Blood Glucose Level Intraoperatively and Effect on Recovery from General Anesthesia in Non-Diabetic Recipient in Renal Transplant Surgery

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ABSTRACT:

BACKGROUND:

Blood glucose increment during surgery is part of stress response, this increment is due to insulin dysfunction and glucose production and hyperglycemia increases complications.

OBJECTIVE:

Assess glucose level change intraoperatively and effect on recovery in non-diabetic recipients in renal transplant surgery.

PATIENTS AND METHODS:

52 patients from 1-1-2016 to 1-3-2017 In renal transplant center. all with standardized anesthetic technique, monitoring of blood glucose pre-induction and every half hour, soluble insulin start to be given for patient when blood glucose reach 200mg/dl as 1 unit for each 10 mg above 200 and recovery assessed using aldrete score.

RESULT:

There is variable increase in blood glucose among patients, 39/52 above 110 mg/dl at pre induction,1 patient was 276mg. 18/52 had 200-250 mg at least once among them,11patients reached 250-300mg,6 patients300-400 and 3reahed above400. 5 patients had delayed recovery with no significance relation to pre-induction level but significant to other readings, risk assessment showed more odd's ratio for delayed recovery in high glucose reading and assessment of increment from pre-induction is a valid test for delayed recovery.

CONCLUSION:

Blood glucose measurement is mandatory in non-diabetic in renal transplant recipients.

KEY WORDS: stress response to surgery, hyperglycemia delayed recovery.

INTRODUCTION:

Blood glucose level change is one product of stress response to surgery which is defined as physiological response to protect body from trauma and enhance chance of survival, stress response involves neuroendocrine, hormonal and thermoregulation and it is more in major surgeries than minors, it was first described by Cuthberson in 1929, Hyperglycemia and insulin resistance are major features of stress response and may persist several days postoperatively [1,2,3,4,5].

Renal transplant surgery is a major surgery with high risk for complication and steroid therapy is a main component of immune suppression, steroids cause attenuation of stress response but increase glucose level [6,7,8].

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In non-diabetic renal transplant recipients blood glucose level is not routinely checked perioperatively [9], hyper-hypoglycemia is known cause of delayed recovery from anesthesia [10].

Recovery from anesthesia is assessed using modified aldrete criteria, which is score system of 10 points and patient is considered good recovered if got at least 9 and patient became ready to discharged to word [11,12,13].

PATIENTS AND METHODS:

52 patients were involved with renal failure presented for renal transplant, no history of diabetes. Cross sectional study had conducted at renal transplant center in medical city complex in Baghdad between1-1-2016 to 1-3-2017. 500mg methylprednisolone IV infusion in 1/2hour was given for all patients.

All patients had received the same anesthetic management, blood glucose test before induction then metoclopramide 10mg, midazolam 0.5mg/kg, fentanyl1mcg/kg, Propofol anesthetizing dose and atracurium 0.5mg/kg, then intubation done and anesthesia maintained with isoflurane inhalational and remifentanil infusion and boluses of atracurium and blood was checked every half an hour.

At the end of surgery anesthetic agents stopped and reversal of muscle relaxant given (neostigmine and atropine),recovery status assessed and extubation done when patient returned his consciousness, reflexes and aldrete score was assessed to discharge patients to word.

Soluble insulin was given to patient when blood glucose reached 200mg/dl in a dose of 1/IU for each 10 mg/dl increment as direct IV route.

Statistical analysis:

Data tabulation, input and coding was done by the use IBM© SPSS© (statistical package for the social sciences) statistic version 22.

For descriptive statistics, percentage were applied, and T-test for normally distributed data and binary logistic regression for risk assessment and *P*-value less than 0.05 was considered significant throughout data analysis.

RESULT:

All patients were between age 18-50, normal BMI.

Surgery time was between 180-200min.

*39/52 of patients had pre-induction glucose above 110mg, all bellow 200mg, one of them was 276mg.

**18/52 had reading between 200mg-250mg from them these 18 patients 11 patients reached 300mg, among these 11 patients 6patients had readings between 300-400mg and of these 6,

three patients reached above 400 mg.

***there was variable response to insulin, 9 patients continued to have increment in blood glucos in spite of insulin therapy.

****recovery was delayed in 5 patients;

2 patients prolonged for1 and 1.5 hours where blood sugar was more than 300mg at last two reading at 6th and 7th reading, but reading less than 400mg.

3 patients prolonged for 3hour and had readings 400 and above.

*****Statistically there was no significant difference between the mean of pre-induction reading of glucose and delayed recovery (141.16-+22.06)mg/dl and those with good recovery the mean blood sugar was (122.11-+28.21) with (P value=0.142),But there was significant difference with other readings table1.

Table 1: Comparison between mean blood sugar levels for each reading and delayed recovery.

Time	Recovery	Mean ± SD	95%CI	P value
Pre-induction	Delayed	141.60± 22.06	-6.751- 45.738	0.142
	Good	122.11± 28.21		
30 minutes	Delayed	192.0± 29.63	28.649- 74.670	0.000
	Good	140.34± 23.84		
60 minutes	Delayed	223.20± 33.31	44.733- 96.730	0.000
	Good	152.47± 26.95		
90 minutes	Delayed	263.0± 44.59	60.635- 134.812	0.000
	Good	165.28± 38.75		
120 minutes	Delayed	296.80± 29.81	72.565- 170.610	0.000
	Good	175.21± 53.37		
150 minutes	Delayed	359.0± 38.14	131.542- 229.139	0.000
	Good	178.66± 52.65		
180 minutes	Delayed	385.0± 56.12	164.667- 255.886	0.000
	Good	174.72± 47.52		
210 minutes	Delayed	386.60± 68.54	172.248- 265.675	0.000
	Good	167.64± 47.41		
Independent sample t-test CI: confidence interval				

******Further analysis using binary logistic regression showed that higher blood glucose reading had more odds of developing delayed recovery time table 2.

Table 2: Risk assessment of the association between mean blood sugar levels and recovery time.

Time	OR	95%CI	P value
Pre-induction	1.017	0.922 – 1.041	0.184
30 minutes	1.077	1.019 – 1.139	0.009
60 minutes	1.093	1.010 – 1.182	0.027
90 minutes	1.050	1.014 – 1.087	0.007
120 minutes	1.035	1.010 – 1.060	0.006
150 minutes	2.129	0.000 – 6.1169[57]	0.991
180 minutes	3.793	0.000 – 1.9083[67]	0.986
210 minutes	1.141	0.897 – 1.452	0.282
Delayed recovery	Reference		
Binary logistic regression			

*******assessment of increment of blood glucose from pre-induction reading was a valid test to differentiate those with table3.

Table 3: ROC curve analysis of increment in blood sugar levels from pre-induction reading as valid tests to differentiate delayed and good recovery times.

Time	AUC	95%CI	P value	Cut-off value	Specificity
30 minutes	0.86	0.756 - 0.980	0.007	>24.25%	76.6%
60 minutes	0.88	0.783 - 0.996	0.005	>38.39%	78.7%
90 minutes	0.89	0.799 - 0.997	0.004	>54.57%	78.7%
120 minutes	0.92	0.851 - 1.000	0.002	>68.05%	83%
150 minutes	0.97	0.918 - 1.000	0.001	>83.01%	87.2%
180 minutes	0.97	0.940 - 1.000	0.000	>89.52%	91.5%
210 minutes	0.97	0.940 - 1.000	0.000	>83.08%	91.5%
ROC; receiver operator characteristic curve analysis					

DISCUSSION:

increment in blood glucose perioperatively was observed in many studies in non-diabetic patients like VASANTI 2013 where 295 non diabetics for non-cardiac surgery,53%had above 126mg/dl, 19patients 6% had above 180mg/dl [(9)].rasoul 2011 showed that 6/59 patients 10% had blood glucose above 180mg/dl[(14)],Rodrigo 2011 stated that high intraoperative glucose assoscited with increase morbidity in paediatric cardiac surgery[(15)].High blood glucose was correlated with graft rejection in diabetic and non-diabetic,micheal [(16)].

Delayed recovery was reported in a non-diabetic patient with surgery for acoustic neuroma removal who developed DKA with delayed recovery and inability to be weaned from ventilator till 24hours,pawar 2014(17).hyperglycemia is one of metabolic causes leads to delayed recovery Safyia 2014[(18)]. Charity[(19)] 2015 .Thomas2006(20),Andra2012[(21)] stated that high blood glucose perioperatively is associated with high of developing complications.

Hyperglycemia is managed perioperatively by using soluble insulin which is sole therapy available for acute hyperglycemia management[(21)].many regimes had been tried to control blood glucose intraoperatively. Van den berghe 2001presented that tight glycemic control 80-110mg/dl had improved morbidity and mortality in critically ill surgical patients[(22)],but these results had been reversed in 2008 by metanalysis by Weiner[(23)], at 2009 study by Griesdale[(24)] by stating that tight glucose control did not improve morbidity and mortality but also increase incidence of hypoglycemia.

Insulin therapy was started at different level in different studies,

200mg/dl was start point for insulin therapy and comparing results in versus with those of continuous insulin to maintain glucose between 80-100mg/dl, results showed more death and stroke for group with less sugar level Elizabeth [(25)].

180-200mg/dl is accepted high level of glucose in non-ICU patients according to joint British Diabetes Societies [(26)] and Endocrine Society [(27)].

American college of physician(ACP) considered 140- 200mg/dl as target blood glucose in patients with or without diabetes [(28).]

CONCLUSION:

*blood glucose increases in surgery in diabetic and non-diabetic patients with unpredicted response to

insulin is common and leading to complications and delayed recovery is one of them.

Recommendation:

1-check blood glucose for all patients, diabetic and non-diabetic Pre- intra-post-operative time in renal transplant.

2-further studies with large samples in cooperation with physicians are required to see outcome.

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