Improve Veterinary Education

Rational Wound Management in Small Animals

Critical Pitfalls and Evidence-Based Lessons

Introduction

Wound management in small animals is a cornerstone of surgical practice. While some wounds follow predictable healing trajectories, many complications arise due to errors in the **early evaluation, bacterial control, closure strategy, or mechanical handling**. When these steps are mishandled, wounds often remain trapped in the **inflammatory phase**, leading to infection, necrosis, and delayed healing.

This document reviews the **four critical control points (CCPs)** where wound management commonly fails, with emphasis on **dogs and cats**. Each CCP is illustrated with clinical reasoning, consequences, and supported by key literature.

Critical Point 1 — Inadequate Initial Evaluation

The Problem

Many failures begin with a **misclassification of the wound**. A dog-bite wound presented 16–24 hours post-trauma cannot be equated to a clean surgical incision. Ignoring wound age, contamination, and tissue viability leads to flawed decisions downstream.

Why It Matters

- **Traumatic wounds are always contaminated** (Devriendt & de Rooster, 2017).
- Delay beyond 6–12 hours allows bacterial replication and biofilm formation.
- Bite wounds cause **crush injury** and undermine subcutaneous tissues—damage often extends deeper than the surface suggests.

Clinical Example

A 7-year-old Labrador with a flank bite wound presented 16 h post-injury. The wound was closed immediately without debridement. Six days later, necrosis, abscess, and systemic illness developed. The root error was misclassifying the wound as suitable for primary closure.

Critical Point 2 — Insufficient Control of Bacterial Load

The Problem

Superficial lavage with a syringe is inadequate. Without **aggressive irrigation, sharp debridement, and drainage of dead space**, bacteria, necrotic tissue, and clots persist.

Why It Matters

- **Lavage**: requires volume, pressure (7–8 psi), and isotonic solution.
- **Debridement**: vital to remove necrotic fascia, fat, and skin until bleeding tissue is visible.
- **Dead space**: allows accumulation of serum and exudate → bacterial proliferation.

Clinical Example

Inadequate lavage and no drain placement left a wound contaminated. Within 48 h, pus and swelling developed, perpetuating inflammation and breaking down the closure.

Evidence

- **Initial Management of Traumatic Wounds (2017):** conversion of a contaminated wound into a clean one depends on proper lavage and debridement.
- **Local Wound Management Review (2024):** modern dressings and negative pressure wound therapy (NPWT) can further decrease bacterial load and stimulate granulation.

Critical Point 3 — Premature Closure

The Problem

Closing a wound that is still contaminated or poorly vascularized is the surgical equivalent of **“sealing the enemy inside.”**

Why It Matters

- **Primary closure** is safe only for clean or clean-contaminated wounds.
- **Delayed primary closure (2–5 days post-trauma)** allows assessment of tissue viability and control of contamination.
- **Secondary closure** or **second-intention healing** may be preferable in chronic or infected wounds.

Clinical Example

A laceration from a bite wound was sutured immediately without debridement. Within days, infection spread under the sutures, leading to abscess formation and necrosis.

Evidence

- Cuddy (2017): **primary closure should be avoided** in contaminated wounds.
- Tobias & Song (2017): emphasize **delayed or staged closure** when infection or necrosis is suspected.

Critical Point 4 — Poor Management of Mechanical and Biological Progression

The Problem

Even after classification and bacterial control, **mechanics and biology must be respected**. Closure under excessive tension or without obliterating dead space compromises perfusion and healing.

Why It Matters

- **Tension** → ischemia, skin necrosis, dehiscence.
- **Dead space** → fluid accumulation, infection.
- **Failure to support granulation** (e.g., via NPWT or dressings) → wound trapped in inflammation.

Clinical Example

A dog with a bite wound closed under tension developed skin necrosis and dehiscence. No drain was placed, and fluid accumulation perpetuated infection.

Evidence

- **Tension-Relieving Techniques (2017):** walking sutures, tension-relieving patterns, and local flaps minimize ischemia.
- **Tensioning Sutures (2017):** gradual approximation of wound edges can exploit skin elasticity without strangling blood supply.
- **Local Wound Management Review (2024):** NPWT accelerates granulation and decreases edema, helping wounds transition beyond inflammation.

Other Contributing Factors

While the four CCPs above are the main culprits, other elements can aggravate outcomes:

- **Systemic factors**: poor nutrition, endocrinopathies, hypoproteinemia.
- **Owner compliance**: inadequate wound care, failure to restrict activity.
- **Antibiotic misuse**: poor penetration in necrotic tissue; over-reliance without surgical source control.

Take-Home Messages

1. **Classify before acting**: time since trauma, contamination, and tissue viability define the plan.
2. **Convert contaminated to clean**: lavage, debridement, drains.
3. **Close only when appropriate**: delayed or staged closure if in doubt.
4. **Manage both mechanics and biology**: tension, perfusion, dead space, granulation.
5. **Think dynamically**: wound plans must adapt with evolution.