Research Article

A comparative study of hyperglycaemic response in well controlled diabetic patients undergoing general and regional anaesthesia

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Abstract

Hyperglycaemic response in diabetic patients can be well controlled with adequate depth in general anaesthesia and it can be totally eliminated in the regional anaesthesia. In group I [general anaesthesia] the hyperglycaemic response was not clinically significant. The haemodynamic response measured as rise in heart rate and blood pressure were also not clinically significant. Where as in group II [Regional Anaesthesia] the differentiation of sympathetic nervous system eliminates hyperglycemic response.

Keywords: Hyperglycaemia, Haemodynamic, GeneralAnaesthesia, Regional Anaesthesia

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Received Date: 23/11/2014 Accepted Date: 03/12/2014

Access this article online

Quick Response Code:

Website: www.statperson.com

DOI: 10 December 2014

INTRODUCTION

Hormones mediate much of the body's homeostatic response to the stress. The circulating concentration of hormones like norepinephrine, epinephrine, cortisol and growth hormone increased in response to most acute stress like anaesthesia and surgery which increases insulin requirement in patients[1] Anaesthesia modifies the stress response produced by the degree of trauma occuring during surgery. The secretion of stress hormones precedes the rise in blood glucose and ketone body concentration[2]. This stress response is known to be attenuated more under regional anaesthesia. The blood glucose is a simple indicator of stress response. This prospective study was conducted intraoperatively to evaluate the blood glucose level in well controlled diabetic patients undergoing surgery under general anaesthesia or regional anaesthesia as an indicator of stress response.

MATERIALS AND METHODS

We were estimating the blood sugar levels following anaesthesia in well controlled diabetic patients [on oral hypoglycemic agents or insulin] undergoing various surgical procedures under general anaesthesia and regional anaesthesia. The study was done on 50 well controlled diabetic patients.

Inclusion Criteria

The patients included in the study group were between 30-70 years of age who were diagnosed having Non insulin dependent diabetes mellitus [under control with treatment] coming under ASA Grade II or III. The patients included in the study group were undergoing elective surgical procedures of duration of more than 30 minutes.

Exclusion Criteria

Uncontrolled diabetic patients, ASA IV patients, Diet controlled patients, Pediatric diabetic patients, Diabetic with systemic illness. Patients were divided into two groups of 25 each; The Group I Patients subjected to general anaesthesia and the Group II Patients subjected to regional anaesthesia. Patients were admitted in the hospital 24 hours prior to the surgery. Two random blood sugar values were taken 12 hours apart to assess the

How to site this article: Suneeth P Lazarus. A comparative study of hyperglycaemic response in well controlled diabetic patients undergoing general and regional anaesthesia. *International Journal of Recent Trends in Science and Technology* December 2014; 13(2): 332-334 http://www.statperson.com (accessed 12 December 2014).

patients diabetic status i.e. both the values coming below 200 mg/dl and urine ketone bodies should be negative. During pre –anaesthetic check up detailed history was taken regarding the duration and treatment of diabetes mellitus. General physical examination was done .Patients were advised to fast overnight and to skip morning dose of antidiabetic drugs. On the day of surgery fasting blood glucose and serum electrolyte levels were estimated before shifting the patient to surgery. Pre medication was given in the observation room of the theatre .In Group I, Inj.Morphine0.1 mg/kg body weight and Inj. atropine 0.02 mg/kg body weight and in Group II: Inj. Morphine 0.1 mg/kg body weight and Tab Diazepam 10mg HS had given. A blood sugar level was estimated with glucometer finger puncture method before starting an IV canulation. .Monitors like ECG, BP, pulse oxymeter were connected to the patients and every 10 minutes readings were taken coming under group 1 were preoxygenated for 3 minutes and induction done with inj. Thiopentone (2.5%) 5 mg/kg bodyweight over a period of 40-60 seconds. Ventilated with 100% oxygen during apnoeic period after injecting muscle relaxant (inj pancuronium 0.1 mg/kg or body weight) and intubated with appropriate size oral endotracheal tube [portex],connected to Boyle's anaesthesia machine and ventilated through closed circuit with a circle absorber. Anaesthesia was maintained with halothane and supplementary dose of pancuronium was given at regular intervals. I V fluid used was Ringer Lactate for all patients .Blood sugar checked at 10, 40 and 70 minutes after induction of anaesthesia for all patients by glucometer method. In group II [subarachnoid /epidural block]after a basal blood sugar reading repeated blood glucose values were taken at 10,40,and70 minutes after the fixation of the local anaesthetic and achieving adequate analgesia. Statistical analysis: Students't' test both independent and paired 't' tests were employed to test the hypothesis for differences in mean values. Principles of glucometer: Reflectance photometry using capillary blood by finger puncture method and spreading on enzyme strips [Glucostix] Make-Borringer Mannheim-Accutrend alpha.

OBSERVATIONS AND RESULTS

Table 1: Age distribution

Age group [years]	General anaesthesia [no]	Regional anaesthesia [no]
35-40	4	5
41-45	9	7
46-50	9	12
51-55	3	1

Table 2: Type of surgery

Type of surgery	General anaesthesia [no]	Regional anaesthesia [no]
Lower abdominal	6	11
Thoracic	2	0
Head andneck	2	0
Lower limb	15	14

Table 3: Interpretation of blood sugar levels [mg/dl] intraoperatively

TIME [minutes]	GROUP I RBS [mg/dl]	't'	GROUP II RBS [mg/dl]	't'
0	163.96	-	166.72	-
10	166.96	2.22	155.56	9.08
40	153.52	6.07	141.24	13.36
70	146.12	9.51	133.76	20.83

DISCUSSION

Anaesthesia modifies the stress response produced by surgery. Along with stress response many hormones [catacholamines, glucagon, cortisol, and growth hormone] also produced which results in the rise of blood sugar levels. Glucose being a simple indicator of stress response we estimated blood glucose level in well controlled diabetic patients [on oral hypoglycemic agents and insulin]undergoing surgery under general anaesthesia and regional anaesthesia. In diabetic patients there is an altered glucose metabolism which is responsible for the hyperglycemic response in these patients. Anaesthesia and surgery increase insulin requirement since they are known to induce stress[2,3] This study is conducted to evaluate hyperglycemic response in well controlled diabetic patients. In group l the maximum number of patients was 9 [36%] under the age group of 41-45 years and in group ll it was 12 [48%] under the age group of 46-50 years .In group l the minimum of 3 cases and group ll the minimum of one case were under the age group of 51-55 years. [tablel] In our study the total number of males were 32 [64%] and females were 18 [36%].In general anaesthesia 14 were males and in regional anaesthesia 18 were males. Ten of the group l cases and fourteen of the group ll cases were had history of diabetes for past 3-5 years. A total number of 20cases in group l and 18 cases in group ll were only on oral hypoglycemic drugs for diabetes. In the group l of 25 diabetic patients for surgery undergoing general anaesthesia showed a marginal rise in blood sugar level from the basal value at 10 minutes after induction of anaesthesia .The mean rise is very small [3mg/dl] with a p value of <0.05.In our study the maximum hyperglycemic response noticed was 19 mg/dl which is insignificant. In both the groups the blood sugar values showed a gradual fall from basal value after 10th minute. The probable cause for this reduced

hyperglycemic response in our study could be due to inclusion of only well controlled diabetic patients and majority of them underwent lower abdominal lower limb surgical procedures. In the remaining 25 diabetics belonging to group II who were undergone surgery by regional anaesthesia were noticed that a gradual fall in random blood glucose level intraoperatively due to deafferentation of the sympathetic system .This may be due to abolition of the hyperglycemic response by central neuraxial blockade. Houghton and colleages reported that central neuraxial blockade maintained normal glucose tolerance and insulin release during surgery and the undergoing anaesthesia.[4] The studies done by Bromage, Brandt and colleagues were able to show complete abolition blood glucose response if effective blockade was maintained during and after upper abdominal and thoracic surgery[5,6]. In another study in PGI Chandigarh to find out the effect of spinal anaesthesia on blood glucose level showed that blood sugar level remained unchanged intraoperatively .During post operative period a rise of blood glucose level 7.503 % was observed . This may be due to anxiety, post operative pain or regression of sympathetic block.

CONCLUSION

In group I cases who underwent surgery in general anaesthesia, the hyperglycemic response was not clinically significant. The haemodynamic response measured as a rise in heart rate for [8beat /min] and blood pressure rise [7mm mg systole] were not also clinically significant. The correlation leads to the conclusion that adequate control of haemodynamic response to induction also controls hyperglycemic response. Whereas in group II cases who underwent surgery in regional anaesthesia eliminates hyperglycemic response due to deafferentation of sympathetic nervous system.

This leads to the conclusion that hyperglycemic response in diabetic patients can be well controlled with adequate depth of anaesthesia in general anaesthesia and it can be totally eliminated in regional anaesthesia.

ACKNOWLEDGEMENTS

I have to truly acknowledge my teacher and guide Prof. Sunitha, Dept of Anaesthesiology, and the staticians of Community Medicine Department M.S.R.M.C, Bangalore who had helped me to complete this study successfully.

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Source of Support: None Declared
Conflict of Interest: None Declared