Anaesthesia, analgesia, restraint and sedation – how to deal with alpacas

Author: NIGEL DOUGHERTY

Categories: Vets

Date: February 25, 2008

NIGEL DOUGHERTY reveals that if you can deal with small animals, alpacas should not present too much trouble

INDIVIDUAL alpacas (or other South American camelids – SACs) may have substantial sale value. As a result, for their medical, surgical or reproductive management, owners of alpacas will often consider the application of gold-standard veterinary care to be warranted. Added to this, alpacas – particularly wethers – are often kept as much-loved family pets. Even in a commercially orientated setting, owners have strong associational attachments with individual animals (Figure 1).

As with any species, familiarity with a repertoire of techniques for the restraint, sedation, anaesthesia and analgesia of alpacas forms an integral part of the overall successful medical and surgical management of these animals. To become conversant with such techniques will add to one's overall competence in the clinical management of this interesting exotic animal.

As such, having the confidence to work with these camelids may add that extra dimension of challenge and satisfaction to the list of species that you already feel comfortable working with.

Irrespective of the peculiarities of the alpaca, by far the most important principle to take home from this article is that they do not really differ, fundamentally, from any of the other species that practitioners routinely deal with. As such, our “model” of the ruminant or the small animal should
provide all of us with the confidence to be able to restrain, sedate, anaesthetise and administer analgesia to alpacas without that element of nervousness in dealing with an animal out of the usual routine.

This article is merely an attempt to refine the good “blueprint” you already have in your mind. However, do remember that none of the drugs described in this article are registered for use in SACs and it is important that you categorically state this to the owners of the animal.

From a restraint point of view, alpacas are generally very docile animals (thanks, perhaps, to 6,000 years of domestication) and are often tolerant of restraint and manipulation – in fact, admittedly as a stress response, they are often inclined to assume sternal recumbency when restrained, and this posture is suitable for physical examination and jugular vein catheterisation.

One hand spanning the ventral neck and one behind the tail and perineum may be all that is required to manipulate smaller animals for basic clinical examination, and I find that a loose pillow cover placed over the head will both pacify the animal and render you free from being spat at.

An intriguing development in the art of chemical restraint is the use of low-dose ketamine “stunning” to achieve sedation.

Here, a combination of butorphanol at 0.1ml per 10kg of a 10mg solution (0.1mg/kg), combined with 10 per cent xylazine at 0.04ml per 10kg to 0.05ml per 10kg (0.4mg/kg for huacayas, 0.5mg/kg for suris) and 0.01-0.02ml per 10kg of 100mg/ml ketamine (0.1-0.2mg/kg) are given subcutaneously. Following this treatment, such microdoses of ketamine (0.1-0.2mg/kg) can be repeatedly administered subcutaneously to achieve sedation.

With a little bit of practice, even a moderately sized male alpaca (60-65kg) can be restrained and blood sampled single handedly by reaching over the neck, forcing the head into a ventral position with the biceps and torso, and using free hands to achieve jugular venipuncture (see Figure 2).

For procedures requiring an animal to be kept particularly still – such as for per-rectum ultrasonography or for transcervical application of a Metricure treatment – then chukkering with, or even without, light additional chemical restraint is often satisfactory. Chukkering involves tying a loop of rope around the caudal abdomen just tightly enough to flex and placing each hindleg in turn through the loop, just proximal to the fetlock.

For a healthy, 50kg animal (your average hembra or small wether), the additional combined injection of 0.35ml of butorphanol (10mg/ml) and 0.15ml of 10 per cent acepromazine (100mg/ml) into the semimembranosus/ semitendinosus muscle complex should provide enough restraint for such procedures.

The same applies for castrations of young males performed under intratesticular local anaesthesia.
A word of caution, though: large males usually require more sedation, especially if they are obstreperous.

**Reducing stress**

To reduce stress and facilitate minimally invasive procedures performed under local anaesthesia (or for non-invasive procedures, such as radiography), moderate levels of chemical restraint may be sufficient, but it is important to note that the drug doses suggested for this will generally be too high to make them suitable for premedication. It is also best to weigh the animal and gauge its condition score – it is easy to overestimate bodyweight and condition in a fully fleeced alpaca.

A combination of 0.01- 0.025ml of 10 per cent xylazine per 10kg and 0.25-0.3ml of 100mg/ml ketamine per 10kg given intramuscularly (equating to 0.1-0.25mg/kg of xylazine and 2.5-3mg/kg of ketamine) will give 15-20 minutes of profound sedation. For longer procedures (requiring around 40 minutes, including castrations in the field), I use a triple combination. Mix 10ml of 100mg/ml ketamine with 1ml of 10 per cent xylazine and 1ml of 10mg/ml butorphanol. Give 1ml of the resulting triple-combo mixture per 17kg bodyweight intramuscularly.

The effects of the xylazine can be reversed by the intravenous administration of yohimbine (at a dose rate of 0.25ml per 10kg of reversal agent – containing yohimbine 10mg/ml), but this must always be given extremely slowly in case inadvertent access has been made to the carotid artery. While not mandatory, it is best to have the animal fasted, but for no more than 24 hours, for procedures of an elective nature. It would also be advisable to position the patient in sternal recumbency, with the head and neck elevated to minimise risk of aspiration.

For more involved and painful procedures, prolonged anaesthesia will obviously be required and the situation will determine whether parenteral ("field") or inhalation anaesthesia (with parenteral induction to facilitate intubation) will be chosen. The aforementioned triple-combo mix may be sufficient for intubation, which is ideal, or an intravenous catheter could be placed and maintenance achieved with 1ml of the triple-combo mixture per 34kg bodyweight every half hour, but this is not ideal.

An alternative parenteral protocol would be a dose of 0.03ml per 10kg of 10 per cent xylazine (equating to 0.3mg/kg), given intravenously two to four minutes prior to the intravenous administration of 0.3ml per 10kg of 100mg/ml ketamine (equating to 3mg/kg). This will provide 20-30 minutes of anaesthesia, which may even be deep enough to allow for intubation. This may then be topped up with 0.05- 0.1ml per 10kg of ketamine (equalling 0.5-1mg/kg) for the next 20 minutes and thereafter as boluses – but ideally this protocol should not exceed 45 minutes. This dose of ketamine can be given in combination with 0.01ml per 10kg of five per cent xylazine (amounting to 0.05mg/kg of xylazine) until a maximum total dose of 1ml per 10kg of 100mg/ml ketamine solution (amounting to a total of 10mg/kg) has been given.
To reiterate, regurgitation is possible with both these parenteral protocols, so measures should be taken to minimise risks of aspiration.

If parenteral anaesthetic induction and maintenance has to be used for situational reasons, premedication should be given first (see below). Inhalation anaesthesia is certainly preferred, if possible, for caesarian sections, given that intravenous anaesthetics for maintenance will require drug metabolism (as opposed to drug redistribution) for induction, and that inhalation anaesthesia is more protective of airways, as well as the fact that asepsis is improved in a hospital setting.

Intravenous induction and inhalation anaesthesia are certainly very strongly advised for debilitated patients, fracture repairs, involved laparotomies (including caesarian section) and other prolonged or advanced procedures. While halothane can be used satisfactorily, isoflurane or sevoflurane is preferred.

Just as with other species, premedication is instrumental to the overall safety and quality of the ensuing anaesthesia, whether it is parenteral or via inhalation. As a rule of thumb, the same drugs used for sedation need to be reduced by half for premedication.

As an alternative to this, anaesthetic induction and maintenance doses need to be reduced correspondingly. It is, however, better to avoid the use of xylazine for premedication and it would be preferable, for instance, to intravenously administer 0.1-0.2ml per 10kg of 10mg/ml butorphanol (equating to 0.1-0.2mg/kg) in combination with 0.6-0.8ml per 10kg of 5mg/ml diazepam (amounting to 0.3-0.4mg/kg of diazepam), given in increments of 0.4ml per 10kg (ie 0.2mg/kg) as a premedication.

Jugular catheterisation is strongly advised – not only for the purposes of induction, but also because of all the advantages of having instant intravenous access. By catheterisation, it is possible to distinguish a correct placement from inadvertent intra-arterial catheterisation in a species where the colour of the blood aspirated is a very insensitive indicator of whether it is arterial or venous. The jugular vein is the most superficial and furthest away from the carotid artery and is located in the most cranial quarter of the neck – approximately 3cm to 8cm caudal to the angle of the jaw.

It is better to use the right jugular vein, so as to avoid accidental oesophageal puncture or stricture following perivascular administration of irritant substances. After a dermal administration of local anaesthetic, a size-15 surgical blade can be used to lance the skin to the adnexa, as well as a 14G over-theneedle catheter, placed directly into the jugular vein and sutured or glued in place.

Catheter placement towards the heart is very useful to distinguish between venous and arterial placement, as an unoccluded vein or artery complex will only pour out of the catheter with inadvertent arterial placement of a catheter.
Intravenous induction agents are as varied in choice as with small animals and include, but are not limited to, the following.

- Thiopentone at 5-10mg/kg. It is essential to administer it via catheter.

- Ketamine at up to 1ml per 10kg of a 100mg/ml solution, equating to 10mg/kg. It is essential to premedicate with diazepam, as above, and better for the preservation of laryngeal and pharyngeal reflexes.

- Propofol at 2-6mg/kg, with maintenance at 0.4mg/kg/hr.

- Alfaxalone at 2-3mg/kg.

These are sufficient enough to achieve intubation. During induction and for intubation, it is absolutely essential that the animal is placed in sternal recumbency with its head elevated and neck outstretched, to reduce the likelihood of passive (deep induction) or active (reflex, too shallow) regurgitation. This positioning – together with extension of the neck and head so as to align the trachea with the oral cavity – facilitates intubation (see Figure 3).

There are two methods of intubation. Firstly, a laryngoscope with a long blade (20cm) is inserted into the commissure of the mouth to visualise the larynx, which is difficult in lamoids because the restricted space of the oropharynx impairs visualisation of the glottis. Then an aluminium rod stylet is placed in the endotracheal tube to keep it rigid. The second method is to couple two eight to 10 French gauge 50cm stiff polyethylene catheters with tape, and hold the mouth open with gauze loops. Gently pull the tongue rostrally and place the catheters into the trachea, so that the endotracheal tube is threaded over the catheters and pushed gently between the cheek teeth into the trachea. For most alpacas, an 8mm outer diameter, 35cm foal catheter (such as a Bivona) with a 9mm air cuff will suffice. But in smaller alpacas, small animal endotracheal tubes may be placed.

Once maintained on halothane or isoflurane, anaesthetic monitoring is performed as per our “model” species. Oscillometric methods of blood pressure monitoring are suitable for alpacas and pulse oximeters can be applied to the tongue, nasal septum, ear or vulva in unpigmented patients (SaO2 being at least 90 per cent).

Perhaps the most valuable information about tissue perfusion and oxygenation is gained from mucous membrane colour, such as the nasal sacs and vulvar membranes in skin-pigmented animals. Pink is good – if these membranes are pink, the brain and kidneys will be too.

Maximum tidal intake is 40ml/kg and this is what is used to gauge the re-breathing bag size and choosing the smallest bag that fits maximal tidal intake, to give the best indication of tidal volume. As with other species, end-tidal capnography is invaluable for gauging trends in (rather than direct reflections of) blood carbon dioxide concentrations. If end tidal pressures rise above 45mm Hg,
corrective measures, such as immediate reduction in anaesthetic depth and intermittent or positive pressure ventilation should be instituted and decisions should be made about the use of mannitol (1mg/ kg IV slowly) in hypoventilating patients. In cases of hypotension, the cause should be identified (for example, anaesthetic depth), an intravenous bolus of fluids should be given (10-30mg/kg-1), and depending on the cause, dobutamine can be administered at 2-5ìgkg-1 min-1.

As with any species, balanced and pre-emptive analgesia should be striven for. The protocol already described for premedication, such as diazepam potentiating the effect of opioids like butorphanol, does address this to some extent.

Adjunctive techniques, including local anaesthesia, can be helpful – as can the application of subarachnoid spinal anaesthesia (either detomidine at 10mcg/kg or morphine at 0.05- 0.1mg/kg at the lumbosacral junction). Postoperatively, various behavioural or physiological indicators of pain that might warrant continued analgesia would include abnormal posture or gait, unwillingness to move, reluctance to stand, reduced food intake, tooth grinding, herd separation and elevations of heart, respiratory rate and body temperature – as well as pallor of mucous membranes.

In these instances, morphine can be given at doses of 0.05mg/ kg IV (or 0.1-0.4mg/kg IM), or butorphanol at doses of 0.05- 0.2mg/kg IV (or 0.1-0.5mg/kg IM). Complementary NSAID use would involve the IV administration of 1.1mg/kg of flunixin SID, together with the IV administration of cimetidine at 2.2mg/kg to minimise the risk of ensuing gastric ulcer development.

I hope this information will help inspire practitioners to gain more conversance with alpaca medicine and surgery.

Acknowledgements

- The extensive experience of David Anderson (founder of the International Cameldid Institute and section head of agricultural practices at Kansas State University) and Christina Dart (registered specialist in veterinary anaesthesia and head of anaesthesia at the University of Sydney’s veterinary centre) was of great value to the preparation of this article.
Figure 1. The author's alpacas closer to their element. Owners form strong bonds with their pets.
Figure 2. The single-handed restraining technique for blood collection.
Figure 3. Positioning a patient’s head and neck to facilitate intubation.
Figure 3. Positioning a patient’s head and neck to facilitate intubation.