1. **Soft Tissue Injuries**  
   *(Class 18)*

2. • Definition of soft tissue  
   - All tissues except bone and teeth

3. • Soft tissue  
   - Layers  
     • Epidermis  
     • Dermis  
     - Vessels  
       » Arterioles  
       » Capillaries  
       » Venules  
     - Nerves  
     - Hair follicles  
     - Sebaceous (oil) glands  
     - Sweat glands  
   • Subcutaneous  
     - AKA Sub-Q fat  
     - AKA adipose fat  
   • Fascia  
   • Muscle  
     - Skeletal muscle

4. • Functions of skin  
   - Prevents water loss  
   - Retards heat loss  
   - Barrier to infection

5. • Internal organs  
   - Types  
     • Solid  
       - Examples  
         » Liver  
         » Pancreas  
       - Bleeds profusely  
     • Hollow  
       - Examples  
         » Stomach  
         » Bowel  
         » Gall bladder  
       - Infections
• Trauma
  - The application of force or energy to the body
  • Sharp objects tend to open the skin (open wounds)
  • Blunt objects, depending on the amount of force at contact, may open the skin or leave it intact (open or closed wounds)

Wounds

• Definition
  - Physical defect of soft tissues caused by the application of force or energy

• Types
  - Closed
    • Application of blunt force where skin remains intact and underlying structures are injured
  - Open
    • Application of penetrating or blunt force where skin opens; underlying structures may also be injured

• Types of closed wounds (Cont.)
  - Contusion
    • Epidermis remains intact
    • Cells are damaged and blood vessels (mostly capillaries) torn in the dermis
    • Swelling and pain are typically present
    • Blood accumulation causes discoloration
  - Hematoma
    • Collection or “pool” of blood beneath the skin
    • Larger amount of tissue damage as compared to contusion
    • Larger vessels are damaged
    • May lose one or more liters of blood

• Types of closed wounds
  - Internal laceration
    • Jagged tear in an organ
    • Usually abdominal
    • Signs and symptoms
      - Hypotension without overt blood loss
      - Abdominal distention
      - Guarding
      - Contused abdominal wall
  - Internal puncture
- Broken bone penetrates an organ
  - Crush
    - Crushing force applied to the body
    - Can cause internal organ rupture
    - Internal bleeding may be severe with shock (hypoperfusion)
    - Compression of structures underlying the skin

- Types of open wounds
  - Incision
    - Straight smooth cut
  - Laceration
    - Jagged tear
    - Break in skin of varying depth
    - May be linear (regular) or stellate (irregular) and occur in isolation or together with other types of soft tissue injury
    - Caused by forceful impact with blunt object
    - Bleeding may be severe
  - Evisceration
    - Protrusion of abdominal organs through abdominal wound
    - Organ is almost always small bowel

- Types of open wounds (Cont.)
  - Abrasion
    - Outermost layer of skin is damaged by shearing forces
    - Removal of skin and perhaps underlying tissues by friction
    - Painful injury, even though superficial
    - No or very little oozing of blood
  - Avulsion
    - Flaps of skin and/or other tissue are torn loose or pulled completely away from the body
    - Soft tissue only
    - Types
      - Total
        » Fragment completely severed from body
        » Treat severed part as amputated part
      - Flap
        » Fragment remains partially attached to body
        » Always replace flap to natural position
        » To certain extent can be used coextensively with amputation
• Types of open wounds (Cont.)
  - Amputation
    • Involves the extremities and other body parts
    • Massive bleeding may be present or bleeding may be limited
    • Tearing or cutting away of tissue
    • Includes soft tissue and bone
  - Types
    - Total or complete
      » Fragment completely severed from body
      » Special care for amputated part
    - Partial
      » Fragment remains partially attached to body
      » Always replace flap to natural position

• Types of open wounds (Cont.)
  - Amputation Assessment
    • Above elbow
      - Level 1 trauma center
    • Above knee
      - Level 1 trauma center
  - Treatment
    • Special bandage

• Types of open wounds (Cont.)
  - Crush injuries
    • Damage to soft tissue and internal organs
    • May cause painful, swollen, deformed extremities
    • External bleeding may be minimal or absent
    • Internal bleeding may be severe
    • Splint

• Types of open wounds (Cont.)
  - Punctures
    • Caused by sharp pointed object or blunt object with high energy
    • May be no external bleeding
    • Internal bleeding may be severe
    • Exit wound may be present
- Punctures
  - Examples:
    - Gun shot wound
      » Entry
      » Exit
      » Caliber
      » Type of bullet
        * Solid
        * Hollow point
      » Proximity
    - Stab wound
      » Slash versus stab
      » Up versus down
      » Length of blade
      » Depth of penetration (hilt marks)
    - Impaled objects
      » Always leave object in place
      » Special bandage
    - Bites
      » Who or what did biting
      » Area affected
      » Observe animal

- Treatment
  - BSI
  - Gloves
  - Gown
  - Eye protection
  - Hand washing
  - Maintain proper airway/artificial ventilation/oxygenation.
  - Management of open soft tissue injuries.
  - Expose the wound.
  - Control the bleeding.
    - Direct pressure
    - Uncover and apply point pressure if bleeding does not halt
    - Elevation
    - Indirect pressure
    - Tourniquet
• Treatment (Cont.)
  - Circulation
    • Check and maintain a central pulse
    • Two IV's of normal saline or lactated ringers running to keep a hypotensive patient's blood pressure 90 to 110 mmHg.
    • If patient is not hypotensive, one IV of normal saline or lactated ringers TKO.
  - Prevent further contamination.
    • Apply dry sterile dressing to the wound and bandage securely in place.
    • Keep the patient calm and quiet.
    • Treat for shock (hypoperfusion) if signs and symptoms are present.
    • NPO
    • Transport with frequent vital signs

• Special considerations
  - Evisceration
    • Do not touch or try to replace the exposed organ.
    • Cover exposed organs and wound with a sterile dressing, moistened with sterile water or saline, and secure in place.
    • Flex the patient's hips and knees, if uninjured.
  - Impaled objects
    • Do not remove the impaled object, unless it interferes with the airway, it would interfere with chest compressions, or interferes with transport.
    • Manually hold the object in place.
    • Trim the object to a manageable size, if necessary.
      - Always cool metal impalements while trimming.
    • Expose the wound area.
    • Control bleeding.
    • Utilize bulky dressings to help stabilize the object.

• Special considerations (Cont.)
  - Large open neck injury
    • May cause air embolism.
    • Cover with an occlusive dressing.
    • Compress carotid artery only if necessary to control bleeding.
  - Amputations
    • Transport the amputated part with the patient, if possible.
    • Otherwise, don't delay transport of critical patient just to find amputated part.
    • Do not complete partial amputations.
    • Immobilize to prevent further injury.
    • Provide specialized care for the amputated part.

• Special Considerations (Cont.)
  - Care for amputated part
    • Find
• Handle with sterile technique
• Remove debris
• Gently irrigate with sterile normal saline
• Wrap with sterile dressing
• Moisten dressing with normal saline
• Place in sealed plastic bag
• Place ice into another plastic bag
• Place first bag into second
• Transport with patient
• Dedicate someone else to find and bring to hospital if patient unstable

38 **Dressing & Bandaging**

39  • Dressing
   – Functions
   • Directly covers wound in order to
     – Stop bleeding.
     – Protect the wound from further damage.
     – Prevent further contamination and infection.
     – Always cover at least 1 inch beyond wound on all sides
   – Features
     • Sterile
     • Rough or smooth

40  • Dressing (Cont.)
   – Types
     • ABD pads
     • Multi-trauma
     • 4 x 4
     • Telfa
     • Occlusive
       – Aluminum foil
       – Vaseline gauze
       – Plastic wrap

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48 **Bandaging**
- Bandages
  - Purpose - holds dressing in place
  - Types
    - Roller gauze
      » Kerlix
      » Kling
    - Triangular bandages
    - Adhesive tape
    - Air splint
    - Ace bandage

- Bandaging Rules
  - Completely assess part to be covered before covering
  - Check distal pulse
  - Apply snugly, but do not occlude distal pulse
  - Pad well
  - Leave fingers and toes exposed
  - Tie knots in "dead spaces"
    - Place knots where patient cannot lay on them
  - Do not leave loose ends
    - Tuck
    - Tape
  - Recheck distal pulse
    - Loosen bandage if absent

- Skills
  - Applying a Lock Loop (This is NOT an Evaluated Skill)
    - Video

- Skills
  - Amputation
    - Skills Manual pages 26 & 27
    - Video

- Skills
  - Head Bandage
• Skills
  • Impaled Object
  • Skills Manual pages 35 & 36
  • Video

Burns
• Definition
  • Tissue injury
    • Epidermis
    • Dermis
    • Deep tissues
  • Resulting from the application of energy
    • Electricity
    • Chemicals
    • Radiation
    • Heat and flame
      • most severe
      • direct contact from hot object
      • direct flame contact

• Effects
  • Cell enzymes deactivated
  • Proteins coagulate
  • Capillary permeability increases
  • Cell permeability increases
    • Burn patients tend to lose lots of fluid
    • The burned areas “weep” fluids
    • Called “spacing” or “third spacing”
  • Physical tissue damage
    • Cell wall destruction
    • Carbonization

• Assessing burns
  • Surface area
  • Depth
  • Age
  • Medical history
  • Pulmonary injury
  • Burn location
  • Concurrent injury
• Assessment (Cont.)
  – Surface area
  • Rule of nines
    – Adult
      » Head, face and neck - 9%
      » Chest - 9%
      » Abdomen - 9%
      » Superior back - 9%
      » Inferior back - 9%
      » Left arm - 9%
      » Right arm - 9%
      » Left thigh - 9%
      » Left leg - 9%
      » Right thigh - 9%
      » Right leg - 9%
      » Groin - 1%

• Assessment (Cont.)
  – Surface area
  • Rule of nines
    – Infant
      » Head, face and neck – 18%
      » Chest - 9%
      » Abdomen - 9%
      » Superior back - 9%
      » Inferior back - 9%
      » Right arm - 9%
      » Left arm - 9%
      » Right thigh - 7%
      » Right leg - 7%
      » Left thigh - 7%
      » Left leg - 7%

• Assessment (Cont.)
  – Surface area
  • Rule of hands
    – Adult patients only
    – Patient’s hand equals roughly 1% of his/her body surface

• Assessment (Cont.)
  – Depth
    • Superficial - involves only the epidermis
    – Old nomenclature
      » First degree
- Characteristics
  » Reddened skin (erythema)
  » Blanches with pressure
  » Pain at the site, but lessened with cold
  » No blistering
  » No edema

- Assessment (Cont.)
  - Depth
    » Partial thickness - involves both the epidermis and the dermis, but does not involve underlying tissue.
    » Old nomenclature
      » Second degree
    » Characteristics
      » Intense pain
      » White to red skin that is moist and mottled
      » Blisters
        * Separation of dermis and epidermis or integral layers of epidermis
        * Serum collects in space

- Assessment (Cont.)
  - Depth
    » Full thickness - burn extend through all the dermal layers and may involve subcutaneous layers, muscle, bone or organs.
    » Old nomenclature
      » Third degree
    » Characteristics
      » Skin color may be white, dark brown or charred, but will not blanche with pressure
      » Loss of sensation - little or no pain, hard to the touch, pain at periphery
      » Eschar may form
        * Leathery skin
        * Will not stretch as usual
        * Underlying edema restricts breathing or creates a tourniquet effect
        * Can be life threatening

- Assessment (Cont.)
  - Age
    » Older patients
- High mortality
- High morbidity
- Infants
  - High mortality
  - High morbidity
- Medical history
  - High mortality and morbidity if
    - Diabetes
    - Heart disease
    - Lung disease
    - Habitual drug or ETOH use

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- Assessment (Cont.)
  - Pulmonary injury
    - Edema of airway structures
    - Fire in a closed space
    - "Sooty" sputum
  - Burn location
    - Face
    - Hands
    - Feet
    - Genitalia
  - Concurrent injury
    - Fractures
    - Open wounds
    - Internal electrical burns

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- Assessment (Cont.)
  - Determine severity
    - Critical burns
      - Full thickness burns involving the hands, feet, face, or genitalia
      - Burns associated with respiratory injury
      - Full thickness burns covering more than 10% of the body surface
      - Partial thickness burns covering more than 30% of the body surface area
      - Burns complicated by painful, swollen, deformed extremity
      - Moderate burns in young children or elderly patients
      - Burns encompassing any body part e.g. arm, leg, or chest.

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- Assessment (Cont.)
  - Determine severity
    - Moderate burns
      - Full thickness burns of 2 to 10% of the body surface area excluding hands, feet, face, genitalia and upper airway
      - Partial thickness burns of 15 to 30% of the body surface area
      - Superficial burns of greater than 50% body surface area
    - Minor burns
- Full thickness burns of less than 2% of the body surface area
- Partial thickness burns of less than 15% of the body surface area
- Superficial burns of less than 50% body surface area

**Treatment**
- Body substance isolation
- Stop the burning process, initially with water or saline.
  - Remove from source of energy
  - Remove hot/burning items
    - Clothes
    - Metal objects
    - Belt buckles
    - Rings
    - Keys
    - Watches
    - Shoe eyelets
    - Metal buttons
    - PROTECT SELF
  - Cool sticking hot substances (tar)
    - Douse with lots of cool water

**Treatment (Cont.)**
- Continually monitor the airway for evidence of closure.
  - High flow oxygen
    - Non-rebreathing mask
    - 15 LPM
  - Bag-valve-mask assembled and ready
  - Assist and supplement breathing as necessary
  - Artificial ventilation as necessary
- Prevent further contamination.
  - Cover the burned area with a dry sterile dressing.
    - Use sterile gloves
    - Use two layers of burn sheets
    - Do not use any type of ointment, lotion or antiseptic.
    - Do not break blisters.

**Treatment (Cont.)**
- Splint concurrent fractures
  - ALWAYS place burn sheet between patient and splint
- Transport.
  - Know local protocols for transport to appropriate local facility.

**Infant and child considerations**
- Relative size
  - Greater surface area in relationship to the total body size.
• Results in greater fluid and heat loss.
• Any full thickness burn or partial thickness burn greater than 20%, or burn involving the hands, feet, face, airway or genitalia is considered to be a critical burn in a child.
• Any partial thickness burn of 10 to 20% is considered a moderate burn in a child.
• Any partial thickness burn less than 10% is considered a minor burn.
  - Higher risk for shock (hypoperfusion), airway problem or hypothermia.
  - Consider possibility of child abuse.

Chemical burns
- Take the necessary scene safety precautions to protect yourself from exposure to hazardous materials.
- Wear gloves and eye protection.
- Emergency medical care
  • Dry powders should be brushed off prior to flushing.
    - Dry lime
    - Elemental sodium
  • Immediately begin to flush with large amounts of water.
  • Continue flushing the contaminated area while en route to the receiving facility.
  • Do not contaminate uninjured areas when flushing.

Electrical burns
- Scene safety
  • Do not attempt to remove patient from the electrical source unless trained to do so.
  • If the patient is still in contact with the electrical source or you are unsure, do not touch the patient.
- Emergency medical care
  • Monitor the patient closely for respiratory and cardiac arrest (consider need for AED).
  • Often more severe than external indications.
  • Treat the soft tissue injuries associated with the burn. Look for both an entrance and exit wound.