Soft Tissue Injuries
Surface Trauma & Burn Injuries

- Abrasions
- Lacerations
- Avulsions
- Puncture wounds
- Human & animal bites
- Contusions
- Burns
Objectives

► Identify the morbidity & mortality of soft tissue injury
► Describe the anatomy & physiology of the skin
► Understand the pathophysiology of wound healing
► Discuss MOI & the signs & symptoms of a variety of soft tissue wounds
► Examine the prehospital management of specific soft tissue injuries/wounds
► Determine the characteristics of wound dressings and bandages
► Describe factors that increase the potential for wound infections
The Integumentary System

- Skin
- Accessory structures: Hair, nails, sensory receptors, sweat glands, sebaceous glands (oil glands) & muscle fibers
- Largest organ system of the body
  - Is Durable
  - Is Pliable
  - Repairs itself
Functions of the Skin

- Consider the skin an “envelope”
- Protects the body against injury & dehydration
- Provides protection against infection
- Maintains fluid balance
- Is involved in the regulation of body temperature
- Sensory function (pain, touch, heat, cold)
- Cosmetic
Anatomy and Physiology

Layers of skin

- **Cutaneous tissue**
  - **Epidermis** - Outermost layer of tightly packed epithelial cells
  - **Dermis** - Thicker contains collagen & elastic fibers, nerves, muscle fibers, sweat & sebaceous glands, blood vessels

- **Subcutaneous tissue** - Loose connective tissue
  - Insulates the body & serves as a shock absorber
  - **Fat**

- **Deep Fascia**
  - Fibrous tissue to insulate, cushion, caloric reserve, body shape & support, protect underlying structures
Wound Healing

Hemostasis of Wound Healing

- Reflex vasoconstriction for up to 10 minutes
- Vasocontraction
- Formation of a platelet plug
- Blood coagulation within seconds (severe) or 1-2 minutes (minor)
- Growth of fibrous tissue into the blood clot
Wound Healing

► **Inflammatory Response - Red & Swollen**
  - Release of chemicals from the injured vessel, platelets, wbc’s
  - Local arteriole vasodilatation
  - Increased capillary permeability in affected area
  - Increased blood flow to meet $\uparrow$ metabolic needs
  - Movement of granulocytes, lymphocytes & macrophages to clear foreign bodies & dead tissue
  - Angiogenesis
  - Epithelialization
  - Collagen deposit w/i 48 hours
Epithelialization
Hemostasis & Inflammation
Wound Healing

► **Proliferating Phase**
  - Overlapping collagen deposits, granulation, angiogenesis & epithelialization

► **Maturation/Remodeling/Reconstructive Phase**
  - Scar tissue ~ 2/3 of original strength
Factors Effecting Wound Healing

- Location - i.e. over an area of movement, lines of tension
- Size/Depth
- Extremes in age can speed or slow healing
- Alcoholism
- Diabetes
- Malnutrition
- Hypoxia
- Cardiovascular disease
- Peripheral vascular disease - Edema
- Kidney or liver failure
- Advanced cancer
- Medications – Aspirin, NSAID’s, steroids, penicillin, anticoagulants, antineoplastic agents
- High-risk wounds
High Risk Wounds

- Wounds in people with pre-existing conditions
- Bites
- Burns
- Crush wounds
- Devitalized tissue
- Foreign bodies
- Organic matter contamination
- Puncture wounds
Abnormal Scar Formation

- **Hypertrophic scar tissue** - Excess accumulation of scar tissue within the wound borders
- **Keloids** - Excess accumulation of scar tissue beyond the original wound borders
Types of Bleeding - External On the Floor

- **Capillary**
  - Bright red
  - Slow flow

- **Venous**
  - Dark red
  - Continuous oozing
  - Onto what type of surface

- **Arterial**
  - Bright red
  - Spurting

What should you include in your radio report?

What about EBL?
Types of Bleeding - Internal

- In the abdomen - Spleen, liver, mesentery, Great Vessels
- In the pelvis
- In the chest
- From long bone injuries

How do you assess this type of bleeding as a paramedic?
Wound Infections

- Open wounds break the first line of defense
- Foreign bodies may cause infection
- Depth & type of wound - associated with contamination and infections
Closed Soft Tissue Injuries

- Types
- Contusion
- Hematoma
- Closed crushing injury
Contusion

- Epidermis is intact
- Cells damaged and blood vessels in the dermis are torn
- Blood accumulation causes bruising. As the blood in the tissues loses oxygen, the area will turn purple, then blue. This bruising effect is called ecchymosis
- Swelling and pain are usually present
Hematoma

- A lump caused by collection of blood beneath the skin (may be > 1 liter)
- Larger amount of cell damage, larger vessels involved
Crush Injury

- Crushing force applied to any body area
- Skin intact - internal damage may be severe
Crush Injuries

**Pathophysiology**
- May be life-threatening
- Difficult to treat due to cellular, vascular & nerve disruption

**Sequelae**
- Hemorrhage & fluid loss
- Destruction of bones & muscles
- Compartment syndrome
- Infection
Crush Injuries

Signs & Symptoms
- Crushed area with soft tissue swelling
- Pain
- Hypovolemia or hypovolemic shock
- Compartment syndrome
- Loss or neurovascular function
Open Soft Tissue Injuries

- Abrasions
- Lacerations
- Incision
- Avulsion
- Amputations
- Open crush injury
- Puncture/penetrating wound
- Impaled object
Abrasion

- Outer most layers of skin are damaged
- Painful
- Minimal bleeding or oozing
- Example: road rash
Lacerations

- Caused by a forceful impact
- Smooth or jagged and of varying depth
- Bleeding may be severe (depends on vessels injured)
Incision

- Caused by a very sharp object
- Varying depths
- Smooth edge
Avulsion

► Flap of skin or tissue torn loose or pulled completely off
► May or may not be viable
► Example: degloving
Amputation

- Extremities (Fingers, hands, arms, toes, foot, leg, or other body parts)
- Jagged skin and/or bone edges typically present
- Guillotine amputations from sharp blades
- Blood loss varies
- Complete or partial
Amputations
Open Crush Injuries

- Damage to soft tissue and internal organs
- Painful, swollen, deformed extremities may be present
- May have minimal external bleeding/ internal bleeding may be severe
- Re-perfusion phenomenon
- Compartment syndrome
Open crush injury
Puncture/ Penetrating Wounds

- Foreign body enters the body
- Bleeding may be severe
- Underlying damage may be extensive
- Increased risk of infection
- Penetrating wounds have entrance and exit sites
Penetrating Entrance Wounds
Penetrating Knife Wounds
Exit Wounds
Impaled Objects

- Instrument that caused injury remains impacted in the wound
Impaled Objects
Treatment Priorities

- Scene Safety
- ABC’s or MARCH
- Control the bleeding
- Dressings
- Stabilization & bandaging
- Medical treatment
Control Bleeding

- Direct pressure
- Elevation
- Pressure dressing
- Pressure points
- Tourniquet??

Apply direct pressure on external wounds with sterile cloth or your hand, maintaining pressure until bleeding stops.
Dressings

- Sterile
- Non-sterile
- Occlusive
- Adherent
- Non-adherent
Medical Treatment

- Bleeding
- Foreign body
- Contaminated wound
- DTP
Special Considerations

► Impaled objects
  ▪ location, complications, stabilization, removal

► Amputation/ avulsion
  ▪ leave loose tissue in place, wrap in gauze and keep cool

► Crush Injuries
  ▪ Prevent sudden death-- ABC’s
  ▪ Prevent renal failure
  ▪ Salvage limbs
  ▪ Fluid therapy
Compartment Syndrome

**Signs & Symptoms**

- Pain disproportionate to injury
- **Sensory deficit**
- Progressive muscle weakness
- Tense swollen area
- Elevated compartment pressures
- Loss of pulses
Compartment Syndrome
Compartment Syndrome

Treatment

- Placement of an intracompartmental monitor
  - \(<20 = \text{normal}\)
  - \(>20 = \text{ischemia}\)
  - \(>30 = \text{necrosis}\)
- Elevation of limb not above heart level
- Fasciotomies to release the pressure
Documentation

- General wound description (size, location, depth, complications)
- Treatment/ interventions
- Patient response to interventions
Questions?
**Wound related factors to consider in the Assessment of the Injured Patient**

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<th>Underlying internal injuries</th>
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