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THE EFFECT OF ANESTHESIA IN HEMATOLOGICAL PARAMETERS IN PATIENT WITH BONE FRACTURE SURGERY

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ABSTRACT The ideal i.v. anesthetic agent has a rapid onset of action and is quickly cleared from the bloodstream and CNS, facilitating control of the anesthetic state (e.g., allowing titration of effect). The ideal agent also protects vital tissues, has other desirable pharmacologic effects (e.g., an antiemetic effect), does not affect the circulatory system or cause other adverse effects, and is inexpensive. Therefore, the periodic testing of various types of anesthetics in hematological parameters have been applied for safety in multiple concentrations and doses. The study has been surfed the effect of anesthetics in hematological parameter (Hb %, sugar, and uric acid) in 11 patients, whom attained orthopedics department in Al-Nasereah hospital. The results showed a significant decrease in hemoglobin amount after the surgery for the 11 patients. Virtually, the time of blood collecting was after the recovery. It is insignificant differences between the means of the blood glucose level before and after the surgery at ($P \leq 0.05$). It is insignificant differences between the means of the blood urea levels before and after the surgery $p \leq 0.05$. Metabolic function was assessed by measuring the concentrations of blood urea and sugar. At different levels of anesthetics in relation to time-before and after surgery- non significant differences among patients were observed in current study. There was decrease in values of hemoglobin and change was significant. It was may be due to the higher tendency of these anesthetics to conjugate to blood proteins, and the hemoglobin is one of these proteins which were affected. Most of the anesthetics were free radical generators which were effected the proteins concentration in blood especially the Hb as the main mediator of transport.

KEYWORDS :

Introduction

Anesthesia is the procedure where the patient feel complete unconscious during the surgery. It is occurring by using different types of substances, called agents. There are many kinds of drugs have been used in surgery, such as sedative materials, anesthetics and recovery materials (antagonizes) [1]. General anaesthesia (GA) is a reversible medical procedure that is commonly induced by the administration of a combination of anaesthetic agents (AAs) to induce amnesia, sedation, hypnosis (loss of consciousness) and immobility in patients.

Intravenous (i.v.) anesthetics include etomidate, midazolam, propofol, thiopental, ketamine, and opioid agonists [2]. The first four agents act by enhancing the activity of the inhibitory neurotransmitter γ-aminobutyric acid (GABA) in the CNS. Ketamine antagonizes the effect of the excitatory neurotransmitter *N*-methyl-D-aspartate (NMDA) on NMDA receptors, and opioid agonists stimulate opioid receptors [3]

The ideal i.v. anesthetic agent has a rapid onset of action and is quickly cleared from the bloodstream and CNS, facilitating control of the anesthetic state (e.g., allowing titration of effect). The ideal agent also protects vital tissues, has other desirable pharmacologic effects (e.g., an antiemetic effect), does not affect the circulatory system or cause other adverse effects, and is inexpensive. Therefore, the periodic testing of various types of anesthetics in hematological parameters have been applied for safety in multiple concentrations and doses [4].

The main target of anesthetics is the nervous system and its participant's functions with other tissues. The hematological parameters of the blood as a mediator to transport these substances to CNS, is also target by changing its characteristics. The anesthetics effects are throughout the respiratory centers, which lead to change the gaseous concentration of blood, increase of blood clotting, and even elevate the RBCs count. It is decrease the kidney excretion rate, which lead to increase in blood urea concentration. It is decrease the body temperature which leads to inhibit the enzyme activity [2].

Chronic use of morphine to relieve pain can cause patients to develop resistance to the drug, requiring progressively higher doses of pain relief. This Acquired tolerance is different from addiction, which refers to a psychological craving. Psychological addiction rarely occurs when morphine is used to treat chronic pain, provided the patient does not have a history of drug abuse. Despite intensive study, relatively little is known about the brain mechanisms that cause tolerance and dependence. Beta-arrestin-2 block tolerance but has no effect on dependence. B –Arrestin-2 is a member of family of proteins that inhibit heterotrimeric G proteins by phosphorylating them. Acupuncture at a location distant from the site of a pain may act by releasing endorphins. Acupuncture at the site of the pain appears to act primarily in the same way as touching or shocking (gate control mechanism). A component of stress induced analgesia appears to be mediated by endogenous opioids, because in experimental animals some forms of stress induced analgesia are prevented by naloxone, a morphine antagonist. However, other forms are unaffected and so other components are also involved [5].

In order to evaluate the effects of anesthesia substances (Pithdin, Atrophin, Morphine, halothane, propofol, sexomethanium chloride, tricerium, prostegmen) in hematological parameters (Hb%, sugar concentration, and blood urea), it has been conducted an experiments by collecting a blood samples before and after the surgery. The statistical differences between the concentrations of blood parameters before and after the surgery is meaning the effect of anesthesia.

Materials and methods

Blood collecting and sampling

A total of11 blood samples were collected during the period from December 2013 to April 2014 in the orthopedics department of Al-Nasereah hospital. Blood was collected with the 5cc syringe, collecting the blood in containers containing EDTA-K_3 to a total volume of 4.5 ml [6].

Hemoglobin determination methods (HB %)

Methods for hemoglobin determination are many and varied. The most widely used automated method is the cyanmethemoglobin method**.** To perform this method, blood is mixed with Drabkin's solution, a solution that contains ferricyanide and cyanide. The ferricyanide oxidizes the iron in the hemoglobin, thereby changing hemoglobin to methemoglobin. Methemoglobin then unites with the cyanide to form cyanmethemoglobin. Cyanmethemoglobin produces a color which is measured in a colorimeter, spectrophotometer, or automated instrument. The color relates to the concentration of hemoglobin in the blood. Place 5 ml of Drabkin`s solution in test tube. Gets 0.02 ml of whole blood using Sahli pipette. Rinse the blood into Drabkin`s solution. Mix and let it stand for 10 min. Then read in a spectrophotometer at 540nm. Prepare a graph of the standard solutions and determine the concentration of each unknown. The normal values for hemoglobin determinations are 12.5- 15 g/dl in woman, while 14-17g/dl in man [7].

Glucose measurement

In principle, simple sugars, oligosaccharide, polysaccharide, and their derivatives, including the methyl ethers with free or potentially free reducing groups, give an orange-yellow color when treated with phenol and concentrated sulfuric acid. The reaction is sensitive and the color is stable. By use of this phenol-sulfuric acid reaction, a method has been developed to determine submicro amounts of sugars and related substances. In conjugation with paper partition chromatography the method is useful for determination of the composition of polysaccharide and their methyl derivatives. It has

been well known developed apparatus (blood glucose monitoring type One Touch Ultra2), depending on this principle. Clinically, put one drop of blood in a strip in the apparatus. Read the sugar value. The normal value is equal to or greater than 160-180 mg/dl (10.0 mmol/L) [8].

Urea level determination

Urea is the end product of protein nitrogen metabolism and is the primary vehicle for removing toxic ammonia from the body. Urea is synthesized in the liver from the ammonia produced from the catabolism of amino acids via the hepatic urea cycle. The conversion from ammonia to urea is regulated by N-acetylglutamate, which activates carbamoyl phosphate synthetase in the urea cycle. Urea Assay Kit provides a rapid, simple, sensitive, and reliable for measurement of Urea level in a variety of samples such as serum, plasma, and urine. In the assay, Urea reacts as substrate with compounds in the presence of enzymes to form a product that reacts with the probe to generate color (ODmax=570nm). The optical density of produced color is directly proportional to the concentration of urea in the solution. The kit can detect as low as 0.5 nmol per well or 10 µM of Urea. The assay is also suitable for high throughput studies. The normal urea level are between 20-40 mg/dl [9,10,11]**.**

The results

The results revealed significant differences between the means of Hb% before and after the surgery at (P≤ 0.05). There is a significant decrease in hemoglobin amount after the surgery for the 11 patients (Fig.1). Virtually, the time of blood collecting was after the complete consciousness; it is not during the operations. The anesthetics effects in sugar values, the results revealed insignificant differences between the means of the blood glucose levels before and after the surgery (P≤ 0.05) (Fig.2.). It is insignificant differences between the means of the blood urea levels before and after the surgery p≤0.05 (Fig.3).

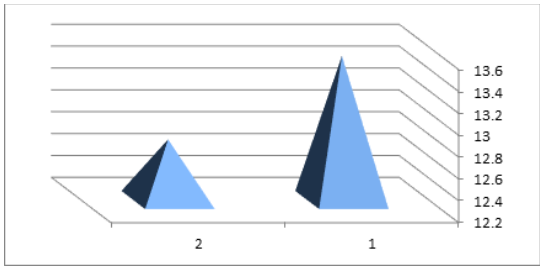

Fig.1.There is a significant differences between the average values of (11) patients hemoglobin 1: before surgery, 2: after surgery, using Fisher test (P≤0.05).

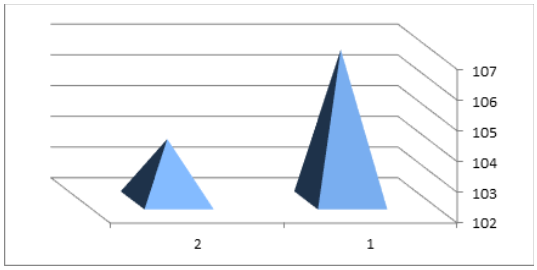

Fig.2. There is insignificant differences between the average values of (11) patients sugar values 1: before surgery, 2: after surgery, using Fisher test (P≤0.05).

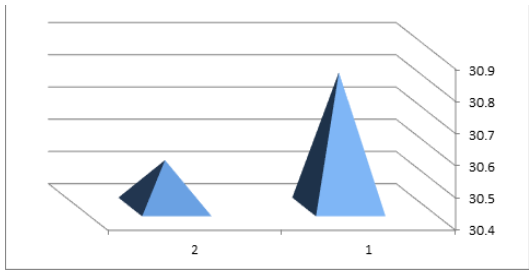

Fig.3. There is slightly differences between the average values of (11) patients urea levels 1: before surgery, 2: after surgery, using Fisher test (P≤0.05)

Discussion

Efficacy of anesthetic was assessed on the basis of physiological and hematological parameters before and after the surgery. In accord slightly non significant lower temperatures were observed. Bradycardia was less pronounced. Overall gradual decrease in the respiratory rate was observed in the current study, which may due to decreased oxygen requirement of body owing to fall in muscular activity. Similar findings have been presented previously by Lagerweij [12], Hammond and England [13].

Metabolic function was assessed by measuring the concentrations of blood urea and sugar. At different levels of anesthetics in relation to time-before and after surgery- non significant differences among patients were observed in current study. Slight decrease in serum urea level was not in agreement with Innes and Nickerson [14]. Anesthetics have diuretic effect due to activation of renal blood volume pressure control system [15]. This may be due to decrease in anti-diuretic hormone.

There was decrease in values of hemoglobin and change was significant. The same picture about decrease of hemoglobin. PCV and Hb decrease during the anesthesia period was due to shifting of fluid from extravascular to intravascular compartment to maintain normal cardiac output [16]. It was may be due to the higher tendency of these anesthetics to conjugate to blood proteins, and the hemoglobin is one of these proteins which were affected. Most of the anesthetics were free radical generators which were effected the proteins concentration in blood especially the Hb as the main mediator of transport [17].

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