

Chapter IX

Diseases and disorders of integumentary system

Topic: Wound and its management

Outline of the presentation

Lesson objectives:

By the end of this lesson students will be able to:

- Explain what is wound? Types of wound.**
- Describe the Patho-physiology of wound healing.**
- List the different Factors affecting wound healing.**
- Elaborate the General principles of wound mgmt / (Protocols of wound**

1. What is wound ? And wound types

| Anything that disrupts the normal integrity of the skin is **called a wound.**



"Types of wounds"

Intentional
Surgical
incision



Non-intentional
Self-inflicted
Accidents/Tra



What is the purpose of classifying wounds?

| It is important to apply appropriate wound management technique

What is intentional wound?

It is created during surgical incision

- Clean wound
- Clean uncontaminated
- Contaminated
- Dirty wound

What is Non-intentional wound?

Self-inflicted

Accidents

Trauma

Closed

wound

▢ Bruising

g Contusion

▢ Hematoma

Open wound

▢ Abrasions/erosion

▢ Lacerations

▢ Puncture

▢ Burns

A. Classification of intentional wound

Clean wound: it is a type of intentional wound created during surgical operations (ovariohystroctomy, castration etc).

Clean contaminated: it is created when GIT are opened without appreciable leakage of intestinal content.

Contaminated wound: it is created on infected area of GIT with appreciable leakage of intestinal content.

Dirty wound: it created pullurent on operation site of hollow organs.

B. Classification of non-intentional open wound

1. Abrasions(Grazes) :

- May appear superficial but have a large surface area that poses an increased risk of infection.
- There is often associated bruising and they can take a long time



Open wound cont....

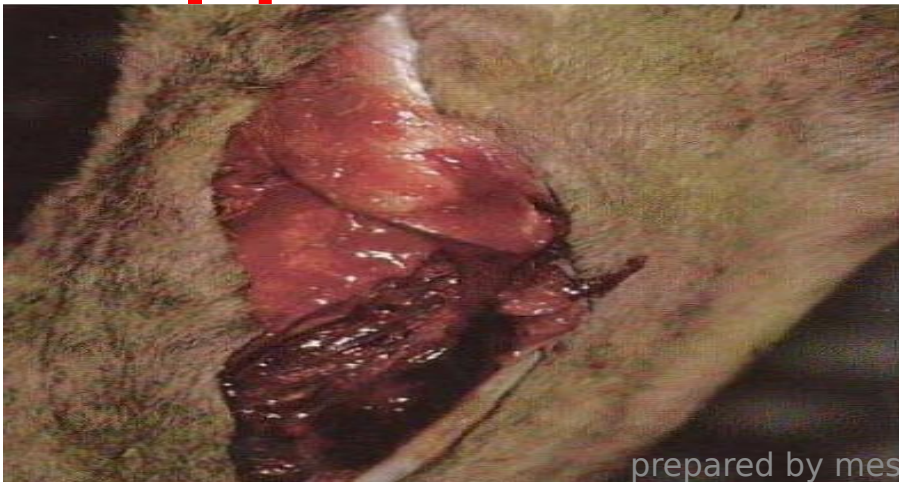
2. Clean-cut (incised):

- Caused by something sharp.
- This can be serious as there is often a **lot of bleeding**.
- The edges of the wound appear clean and straight and the wound goes deeper into the tissue than



3. laceration

- ⌘ Characterized by sharply incised edges with minimal tissue trauma. Irregular tear-like wounds. These can be **superficial or deep**.
- ⌘ Superficial pertains to the skin, and Deep pertains to tendons and muscle.
- ⌘ If tissue is torn away, the wound is called an **avulsion**.



Cont...

- Lacerated wound which is presented within **12 hrs**: perform minimal debridement of the tissues, lavage of wound, and a primary closure.
- Over 12 hrs. old: en bloc debridement of the wound and primary closure.
- Heavily contaminated/old lacerations: debridement, and lavage. These are **uncommonly** seen.

4. Puncture wound

⌘ **Caused by a piercing object.**

⌘ Can you give me some examples?

- Gunshots
- Bite wounds
- Insect stings
- Nail
- Arrows



⌘ They are also more easily overlooked.

5. Burns

- It can be Thermal, freeze, chemical, sun burn etc..
- The face and eyes, the breast, back, and legs are most often involved.
- burns from explosions usually affect the head, breast and neck.

Closed accidental wound types

1. Hematoma

- ⌘ A hematoma is the accumulation of a large volume of free blood under the skin.
- ⌘ Hematoma can be differentiated from edema or inflammatory fluid by the '**finger press test**'. In the case of edema.
- ⌘ A finger pressed onto the swelling and then removed will leave an indent that remains visible for some minutes.

Cont...

- ⌘ If the swelling is inflammatory, there will probably be no pitting with pressure:
- ⌘ In the case of **hematoma** the indentation will disappear immediately the finger is removed.
- ⌘ Treatment of hematoma can be left to organize or can be drained according to clinical preferences.

2. Bruise

- Bruise is the result of bleeding and tissue destruction within and **under the intact skin**, that causes damage to capillary beds or larger blood vessels.
- Treatment is seldom required, but In some sites (such as eyelids or penis) ice packs or possibly cold-hosing can be used **to reduce the local inflammation** and control swelling.

2. Pathophysiology of wound healing; 4 phases

Wound healing: is a dynamic process and more than one phase of wound healing is usually occurring at any time and **has 4 phases.**

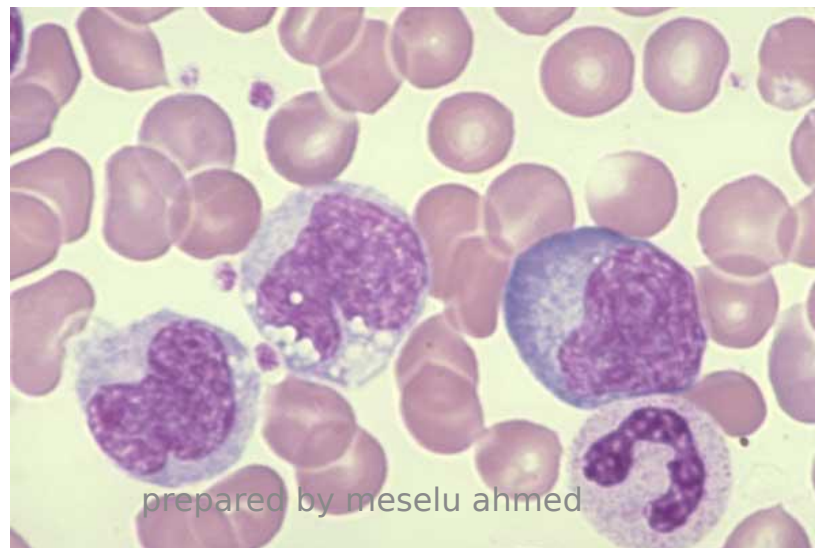
1. Inflammatory phase
2. Debridement (destructive) phase
3. Repair (Proliferative) phase
4. Maturation phase

Inflammatory Phase

- Begins immediately after injury.
- Blood fills the wound and cleans the wound surface.
- Hemorrhaging slows, and vasoconstriction occurs lasting about 5 to 10 minutes.
- Blood vessels dilate and leak fluid that contains clotting elements into the wound. It's this fluid along with blood that causes a blood clot to form, thereafter a scab forms.
- The severity of the wound dictates whether stitches are placed.

Debridement Phase

- Occurs about 6 hrs. after injury.
- Neutrophils and monocytes appear in the wound. These guys remove necrotic tissue, bacteria, and foreign material from the wound.



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Repair Phase

- Occurs 3 to 5 days after injury
- Fibroblasts invade the wound and produce collagen that will mature into fibrous or scar tissue.
- Granulation tissue bed begins to form filling in the wound.
- New epithelium forms on the wound surface.
- Suturing wounds bypasses the repair phase with epithelialization occurring almost immediately, as early as 24-48 hrs.

The Healing Process

- Full restoration of natural anatomy is seldom if ever achieved. Scarring is the inevitable outcome of wounding in any tissue. In some cases this limits function or the cosmetic appearance.
- Healing can be achieved in one of **three ways**:
 1. *Primary or first intention healing.*
 2. *Secondary or second intention healing.*
 3. *Delayed primary healing*

1.Primary (First Intention) Healing

- ⌘ This is usually used where suturing easily reunites wound margins, and there is no detectable reason for wound healing failure.
- ⌘ Minimal granulation tissue formation and epithelial migration are required.

The major mechanisms of healing applicable to surgical and accidental wounds

Surgical wound

Accidental wound

First intention healing:

Second intention healing:

Rapid healing

Slow healing

Small scar

Extensive scarring

Rapid restoration of tissue strength

Slow/weak tissue strength

Minimal infection/complication

Complication rate high

2. Secondary intention healing

- ⌘ In this tissue granulation must fill the base of the wound before epithelization is completed.
- ⌘ *It depends on the inflammatory response.*
- ⌘ *The longer the wound takes to heal more scar is formed so scar formation the less cosmetic appearance.*
- ⌘ So clinician try to close wounds by primary wound intention wound management even though it is difficult.

The major clinical importance difference b/n surgical and accidental wounds

Surgical Wounds

Predictable site

Predictable direction

Predictable tissue involvement

Minimal skin damage

Closure by primary union is the norm

Wound break down is rare

Infection is preventable and is rarely significant

Accidental wound

Unpredictable site

Unpredictable direction

Unpredictable tissue involvement

Concurrent bruising and tearing of skin

Closure by primary union is less usual and may be difficult

Wound break down is relatively frequent

Infection is an almost inevitable complication and is common

3. Factors that affect wound healing

- ‖ Infection
- ‖ Movement
- ‖ Foreign body
- ‖ Necrotized tissue
- ‖ Poor blood supply
- ‖ Poor nutrition/health status
- ‖ Age

4. Wound management protocols

- Owners protocol for wound management
- Veterinarians protocol for wound management
- Minimizing the potential problems of wound
 - Early intervention
 - Application of sound surgical principles
 - Use of appropriate debridement & lavage technique
 - Prevent/reduce infection

5. Basic wound

management (BWM)

| The aim of wound management (treatment) is:

- To stop bleeding
- To cleans and prevent infection
- To promote wound healing (as quickly and effectively as possible).

| Basic wound management

- ♣ History
- ♣ Restrain
- ♣ Hemorrhage control
- ♣ Cleaning
- ♣ Wound assessment
- ♣ Wound debridement
- ♣ Wound lavage
- ♣ Wound Dressing
- ♣ Wound closure
- ♣ Supportive treatment

A. Wound Management Immediate Wound Care

- **Bathing:** Use a clean swab with warm water (containing a small amount of a suitable cleanser or antiseptic) to gently cleanse a wound.
- **Cold hosing :** Washed (for approximately 15 minutes at a time) over an injury, to sooth and reduce swelling.
- **Poulticing:** Apply a poultice (hot or cold) to aid treatment. Cold poultices are used to **reduce inflammation** caused by kicks or knocks. Hot (but comfortable to the touch)

Cont...

- Cover the wound with a clean dry bandage to prevent further contamination.
- Water soluble antibiotic ointments may be applied. Do not use creams or powders as they act as foreign bodies and delay wound healing.
- The above should be done until definitive treatment is initiated. **Life-threatening injuries and stability of the animal must be attended to first.**

B. Wound Lavage

Reduces the amount of bacteria by removing debris and loose particles and tissue from the wound.

Bacterial cultures can be taken from tissue samples.

Large volumes of warm sterile, balanced electrolyte solution are preferred for lavage.

The mechanical action of the lavage is the most important factor for successful lavage.

C. Wound Debridement

- Is necessary to remove all contaminated devitalized or necrotic tissue and foreign material from the wound.
- Surgically: excise the affected tissue in layers, beginning at the surface and progressing to the wound depths.

6. Methods of wound closure

Table 4-4 METHODS OF WOUND CLOSURE

Method	Comments
Primary closure	Closure of a wound with sutures; indicated for fresh clean wounds with minimal contamination/trauma or surgically created wounds; results in <i>first-intention healing</i>
Suture or graft	
Delayed primary closure	Closure of a wound before 3-5 days after injury; that is, before development of granulation tissue; indicated for moderately contaminated/traumatized wounds
1-3 days post trauma	
Contraction and epithelialization	Wound allowed to heal without surgical closure; wound closes as a result of contraction and epithelialization; may not be possible or desirable in all wounds; results in <i>second-intention healing</i>
Dirty or contaminated wounds	
Secondary closure	Closure of a wound after 3-5 days; that is, after granulation tissue has developed in the wound; indicated in severely contaminated/traumatized wounds that require considerable debridement and prolonged wound management; takes advantage of the positive effects of granulation tissue; results in <i>third-intention healing</i>
3-5 days post trauma	

Healing Method: Dependent on the age and condition of the wound

⌘ 1st Intention Wound Healing (Primary closure)

- Wound is sutured closed, used when wounds are 6-8 hrs. old with minimal tissue damage and contamination.

⌘ 2nd Intention Wound Healing (Healing by contraction and epithelialization)

- θ Wound is left to heal open. These wounds are 5 days or older and have significant tissue damage or are excessively contaminated.

θ After surgical debridement and open wound management, the wound healed by second intention with contraction and epithelialization.

ϖ After several weeks, the wound is completely closed. Note the hairless, shiny new epithelium. The epithelium will thicken over time but will always remain fragile.

ϖ 3rd Intention Wound Healing (Secondary closure)

- Delayed primary closure. Wound is sutured closed after the granulation tissue has formed. 3-5 day old wounds and are heavily contaminated or infected

The “Golden Period”

Time is one of the factor that contribute for wound infection

Wounds treated within 6 to 8 hours of injury are treated within the “golden period”, meaning that bacterial levels **have not multiplied** to critical numbers yet and the tissue has not become infected.

Wounds treated after the golden period should not be closed, because infection is likely.

Based on the time b/n wound occurrence and initial Rx wounds are classified in to

Class-I: those presented from 0 to 6 hours post wounding

Class-II: those presented from 6 to 12 hours post wounding

THE END

Exercise

1. What are the factors that inhibit wound healing?
2. By what three methods can wound healing be achieved?
3. What techniques can be used to optimize healing of surgical wounds?
4. Which vitamins and minerals affect wound healing?

Cont...

Answer for question no 3

Any technique that reduces inflammation, minimizes tissue destruction, clears debris, and promotes a moist environment will optimize healing of surgical wounds. Some specific techniques are to perform meticulous hemostasis, limit the use of electrocautery, handle tissue with atraumatic instruments, achieve early and precise tissue approximation, avoid crush injury, and minimize suture material (foreign bodies) in the wound. Early and frequent cleansing helps to gently débride wounds by clearing surface exudates, bacteria, and debris. Also, evidence indicates that covering immature epithelium with silicone sheeting, paper tape, or other materials that simulate a mature stratum corneum can beneficially modulate the scarring process.

Answer for question no 4

Vitamin A decreases the inflammation in wounds and may improve wound healing in steroid-dependent patients. Vitamin C is necessary for the hydroxylation of lysine and proline in collagen cross-linking. Essential fatty acids are required for all new cell synthesis. Magnesium and zinc are important cofactors for DNA synthesis, protein synthesis, and cellular proliferation. Copper-based enzymes catalyze the cross-linking