STUDY REGARDING THE CHANGES IN SOME HEPATIC PARAMETERS DURING GENERAL ANESTHESIA IN A GROUP OF DOGS

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Abstract

The main organ involved in the biotransformation of the anesthetic drugs used for general anesthesia is the liver. Drugs will be at this level transformed into more easily excreted substances known as metabolites.The evaluation of the hepatic function before general anesthesia is essential for a safe and individualized protocol.Comprehensive understanding of the anesthetic drugs and their effects on hepatic functions during anesthesia remains fundamental.Techniques and protocols used for anesthesia and intensive care in the recovery phase will be designed taking into account the trend of the hepatic parameters.This study will focus on how the general anesthesia influences hepatic parameters measured before premedication and in the early recovery phase: alanine aminotransferase (ALT), alkaline phosphatase (ALP),total proteins (TP) and albumin (ALB). Following the result of the study,we discovered that ALP increased with 11% and ALT decresed with 12% after general anesthesia in comparison with the value before premedication.

Key words:general anesthesia,liver,biotransformation

INTRODUCTION

This study will present the changes that appear on some hepatic parameters during general anesthesia in a group of dogs.The liver is the central organ involved in the metabolism of the anesthetic drugs.The blood that arrives from the gastrointestinal tract is full of proteins,carbohydrates,fats and other exogenous particles(drugs,bacteria).From the total cardiac output,25-30%flows through the liver via dual blood supply: the hepatic artery and the portal vein (Grimm, K. A. *et al*, 2015).

Liver has multiple functions,among which the biotransformation of anesthetic drugs is the most important.The hepatic parameters that will be taken into consideration in this study are: alanine aminotransferase (ALT), alkaline phosphatase (ALP),total proteins (TP) and albumin (ALB).

TP is a biochemical test for measuring the amount of proteins in the blood plasma.They are mainly produced by the liver and they have multiple functions,including transport of lipids, vitamins, hormones and minerals.Some blood proteins have different functions and can act as enzymes or protease inhibitors.Here we can list just a few types of proteins: albumins, globulins or fibrinogen.

ALB is the main total protein and accounts around 55%of it..It has a major contribution on maintaining the oncotic pressure of plasma and acts as a major carrier for insoluble molecules.The majority of anesthetic drugs has insoluble molecules,so the level of ALB needs to be within normal range.

ALT is a hepatic enzyme and is found mainly in the hepatocytes and in a small quantity in other organs(kidney,skeletal muscles).Elevation in ALT occure secondary to leakage from the hepatocytes after the damage of the hepatocyte membrane.(Ettinger S, *et al, 2017*).ALP is a membrane bound glycoprotein that hydrolyzes phosphate esters.In dogs and cats it is produced by the liver,renal cortices,intestine and placenta.(Nelson R, Couto C, 2019).

For the blood tests we used the veterinary biochemical analisator SMT-120V.The operating system is based on the spectrometry tehnique.The sample used for this machine can be serum,plasma or blood and it needs to be collected in lithium heparin tubs.

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Fig 1.Biochemical lab analisator SMT-120V

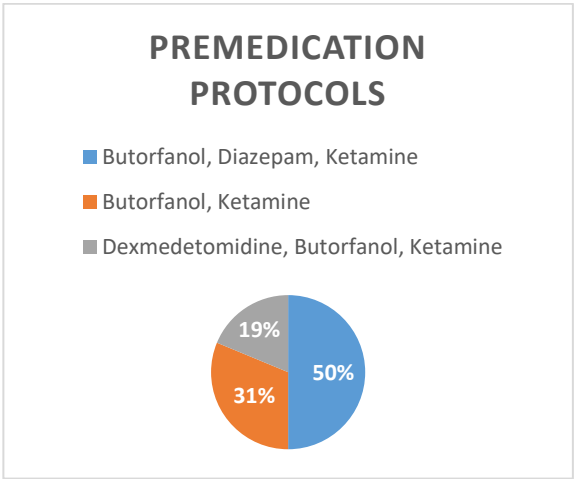

Fig 2.Premedication protocols used in the study group

MATERIALS AND METODS

This article represents a clinical study conducted on 16 canine patients,with age between 1 and 12 years old.The study was conducted by The Veterinary Medicine Faculty Bucharest and will describe how hepatic parameters change before and after general anesthesia.A preanesthetic exam was performed for each patient,including blood tests and full cardiac exam.Based on this results,the patient was assigned an ASA status(American Society of Anesthesiology).We selected the patients that were included in II-III ASA score. Patients underwent different types of surgeries,including ophtalmological surgeries (cataract and intrasclerotic prosthesis) and urogenitalsurgeries (ovariohysterectomy, cystotomy or perineal hernia). Depending on the procedure type ,the time the animal spent under anesthesia was different.For example,the opthalmological procedures were shorter and did not require a very deep anesthesia plan compared with the urogenital ones.

Depending on surgery types and the expected pain level,we used multiple anesthetic protocols..All of them included Propofol (2-5 mg/kg,IV) for induction, intubation and maintenance with Isoflurane in 100%oxygen.Ringer solution was administrated throughout all the surgery,on a rate of 3-5 ml/kg/h.

Based on the premedication,we can divide the study group into 3 categories:first group was premedicated with Butorfanol (0.2 mg/kg),Diazepam (0.2 mg/kg)and Ketamine (2 mg/kg), second group with Butorfanol (0.2 mg/kg) and Ketamine (2 mg/kg) and the thrid group with Dexmedetomidine (2mcg/kg), Butorfanol (0.3 mg/kg)and Ketamine(2 mg/kg), as presented in Fig 2.

The patients of this study were also divided into 2 groups based on their age:first group includes patients with age from 1 up to 6 years old and the second one patients from 7 to 12.

For the purpose of this study,the before and after biochemical tests were taken on the same lab device for better results comparison..The parameters that we took into account for this study are ALT,ALP,TP,ALB.

RESULTS AND DISSCUTIONS

The results suggested an increase with 11%in the ALP value,respectively 19%in ALB value and a decrease with 12%in ALT value,respectively 2%in TP value within the hole group of dogs.

For the group age 1 to 6 years old,we noticed an increase with 33.04%in ALP value,respectively 25.43%in ALB value and a decrease with 30.03%in ALT value,respectively 4.82%in TP values.

In dogs with age between 7 and 12 years old,we noticed only an increase values compared with the values obtained before premedication: 6.66%in ALP, 7.71%in ALT, 12.65 in ALB value and 0.38%in TP value.All this values can also be found in the table Fig.3.

As seen in the study,all the parameters in the age group 7 to 12 years increased.This can be explained by the age and the fact that the liver has reduced metabolic functions.On the other hand,in the 1 to 6 years old group,there was a significant increase in the ALP values,respectively a decrease in ALT values.

In human medicine, serum liver enzymes have a significantly increase during the first 48 hours after laparoscopic cholecystectomy and laparoscopic colorecal cancer resection (Tan, M.*et al*, 2003). Also, other studies showed that both total

intravenous anesthesia as well as inhalatory anesthesia are useful and can be used for patients that have elevated liver enzymes values.Both types of anesthesia may determine a transitory elevation in the liver enzymes,but this will not severely affect the liver function (Oh S. *et al*, 2020)

CONCLUSSIONS

In conclusion,there are differences in the hepatic parameters that were taken into account for this study(ALT,ALP,TP,ALB).The parameters were measured before premedication and in the early recovery phase.This modifications can be associated with the age of the patient,the type of the surgery and the duration of the anesthesia. Further studies will be continued in order to test bigger groups on different protocols.

Date from the hole study group				
Row Labels	**Average of ALP(U/L)**	**Average of ALT(U/L)**	**Average of ALB(g/dl)**	**Average of TP(g/dl)**
After	183.08125	72.75	2.98125	6.63125
Before	203.6875	64.36875	3.54375	6.48125
Difference	**11%**	**-12%**	**19%**	**-2%**

dogs with age between 1-6 years				
Row Labels	**Average of ALP(U/L)**	**Average of ALT(U/L)**	**Average of ALB(g/dl)**	**Average of TP(g/dl)**
After	63.75	74.125	2.9	6.7375
Before	84.8125	51.8625	3.6375	6.4125
Difference	**33.04%**	**-30.03%**	**25.43%**	**-4.82%**

dogs with age between 7 and 12 years				
Row Labels	**Average of ALP(U/L)**	**Average of ALT(U/L)**	**Average of ALB(g/dl)**	**Average of TP(g/dl)**
After	302.4125	71.375	3.0625	6.525
Before	322.5625	76.875	3.45	6.55
Difference	**6.66%**	**7.71%**	**12.65%**	**0.38%**

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