Field Sedation and Anesthesia of Ruminants

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KEYWORDS

• Bovine • Cattle • Ruminants • Field anesthesia • Sedation

KEY POINTS

- The general principles of anesthesia and monitoring should be applied to ruminants.
- Any change in the respiratory rate or tidal volume, subsequent to heavy sedation or general anesthesia, has a significant impact on respiratory function.
- Depending on the purpose of chemical restraint, different protocols and drug doses may be used; it is generally accepted that drug combinations are more effective for sedation and analgesia than any single drug.

INTRODUCTION

Dairy cows are generally tranquil and used to being handled; thus, many procedures can be performed using mild physical restraint with the aid of local or regional anesthesia while the animal is standing. This is fortunate, as recumbency and general anesthesia of ruminants have inherent risks. On the other hand, beef cattle are infrequently handled, and thus require more substantial forms of physical restraint and are more likely to require sedation. Additionally, beef cattle usually require larger doses of sedating and anesthetic drugs than do dairy cattle.

If recumbency is necessary for completion of a procedure, sedation can, in some cases, be used in association with a casting rope to induce recumbency. Surgical anesthesia is best performed with an endotracheal tube in place to protect the airway, but this may not always be feasible under field conditions.

Small ruminants, in contrast, are easier to handle, and many commonly performed procedures, such as cesarean section, can be done under local anesthesia, using mild physical restraint with the animal in lateral recumbency, and often without the need for sedation. Nevertheless, sedation has been shown to decrease the stress response and would be expected to improve the animal's comfort in some instances.

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CONSIDERATIONS FOR ANESTHESIA OF RUMINANTS

Sedatives and general anesthetics adversely alter cardiovascular and respiratory function; therefore, to improve patient safety, the general principles of anesthesia and monitoring should be applied to ruminants. In addition, ruminants have some unique features that distinguish them from monogastrics, and these must be considered in order to successfully manage the animal during the course of sedation and anesthesia.

Fasting

In adult cattle undergoing elective procedures, feed should be withheld for 24 to 48 hours, and water for 12 to 18 hours, depending on the size of the animal and the procedure to be performed. Small ruminants are generally not fasted longer than 24 hours, and water is not withheld for more than 12 hours. Excessive fasting should be avoided, as it may result in a change in ruminal flora and predispose the animal to ketosis.[1] In addition to decreasing the likelihood of regurgitation, fasting, by decreasing the mass of the ruminal contents, will ameliorate the effects of compression by the rumen on respiratory and cardiovascular function in the recumbent animal. Young ruminants on a milk diet are subject to developing hypoglycemia during episodes of fasting and anesthesia, as are all young animals; thus, they are not usually fasted. Additionally, it is prudent to periodically measure blood glucose in young animals under general anesthesia or, if that is not feasible, intravenous fluids should be supplemented with dextrose during the perioperative period. Older animals transitioning to solid feed are at a lower risk of developing hypoglycemia, and thus can be fasted for short periods.

Ruminal Tympany and Regurgitation

The volume of the rumen in the adult bovine can be up to 600 L, and because the rumen cannot be emptied by fasting prior to surgery, there is always a risk of bloating and regurgitation of ruminal contents. Distension of the rumen from gas accumulation and the loss of esophageal sphincter tone during a deep plane of anesthesia[2] can result in regurgitation of ruminal contents into the oropharynx.

Large volumes of gas, primarily carbon dioxide and methane, are produced in the rumen, and in the conscious animal, these gases are actively vented by eructation.[3] However, under general anesthesia or heavy sedation, ruminoreticular motility and eructation are reduced or absent, and this can result in accumulation of these gases, leading to ruminal tympany. Ruminal tympany also compounds drug-induced respiratory and cardiovascular compromise by compressing the lungs and vena cava, respectively (see further discussion in the cardiovascular section). Tympany usually resolves when the animal is placed in sternal recumbency during recovery from anesthesia.

Saliva Production

The volume of saliva produced in ruminants is considerable, and volumes up to 16 and 160 L/d have been reported for sheep and cattle, respectively.[3] The volume of saliva produced during anesthesia does not differ from the conscious state,[4] but due to the inability of the animal to swallow, it appears to be greater. In any case, this copious volume of salvia can cause obstruction of the unprotected airway. Anticholinergics, such as atropine and glycopyrrolate, are not used by the authors to decrease saliva production, because large doses of these drugs are necessary to achieve a decrease,