

Blood Glucose Changes between Preoperative Administration of Sorbitol 25Gram / 500ml (Tutofusin®) and Lactated Ringer in Patient Undergoing Elective Surgery



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ABSTRACT

Background: Perioperative blood glucose control affects intraoperative and postoperative morbidity and mortality. Stress response often associated with increase glucagon secretion and insulin resistance causing hyperglycemia. The combination of tissue injury, fasting, bleeding, anesthetic medications and low temperature lead to increased stress responses.

Objective: This study aims to compare the changes in postoperative plasma blood glucose between preoperative administration of sorbitol 25 gram / 500 ml (Tutofusin®) and Lactated Ringer (LR) in elective surgery patient.

Methods: A total of 66 patients were randomized to one of the following groups: S group received 500 ml intravenous fluid containing sorbitol 25 gram (Tutofusin 500cc); LR group received 500 ml of lactated ringer solution, both were given preoperatively while on fasting period. Blood glucose was measured preoperatively, before induction of anesthesia, and postoperative once the patient arrive at the recovery room.

Results: There were no significant differences in the blood glucose values at preoperative and prior to induction of anesthesia. Postoperatively, sorbitol group had significance lower blood glucose level compared to LR group (P= 0.006). Furthermore, preoperative sorbitol administration decreased blood glucose level while LR administration post-operative increased blood glucose level (P= 0.024). Conclusion : Preoperative administration of Sorbitol 25 gram / 500 ml (Tutofusin®) did not increase postoperative plasma glucose level compared with Lactated-Ringer solution.

Background and Aims

Management of glycemic levels in the perioperative setting is crucial as it affects perioperative morbidity and mortality [1,2]. Fasting prior to elective surgery may deplete hepatic glycogen stores, so increase the demand for amino acids for gluconeogenesis rather than tissue repair during postoperative period. A study reported that preoperative glucose-containing fluid administration stimulate insulin secretion and cause accumulation of pyruvate and alanine that can be used immediately by the body [3].

Glucose-containing fluid administration is also useful to prevent acute catabolism after upper abdominal surgery [4]. Tutofusin is intravenous fluid containing glucose, specifically sorbitol. Sorbitol is a monosaccharide alcohol that has unique characteristic as it is metabolized not depending on insulin [5]. Its administration has little or no effect on increasing plasma glucose [6]. Therefore, we want to know the effect of preoperative sorbitol 25 gram / 500 ml (Tutofusin®) on blood glucose level.

Materials and Methods

The study was conducted at a tertiary care hospital during January 2017 after obtaining clearance from institutional review board. Informed consents were acquired from all subjects before participating in this study. The patients included for the study aged 18-60 years, with American Society of Anesthesiologists' (ASA) I-II physical status and who were going to undergo elective surgery. Exclusion criteria were diabetes mellitus, consumption of corticosteroid, trauma injury, allergic to sorbitol, painful condition with Visual Analog Score (VAS)>6. Subjects were randomly assigned to two groups. Group S received sorbitol containing fluid (Tutofusin®) as maintenance fluid, and Group R received Lactated Ringer solution during preoperative fasting.

All participant study had intravenous access using either 20 G or 18 G intravenous catheter. After plasma blood glucose was checked, a 500 ml sorbitol solution or 500 ml Lactated Ringer solution were administered within 8 hours during preoperative period. Then, anesthesia practice standard was applied to all participants. Plasma blood glucose level was re-evaluated prior to induction of anesthesia and after participants arrived at recovery room. Analyses were done on all subjects who had received treatment according to the protocol. Data were expressed in terms of numbers and percentages, mean and standard deviations. The primary outcome was the postinduction and postoperative blood glucose level changes from preoperative level. The data between the two groups were analyzed for differences using Mann-Whitney U tests for numerical data and Fisher's exact tests for categorical data with the significance level of 0.05. Data were analysed using SPSS 20 software computer program (Figure 1).

Results

A total of 211 subjects were assessed for eligibility for this study. As shown in (Figure 1), 145 subjects were excluded. Randomization was done on 66 subjects. One patient from LR group was excluded from analysis because the surgery was postponed (Table 1). Characteristics of the subjects are presented in (Table 1). There were no differences between the two groups for age, sex, body mass index, ASA physical status, fasting duration, surgery duration, bleeding volume and anesthetic technique. No statistically significant difference was shown for preoperative blood glucose levels in both groups (Table 2). Table 2 shows that both groups had no difference of blood glucose level after induction ($P= 0.96$). The change from preoperative level also showed similar result in both groups ($P= 0.48$). Postoperatively, sorbitol group had significance lower blood glucose level compared to LR group ($P= 0.006$). Furthermore, preoperative sorbitol administration decreased blood glucose level while LR administration postoperative increased blood glucose level ($P= 0.024$).

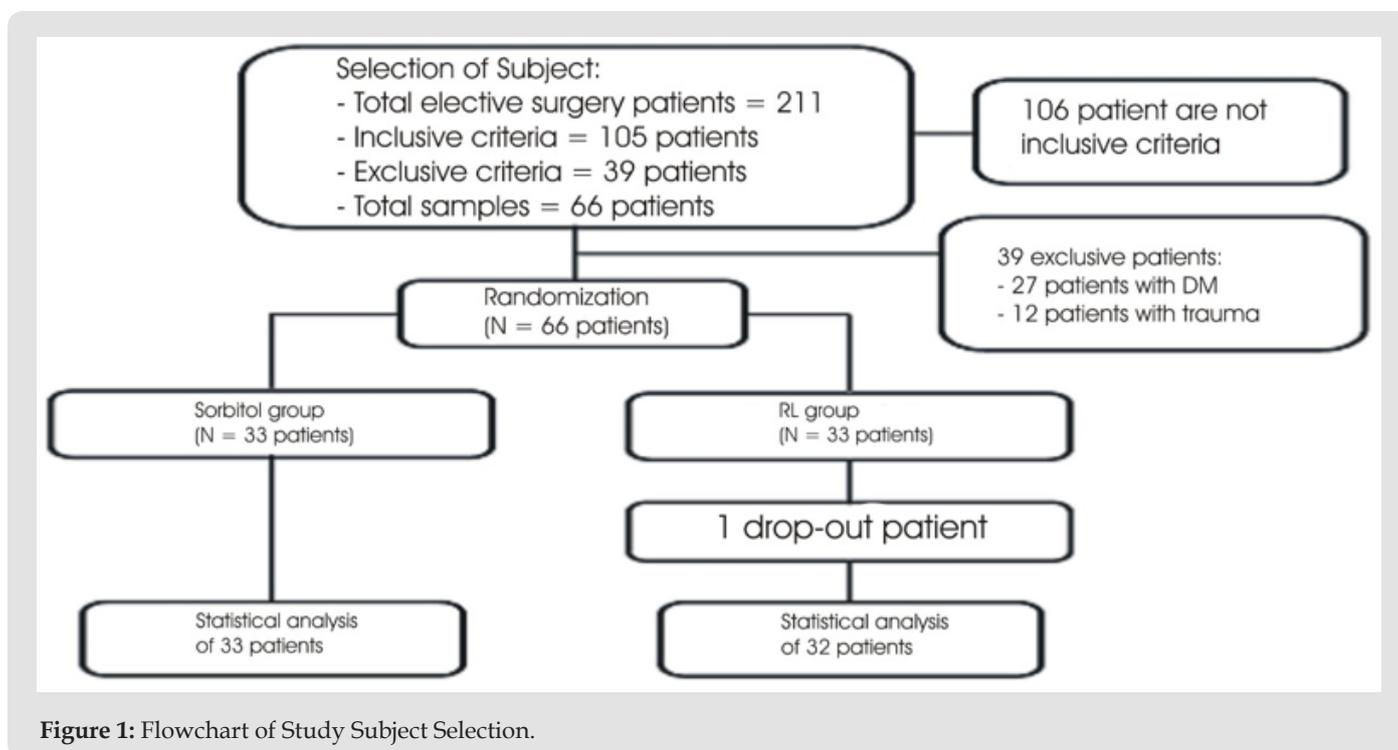


Figure 1: Flowchart of Study Subject Selection.

Table 1: Baseline Characteristics.

Variable	Groups		P
	S (n = 33)	RL (n =32)	
Age (years)	43.15 (11.50)	44.37 (12.29)	0.62
Male (n)	15 (46.9)	13 (39.4)	1.00
Female (n)	17 (53.1)	19 (60.6)	
Body mass index (kg/m ²)	22.31 (2.41)	22.29 (2.37)	0.92
ASA Physical Status			
ASA I (n)	8 (22.2)	9 (25.0)	0.22
ASA II (n)	28 (77.8)	27 (75.0)	
Preoperative blood glucose level (mg/dl)	97.2 (20.4)	103.6 (35.9)	0.94
Fasting duration (minute)	503 (39)	519 (71)	0.24
Surgery duration (minute)	115 (49)	151 (78)	0.06
Bleeding volume (ml)	184 (123)	234 (172)	0.33
Anesthetic Technique			
General anesthesia (n)	23 (69.7)	25 (78.1)	0.57
Regional anesthesia (n)	10 (30.3)	7 (21.9)	

Note: Data in number (%) or mean (SD).

Table 2: Perioperative plasma blood glucose level.

Parameters	Groups		P (95% CI)
	S (n = 33)	RL (n =32)	
Preoperative (mg/dl)	97.2 (20.4)	103.6 (35.9)	0.94
Postinduction (mg/dl)	87.0 (20.8)	87.7 (19.6)	0.96
Change from baseline (mg/dl)	-10.2 (24.5)	-15.9 (27.2)	0.48
Postoperative (mg/dl)	94.5 (17.5)	116.0 (32.0)	0.006*
Change from baseline (mg/dl)	-2.6 (22.1)	12.5 (41.5)	0.024*

Discussion

This study showed that preoperative lactated-ringer solution administration increased the blood glucose level postoperatively. LR solution was reported to increase blood glucose level compared to normal saline as intraoperative maintenance fluid for diabetic patients [7]. Lactate is precursor for gluconeogenesis, and gluconeogenesis rate is higher in patients with diabetes, especially in surgery stress condition. However, a study by Saringcarinkul [4] in non-diabetic patients receiving perioperative solution of LR or D5% 0.45% NaCl 2 cc/kg/hour started in the morning before surgery showed that the blood glucose level increased significantly in D5 0.45% NaCl Group compared to LR Group at 1 hour prior to surgery and at the end of surgery [5]. Therefore, LR may serve as alternative choice to perioperative intravenous solution in non-diabetic patients. This study showed that preoperative sorbitol solution administration prevented the increase of post-operative blood glucose level. Another study showed that 67% patients receiving D5 0.45% NaCl with 20 mmol/liter KCl group experienced at least one episode of hyperglycemia with capillary blood glucose value > 150 mg/dl; while in LR Group only 29% of patients had hyperglycemia [7].

They also found that the need of rescue insulin to maintain homeostasis in glucose containing solution group was higher than LR Group [8]. Study by Chin [9] concluded that initial administration of intravenous solution containing glucose was not needed to prevent hypoglycemia in major elective operation; however, glucose administration is useful to minimize catabolism during major abdominal surgery [9]. Limitations in our study were that extraction of blood sample and starting the maintenance solution preoperatively disrupted patients' resting time. Due to unpredictability of the duration of first surgery of the day, precise control of preoperative fasting for the subsequent operations would be difficult. As mentioned in the introduction, duration of surgery and bleedings are causing stress responses that may contribute to increase in plasma blood glucose. Although in this study, the mean differences in duration of surgery and bleeding between two groups was not statistically significant, but the mean value were higher in the LR group compare to the Sorbitol Group.

Conclusion

This study concludes that preoperative administration of 25-gram sorbitol/500 ml (Tutofusin®) prevented the increase of blood glucose level postoperatively compared to Lactated Ringer solution.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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