

ANESTHETIC TECHNIQUE FOR LIVER TRANSPLANTATION IN PIGS. ¹

TÉCNICA ANESTÉSICA NO TRANSPLANTE DE FÍGADO EM SUINOS

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SUMMARY

Introduction: the interventionists procedures, as in the case of liver surgeries, needs anesthesia to provide ideal conditions for the patient. Among the animals utilized for experimentation, pigs are highlighted by their anatomical similarity to humans, being, therefore, a good animal to be studied. **Objective:** realize anesthesia in surgical procedures on medium-sized animals, mainly in pigs, due to easy performance and low cost. **Method:** for this study, fourteen pigs weighing between 8-12 kg were utilized. Sedation with the application of ketamine was carried out (10 mg/kg) associated with xylazine (1 mg/kg). Then, a catheterization of the internal jugular vein and internal carotid artery was realized. After this procedure, it was initiated the maintenance with the administration of fentanyl 3-5 µg/kg and ketamine 2-5mg/kg and followed this time with the installation of halothane and oxygen. **Conclusion:** the anesthetic technique proposed was easily carried out by trained professionals or students, enabling the realization of liver transplantations as well as other surgeries, demonstrating to be safety for the manipulator and the animal.

KEY WORDS: anesthesia, pigs, liver transplantation

INTRODUCTION

Among the animals utilized for experimentation, pigs are highlighted by their anatomical similarity to humans, referring to aspects related to dentistry, morphology, renal physiology, cardiovascular physiology and anatomy, and digestive physiology and anatomy.¹

In addition, Tumbleson² complements that pigs are usefuls for studies in biomedical researches, once it presents structure and function similarities to humans, including size, food pattern, digestive physiology, dietetic habits, structure and kidney functions, pulmonary vascular structure, distribution of the coronary artery, tendency for obesity, respiratory rate and

social behavior.^{2,3} These similarities are quite smaller in other animals of experimentation such as rats, mice, dogs and rabbits.⁴

According to ethical principles determined by COBEA (The Brazilian College of Animal Experimentation), all procedure that submits the animal to pain must be preceded by sedation, analgesia and/or adequate anesthesia appropriate to the specie and procedure.⁵

Therefore, procedures that have intervention, as in the case of liver surgeries,^{6,7} needs anesthesia to provide ideal conditions for the patient, like hypnosis, analgesia, muscular relaxation and neuron vegetative protection of perfusion and oxygenation of tissues, beyond providing a satisfactory quantity of energetic fluids that

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assist in metabolic demands.⁸

This way, the realization of anesthesia in medium-sized animals procedures, mainly in pigs, rescinds an anesthetic technique of easy performance and low cost.

METHODS

All animals of the present research were cared according to the current national legislation for animal vivisection (Federal law 11.714 on October 8th, 2008) and norms of the Brazilian College of Animal Experimentation (COBEA), and after the approval of the project by the Ethics Committee of the Center of Biological Sciences of Health at the Pará State University, by the Nucleus of Research and Medical Extension (NUPEM-UEPA) and the technician responsible for the Experimental Surgery Laboratory (LCE) at UEPA.

Sample

In the present study, fourteen female landrace were utilized, weighing between 8-12 kg, considering that they were previously adapted to the Experimental Surgery Laboratory at Pará State University for a period of 15 days. The animals were maintained in an environment where water and food were offered *ad libitum* during all study. The technique was developed during the realization of liver transplantations.

Procedures

Induction

The induction with an application of ketamine 10mg/kg, associated with xylazine 1 mg/kg intramuscularly in the gluteus region of the pig was started. The effect arose with whole intensity approximately 5 to 15 minutes after the injection. This procedure was still realized in the nursery.

Then, it was performed the cleaning of the animal and tricotomy of the whole abdominal and thoracic region spending not more than 5 minutes, because in case of long wait for the pig intubation, the death by

depression and the respiratory system arrest may occur. After the realization of the intubation or tracheotomy, the animal was connected to an artificial respirator. It was followed, then, with the vascular dissection and catheterization.

Maintenance

After this procedure, the maintenance with the administration of fentanyl 3-5 µg/kg lasting 25 minutes and ketamine 2-5mg/kg was started. The action of it initiated from 30 to 60 seconds after its administration and duration of 1 to 3 minutes.

Subsequently, the researchers continued this procedure with halothane associated to oxygen.

DISCUSSION

The anesthetic induction initiated still in the nursery of the pig, considering that bradycardia and respiratory depression caused by the use of xylazine is void by ketamine.^{9,10,11} With this association, we got the muscle relaxation and the induction of the animal, facilitating subsequent procedures, and they are used today in many studies to induce the animal.^{12,13,14}

In Prado Filho et al research⁹, realized with the canine specie, the anesthetic induction was carried out only with the mean dose of 10 mg/kg of xylazine and this was considered sufficient for a good induction. Probably, the metabolic response of the dog (utilized animal in the work by Prado Filho), is different from the pig (animal utilized in the present research), as with the pig the administration of other drug beyond xylazine becomes necessary. Otherwise it would be difficult to realize the following procedures.

In addition, the dose of xylazine in the research is superior to the dose realized in the present study. Thus, the non-utilization of other medicines during induction may be justified, however it is important to highlight that xylazine even in the dose advocated by the literature of 2mg/kg causes respiratory

depression and bradycardia.

Still in the induction, it becomes necessary the controlled mechanic respiratory support with the endotracheal intubation when possible, once the deepest glottis may difficult the procedure. When it is not possible, we realize tracheotomy in order to maintain saturation O₂ at 98% and prevent the respiratory arrest. The dissection and the catheterization were carried out in the internal jugular vein + left Premature Atrial Contraction and internal left carotid artery, for the administration of medicines and verification of mean arterial pressure, respectively.

In the research by Meletti and col.¹⁵, the endotracheal intubation was realized with mechanic controlled respiration, dissection and catheterization of the right and left femoral veins for the administration of drugs, as well as the left femoral artery for the measurement of the mean arterial pressure. In Prado Filho et al research, though, only the dissection of the cephalic vein was carried out with the same objective⁹.

Differences in relation to dissected and catheterized veins occur, probably, by the facility of their approaching (femoral and cephalic) in dogs, what does not occur in pigs, being the left internal jugular of easier access. This also is valid for the difference in the dissection and arterial catheterization what occurs in relation to the present study and by Meletti et al¹⁶.

The anesthetic maintenance was realized with a halothane, what was administrated with takaoka vaporizer together with oxygen. We perceived a good response from the pig to this anesthetic, once the maintenance of the anesthetic plan was satisfactorily realized.

According to Kallas et al (2001)¹⁷, the halothane presented a safe option for the anesthesia of rabbits, considering that in their study we perceived the maintenance of a depressed MAP, but without great repercussions to the animal. This fact was associated to the utilization of halothane since we know this has been a frequent finding in the utilization of this anesthetic.

According to the study by Oliva (2000)¹⁸ in dogs, sevoflurane associated with the nitrous oxide presented good results related to heart frequency and alterations biologically acceptable in arterial pressure values. This anesthetic is one of the best halogen, since it doesn't provoke important cardiovascular alterations. Nevertheless, we know that this is a nephrotoxic and hepatotoxic substance for rats¹⁹, not having been proved yet if the nephrotoxic fact extends to pigs, but it has been proved to not be hepatotoxic²⁰.

There was no evaluation on the anesthetic recuperation once this technique was developed for liver transplantations in pigs, considering that as the donor as the receptor were submitted to euthanasia at the end of the procedure. This occurs due to the fact that the study is still in the first stage, and we don't evaluate the animal survival.

CONCLUSION

Trained professionals or scholars easily carried out the proposed anesthesia technique, enabling the realization of liver transplantations, as well as other surgeries, and it has demonstrated to be safe for the manipulator and the animal.

RESUMO

TÉCNICA ANESTÉSICA PARA TRANSPLANTE DE FÍGADO EM SUÍNOS

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Introdução: os procedimentos que têm de intervenção, como no caso das cirurgias de fígado,

necessita de anestesia para manter o paciente em condições ideais. Entre os animais utilizados nas experiências, os porcos são destacados por sua similaridade anatômica para os seres humanos, sendo, portanto, um bom animal a ser estudado. **Objetivo:** a realização de anestesia em procedimentos em animais de médio porte, principalmente em suínos por desempenho fácil e de baixo custo. **Método:** para este estudo, 14 porcos com peso entre 8-12 kg foram utilizados. Sedação com a aplicação de cetamina foi realizada (10 mg / kg) associada com xilazina (1 mg / kg). Em seguida, um cateterismo de veia jugular interna e artéria carótida interna foi realizado. Após este procedimento, iniciou-se a manutenção com a administração de fentanil 2-5mg/kg 3-5 mg / kg e cetamina e seguiu-se desta vez com a instalação de halotano e oxigênio. **Conclusão:** a técnica anestésica proposta foi facilmente realizada por profissionais treinados ou estudantes, permitindo a realização de transplantes de fígado, assim como outras cirurgias, demonstrando ser de segurança para o manipulador e o animal.

DESCRITORES: anestesia, porcos, transplante de fígado

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