Original Research Article

The study of blood glucose level changes during general anesthesia in patients undergoing surgery

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Abstract

Background: Analgesia is meant to reduce the pain produced by surgery. To fulfil this requirement various drugs such as alcohol, opium, hashish and balladona have been used in the past by the Egyptians and Chinese for the control of pain during surgery when the anesthesia was not known. Glucose is a carbohydrate required for energy. During the process of metabolism of glucose the source storage come into play. Nervous influence, enzymatic action and hormonal involvement also have a significant role.

Aim: The aim of the study was the study of blood glucose level changes during general anesthesia in patients under surgery.

Materials and methods: The present study was done in the department of Anesthesiology during the year 2015-2016, 60 patients with age group of 25-65 years along with different sex distribution.

Results: Regarding the anaesthesia group, there were 15 patients in the age group of 25-35 years and 36-45 years each.14 patients were in age group 46-55 years, while 16 patients in the age group of 56-

65 years. Out of 60 patients 33 patients (55%) were male patients while remaining 27 patients (45%) were female patients.

Conclusion: Present study showed that there is very highly significant rise in blood glucose level during the ether anesthesia while in case of relaxants there is only significant rise in blood glucose level.

Key words

Blood sugar, Pancuronium, Ether, Vecronium, Gallamine.

Introduction

Anesthesia was not known prior to 1846 although the anaesthetic properties of ether already described by Faraday in 1818.the use of ether in 1846 by W.T.G Mortan opened up a new era of painless surgery with the help of drugs [1].

Presently there are various anaesthetic agents ether still stands out as the most commonly used anesthetic agents in our country.

Surgeries are considered to be the combination of multiple factors including tissue damage, fasting, blood loss, effects of medication and temperature changes from a metabolic point of view. Combinations of all these factors give rise to stress response. The stress response to surgery is characterized by increased secretion of pituitary hormones and activation of the sympathetic nervous system [2, 3]. The ultimate effect of these various endocrine changes is increased catabolic activity by increased secretion of catabolic hormones like cortisol and glucagon. The effect of these endocrine and metabolic changes ultimately leads to increased neoglucogenesis and hyperglycemia. So this stress response may be quantified by the incidence of hyperglycemia.

The metabolic changes appear to be proportional to the severity of the surgical trauma with plasma cortisol and blood glucose concentration rising slightly during minor surgical procedures but significantly during major intra-abdominal operations [4]. Conventionally any balanced salt solution containing sodium chloride and potassium is equally effective as maintenance fluid. But the obligatory glucose requirement of brain and red blood cells can only be met by dextrose containing solutions. In a fasting patient, if carbohydrate is not provided from extraneous source, glycogenolysis and gluconeogenesis from amino acid pools provide the necessary glucose, but accelerate protein catabolism. Dextrose prevents protein catabolism [5].

As our country is a developing country so the ether is still in use alone with several muscle relaxan due to the shortage of the sophisticated and costly instruments. Various experimental studies have been performed with a view to investigate the effect of anaesthesia on blood sugar and its mechanism because level of the blood sugar is the one of the parameter for safety of the patients [6-9].

Glucose the main conversion product of carbohydrate food enters the blood from the intestine. Glucose is distributed fairly uniformly throughout the body fluid both extracellular and intracellular. Maintenance of the blood sugar at a constant level is a balance between production and loss [10].

Preoperative psychic stress is reported to cause a significant elevation of blood sugar level regardless preoperative starvation.

One study showed that that there was a rise in blood glucose level after induction and during surgery. Ether showed hyperglycaemic tendency and maximum rise in blood sugar was observed in patients operated under ether anesthesia [11].

As far as the effect of muscle relaxant is concerned its effect on blood glucose level during anaesthesia not much work have been done but it is clear that the muscle relaxant have no direct effect on the blood sugar physiology. Any change in the blood sugar level may be due to the other factors like anxiety, hyperventilation or hypoventilation during anaesthesia and lighter plain of anaesthesia [11-14].

Materials and methods

The present study was conducted in the department of Anaesthesiology during the year 2015-2016, with the aim to study the blood glucose level changes during general anaesthesia in patients undergoing surgery.

Fifty adult indoor patient of either sex between 25-65 years of age scheduled for various elective surgical procedures comprised the materials for study.

Patients were divided into four groups of 10 patients each, depending upon the type of anaesthetics used.

The maintenance of anaesthesia was done as follows:-
Group – I: O_2+N_2 + Ether
Group – II: O_2+N_2 + Pancuronium
Group – III: O_2+N_2 + Gallamine
Group – IV: O_2+N_2+Vacuronium

All the patients were of physically fit belonging to A.S.A. grade I or II. They were thoroughly examined preoperatively as to their clinical fitness. Relevant special investigation along with routine investigations was done for the purpose of study. Patients were kept empty stomach for at least 12 hours before the induction of anesthesia.

Premedication consisted of injection atropine 0.06mg intramuscularly 30-45 minutes prior to the induction of anesthesia.

First blood sample was taken just before the premedication. Vein puncture was performed with a 16 or 18 gauze I/V canula under proper aseptic condition. Any intravenous drip of ringer lactate or saline was started. Dextrose and dextrose saline infusion was avoided through the study period. Just before induction the IInd blood sample was taken after recording the pulse, diastolic and systolic blood pressure. Intermittent positive pressure ventilation was continued. 3rd blood sample were taken out after intubation.

Maintenance of Anesthesia

Group – I (Ether): After connecting the patient with Boyles apparatus anaesthesia was maintained with O_2 and N_2O (40:60) and ether was started and controlled ventilation was continued until spontaneous respiration resumed IVth blood sample was taken 30 minutes after intubation and administration of ether.

Group – II (Pancuronium): After connecting the patient with Boyles apparatus positive pressure ventilation was continued. When the effect of suxamethonium were completely then pancuronium was given in the dose of 0.1mg/kg body weight intravenously to keep the patient relaxed and controlled ventilation continued, top up doses were given when required.

Group III (Gallamine triethiodide): In this group gallamine triethiodide in the dose of 2 mg/kg body weight was given intravenously after the effect of suxamethonium was over in the same manner as in case of group II. Controlled ventilation continued, top up doses were given when required.

Group IV (Vencuronium): In this group the patient received vecuronium in dose of 0.08mg/kg body weight intravenously in the same manner. Top up dose was given when required.

Reversal of patient group I was spontaneous after the withdrawal of the anaesthetic drugs, for the rest of 4 groups the reversal was needed. Post-operative sample of blood was collected as a fifth sample.

Blood glucose estimation was done with the help of glucometer.

Results

In the present study the effect of ether, pancuronium, gallamine and vecuronium on blood sugar level was compared and evaluated in 60 patients. Patients were of both sexes and over the age of 25 -65 years. These 60 patients were randomly allocated into four groups depending upon the anaesthetics. Each group was comprised of 15 patients.

Regarding the anaesthesia group there were 15 patients in the age group of 25-35 years and 36-45 years each.14 patients were in age group 46-55 years, while 16 patients in the age group of 56-65 years (**Table – 1**).

Sex distribution

Out of 60 patients 33 patients (55%) were male patients while remaining 27 patients (45%) were female patients (**Table – 2**).

Type of operation in which the drug was used was as per **Table – 3**. Values in terms of mean and standard deviation were as per **Table – 4**. The results obtained from the all four groups were compared by using simple statistical method. The t test was used to compare between each group and p value was taken from chart of probability.

Table – 1: Age distribution of the patients.

Age group	I(E)%	II(P)%	III(G)%	IV(V)%	Total
25-35	5	3	4	3	15
36-45	1	5	7	2	15
46-55	5	3	2	4	14
56-65	5	4	6	3	16
Total					60

Table – 2: Sex distribution.

Sex	Ether	Pancuronium	Gallamine	Vecuronium	Total
Male	7	5	10	11	33(55%)
Female	8	10	5	4	27(45%)
Total	15	15	15	15	60

Table – 3: Type of operation in which the drug were used.

Sr. No.	Name of operation	I(E)	II(P)	III(G)	IV(V)	TOTAL
1	Mastectomy	2	-	1	-	3
2	K.nailing	-	-	2	2	4
3	Cystolithotomy	2	1	-	1	4
4	Nephrolithotomy	-	1	1	1	3
5	Hystrectomy	2	2	1	2	7
6	Mastoidectomy	3	2	2	1	8
7	Tonsillectomy	1	-	3	1	5
8	Cholecyctactomy	2	3	1	3	9
9	Laperatomy	4	4	5	4	17
Total						60

Table – 4: Values in terms of mean and standard deviation.

Sample	Ether	Pancuronium	Gallamine	Vecuronium	p-value
I	86.5±29.81	79.9 ± 31.20	80.37± 24.9	79.56± 32.43	<0.001
II	89.9±26.93	84.7± 41.23	83.99±23.50	87.47± 20.99	<0.003
III	103.9±33.64	83.89 ± 58.96	84.28 ±35.80	90.32 ±23.88	<0.001
IV	112.39±30.23	87.76 ±34.87	90.09 ± 37.99	92.78±24.38	<0.005
V	111.23±23.56	88.94 ±38.99	84.93±32.88	97.38±21.89	<0.001

Discussion

The present study was performed to evaluate the changes in blood glucose level due to the effect of ether and 3 muscle relaxant pancuronium, gallamine and vecuronium when they are used for general anaesthesia.in the present study only adult patients were selected. Their age ranged between 25-65 years to circumvent the variables at the extremes of age. Patients subjected to routine surgical procedures were included in this study and emergency procedure were excluded to maintain standard condition as for as possible. All patients were of ASA grade I or II [15-18].

The rise in blood glucose level up to the premedication is almost equal in all four groups of this study.

Any form of stress is accompanied by change in the level of cortisol catecholamine growth hormone insulin and glucagon which are intimately associated with the regulation of blood glucose [19, 20].

The changes in blood glucose level due to the influence of ether and other 3 muscle relaxant was as under:-
Group I Ether - 23.00 mg%
Group II pancuronium - 4.26 mg%
Group III Gallamine - 4.7 mg%
Group IV vecuronium - 7.66 mg%

This shows that there is very highly significant rise in blood glucose level during the ether anaesthesia while in case of relaxants there is only significant rise in blood glucose level.

Conclusion

From the present study we concluded that in comparison of muscle relaxant ether causes much more hyperglycaemia during general anaesthesia which is very highly significant rise. But in case of muscle relaxant the change in blood glucose level is just significant.

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