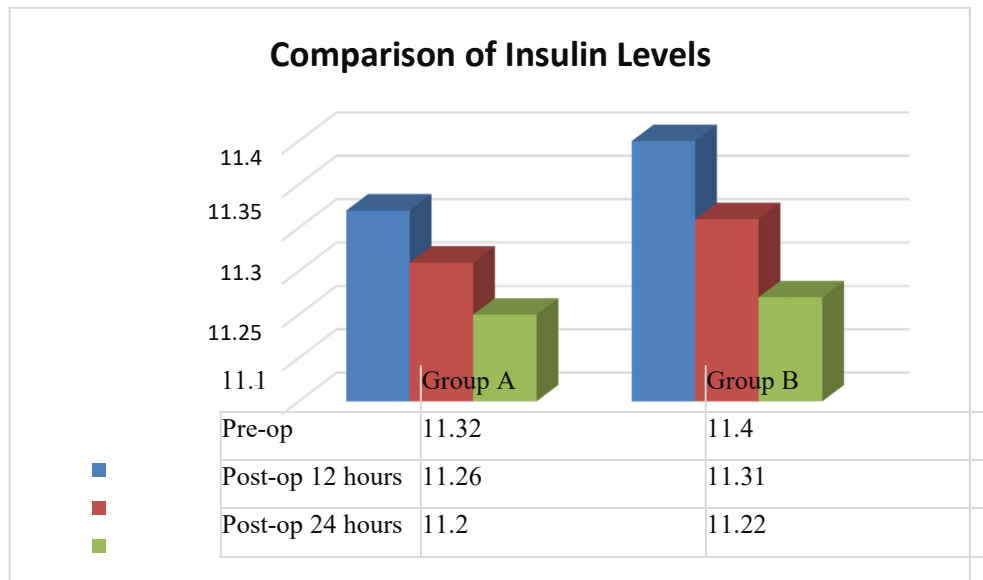
Blood Glucose Levels	Group A		Group B		p value
	Mean	SD	Mean	SD	
Pre-op	142.96	8.35	145.78	9.88	0.527
Post-op 1 hour	137.48	8.08	140.52	8.68	0.531
Post-op 3 hours	126.24	10.10	144.42	9.18	0.001
Post-op 6 hours	129.02	9.73	141.84	8.02	0.001
Post-op 12 hours	134.26	6.45	135.48	6.32	0.518
Post-op 24 hours	139.56	7.88	140.92	7.17	0.526

Comparison of Insulin Levels between groups

The pre-op ($11.32 \pm 0.74 \text{uU/ml}$ vs. $11.40 \pm 0.83 \text{uU/ml}$; $p=0.408$), post-op 12 hours ($11.26 \pm 0.63 \text{uU/ml}$ vs. $11.31 \pm 0.73 \text{uU/ml}$; $p=0.412$) and post-op 24 hours insulin levels ($11.20 \pm 0.67 \text{uU/ml}$ vs. $11.22 \pm 0.73 \text{uU/ml}$; $p=0.415$) was comparable and statistically not significant as per Student t-test.

Table 2: Comparison of Insulin Levels between groups

Insulin Levels	Group A		Group B		p value
	Mean	SD	Mean	SD	
Pre-op	11.32	0.74	11.40	0.83	0.408
Post-op 12 hours	11.26	0.63	11.31	0.73	0.412
Post-op 24 hours	11.20	0.67	11.22	0.73	0.415



Graph 1: Comparison of Insulin Levels between groups

Discussion:

A hospital based double blind study was undertaken with 100 diabetic patients to evaluate the effect of intra-operative dexmedetomidine infusion on post-operative blood sugar levels and insulin levels in lower limb surgeries under spinal anaesthesia. The patients were distributed by computer generated random number into two groups.

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 diabetes mellitus patients is a significant factor in reducing complications⁴ 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 alpha2-adrenergic receptor agonist blunts this response but the activation of alpha 2-adrenergic receptors inhibits insulin secretion⁽²⁰⁻²²⁾. Dexmedetomidine is a selective alpha2-adrenergic receptor agonist with a $\alpha 2:\alpha 1$ activity ratio of 1620:1, which is relatively high⁵. Therefore, a dexmedetomidine infusion has the potential to affect glucose levels.

In our study, the pre-op (142.96±8.35mg/dl vs. 145.78±9.88mg/dl; p=0.527) and post-op 1 hour (137.48±8.08mg/dl vs. 140.52±8.68mg/dl; p=0.531) blood glucose level between groups was comparable while there was significant decrease in blood glucose level in Group A in post-op 3 hours (126.24±10.10mg/dl vs. 144.442±9.18mg/dl; **p=0.001**) and post-op 6 hours (129.02±9.73mg/dl vs. 141.84±8.02mg/dl; **p=0.001**) compared to Group B as per Student t-test. The post-op 12 hours (134.26±6.45mg/dl vs. 135.48±6.32mg/dl;

p=0.518) and post-op 24 hours (139.56±7.88mg/dl vs. 140.92±7.17mg/dl; p=0.526) blood glucose levels was comparable between the groups as per Student t-test. This finding was consistent with the studies of Yacout AG et al⁶, Harsoor SS et al⁷, Vasanthi B et al⁸ and Mostafa RH et al⁹.

Mostafa RH et al⁹ study assessing the clinical efficacy of dexmedetomidine premedication on neuroendocrine stress response by analysis of perioperative fluctuation of blood sugar level during laparoscopic bariatric surgery, found that perioperative administration of dexmedetomidine infusion had essentially weakened the stress response. In the placebo group there was significantly higher blood sugar values compared to Dexmedetomidine one hour after start of surgery up to 6 hr later.

It was observed in the present study that the pre-op (11.32±0.74uU/ml vs. 11.40±0.83uU/ml; p=0.408), post-op 12 hours (11.26±0.63uU/ml vs. 11.31±0.73uU/ml; p=0.412) and post-op 24 hours insulin levels (11.20±0.67uU/ml vs. 11.22±0.73uU/ml; p=0.415) was comparable and statistically not significant as per Student t-test. Hui Yun S et al⁸ noted similar observations in their study.

Conclusion:

Dexmedetomidine infusion intraoperatively maintained constant blood glucose levels relative to baseline within 24 hours post-operatively in diabetic patients. Administration of Dexmedetomidine also maintained constant insulin levels.

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Was informed consent obtained from the subjects involved in the study? YES

For any images presented appropriate consent has been obtained from the subjects: NA

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