

Essential Fundamentals of Pre-Surgery Protocols for Conducting Successful Surgery, such as Cannulation in the Pig

Victor M. Ogbamgba¹, Ntinya C. Johnson¹ and James T. Mbachiantim²

¹Rivers State University, Port Harcourt, Department of Animal Science, Nigeria

²Federal University of Agriculture, Makurdi, Department of Nutrition and Dietetics, Nigeria

Abstract. The key to successful surgery begins with good pre-surgery preparations. The anatomy of the pig is quite similar to that of humans. Therefore, the pig model has become the animal model for biomedical research. Thus a sound knowledge of the pig model may be used to improve human surgeries as it relates to human anatomy. To this point therefore, the pre-surgery procedure in the pig is very similar to that of humans. In the pre-surgery preparations, all chemicals, drugs, gowns, all instruments and equipment required must be seen to be in readiness conditions before embarking on the surgery plan as to avoid putting the animal in risks. Candidates for surgery must first be fasted as to ease the handling of the animal tissues. Overall, the final steps prior to surgery is the checklist, including the personnel to be involved in the surgery. In this paper, areas that require coverage in the pre-surgery preparations are fully covered to better guide in the successful surgery operations, such as cannulation of the pig used in biomedical research.

Key words: Pre-surgery preparations, Biomedical research, Checklist and the Pig

Introduction

The pig model is usually used as the animal model for biomedical research principally because of the anatomical and physiological similarities between the pig and humans (Pond & Mersmann, 2000; Yen, 2000). For recovery animal surgery, be it intra-gastric catheterization or inserting of ileal-cannula for conducting biomedical research, there are basic pre-surgical preparations if such surgery is going to be successful. In every animal surgery, three stages are involved, namely: pre-surgical preparations, the surgery itself and post-surgical care (CCAC, 1993). These stages are critical and fundamentally essential in achieving a successful surgery and the experimental goal for which the surgery-animals are intended for.

This is very important in that data obtained from such studies are often useful in promoting quality of lives, including those of humans as previously alluded to based on the almost complete anatomical and physiological similarities between the species (Yen, 2000). This positions the essential pre-surgery preparations for a successful surgery. This paper is intended to critically examine the intricacies and step by step procedural pre-surgery preparations, using the pig as the animal model because of its importance in biomedical research (Pond & Mersmann, 2000).

Surgical Instruments

Proper pre-surgery preparations are the very fundamental keys to successful surgeries. Therefore, in preparing to conduct recovery animal surgery all chemicals, drugs, gowns, all instruments and equipment required for the surgery must be acquired in enough quantities in advance and the equipment must also be in a good working conditions to avoid putting the animal at risk and pain during surgery (Kuhlman et al., 2008). If these conditions are not properly maintained it can lead to biasing of data results. Furthermore, the gowns to be used must be in their sanitized states and professionally folded and the instruments must also all be in sanitized conditions before autoclaving for those that require autoclaving to ensure non-infection of animal during surgery (Fitzgerald, 1979).

Personnel

Closely related to instruments is the fact that the numbers of personnel (number of persons) who are going to be involved in the surgery must be decided and thus known prior to conducting the surgery as well as their responsibilities based on their professional knowledge and experience to avoid delaying the surgery process which has a great potential of exposing the animal to risk (Schofield, 1994).

Animals' Surgery Environment

Animals earmarked for surgery should be conditioned in their facility for at least 5-7 days prior to undergoing survival surgery (Swindle, 2007). The animals need to be familiar with their environments during recovery. In this way, allowing them to be familiar with their environments prior to surgery removes the stress of adjusting to their environments during recovery (Swindle, 2007).

Assessment of Animals for Surgery

Usually, this include observing the feed intake level of the animal, voluntary activities and symptoms of ill-health such as diarrhea. If there are symptoms of sickness, rectal temperature is usually taken and the attention of the veterinarian is called in for consultation. Therefore, the animals must be in a good state of health to minimize complications during and after surgery (Swindle, 2007). This factor is very important because only healthy animals can qualify as anesthetic candidates. Therefore, any animal undergoing clinical or subclinical disease often experience anesthetic complications and thus are not good candidates for a successful surgical procedure. However, if a disease has been induced as part of the research protocol prior to surgical procedure, it is critical to understand that disease process and how it will affect anesthesia and surgery (Swindle, 2007).

Fasting

When all of the above are ascertained, surgery animals are then fasted prior to surgery by removing solid food but not water to prevent dehydration. Pigs are known to have rapid intestinal transport times in the upper gastrointestinal tract and few hours to empty the stomach; 6 to 8 hours fasting usually suffice for most surgical operations (Swindle, 2007; NRC, 2012). However, fasting is traditionally done by withdrawing food from the animals on the afternoon of the day preceding the surgery day. Fasting prior to surgery reduces the risks associated with bloating, choking, reflux and also ensures a smoother recovery (Swindle, 2007; NRC, 2012).

Surgery Time

Surgeries are better conducted in the morning. Therefore, the morning following fasting is most preferred for surgery because the tissues could be better handled and secondly it will allow available time for observations of the animal as it recovers. To support this point further for instance, Friday afternoon (P. M.) would not be an appropriate time to begin a surgery as there will be limited staff to assist with problems that may arise and post-surgical monitoring will be required during the weekend. This is capable of complicating post-surgery matters following the surgery (Schofield, 1994).

Medications

Surgery candidates must be given their needed pre-anesthetic medications; such as pre-mix to ease their anesthetic process (National Research Council, 2011). This is achieved by first weighing the animal to enable calculating drug dosages and to insure that a baseline weight is known should the animals develop complications post-operatively (National Research Council, 2011). For examples swine pre-mix (containing ketamine 50 mg, xylazine 10 mg and

butorphanol 1 mg per ml of the premix solution) should be given at a dose of 0.2 ml/body weight for pigs more than 15 kg becomes handy as a pre-anesthetic drug and tranquilizer azaperone should be injected for pigs with body weights less than 15 kg and allowed in a quiet area for about 15 minutes prior to masking for inducing anesthesia, respectively. However, with very young piglets stresnil is usually used but also based on weights to sedate the animals. These medications are important because they reduce fear and aid in stress-free induction of anesthesia, reduce the amount of other anesthesia agents, assist in smoother recovery from anesthesia, reduce salivary and bronchial secretions; block the vaso-vagal reflex associated with intubation and surgery, reduce pre-operative and immediate post-operative pain and distress (National Research Council, 2011).

Surgery Area

The surgery area must be very cleaned, well-sanitized to avoid or prevent surgical asepsis, minimized to laboratory traffic not related to the surgery and must also be free from contamination such as open windows and fans which can blow dust into the area (Fitzgerald, 1979).

Conclusions

Pre-surgical preparations primarily concern with knowing exactly what instruments and supplies that are required for the surgery to be performed. Furthermore, due to extreme importance of avoiding and preventing stress and ensuring the welfare of the animal good pre-planning is very fundamental to the success of a surgery. Therefore, it is after the checklist to good pre-surgical preparations summarized below is confirmed that the animals for surgery can be fasted in readiness for surgery. The checklist includes the followings:

1. Read and understand the procedures as described in the protocol
2. Ensure that all instruments, implants and substances to be used during surgery are sterilized using the standard operating procedure to avoid surgical asepsis.
3. Ensure that all necessary equipment, drugs and other supplies are on hand before anesthetizing the animal.
4. Ensure that those persons performing surgery are familiar with the anatomy and physiology of the animal. This goes a long way in determining the best surgical approach and promote a speedy recovery.

References

- CCAC. (1993). *Canadian Council on Animal Care Guide. Guide to the care and use of experimental animals* (Vol. 1, 2nd ed.). CCAC Ottawa, ON.
- Fitzgerald, R. H. (1979). Microbiologic Environment of the Conventional Operating Room. *Arch. Surg.*, 114, 772-775.
- Kuhlman, S. M., Flegal, M. C., Fox, L. K., & Murphy, M. H. (2008). Notes from the Academy of Surgical Research Pages: Principles of anesthesia monitoring. *J. Investigative Surg.*, 2(3), 161-162.
- National Research Council. (2011). *Guide for care and use of laboratory animals* (8th ed.). Natl. Acad. Press, Washington, DC.
- NRC. (2012). *Nutrient Requirements of Swine* (11th ed.). Natl. Acad. Press, Washington, DC.
- Pond, G. W. & Mersmann, H. J. (2000). *Biology of the Domestic Pig*. Cornell University Press, Ithaca, New York.
- Schofield, J. C. (1994). Principles of aseptic technique. In *Essentials for Animals Research; A Primer for Research Personnel* (pp. 59-77). Washington DC. Natural Agricultural Library.

- Swindle, M. M. (2007). Anesthesia, Analgesia and Perioperative Care. In *Swine in the laboratory* (2nd ed., pp. 35-79). Surgery, Anesthesia, Imaging and Experimental Techniques. Illustrator, Richard Hughes, CRC Press.
- Yen, J. T. (2000). Digestive system. In W. G. Pond & H. J. Mersmann (Eds.), *Biology of the Domestic Pig* (Chap. 8). Cornell University Press, Ithaca, NY.