

## **SURGICAL TECHNIQUE FOR LIMB AMPUTATION IN RUMINANTS**

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Amputation is a last resort procedure to save the life of an animal. In cattle, digit amputation is performed successively in animals of various age and production type. The procedure is simple with a quick return to previous production. Limb amputation is not frequently performed because of the weight of the animal and long aftercare. Sparse literature reported successful attempt of amputation in cattle with or without prosthesis. Reports are limited principally to heifers or light animals with the use of prosthesis.

Comminuted open fracture with severe contamination or infection and poor blood supply is the most common reason for amputation. Non union, ischemia, frostbite and osteomyelitis are other reasons for amputation. Unfortunately, the decision for amputation is often delayed because other treatments are attempted or the animal is euthanized because of the poor prognosis. Alternative to amputation must always be considered first. Before the amputation, some questions must be asked. What will be the purpose of this animal? What will be the weight at maturity? Is prosthesis considered? Will the owner be willing to do the aftercare? How long would they like to keep the animal in herd? Is the other limb can support the extra weight?

The prosthesis is favored for cosmetic reason and to improve weight bearing and consequently the life expectancy. A prosthesis demands aftercare from the owner, it should be removed regularly to be cleaned and the stump monitored for pressure sores. Also, it might need some adjustment if the animal is growing or muscle mass changes. A prosthetic technician must be called first before you decide where to amputate. If the amputation is performed as an emergency procedure, remember that they prefer to keep as much as possible of the limb. Revision can be made after to better fit the prosthesis. The larger is the distal extremity of the bone in contact with the prosthesis, the better will be the distribution of the weight of the animal. It will decrease the incidence of stump sores. Nowadays the prosthesis is made of aluminum, titanium and carbon fibers. They are light and resistant but expensive. Homemade prosthesis can be made with synthetic casting and light metal or plastic. If prosthesis is not an option, therefore the limb must be amputated as high as possible. Otherwise, the animal will attempt to bear weight on the stump and might injured himself or delay the healing of the surgical incision.

The limb is amputated through the diaphysis or by disarticulation. Disarticulation is easier to perform with less bleeding. It gives a wider surface of weight bearing in case a prosthesis must be fit. Wherever is the amputation, the surgeon should always keep as much soft tissues as possible to cover the bone extremity. It is very difficult to achieve in large animals when amputation is immediately below the carpus or the tarsus.

Skin flap must be planned in advance. There is no defined joint-flap 'design' in cattle because the procedure is rare and case presentations so different. Muscle and fascia should be kept attached to the skin to improve healing and form padding between the bone and the skin. The suture line should never be on the distal aspect of the stump. Usually the ratio will be 1:2 or 1:3 depending of the diameter of the bone to cover. The suture line will not be on the tension surface. For example, a disarticulation at the level of the radiocarpal joint will have a skin flap suture over the stump at the caudal aspect of the distal radius. Considering blood supply, it is more abundant at the caudal aspect of the limb than cranial.

Amputation can be performed under general anesthesia. Some patients are poor anesthetic candidates because of the pain, hemorrhage from the injury and infection. Amputation is a quick procedure. Therefore, brachial block anesthesia can be used alone for carpal disarticulation or metacarpal amputation. For the pelvic limb, epidural anesthesia is sufficient for amputation of the distal femur (camelids) or proximal metatarsus. Appropriate assistance is necessary for recovery. A tourniquet is often used to control hemorrhage during the amputation. To improve analgesia, lidocaine can be injected intravenously under the tourniquet. The distal limb to be amputated is wrapped with a plastic bag and the proximal portion of the limb is prepared surgically. The skin incision is performed as planned with the appropriate flap size to cover the stump. Larger flap can be trimmed eventually. All necrotic or infected tissue are resected. If the amputation site is near the joint and skin salvage is not enough to close the incision then the wound will heal by second intention. Bleeding is more important if amputation is through the diaphysis. Hemorrhage is better control if a flap of muscle covers the extremity of the bone when possible. Some articular surface are very irregular and sharp edges must be removed with a rongeur to make the surface smooth before covering it with the flap. Large vessels are ligated. Tourniquet is removed to ensure adequate hemostasis. Skin is sutured in a routine fashion. Tension sutures are not necessary if the flap is adequate. The stump is covered by a thick bandage to prevent any trauma to the suture line when the animal will stand.



Distal articular surface of the radius smoothed away with rongeurs



Flap sutures over the distal end of the radius



Postoperative bandage with extra padding to protect the stump extremity

**Figure 1:** 1 month-old Piedmontese calf disarticulated at the antebrachiocarpal joint.

Although the procedure seems awfully painful, we have seen animal not eating well before starting to eat again normally the following day. NSAIDs are given for 3 days postoperatively. Choice of antibiotics and their duration are quite variable depending of each case. Management of the stump could be difficult postoperatively. Dehiscence, infection, exuberant granulation tissue are all potential complications. Daily care is often necessary especially if the wound is healing by second intention until covered by skin. Prosthesis fitting and reeducation will be delayed by stump complications. Amputated cattle are generally confined to a stall to avoid premature break down of the opposite leg.



20-month-old pregnant Holstein heifer with a distal tarsus amputation



22-month-old pregnant Holstein with a proximal metacarpal amputation. The prosthesis was homemade.

Figure 2: Postoperative outcome of 2 pregnant heifers amputated.

Short term prognosis is generally good. Long term prognosis is strongly related to the weight of the animal and its activity. Usually we recommend that female should not be bred and kept as embryos' donor. Beef cattle will be sent to slaughter at the appropriate weight and before the break down of the opposite leg. Finally, amputated pregnant animals are culled after calving.

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