Bandaging in Dogs and Cats: Basic Principles

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ABSTRACT: An integral part of veterinary medicine, bandages provide several benefits, including wound protection, injured limb support, and pressure to decrease hemorrhage. Most bandages consist of three layers: primary (contact), secondary (intermediate/absorbent), and tertiary (outer/protective). The primary layer, which can be adherent or nonadherent, is generally dictated by the stage of wound healing. The type of wound, the amount and type of exudate, and the healing stage are all determining factors for primary layer selection. Nonadherent bandages are indicated for an open wound as it heals and forms healthy granulation tissue or for a closed or partial-thickness wound. The secondary bandage layer is designed to absorb wound fluids, protect the wound from trauma, and immobilize injured limbs. The tertiary layer provides an outer, protective layer for the bandage.

Bandages are widely used in small animals for dressing open wounds, providing pressure for hemorrhage, reducing postoperative limb swelling, and immobilizing fractured limbs. The ideal bandage should have several properties (see Properties of the Ideal Bandage). Different injuries require specific types of bandages. Selection of bandage material and method of application may influence the healing rate. This article reviews the indications and principles for bandaging open and closed wounds in dogs and cats.

PROPERTIES AND FUNCTIONS OF BANDAGES

Bandages serve several functions in aiding wound healing in dogs and cats, including absorbing wound drainage; protecting wounds from further injury, desiccation, and contamination; providing pressure to obliterate dead space and reduce edema and hemorrhage; speeding the rate of epithelialization; enhancing wound contraction; immobilizing adjacent osseous structures; and providing comfort during convalescence. Bandages are composed of three layers: the primary (contact) layer, the secondary (intermediate/absorbent) layer, and the tertiary (outer/protective) layer. In addition, bandages are made from many types of materials (Table I).
**PRIMARY LAYER**

The primary bandage layer should be sterile and remain in close contact with the wound surface.\(^1\)\(^4\) Depending on the healing stage, this contact layer can allow wound exudate to pass through to the secondary layer. Additionally, this layer can be used to debride tissue, deliver topical medications, or form an occlusive seal over a wound.\(^1\)\(^2\) Adherent and nonadherent bandages comprise the two categories of material in this layer. The stage of wound healing will determine which type of material should be applied. Adherent bandages are indicated for the debridement stage, whereas nonadherent bandages are used for wounds in the reparative stage.\(^1\)\(^3\)\(^5\)\(^7\)

**Adherent Bandages**

Surgical debridement of a wound is usually preferred over bandage debridement. An adherent bandage is indicated when excision of devitalized tissue might jeopardize vital structures or when tissue viability is questionable.\(^1\)\(^6\)\(^10\) An adherent bandage is particularly useful for debridement of necrotic tissue adhering to vital structures, tissue that is inaccessible and difficult to debride, and tissue that loses viability during the healing process. Wide-mesh gauze without cotton filler should be used for this layer to facilitate the removal of loose debris, necrotic tissue, and foreign material when the bandage is discarded.\(^1\)\(^2\)\(^5\)\(^6\) Adherent bandages are typically used for 3 to 7 days, depending on wound severity and the amount of necrotic tissue present. Three common types of adherent bandages are dry-to-dry, wet-to-dry, and wet-to-wet (Table II).

**Dry-to-Dry**

Dry-to-dry bandages are indicated for wounds that have foreign material or necrotic tissue with copious exudate that does not aggregate.\(^1\)\(^6\) The wound should be in the debridement stage of healing when the exudate is low in viscosity.\(^3\) To apply this type of bandage, wide-mesh gauze should be placed over the wound surface; this layer should then be covered with cast padding, roll gauze, and a protective outer layer. The bandage should be removed after the primary and secondary layers have absorbed the fluid and debris from the wound surface and the primary layer has subsequently dried.\(^1\)\(^4\)\(^6\) Initially, the bandage may need to be changed as often as two to three times daily. Frequency usually decreases to

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**Properties of the Ideal Bandage\(^1\)\(^9\)**

- Easy to apply and comfortable for the patient
- Free of residue that might adhere to wound
- Can be sterilized and has a long storage life
- No adverse effects on healing
- Inert and nonflammable
- Removes and stores exudate away from wound
- Provides needed support to injured limb
- Provides thermal insulation and maintains moist environment
- Inexpensive

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**TABLE I**

*Commonly Used Bandage Materials*\(^3\)\(^6\)\(^8\)\(^10\)

<table>
<thead>
<tr>
<th>Bandage Layer</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary layer</td>
<td>Adherent</td>
</tr>
<tr>
<td>Nonadherent semioclusive</td>
<td>Wide-mesh gauze</td>
</tr>
<tr>
<td>Nonadherent occlusive</td>
<td>Wide-mesh gauze impregnated with petrolatum</td>
</tr>
<tr>
<td></td>
<td>Wide-mesh gauze impregnated with polyethylene glycol</td>
</tr>
<tr>
<td></td>
<td>Wide-mesh gauze impregnated with petrolatum-based antibiotic ointment</td>
</tr>
<tr>
<td></td>
<td>Cotton nonadherent dressing</td>
</tr>
<tr>
<td></td>
<td>Rayon/polyethylene dressing</td>
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<tr>
<td></td>
<td>Hydrocolloid adhesive layer dressing</td>
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<tr>
<td></td>
<td>Polyurethane films</td>
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<tr>
<td></td>
<td>Hydrogel</td>
</tr>
<tr>
<td></td>
<td>Nonadherent occlusive</td>
</tr>
<tr>
<td></td>
<td>Absorbent cotton</td>
</tr>
<tr>
<td></td>
<td>Cast padding</td>
</tr>
<tr>
<td>Secondary layer</td>
<td>Roll gauze</td>
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<tr>
<td></td>
<td>Stockinette</td>
</tr>
<tr>
<td></td>
<td>Porous adhesive tape</td>
</tr>
<tr>
<td></td>
<td>Elastic adhesive tape</td>
</tr>
</tbody>
</table>

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**Contact Layer**

**Debridement Stage**

**Wide-mesh Gauze**
once or twice daily as the wound begins to heal. Although moistening the bandage immediately before removal may help decrease pain, the patient may need to be lightly sedated with an analgesic (e.g., an opioid). In addition, a new bandage is easier to apply to a sedated patient. As the wound begins to heal, a wet-to-dry bandage should be used.

**Wet-to-Dry**

Wet-to-dry bandages are the most common type used initially for traumatic shear and large open wounds. This type of bandage should be used as the debridement stage advances or when the inflammatory exudate is purulent. Wet-to-dry bandages are indicated for wounds that have foreign material, necrotic tissue, or viscous surface inflammatory exudate (Figure 1A).1,2,4–6

The bandage is applied by moistening sterile, wide-mesh gauze with a wetting solution (e.g., lactated Ringer’s solution, sterile saline, or a 0.05% dilution of chlorhexidine diacetate solution).6 The gauze should be wrung out thoroughly and then placed directly on the wound (Figure 1B), followed by the secondary and tertiary layers (Figures 1C and 1D). The fluid in the gauze will help dilute the exudate and facilitate its absorption and removal from the wound surface. If a significant amount of exudate is expected, a layer of dry wide-mesh gauze can be applied over the wet layer to increase the absorptive capacity of the bandage.

Necrotic tissue and foreign material that adhere to the gauze as the bandage dries will be removed with the bandage.1,4–6 Because removal of this type of bandage may be painful, pain medications and sedatives may be needed and/or the bandage can be moistened before removal.

**Wet-to-Wet**

Although not widely used, wet-to-wet bandages are indicated for promotion of wound drainage.1 Because its debriding capacity is low, this type of bandage should be used only in wounds with abundant viscous exudate with little foreign debris or necrotic material. This wound type is uncommon; therefore, the opportunity to use wet-to-wet bandages is rare. The bandage must remain wet from the time of placement to the time of removal. Wet-to-wet and wet-to-dry bandages are applied the same way, but the wet-to-wet bandage is removed before it has dried. As with wet-to-dry bandages, the wetting solution dilutes the viscous wound fluid and aids in its absorption.

**Nonadherent Bandages**

As wounds heal and healthy granulation tissue begins to form, the primary bandage layer should not adhere to the wound but should allow exudate absorption by the secondary layer.1,4,6–8,11 Nonadherent bandages are indicated for closed or partial-thickness wounds. For wounds involving deep tissue or bone but not skin, a primary layer may be unnecessary.

The two types of nonadherent bandages are described as occlusive and semiocclusive. These bandages are designed to provide an environment that is conducive to optimal wound healing. Semiocclusive bandages are permeable to air and maintain a moist environment while allowing excess exudate to be absorbed from the wound surface.8,11,12 Occlusive bandages are impermeable to air and indicated for healthy wounds with minimal exudation.8

Lee and colleagues11 examined the effects of nonadherent semiocclusive bandage material on open wounds. The bandages were applied to wounds that were chronically infected or that had failed to heal. The semiocclusive bandage was moistened before application and then left in place for 48 hours. The results showed that the semiocclusive bandage was effective in reducing the size of the wound and improving the healing process.

**TABLE II**

<table>
<thead>
<tr>
<th>Bandage Type</th>
<th>Indications</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry-to-dry</td>
<td>Necrotic tissue and foreign material, copious amounts of low-viscosity exudate</td>
<td>Has better absorptive capacity than a wet bandage</td>
<td>May remove viable tissue, tissue may desiccate in the dry environment, painful to remove</td>
</tr>
<tr>
<td>Wet-to-dry</td>
<td>Necrotic tissue and foreign material, viscous exudate</td>
<td>Fluid dilutes exudate so it can be absorbed, antibacterial wetting fluid is used</td>
<td>May remove viable tissue, may enhance bacteria and/or macerate normal tissue surrounding the wound if too wet, painful to remove</td>
</tr>
<tr>
<td>Wet-to-wet</td>
<td>Minimal necrotic tissue or foreign material, abundant viscous exudate</td>
<td>Promotes wound drainage, not painful to remove, moist wound environment minimizes cell death</td>
<td>May enhance bacteria and/or macerate normal tissue surrounding wound if too wet</td>
</tr>
</tbody>
</table>
in dogs. Differences in wound contraction and epithelialization between wounds treated with commercial petrolatum emulsion dressings and those treated with rayon/polyethylene and cotton nonadherent film dressings were reported. All wounds contracted rapidly during the first 14 days and progressed more slowly from day 14 to 21. However, by day 7, the wounds treated with petrolatum emulsion dressings had a significantly higher mean percentage of wound contraction than did those treated with rayon/polyethylene and cotton nonadherent film dressings. With regard to epithelialization, however, the results differed. Wounds treated with petrolatum emulsion dressings epithelialized more slowly than did those treated with rayon/polyethylene or cotton nonadherent film dressings. The results of this study indicate that semiocclusive, nonadherent wide-mesh petrolatum dressings should be used for wounds that are free of necrotic tissue and have newly formed granulation tissue and some exudate but have not yet epithelialized. Once epithelialization begins, a nonadherent bandage without petrolatum should be used.

Occlusive dressings accelerate wound epithelialization and collagen synthesis by protecting the wound and retaining moisture. These dressings are indicated for wounds that have an established granulation tissue bed, advanced contraction and minimal exudate, and have begun to epithelialize. There is some controversy regarding whether the occlusive bandages enable or promote bacterial invasion and wound infection. With semiocclusive bandages, bacteria can be removed as the exudate is absorbed from the wound surface. With occlusive bandages, however, bacteria become trapped beneath the impermeable bandage material and are able to proliferate in the moist environment. Although bacterial numbers increase over time with occlusive bandages, the healing process is not necessarily slowed. In addition, one study found that occlusive, hydrocolloid bandages restrict the release of bacteria into the air during bandage changes, thus minimizing their contribution to nosocomial infections.
SECONDARY LAYER

The purpose of the secondary bandage layer is to absorb blood, serum, exudate, bacteria, and necrotic debris from the wound (Figure 1C). The material must have adequate capillary action and should be thick enough to absorb the fluid. It also serves to protect the wound from trauma and immobilize the limb if indicated.1,4–7 To achieve maximum drainage, this layer should be in contact with the primary layer but not with excessive pressure as to limit absorption.1,5,6 To avoid possible contamination with environmental bacteria, the bandage must be changed before it soaks through to the tertiary layer. Thus this layer should be changed often when the wound is draining heavily.6

TERTIARY LAYER

The tertiary bandage layers serve to hold the other layers of the bandage in place and may be used to immobilize the wounded area (Figure 1D).1,4–7 The gauze bandage and elastic adhesive tape should be in contact with the secondary layer for maximum drainage to occur; however, it should not be wrapped so tightly as to interfere with absorption.1,4–7

BANDAGE AFTERCARE

All bandages should be kept clean, dry, and intact. Bandage changes should be scheduled appointments, and owners should be instructed to call or visit the clinic if a problem arises with the bandage between appointments. Some patients may need to be discharged with an Elizabethan collar to eliminate the opportunity for them to chew the bandage.

REFERENCES


About the Authors

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ARTICLE #1 CE TEST

The article you have read qualifies for 1.5 contact hours of Continuing Education Credit from the Auburn University College of Veterinary Medicine. Choose only the one best answer to each of the following questions; then mark your answers on the test form inserted in Compendium.

1. The secondary or intermediate bandage layer
   a. remains in close contact with the wound surface.
   b. holds the other layers in place.
   c. can be used to deliver topical medications.
   d. absorbs blood, serum, exudate, bacteria, and necrotic debris from the wound.

2. ______________ is appropriate for a wound in the debridement stage.
   a. Cotton nonadherent dressing
   b. Rayon/polyethylene dressing
   c. Wet-to-dry bandage
   d. Nonadherent occlusive dressing

3. A wet-to-dry bandage is a type of
   a. nonadherent, occlusive bandage.
   b. nonadherent, semi-occlusive bandage.
   c. adherent bandage.
   d. nonadherent, hydrocolloid adhesive layer dressing.

4. What advantage do dry-to-dry bandages have over wet-to-dry and wet-to-wet bandages?
   a. They will decrease bacteria.
   b. Bandage removal is not painful.
c. They have a better absorptive capacity.
d. They minimize cell death.

5. Although not widely used, __________ promote(s) wound drainage.
a. dry-to-dry bandages
b. wide-mesh gauze impregnated with polyethylene glycol
c. cotton nonadherent dressing
d. wet-to-wet bandages

6. Dry-to-dry bandages must be changed
a. every 3 weeks, with no exceptions.
b. initially up to three times a day, with the frequency usually decreasing to once or twice a day as the wound heals.
c. once a week initially, then every 3 weeks.
d. every two hours for the first week, then every 6 hours until healing has occurred.

7. Nonadherent bandages should be used
a. during the debridement stage.
b. for wounds with substantial necrotic tissue.
c. for wounds with a substantial foreign material.
d. as wounds heal and healthy granulation begins to form.

8. Adherent bandages are typically used for _____ days.
a. 1 to 2
c. 2 to 3
b. 3 to 7
d. 6 to 8

9. What type of bandage should be used when epithelialization begins?
a. nonadherent without petrolatum
b. wet-to-dry
c. nonadherent with petrolatum
d. wet-to-wet

10. The intermediate bandage layer
a. should allow exudate absorption and protect the wound.
b. is rarely necessary for most bandages.
c. is composed of elastic adhesive tape.
d. should come in direct contact with the wound.