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Analgesia and anesthesia in camelids☆

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Abstract

South American camelids, alpacas and llamas, are increasing in popularity. As a result, veterinarians in North American and European countries are treating increasing numbers of these species in their practices. This article reviews some of the common anesthetic and analgesic practices used in camelids.

Keywords: Anesthesia; Camelids; Analgesia; Tranquilizer; Monitoring

1. Introduction

South American camelids, alpacas and llamas, are increasing in popularity. As a result, veterinarians are also treating increasing numbers of these species in their practices. Many of the principles of veterinary anesthesia, which are applied to other species will also apply to these animals. However, knowledge and understanding of characteristics peculiar to these species will increase our ability to safely manage them under anesthesia and therefore enable veterinarians to perform surgical procedures and pain management adequately. This article reviews some common anesthetic practices used in camelids.

2. Handling

Manipulation can be difficult due to the unruly nature of these animals. A halter is used for restraint and it is best to handle the animal by the neck and dorsum. Standing beside the animal helps to prevent spits, bites and strikes to the handler. A towel covering the mouth may also be effective.

Intramuscular injections can be given at sites with good blood supply, such as the quadriceps, triceps or lumbar epaxial muscles. Venous catheterization is a great tool for induction of anesthesia, as well as for fluid and antibiotic administration during surgeries.

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The cephalic vein can be catheterized in young animals, but is more difficult in adults due to the thickness of the skin. In the latter, the jugular vein is a more ideal site for venous access.

3. Anatomical and physiological considerations

Due to presence of the esophagus medial to the left internal jugular vein, venipuncture and catheterization of the right jugular is preferred over the left. Inadvertent arterial puncture is a potential complication due to the proximity of internal jugular veins to the common carotid arteries. Carotid penetration is indicated by the high pressure and bright red blood color. Digital pressure should be applied for few minutes to prevent hematoma formation. In addition, a jugular furrow is rarely visualized in the thick adult skin, so palpation for engorgement can help to locate the vein. The middle third of the neck is the most successful site for placement.

Asepsis before catheterization is necessary, and subcutaneous administration of a small amount of local anesthetic at the puncture site is desirable. Pricking the skin with a blade or needle of greater diameter is recommended, facilitating catheter introduction without damaging the delicate catheter tip.

During anesthesia of camelids, as in ruminants, saliva or stomach contents can be aspirated at induction or while intubating the trachea. An insufficient depth of anesthesia when endotracheal intubation is performed will likely cause the animal to regurgitate. Further, the rumen and other viscera can displace the diaphragm cranially, reducing lung capacity, especially in the presence of tympany. Animals should be fasted 12–18 h and deprived of water for 8–12 h before anesthesia, decreasing the amount of fermentable ingesta and liquid in the rumen (Riebold et al., 1989). However, fasting neonates is not advised because hypoglycemia may occur.

In camelids, endotracheal intubation is crucial to prevent aspiration of stomach contents and to provide the anesthetist with better control of patient ventilation. Pre-operative evaluation of blood chemistry and hematology values is indicated. The laboratory results can be compared to reference values (Riebold et al., 1989; Table 1).

Table 1
Normal values for blood chemistry and hematology in llamas

Normal values	Mean ± S.D.
Blood chemistry	
Albumin (g/dl)	3.6 ± 0.6
Alkaline phosphatase (IU/l)	38.6 ± 23.3
AST (IU/l)	113.2 ± 41.6
Bilirubin (mg/dl)	0.2 ± 0.2
BUN (mg/dl)	29.0 ± 6.1
Calcium (mg/dl)	9.0 ± 0.7
Chloride (mEq/l)	115.9 ± 4.8
CK (IU/l)	81.8 ± 110.0
Creatinine (mg/dl)	2.5 ± 0.5
GGT (IU/l)	19.8 ± 4.8
Glucose (mg/dl)	134.2 ± 36.0
Magnesium (mEq/l)	1.9 ± 0.3
Phosphorus (mg/dl)	5.8 ± 2.2
Potassium (mEq/l)	3.8 ± 0.9
Total protein (g/dl)	5.9 ± 0.5
Sodium (mEq/l)	149.4 ± 5.4
Hematology	
Hemoglobin (g/dl)	15.3 ± 1.7
Hematocrit (%)	34.0 ± 4
Erythrocytes ($\times 10^6$cells/mm^3)	10.88 ± 1.1
Leukocytes ($\times 10^3$cells/mm^3)	15.0 ± 5.0
Plasma protein (g/dl)	6.5 ± 0.4
Fibrinogen (mg/dl)	300.0 ± 114.0

S.D., standard deviation.

4. Tranquilizers

There are a large number of possible drug combinations, which can be administered to camelids in order to provide sedation and analgesia. Alpha-2 agonists and opioids are the most common premedicants used in camelids. Xylazine is the α_2-agonist most commonly used in alpacas and llamas (0.1–0.66 mg/kg, i.v. or 0.25–0.9 mg/kg, i.m.) (Riebold et al., 1989). In Bactrian camels sedated with xylazine, regurgitation of the rumen contents and ruminal tympany are uncommon and recovery is usually achieved without excitement or struggle (Custer et al., 1977). Sedation is dose-dependent and recumbency can be achieved with higher doses. In camelids, doses of 0.1–0.2 mg/kg (i.v.) will provide sedation without recumbency (Heath, 1989; Riebold, 1996), while intravenous doses of 0.3–0.6 mg/kg will produce 30–45 min of recumbency in llamas (Riebold et al., 1989). Alpacas seem to be less sensitive to xylazine than llamas; therefore higher doses may be necessary to provide desirable