

Surgical Note

Recommendations to Prevent Hindlimb Paralysis in Non-Human Primates

Hindlimb paralysis may occur in the cannulated leg when the animal's mean blood pressure value is lower than 80 mmHg for an extended period during the surgical procedure, if the animal's temperature drops below 97° F/36° C, or if there is a repeat reperfusion injury during additional anesthetic episodes. It can also occur from thromboembolism, either originating from the catheter, or within the artery following its ligation. It can also occur if the deep femoral artery is inadvertently ligated as well.

Signs of hindlimb paralysis/paresis/dry gangrene typically include either a reduced or complete loss of mobility in the cannulated leg and may also include:

- Curled toes
- Skin that is cold to the touch
- Flaking skin
- Swelling
- Edema
- Redness
- Black or necrotic-looking tissue as the post-operative period increases

Symptoms occur usually within a couple of days of surgery. Once this condition occurs, there is typically no treatment that can offer relief or reverse it. Prevention is critical.

Important factors to consider:

Surgical Technique Tissue handling and surgical technique can play a big part in the occurrence of issues.

- Extreme care should be used during surgery to not damage the femoral nerve.
- Dissect out the minimum amount of tissue that is necessary to cannulate the vessel.
- Use delicate surgical technique.
- Ensure that the nerve is not ligated with the vessel.
- Cannulate the vessel as distal as possible to avoid inadvertent ligation of the deep femoral artery.

Temperature Maintain animal's body temperature above 97° F during preparation, surgery, and recovery.

- Turn on supplemental heat source prior to bringing animal into the prep and surgery suite.
- Use supplemental heat during surgical preparation through surgical recovery.
- Once the body temperature has dropped, a Bair Hugger cannot make up the lost heat.
- Additional heat can be applied by using warmed saline bags placed under the Bair Hugger.
- Cover the feet and tail of the animal to help prevent temperature loss.
- Ensure no part of the animal is in contact with the surgical table.
- Warm surgical scrub materials in an incubator and keep warm.
- Minimize the time from the surgical preparation to the time the animal is draped.
- Use warmed fluids.

Blood Pressure

- If possible, do not use Dexmedetomidine or Xylazine for anesthesia. If they are required, pressor support will be needed as well.
- Ensure the cannulated leg is not secured too tightly or at all to the table during the procedure.
- If restraint is necessary for cannulating the vessel, remove the restraint as soon as the catheter is in place.
- Insert the blood pressure catheter first, after the device has been placed and before biopotential leads have been placed. This will allow more precise and continuous monitoring of the blood pressure throughout the surgery to maintain it above 80 mmHg.
- Phenylephrine will increase blood pressure while not increasing the heart rate. Have a dedicated IV line with Phenylephrine connected prior to starting surgery. Two suggestions for preparation of phenylephrine are as follows, but consult your staff veterinarian:
 - Dilute 10 mg of phenylephrine in 500 ml LRS or 5% dextrose solution
 - Administer at 10 ml/kg/hr or to effect to maintain mean BP \geq 80 mmHg
 - Dilute 210 mg of phenylephrine into 500 ml sterile saline, 5% dextrose solution, or LRS.
 - Administer drip of 1 drop per second, not to exceed 10 ml/kg/hr
 - Once the blood pressure has risen, decrease the volume to 4-6 drops per minute (0.5-1.0 μ g/kg) to maintain the pressure value throughout the surgical procedure.¹
- If an opioid is used in addition to NSAIDs, it is recommended to wait until after the surgery and the animal is still lethargic before administration of the opioid.

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Repeated anesthetic events after first surgery.

- Do not use Dexmedetomidine or Xylazine as an anesthetic as they are vasodilators and will lower BP.
- For any quick post-op sedation, use straight ketamine.
- Any future anesthetic event using anything other than ketamine will require vasopressor and temperature support.