Splinting and Bandaging Liz LaFond, DVM, DACVS, CCRP University of Minnesota Saint Paul, MN

There are many objectives that may be considered when constructing a splint or bandage. These objectives may include: limiting swelling, immobilizing the area, controlling pain, preventing further contamination, maintaining a moist environment, aiding in wound debridement, and absorbing fluid. It is important to have the relevant goals in mind when designing and placing a bandage in order to achieve optimal results. This session will review the construction of an effective bandage and describe proper choice and placement of the most common bandages used for temporary or definitive management of veterinary orthopedic diseases.

Anatomy of a bandage

Regardless of the type of bandage placed, three layers must be considered. A primary layer must be included if there is an open wound or freshly closed surgical wound. A secondary layer can have a number of functions, including protection from "splint disease", control of edema, and absorption of fluid. The tertiary layer is necessary for all bandages to hold the other layers in place and protect the deeper layers or wound from the environment.

Primary or contact layer – this is the layer that has direct contact with the patient and is indicated any time there is an open wound or surgically closed wound that is not completely healed or that still has external sutures in place. Contact layers are either adherent or non-adherent and allow for fluid to be absorbed into the secondary layer. Uncomplicated immediate post-surgical wounds are expected to produce a small amount of exudate for the first few days postoperatively and should be covered with a non-adherent layer. For open wounds, the choice of adherent or non-adherent dressing is dependent on the stage of healing. Adherent dressings aid in removal of contaminants or devitalized tissues and are used when continued debridement is necessary. In a clean, healthy wound or one in which a healthy granulation bed has developed, a non-adherent contact layer is indicated.

Secondary or absorbent layer – this layer functions to absorb fluid and pads the wound and tissues. This layer consists of cotton or cast padding. When applying splints or casts, the amount of padding used must be carefully considered. Increased padding is protective for pressure points and can help to minimize the risk of "splint disease". Too much padding between a limb and rigid splint material can allow for excess motion and may be problematic when used for definitive treatment of a fracture.

Tertiary or supportive layer – this layer functions to hold the primary and secondary layers in place, can be used to apply pressure to tissues and serves as a barrier from the environment for the deeper layers. Splinting or casting material is incorporated within the tertiary layer or between the secondary and tertiary layers when immobilization of a limb is desired.

External coaptation for temporary fracture management

The objectives for management of a fracture in the emergency room setting are primarily to prevent further damage to tissues, control pain and edema, and and protect any open wounds from further contamination. These splints are usually not expected to stay in place for more than 2-3 days.

External coaptation for definitive fracture management

Careful construction and adherence to some important principles are necessary for coaptation that is applied for definitive fracture management. These bandages are meant to remain in place for long enough periods of time that, if not constructed and monitored carefully, can lead to suboptimal healing or, at worst, severe, limb-threatening complications. Factors that must be taken into consideration include fracture classification, patient factors (age, temperament) and client factors (ability to care for a bandage and return for rechecks)

Fractures distal to the elbow and stifle are most amenable to external coaptation as primary management. Highly comminuted fractures or those very close to joints are less successfully managed this way regardless of location on the limb. In general, immobilization of the joint above and the joint below the fracture are necessary to limit mobility at the fracture site enough to allow for adequate callus formation. In certain cases of very distal radial/ulnar or tibial/fibular fractures, mobility can be maintained in the elbow or stifle with a well-constructed cast or splint.

Fracture apposition and alignment are important to consider. Radiographs are made following bandage placement to ensure proper alignment and adequate apposition and to document status of the fracture. Overriding fracture fragments (without end to end contact) will have a harder time healing than if there is a minimum of 50% contact of the fracture fragment ends. It is worth the effort to ensure adequate fracture apposition.

Rechecks - Post-reduction management for externally coapted fractures involves careful owner education and regular rechecks. Weekly rechecks are recommended regardless of whether the bandage is expected to be changed. For the first 2-3 weeks of fracture stabilization, it is preferable not to change the bandage if possible so as to avoid disturbing the forming fracture callus. Very young growing animals may need a new bandage and splint to be constructed weekly.

Complications

Complications associated with bandages, casts and splints can range from mild skin irritation to limb-threatening "splint disease". Proper construction of bandages, diligent monitoring, and good client education for proper maintenance are all important to avoid complications.

Once the bandage is removed

Following removal of a bandage used for orthopedic injury, there will be some joint tissue contracture and muscle atrophy. In many cases, spontaneous use of the limb again may be sufficient for rehabilitation. Techniques to assist with rehabilitation include joint range of motion and proprioceptive enhancement exercises

Specific bandages

Robert Jones bandage - A true Robert Jones bandage is primarily used for emergency stabilization of fresh injuries. It consists of a very thick layer of cotton padding that conforms safely and comfortably to the limb shape. This padding is very tightly compressed such that it becomes firm enough to provide substantial stabilization as well as protective padding and edema control.

Modified Robert Jones - Probably the most common bandage constructed in veterinary orthopedics, there are many modifications to the Robert Jones bandage that have been used, each designed to enhance specific functions. For instance, increasing the padding in the secondary layer can help control or treat skin irritation. Pressure can be enhanced or limited in certain areas to improve comfort or control effect on vascularity and "pressure points". Likewise, the primary and tertiary layers can be tailored to the specific needs of the patient and injury

Walking Bars - An often overlooked but potentially very effective adjunct to a splint or cast is a walking bar. This is a bar that is placed on the distal aspect of the bandage that can prevent weight-bearing on the toes, limit movement in distal soft tissues including toe pads, and protect the distal bandage from scuffing.

Spica Splint - A spica splint is designed to limit mobility and provide compression in the proximal limb and includes a rigid or semi-rigid splint that extends over the shoulders or hips. It can be effective for support in the proximal limbs, but is cumbersome for prolonged use and may be difficult to construct or maintain in the hindlimb, especially in male dogs.

Ehmer Sling - Used primarily for the management of craniodorsal coxofemoral luxation or as an adjunct for acetabular fracture management, an Ehmer, or figure-of-eight, sling is designed to maintain flexion, internal rotation and abduction of the hip, keeping the femoral head in a position that resists re-luxation. It is important to keep in mind that an Ehmer sling is *contraindicated* for treatment of caudoventral luxations.

Conclusion

A properly applied and managed bandage is an important adjunct in veterinary orthopedics. The practitioner must consider the objectives for the bandage and choose the correct type for the specific needs of the patient. Once chosen, the proper construction and management of the coaptation can make the difference between success and failure.