

# Restraint and Anesthesia (CAMEL)



**Nose halter (Khataam) to control head movements and to make the animal to sit.**



**Muzzle to prevent bite attempts by the animal.**



**Tying of fore limb.**



**Grasping nostrils and lower lip to control the animal.**



**Hobbling of the forelimbs to prevent kicking by the animal.**



**Tying the hind limbs together above the stifle joints to control movements of the hind limbs.**



**Tying of both fore and hind limbs..**



**The sedated animal cast in the left lateral recumbency. See the attendant grasping the nostrils to control the head movements.**



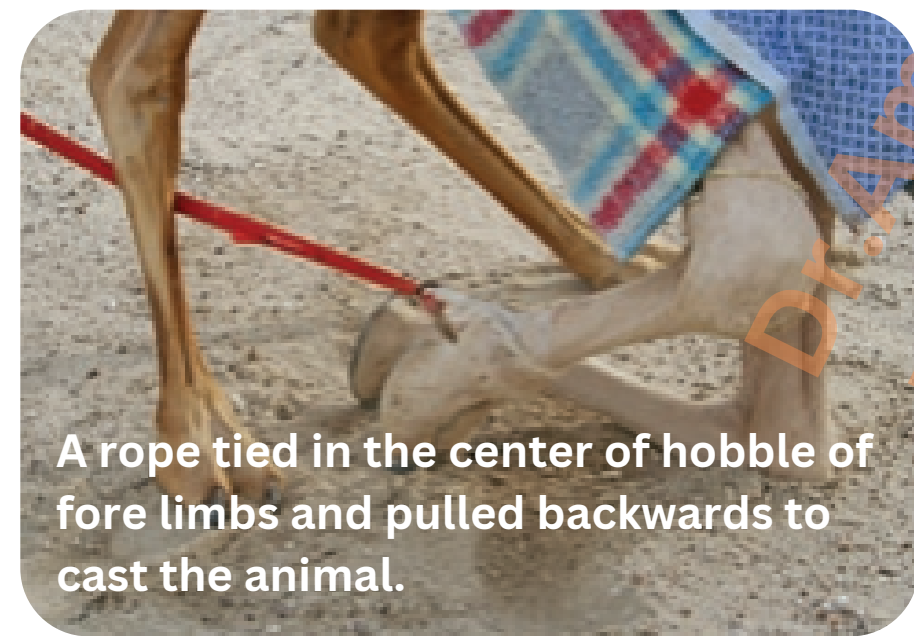
**The rope passed from under the hind pasterns and in front of the hump to keep the flank area clear.**



**Suitable restraint for castration. Note tying of upper hind limb to the corresponding forelimb to get enough space for surgery.**



**Passing a long rope in 2-3 circles around all the legs to throw the animal down.**



**A rope tied in the center of hobble of fore limbs and pulled backwards to cast the animal.**



**Tying the end of the nose halter to a pole and passing a rope around all the legs to control the vicious animals**

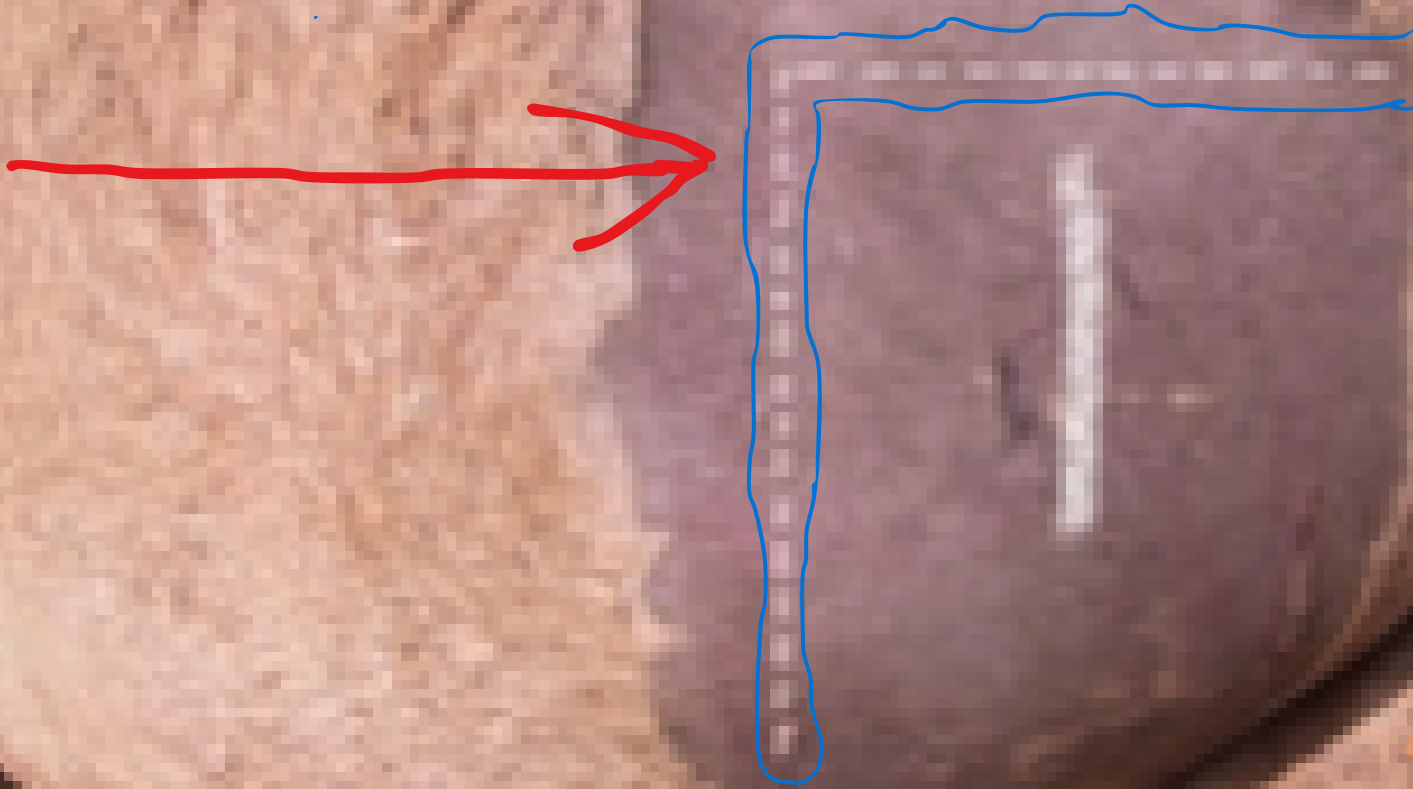
# Infiltration of the local anesthetic at the proposed incision site.



The two analgesic agents most commonly used are 2% solution of lignocaine hydrochloride and 2% mepivacaine hydrochloride.



Inverted “L” block to block the nerves entering the surgical field



Dr. Aman Ullah Zuhair  
DVM, RVMP, PLVMC

## **Anesthesia:**

Anesthetics are used for a variety of reasons, such as to minimize or eliminate pain, relax muscles and even to facilitate clinical examination and diagnostic procedures.

Different anesthetic regimens in practice for other animals also hold true in the camel. In the camel however, sedation of the animal is preferred to local infiltration as it provides an easy restraint and is also safe for the operator.

### **1. Local and Regional Analgesia**

The two analgesic agents most commonly used are 2% solution of lignocaine hydrochloride and 2% mepivacaine hydrochloride.

#### **a. Local Analgesia:**

This implies injection of the analgesic agent at the proper incision or surgery site to desensitize a limited local area. A small amount of analgesic agent is injected at an initial site with a small needle and then a longer needle is inserted through the initial desensitized region and the analgesic agent is deposited. The skin and the subcutaneous tissues are infiltrated first and then the deeper layers such as muscles and the facial planes.

Infiltrating injections should be made in straight lines and fanning should be avoided as it causes tissue trauma.

This technique can be used for suturing wounds and for removing small cutaneous lesions.

It may also be used in the form of a “line block” for laparotomy where the analgesic agent is injected along the line of incision .

However, this will cause tissue edema which may affect wound healing

#### **b. Regional Analgesia:**

Regional analgesia is desensitizing a given region by blocking the major nerves supplying that area.

This technique is quite commonly used and can be described under the following sub-heads.



## **b. Regional Analgesia:**

### **i). Inverted L Block.**

This is the simplest way of regional analgesia for flank or paramedian laparotomies. The analgesic agent is deposited in the form of an inverted “L” to create a wall of analgesia enclosing the surgical field thereby blocking all the nerves .

### **ii). Paravertebral Block:**

This technique involves blocking of the last thoracic and first and second lumbar nerves to achieve analgesia of the flank region as they supply sensory and motor innervation to the skin, fascia, muscles and peritoneum of the flank.

This region, particularly in the camel; may be the only choice for laparotomy to carry out rumenotomy, cesarean section and surgical manipulations on the abomasum and the intestines.

The land marks to locate these spinal nerves are the tips of the transverse processes of the lumbar vertebrae. Anatomically, the nerve is most localized at the intervertebral foramen.

After exit from the intervertebral foramen the nerve divides into dorsolateral and ventral branches and both of the branches are blocked.

# Technique for Lumbar Nerve Block in Camel

The technique described involves blocking the last thoracic and first three lumbar nerves in camels for surgical procedures, providing anesthesia to the corresponding area.

## Last Thoracic Nerve Block (T13):

**Site Identification:** The transverse process of the first lumbar vertebra (L1) is not palpable. Instead, an imaginary line is drawn 2 cm lateral to the body's midline, extending from the anterior edge of the second lumbar vertebra (L2) transverse process. This line marks the anterior border of the L1 transverse process.

**Needle Insertion:** A 16 gauge, 10 cm needle is inserted vertically at this point. The needle is advanced until it contacts the anterior border of the L1 transverse process. It is then redirected under the tip, and 10 ml of local anesthetic is injected to block the ventral branch of the last thoracic nerve.

**Dorsal Branch Block:** The needle is withdrawn, and another 10 ml is deposited to block the dorsal branch of the nerve.

## First Lumbar Nerve Block (L1):

**Site Identification:** The midpoint of the lateral edge of the L2 transverse process is marked as the site for blocking the first lumbar nerve.

**Needle Insertion:** A needle is inserted at this point, and 5 ml of local anesthetic is injected just above the transverse process. Another 5 ml is administered as the needle is withdrawn to block the dorsolateral branch of the first lumbar nerve.

## Second Lumbar Nerve Block (L2):

**Site Identification:** To block the dorsolateral branch of the second lumbar nerve, 5 ml of solution is injected just above the lateral tip of the L3 transverse process. Another 5 ml is injected during withdrawal of the needle.

**Ventral Branch Block:** The needle is then redirected towards the posterolateral edge of the L2 transverse process, and 10 ml of local anesthetic is deposited under the process to block the ventral branch of the first lumbar nerve.

## Third Lumbar Nerve Block (L3):

**Site Identification:** For blocking the dorsolateral branch of the third lumbar nerve, 5 ml of solution is injected at the posterolateral edge of the L4 transverse process, with another 5 ml during the needle withdrawal.

**Ventral Branch Block:** The needle is redirected under the ventral aspect of the L3 transverse process, and 10 ml of solution is deposited to block the ventral branch of the second lumbar nerve.

## Anesthesia:

**Induction and Duration:** Anesthesia takes about 10-15 minutes to induce and lasts for 45-60 minutes.

**Effectiveness:** The incision site is tested, and if the block is successful, the animal will not resist the skin incision.



## Paralumbar Block (Magda Technique) in Camels

The Magda Technique for lumbar nerve blocks involves a lateral approach to anesthetize the branches of the last thoracic (T13) and first two lumbar nerves (L1 and L2). It is used to provide effective analgesia during surgery without causing paralysis of the lumbar muscles.

### Procedure Overview:

#### Needle Insertion:

A 16 gauge, 10 cm long needle is introduced laterally under each transverse process of the first, second, and fourth lumbar vertebrae. The needle is directed towards the midline of the camel's body.

#### Injection for Ventral Branch Block:

10 ml of analgesic solution is injected near the transverse processes at each site (T13, L1, L2). The needle is slightly withdrawn and redirected cranially and caudally. An additional 5 ml of solution is deposited at each site to block the ventral branches of the nerves.

#### Injection for Dorsolateral Branch Block:

The needle is then redirected slightly dorsally and caudally to deposit 20 ml of solution near the transverse processes. This blocks the dorsolateral branches of the nerves.

#### Muscle Function:

The technique does not cause paralysis of the lumbar muscles, allowing for natural movement of the spine. This is important in ensuring that the camel's posture remains intact during procedures that do not require the animal to be in a standing position.

#### Key Points:

The Magda Technique offers targeted nerve blockade, providing effective pain relief during surgery. It avoids lateral deviation of the spine, which is crucial when the camel is not in a standing position during surgery.

This technique is ideal for providing analgesia without compromising muscle tone or spinal stability, allowing the surgical procedure to proceed smoothly.

# Epidural Anesthesia in Camels:

## Technique and Application

### Overview:

Epidural anesthesia involves the deposition of a local analgesic solution between the dura mater and periosteum of the spinal canal (epidural space).

It is used to desensitize the caudal nerve roots after they emerge from the dura mater, providing pain relief in the hindquarters.

### Types of Epidural Anesthesia:

**Caudal Epidural Anesthesia:** Aims to block sensation in the perineal region, including the anus, vulva, and caudal thighs, without affecting motor control of the hind limbs.

**Cranial Epidural Anesthesia:** Provides anesthesia for more cranial areas, including pelvic limb surgeries and udder amputation, by affecting a wider area of the spinal cord.

### Dosage and Effectiveness:

#### Caudal Epidural Anesthesia:

The usual dose is 1 ml per 50 kg of body weight of 2% Lignocaine Hydrochloride. This results in desensitization of the anus, vulva, perineum, and caudal thighs, while motor control of the hind legs is preserved.  
Effect: Indicated by a flaccid tail, ballooning of the rectum, and relaxed anal sphincter.

#### Cranial Epidural Anesthesia:

The usual dose is 1 ml per 5 kg of body weight. This is typically used for pelvic limb surgeries or udder amputation in combination with deep sedation.

### In Camels:

**Dose range:** Typically between 0.5-1 ml per 10 kg body weight for caudal and cranial epidural anesthesia. This provides the desired effect based on the surgery type.

**Specific Conditions:** Used for surgeries like tail amputation, rectal prolapse, perineal lacerations, uterine prolapse, teat fistula repair, and minor hind limb manipulations.

For longer-lasting effects (up to 2 hours), the dose can be increased to 1.5 ml per 10 kg of body weight for full relaxation of the hind legs.

### Technique:

### Technique:

#### Needle Insertion:

A 16-gauge needle is inserted into the sacro-coccygeal space at a 45-50 degree angle, directly along the midline, with the needle bevel pointing forward.

The needle is advanced until the tip touches the floor of the spinal canal.

#### Correct Placement:

There should be no blood when the needle is correctly placed. If blood appears, withdraw and reinsert the needle.

**Injection:** Once the needle is in position, the anesthetic solution is injected without resistance.

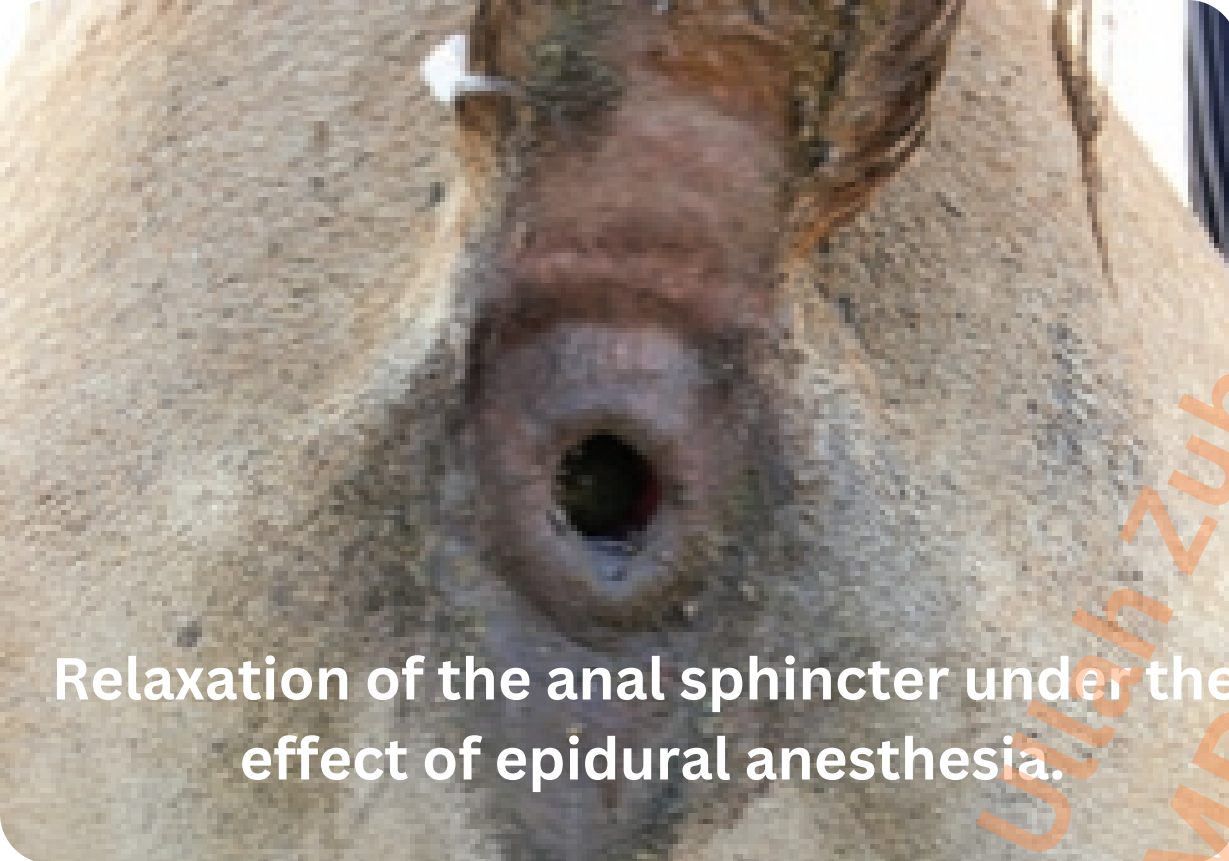
#### Considerations:

The camel is usually in a recumbent position for surgery, so adjusting the dose between caudal and cranial epidural anesthesia ensures the desired effect.

For udder surgeries, always administer deep sedation alongside epidural anesthesia to ensure comfort and relaxation.

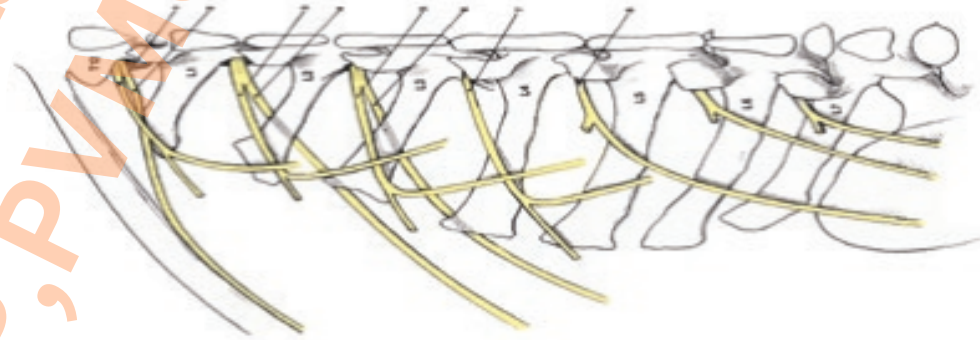
#### Conclusion:

Epidural anesthesia in camels is a valuable technique for pain management in hindquarter surgeries. By adjusting the volume and injection site, veterinarians can effectively block sensory and motor nerves for a wide variety of procedures, offering comfort and facilitating safe surgical interventions.

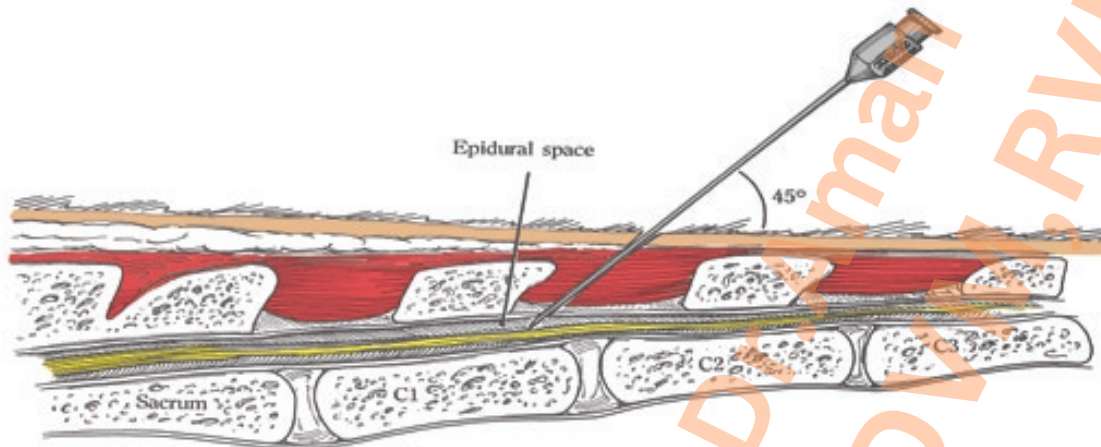


Relaxation of the anal sphincter under the effect of epidural anesthesia.

Arrows showing the sites of injections to block the dorsolateral (→) and ventral (...) branches of the last thoracic and 1st and 2nd lumbar nerves.



Epidural anesthesia.



Epidural anesthesia. See the angle of the needle with position of its point in the epidural space.



## Ocular Analgesia: Four-Point Retrobulbar Block

### Overview:

The four-point retrobulbar block is commonly used to provide ocular analgesia, particularly for procedures like enucleation (removal of the eyeball). It involves the injection of an analgesic solution at four points around the eye: dorsally, ventrally, and at both medial and lateral canthi.

### Procedure:

#### Needle Selection:

Use a slightly curved 18-gauge needle that is 8 to 10 cm long.

#### Injection Sites:

The needle is directed towards the apex of the orbit from each of the **four points**:

**Dorsal Canthus:** At the top of the eye.

**Ventral Canthus:** At the bottom of the eye.

**Medial Canthus:** Near the inner corner of the eye.

**Lateral Canthus:** Near the outer corner of the eye.

#### Injection:

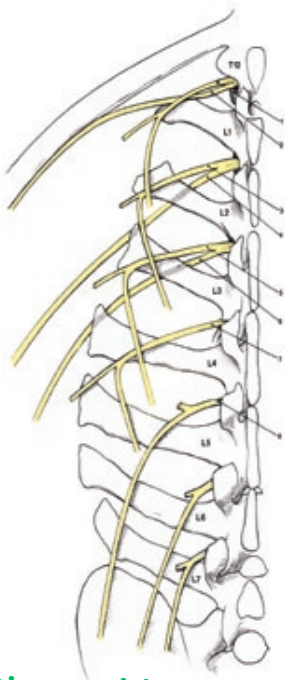
10 ml of the analgesic solution is injected at each of the four points, providing comprehensive anesthesia around the orbit.

#### Effectiveness:

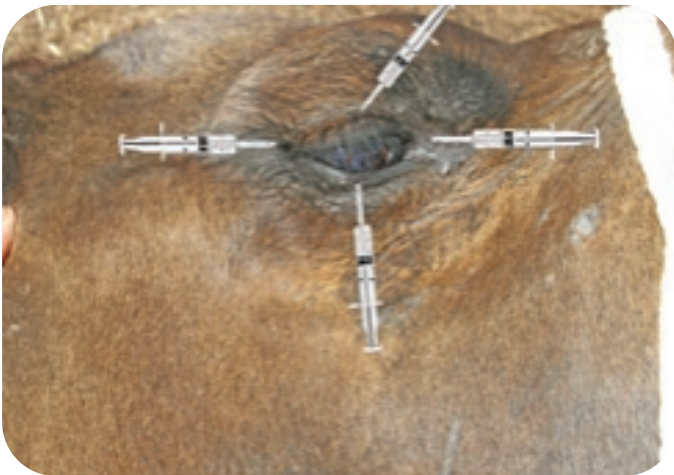
This block results in effective anesthesia for the enucleation procedure by targeting the nerves that supply the eyeball.

#### Conclusion:

The four-point retrobulbar block is an efficient technique for ocular analgesia, ensuring satisfactory pain relief during eye surgeries, particularly enucleation, by delivering the analgesic solution around the orbit.



Relative positions of the last thoracic and 1st & 2nd lumbar nerves and their branches for carrying out the paravertebral block.



Ocular analgesia. Note the position of the needles for four-point retrobulbar block.



# Nerve Blocks for Limbs and Intravenous Limb Anesthesia in Camels

## 1. Nerve Blocks for the Limbs

In camels, the Volar and Plantar nerve blocks are commonly used for surgical manipulations of the fore and hind limbs, respectively.

### Volar Nerve Block (Forelimb):

**Injection Site:** About 2 inches above the fetlock joint, just cranial to the lateral border of the superficial flexor tendon.

**Volume and Solution:** Inject 5 ml of 2% Lignocaine Hydrochloride on both the medial and lateral sides of the limb.

**Action:** Gently massage the injection sites to disperse the analgesic solution, which will diffuse into the perineural tissue, providing analgesia to the area supplied by the nerve.

### Plantar Nerve Block (Hindlimb):

Similar technique and approach as the Volar Nerve Block, applied to the hind limb.

These blocks provide effective local analgesia for surgical manipulations of the foot and are common in camel procedures.

**Note:** The Median, Ulnar, Peroneal, and Posterior Tibial nerve blocks—commonly used in horses for detecting lameness or performing minor limb surgeries—are not typically used in camels and are therefore not mentioned here.

## 2. Intravenous Limb Anesthesia

Intravenous limb anesthesia is a technique used for achieving local analgesia in the distal limb, replacing specific nerve blocks in some cases.

### Procedure:

**Animal Positioning:** The camel is restrained in the desired lateral recumbency.

**Tourniquet Application:** A rubber tubing or umbilical tape is applied below the carpus (forelimb) or hock (hindlimb) to isolate the distal limb.

**Injection Site:** The dorsal common digital vein in the metacarpal or metatarsal region is selected for injection.

**Injection Volume:** Inject 10-20 ml of 2% Lignocaine or Mepivacaine Hydrochloride into the vein.

**Important Note:** Avoid Lignocaine with Epinephrine, as the vasoconstriction caused by the combination may prevent effective desensitization.

**Post-Injection:** The injection site is gently massaged to prevent hematoma formation.

**Effect:**

**Onset:** The distal limb will be anesthetized within 5 minutes.

**Duration:** The analgesic effect lasts about two hours, as long as the tourniquet remains in place.

### After Surgery:

**Releasing the Tourniquet:** After the operation, the tourniquet should be released slowly (over 10 to 15 seconds), allowing the limb to regain normal sensation in about 5 minutes.

### Safety:

No reported toxicity related to the entrance of the anesthetic drug into the general circulation when the technique is properly performed.

### Conclusion

Nerve blocks (Volar and Plantar) offer targeted analgesia for foot surgeries in camels, effectively numbing specific areas.

Intravenous limb anesthesia is an efficient alternative, providing local analgesia for distal limb procedures and avoiding the need for specific nerve blocks.



**Intravenous limb anesthesia. Note the needle in the dorsal common digital vein in the metacarpal region.**



# Analgesia, Sedation, and Tranquilization in Camels

- 1. Analgesia:** An analgesic agent temporarily abolishes the awareness of pain. These agents are essential in managing pain during and after surgical procedures, ensuring the animal remains comfortable.
- 2. Sedation:** Sedatives are narcotic agents used to calm a nervous, aggressive, or excited animal. These drugs help relax the camel and make it more manageable during procedures.
- 3. Tranquilization:** Tranquilizers bring about behavioral changes, making the animal relaxed and unconcerned about its surroundings, often necessary in less invasive procedures or handling.

## Common Drugs for Sedation and Tranquilization in Camels:

**Acepromazine:** Used for calming and tranquilizing.

**Xylazine:** A sedative and analgesic, commonly used for moderate sedation.

**Detomidine:** A more potent sedative, used for deeper sedation.

**Chloral Hydrate:** A sedative for tranquilization.

**Diazepam:** Used for calming and managing anxiety

### **Routine Sedation Protocol:**

#### **Combination of Xylazine and Ketamine:**

**Dose Rate:** 0.4 mg per kg body weight of each drug, administered intravenously.

**Preparation:** Both drugs can be mixed in the same syringe for convenience.

**Initial Dose:** Administer half the recommended dose initially, especially for camels in less-than-optimal health. Supplement the dose if necessary based on the camel's response.

**Effect Duration:** The sedation lasts for 30-40 minutes.

**Recovery Time:** The camel typically recovers in 60-70 minutes.



A 6 year old male camel deeply sedated for castration using xylazine and ketamine combination intravenously

### **Important Considerations:**

**Health Status:** Always perform a physical examination and consider laboratory evaluations to ensure the camel is healthy before administering sedation or tranquilization.

### **Risk of Regurgitation:**

Camels are prone to regurgitation and aspiration pneumonia, especially when pressure is exerted on the abdominal cavity (e.g., in lateral recumbency).

To minimize this risk, it's advisable to fast the camel for at least 24 hours before sedation or tranquilization, unless the situation requires emergency intervention.

### **Emergent Situations:**

In emergency procedures, regional or local anesthesia with minimal sedation is preferred to avoid risks associated with full sedation.

### **Conclusion:**

Sedation and tranquilization are essential tools in camel veterinary practice to manage behavior and ensure safety during procedures.

By selecting appropriate sedatives like Xylazine and Ketamine, and carefully managing dosage based on the camel's health status, veterinarians can provide effective sedation while minimizing risks like aspiration pneumonia.

Always monitor the animal's condition and adjust treatment plans accordingly, particularly in emergent or critical care situations

# General Anesthesia in Camels

In camels, most surgical procedures can be performed under sedation and local anesthesia. However, general anesthesia is necessary for certain procedures, such as internal fixation of fractures, limb amputations, or udder amputations. These procedures can also be done under cranial epidural anesthesia combined with deep narcosis or total intravenous anesthesia (TIVA) using a 10% aqueous solution of Chloral hydrate and Magnesium sulfate.

## Indications for General Anesthesia:

Internal fixation of fractures

Limb or udder amputations

Complex surgeries requiring extensive tissue manipulation, hemostasis, and aseptic techniques.

## Pre-Operative Considerations:

**Fasting:** Before induction, camels should be fasted to reduce the risk of regurgitation and aspiration pneumonia.

**Adults:** Food should be withheld for 36 to 48 hours, water for 12 to 18 hours.

This precaution helps to minimize risks associated with bloat and aspiration.

## Induction of General Anesthesia:

### Sedation Protocol:

**Xylazine and Ketamine:** These two drugs are commonly used for sedation.

**Dosage:** 0.4 mg per kg body weight for each drug intravenously.

**Effect:** Sedation for 30-40 minutes, with recovery taking about 60-70 minutes.

**Pre-surgical Sedation:** The animal is deeply sedated before gas inhalation anesthesia is initiated.

## Technique of Endotracheal Intubation:

**Step 1:** Sedate the animal using the Xylazine-Ketamine combination.

**Step 2:** Use a self-retaining mouth gag to keep the camel's mouth open for easier access.

**Step 3:** Endotracheal tube placement:

A rubber pipe is passed through the endotracheal tube into the larynx.

The endotracheal tube is then slid over the rubber pipe into the trachea, and the rubber pipe is removed.



**Shifting of the sedated animal to the operation theatre with the help of crane.**



**General anesthesia with a combination of Isoflurane, Nitrous oxide and Oxygen. Note the position of the self-retaining mouth gag and endotracheal tube.**

Dr. Aman Ullah Zubair, PVMC  
DVM, RVMP

## **Inhalation Anesthesia:**

**Preferred Gases:** Isoflurane or Halothane combined with Nitrous oxide (N<sub>2</sub>O) and Oxygen (O<sub>2</sub>).

**Induction:** Begin with 5% of the chosen anesthetic (Isoflurane or Halothane).

**Maintenance:** For adult camels:

**Oxygen flow rate:** 4 to 5 liters per minute.

**Anesthetic concentration:** 1-3% of Isoflurane or Halothane.

For calves, use 1-1.5% concentration.

**Recovery:** Typically smooth and rapid, but keep the animal in sternal recumbency to prevent aspiration.

## **Post-Surgical Considerations:**

**Positioning during Recovery:** Ensure that the camel recovers in a sternal recumbency position to avoid aspiration of ruminal contents.

**Transport:** During transport to the hospital or clinic, deep sedation is advisable for injured or critically ill animals.

## **Transportation of Injured Camels:**

**Fracture or Dislocation Management:** If the camel is suffering from fractures, it is essential to immobilize the affected limb using a splint or temporary cast.

**Sedation:** Deep sedation should be used to avoid any movement that could worsen the injury.

## **Transportation:**

Use cranes or specialized vehicles for lifting and transporting the camel.

Ensure that the vehicle has soft bedding to avoid skin bruises and that the driver drives smoothly to avoid further injury.

## **Conclusion:**

General anesthesia in camels requires careful planning and consideration, from preoperative fasting to the proper induction technique. The use of Xylazine-Ketamine for sedation, endotracheal intubation, and inhalation anesthesia provides optimal conditions for performing invasive surgeries. Proper monitoring during anesthesia and recovery is essential to prevent complications like aspiration, ensuring smooth recovery.