Chapter 26 - Soft-Tissue Injuries

1 National EMS Education Standard Competencies (1 of 4)
   Trauma
   Applies fundamental knowledge to provide basic emergency care and transportation based on assessment findings for an acutely injured patient.

2 National EMS Education Standard Competencies (2 of 4)
   Soft Tissue Trauma
   • Recognition and management of
     – Wounds
     – Burns
       • Electrical
       • Chemical
       • Thermal
     – Chemicals in the eye and on the skin

3 National EMS Education Standard Competencies (3 of 4)
   • Pathophysiology, assessment, and management
     – Wounds
     • Avulsions
     • Bite wounds
     • Lacerations
     • Puncture wounds
     • Incisions

4 National EMS Education Standard Competencies (4 of 4)
   • Pathophysiology, assessment, and management (cont’d)
     – Burns
       • Electrical
       • Chemical
       • Thermal
       • Radiation
     – Crush syndrome

5 Introduction (1 of 3)
   • Soft-tissue injuries are common.
     – Simple as a cut or scrape
     – Serious as a life-threatening internal injury
   • Do not become distracted by dramatic open wounds.
     – Do not neglect airway obstruction.

6 Introduction (2 of 3)
   • Soft tissues of the body can be injured through a variety of mechanisms:
     – Blunt injury
     – Penetrating injury
     – Barotrauma
     – Burns

7 Introduction (3 of 3)
   • Soft-tissue trauma is a common form of injury.
• Death is often related to hemorrhage or infection.
• Soft-tissue injuries can often be prevented by simple protective actions.

9 The Anatomy and Physiology of the Skin (1 of 10)
• The skin is the body’s first line of defense against:
  – External forces
  – Infection
• The skin is relatively tough, but still susceptible to injury.
  – Range from simple bruises and abrasions to serious lacerations and amputations

10 The Anatomy and Physiology of the Skin (2 of 10)
• In all instances, the EMT must:
  – Control bleeding.
  – Prevent further contamination to decrease the risk of infection.
  – Protect wounds from further damage.
  – Apply dressings and bandages to various parts of the patient’s body.

11 The Anatomy and Physiology of the Skin (3 of 10)
• Skin varies in thickness.
  – Thinner in the very young and very old
  – Thinner on the eyelids, lips, and ears than on the scalp, back, soles of feet
  – Thin skin is more easily damaged than thick skin.

12 The Anatomy and Physiology of the Skin (4 of 10)
• The skin has two principal layers: the epidermis and the dermis.
  – Epidermis: tough, external layer
  – Dermis: inner layer

13 The Anatomy and Physiology of the Skin (5 of 10)

14 The Anatomy and Physiology of the Skin (6 of 10)
• Skin covers all the external surfaces of the body.
• Bodily openings are lined with mucous membranes.
  – Provide a barrier against bacterial invasion
  – Secrete a watery substance that lubricates the openings

15 The Anatomy and Physiology of the Skin (7 of 10)
• Skin serves many functions.
  – Keeps pathogens out
  – Keeps fluids in
  – Helps body regulate temperature
  – Nerves in the skin report to the brain on the environment and sensations.

16 The Anatomy and Physiology of the Skin (8 of 10)
• Any break in the skin may allow bacteria to enter and increases the possibilities of:
  – Infection
  – Fluid loss
  – Loss of temperature control
Chapter 26 - Soft-Tissue Injuries

17 **The Anatomy and Physiology of the Skin (9 of 10)**
- Three types of soft-tissue injuries:
  - Closed injuries
    - Damage is beneath skin or mucous membrane.
    - Surface is intact.
  - Open injuries
    - Break in surface of skin or mucous membrane
    - Exposes deeper tissues to contamination

18 **The Anatomy and Physiology of the Skin (10 of 10)**
- Three types of soft-tissue injuries (cont’d):
  - Burns
    - Damage results from thermal heat, frictional heat, toxic chemicals, electricity, or nuclear radiation

19 **Pathophysiology of Closed and Open Injuries (1 of 2)**
- Pathophysiology
  - Cessation of bleeding is the primary concern.
  - The next wound healing stage is inflammation.
  - A new layer of cells is then moved into the damaged area.

20 **Pathophysiology of Closed and Open Injuries (2 of 2)**
- Pathophysiology (cont’d)
  - New blood vessels form.
  - Collagen provides stability to the damaged tissue and joins wound borders.

21 **Closed Injuries (1 of 4)**
- Characteristics of closed injuries:
  - History of blunt trauma
  - Pain at the site of injury
  - Swelling beneath the skin
  - Discoloration

22 **Closed Injuries (2 of 4)**
- A contusion (bruise) causes bleeding beneath the skin but does not break the skin.
  - Caused by blunt forces
  - Buildup of blood produces blue or black ecchymosis.
- A hematoma is blood collected within damaged tissue or in a body cavity.

23 **Closed Injuries (3 of 4)**
- A crushing injury occurs when a significant amount of force is applied to the body.
- Extent of damage depends on:
  - Amount of force
  - Length of time force is applied
- When an area of the body is trapped for longer than 4 hours, crush syndrome can develop.

24 **Closed Injuries (4 of 4)**
- Compartment syndrome results from the swelling that occurs whenever tissues are injured.
- Severe closed injuries can also damage internal organs.
– Assess all patients with closed injuries for more serious hidden injuries.

25 Open Injuries (1 of 7)
• In an open injury the protective layer of the skin is damaged.
• The wound is contaminated and may become infected.
• Four types:
  – Abrasions
  – Lacerations
  – Avulsions
  – Penetrating wounds

26 Open Injuries (2 of 7)
• An abrasion is a wound of the superficial layer of the skin.
  – Caused by friction when a body part rubs or scrapes across a rough or hard surface

27 Open Injuries (3 of 7)
• A laceration is a jagged cut.
  – Caused by a sharp object or blunt force that tears the tissue
• An incision is a sharp, smooth cut.

28 Open Injuries (4 of 7)
• An avulsion separates various layers of soft tissue so that they become either completely detached or hang as a flap.
  – Often there is significant bleeding.

29 Open Injuries (5 of 7)
• An amputation is an injury in which part of the body is completely severed.
• A penetrating wound is an injury resulting from a piercing object.
  – Can damage structures deep within the body

30 Open Injuries (6 of 7)
• Stabbings and shootings often result in multiple penetrating injuries.
  – Assess the patient carefully to identify all wounds.
  – Count the number of penetrating injuries.
  – Determine the type of gun when possible, but do not delay transport.
  – You may have to testify in court.

31 Open Injuries (7 of 7)
• Blast injuries
  – Primary blast injury: damage caused by the blast wave and sudden pressure changes
  – Secondary blast injury: damage results from flying debris
  – Tertiary blast injury: victim is thrown by explosion, perhaps into an object

32 Patient Assessment of Closed and Open Injuries
• More difficult to assess a closed injury than an open injury
  – You can see an open injury.
• Consider the possibility of a closed injury when you observe:
  – Bruising
  – Swelling
  – Deformity
  – The patient reporting pain
Scene Size-up (1 of 2)
- Scene safety
  - Observe the scene for hazards to your crew, bystanders, and the patient.
  - Consider the need for additional resources.
  - Take the necessary standard precautions.
  - Be careful where you put your hands, place your equipment, and how you package the patient.
  - Focus on controlling the bleeding.

Scene Size-up (2 of 2)
- Mechanism of injury
  - Look for indicators of the MOI as you assess the scene.
  - The MOI may provide information about potential safety threats.
  - Evaluate scene safety and consider additional resources.

Primary Assessment (1 of 4)
- Identify life threats and transport priority.
- Form a general impression.
  - Look for indicators of the patient's condition.
  - Check for more serious hidden injuries.
  - Check for responsiveness.

Primary Assessment (2 of 4)
- Airway and breathing
  - Provide high-flow oxygen.
  - Ensure that the patient has a clear and patent airway.
  - Protect the patient from further spinal injury.
  - Assess the patient for adequate breathing.
  - Inspect and palpate the chest for DCAP-BTLS.

Primary Assessment (3 of 4)
- Circulation
  - Assess the patient's pulse rate and quality.
  - Determine the skin condition, color, and temperature.
  - Check the capillary refill time.
  - You may need to treat the patient for shock.

Primary Assessment (4 of 4)
- Transport decision
  - Immediately transport in these cases:
    - Poor initial general impression
    - Altered level of consciousness
    - Dyspnea
    - Abnormal vital signs
    - Shock
    - Severe pain

History Taking (1 of 2)
- Investigate the chief complaint.
  - Obtain a medical history.
– Obtain a SAMPLE history.
  • Using OPQRST may provide some background on isolated extremity injuries.
  • Try to use SAMPLE, OPQRST, and DCAP-BTLS together.
– If the patient is unresponsive, attempt to obtain the history from other sources.

History Taking (2 of 2)
• Typical signs of an open injury:
  – Bleeding
  – Break(s) in the skin
  – Shock
  – Hemorrhage
  – Disfigurement or loss of a body part

Secondary Assessment (1 of 5)
• After you evaluate ABCs and treat immediate life threats, a more detailed assessment should follow.
• Secondary assessment:
  – Is a more systematic full-body scan
  – Typically occurs en route to the emergency department

Secondary Assessment (2 of 5)
• Physical examination
  – Listen to breath sounds.
  – Determine the respiratory rate.
  – Note the pattern and quality of respiratory effort.
  – Assess for asymmetric chest wall movement.

Secondary Assessment (3 of 5)
• Physical examination (cont’d)
  – Assess the neurologic system.
  – Assess the musculoskeletal system with a detailed exam of entire body.
  – Assess all anatomic regions.

Secondary Assessment (4 of 5)
• Vital signs
  – Reassess the vital signs to identify how quickly the patient’s condition is changing.
  – Signs that indicate hypoperfusion and the need for rapid transport:
    • Tachycardia
    • Tachypnea
    • Low blood pressure

Secondary Assessment (5 of 5)
• Vital signs (cont’d)
  – Weak pulse
  – Cool, moist, and pale skin
• Reassessment indicates how well the patient is tolerating the injury and the effectiveness of your interventions.

Reassessment (1 of 5)
• Repeat the primary assessment.
• Assess the effectiveness of prior treatments.
• Reassess vital signs and the chief complaint.

47 Reassessment (2 of 5)
• Recheck patient interventions.
• Reassess bandaging.
• Identify and treat changes in the patient’s condition.

48 Reassessment (3 of 5)
• Interventions
  – Assess and manage all threats to the patient’s airway, breathing, and circulation.
  – Give oxygen to patients with traumatic injuries that impact the airway or ventilation or those with a potential for shock.
  – Expose all wounds, control bleeding, and be prepared to treat for shock.

49 Reassessment (4 of 5)
• Interventions (cont’d)
  – Flush small wound surfaces with sterile saline prior to applying a dressing.
  – Do not remove any material stuck in the wound.
  – Splint extremities that are painful, swollen, or deformed.

50 Reassessment (5 of 5)
• Communication and documentation
  – Description of the MOI
  – Position in which you found the patient
  – Amount of blood loss
  – Location and description of any soft-tissue injuries or other wounds
  – Size and depth of the injury
  – How you treated the injuries

51 Emergency Medical Care for Closed Injuries (1 of 3)
• No special emergency care for small contusions
• Extensive injuries could lead to hypovolemic shock.
  – Closely watch any area of injury, no matter how minor.

52 Emergency Medical Care for Closed Injuries (2 of 3)
• Treat closed soft-tissue injury using the RICES mnemonic:
  – Rest
  – Ice
  – Compression
  – Elevation
  – Splinting

53 Emergency Medical Care for Closed Injuries (3 of 3)
• Signs of developing shock:
  – Anxiety or agitation
  – Changes in mental status
  – Increased heart rate
  – Increased respiratory rate
  – Diaphoresis
– Cool or clammy skin
– Decreased blood pressure

54 **Emergency Medical Care for Open Injuries (1 of 11)**
• Before caring for the patient, follow standard precautions.
• If life-threatening bleeding is observed, assign a team member to apply direct pressure.
• Cover wounds of the chest, upper abdomen, or upper back with an occlusive dressing.

55 **Emergency Medical Care for Open Injuries (2 of 11)**
• Control bleeding using:
  – Direct, even pressure and elevation
  – Pressure dressings and/or splints
  – Tourniquets

56 **Emergency Medical Care for Open Injuries (3 of 11)**
• All open wounds are assumed to be contaminated and present a risk of infection.
• Control bleeding by splinting the extremity, even if there is no fracture.

57 **Emergency Medical Care for Open Injuries (4 of 11)**
• Abdominal wounds
  – An open wound in the abdominal cavity may expose internal organs.
  – In an evisceration, the organs protrude through the wound.

58 **Emergency Medical Care for Open Injuries (5 of 11)**
• Abdominal wounds (cont’d)
  – Cover the wound with sterile gauze.
  – Secure the gauze with an occlusive dressing.
  – Keep the organs moist and warm.

59 **Emergency Medical Care for Open Injuries (6 of 11)**
• Impaled objects
  – Remove an impaled object only when:
    • The object is in the cheek or mouth and obstructs the airway.
    • The object is in the chest and interferes with CPR.

60 **Emergency Medical Care for Open Injuries (7 of 11)**
• Neck injuries
  – Open neck injuries can be life threatening.
  – Open veins may suck in air and cause cardiac arrest.
  – Cover the wound with an occlusive dressing.
  – Apply manual pressure but do not compress both carotid arteries at the same time.

61 **Emergency Medical Care for Open Injuries (8 of 11)**
• Small-animal bites
  – A small animal’s mouth is heavily contaminated with virulent bacteria.
  – Wounds may require:
    • Debridement
    • Antibiotics
    • Tetanus prophylaxis
    • Surgical repair
  – Bites should be evaluated by a physician.
Emergency Medical Care for Open Injuries (9 of 11)

• A major concern is the spread of rabies.
  – Acute, potentially fatal viral infection of the central nervous system
  – Can affect all warm-blooded animals
  – Transmitted through biting or licking an open wound
  – Prevented only by a series of special vaccine injections

Emergency Medical Care for Open Injuries (10 of 11)

• Human bites
  – The human mouth contains an exceptionally wide range of bacteria and viruses.
  – Regard any human bite that has penetrated the skin as a very serious injury.
  – Can result in a serious, spreading infection

Emergency Medical Care for Open Injuries (11 of 11)

• Emergency treatment:
  – Apply a dry, sterile dressing.
  – Promptly immobilize the area with a splint or bandage.
  – Provide transport to the ED.

Burns (1 of 2)

• Account for approximately 3,400 deaths per year
• Among the most serious and painful of all injuries
• A burn occurs when the body receives more radiant energy than it can absorb.
  – Sources of this energy may include heat, toxic chemicals, and electricity.

Burns (2 of 2)

• Always perform a complete assessment to determine whether other serious injuries are present.
• Children, older patients, and patients with chronic illnesses are more likely to experience shock from burn injuries.

Pathophysiology of Burns (1 of 3)

• Pathophysiology
  – Burns are soft-tissue injuries that are created by the transfer of radiation, thermal, or electrical energy.
  – Thermal burns occur when the skin is exposed to temperatures higher than 111°F.

Pathophysiology of Burns (2 of 3)

• Pathophysiology (cont’d)
  – Severity of a thermal injury correlates directly with:
    • Temperature
    • Concentration
    • Amount of heat energy possessed by the object or substance
    • Duration of exposure

Pathophysiology of Burns (3 of 3)

• Pathophysiology (cont’d)
  – The greater the heat energy, the deeper the wound.
  – People reflexively limit heat energy and exposure time.
  • They cannot do so if unconscious or trapped.

Complications of Burns (1 of 2)
• When a person is burned, the skin that acts as a barrier is destroyed.
• Burns create a high risk for:
  – Infection
  – Hypothermia
  – Hypovolemia
  – Shock

Complications of Burns (2 of 2)
• Burns to the airway are of significant importance.
• Circumferential burns of the chest can compromise breathing.
• Circumferential burns of an extremity can lead to neurovascular compromise and irreversible damage.

Burn Severity (1 of 5)
• Burn severity depends on:
  – Depth of burn
  – Extent of burn
  – Critical areas involved
    • Face, upper airway, hands, feet, genitalia
  – Preexisting medical conditions or other injuries
  – Patient younger than 5 or older than 55

Burn Severity (2 of 5)
• Depth of burns
  – Superficial (first-degree) burns
    • Involve only the top layer of skin
  – Partial-thickness (second-degree) burns
    • Involve the epidermis and some portion of the dermis
    • Blisters are present.
  – Full-thickness (third-degree) burns
    • Extend through all skin layers

Burn Severity (3 of 5)

Burn Severity (4 of 5)
• Extent of burns
  – Estimated using the rule of palm or rule of nines
  – The proportions differ for infants, children, and adults.
  – Include only partial-thickness and full-thickness in estimations of the extent of burn injury.

Burn Severity (5 of 5)

Patient Assessment of Burns
• When you are assessing a burn, it is important to classify the victim's burns.
• Classification of burns is based on:
  – Source of the burn
– Depth of the burn
– Severity of the burn

78 Scene Size-up (1 of 2)
• Scene safety
  – Observe the scene for hazards and safety threats.
  – Ensure that the factors that led to the patient’s burn injury do not pose a hazard.
• Mechanism of injury
  – Determine the type of burn that has been sustained and the MOI.

79 Scene Size-up (2 of 2)
• Mechanism of injury (cont’d)
  – Gather information from the patient about the extent of the injury.
  – Assess the scene for environmental hazards.
  – Determine the number of patients.
  – Call for additional resources early.
  – Consider the potential for other injuries.

80 Primary Assessment (1 of 5)
• Begin with a rapid exam.
• Form a general impression.
  – Look for clues to determine the severity of injuries and the need for rapid treatment.
  – Be suspicious of clues that may indicate abuse.
  – Consider the need for manual spinal stabilization.
  – Check for responsiveness using the AVPU scale.

81 Primary Assessment (2 of 5)
• Airway and breathing
  – Ensure that the patient has a clear and patent airway.
  – Be alert to signs that the patient has inhaled hot gases or vapors:
    • Singed facial hair
    • Soot present in and around the airway

82 Primary Assessment (3 of 5)
• Airway and breathing (cont’d)
  – Heavy amounts of secretions and frequent coughing may indicate a respiratory burn.
  – Quickly assess for adequate breathing.
  – Inspect and palpate the chest wall for DCAP-BTLS.

83 Primary Assessment (4 of 5)
• Circulation
  – Assess the pulse rate and quality.
  – Determine perfusion based on the patient’s skin condition, color, temperature, and capillary refill time.
  – Control significant bleeding.
  – Assess for shock.

84 Primary Assessment (5 of 5)
• Transport decision
  – Consider rapid transport for a patient who has:
• An airway or breathing problem
• Significant burn injuries
• Significant external bleeding
• Signs and symptoms of internal bleeding
  – Consider consulting ALS providers.

History Taking (1 of 3)
• Investigate the chief complaint.
  – Be alert for signs and symptoms of other injuries due to the MOI.
  – Typical signs of a burn:
    • Pain
    • Redness
    • Swelling
    • Blisters
    • Charring

History Taking (2 of 3)
• Investigate the chief complaint. (cont’d)
  – Regardless of the type of burn injury:
    • Stop the burning process.
    • Apply a dressing to prevent contamination.
    • Treat the patient for shock.

History Taking (3 of 3)
• SAMPLE history
  – Along with the SAMPLE history, ask the following questions:
    • Are you having any difficulty breathing?
    • Are you having any difficulty swallowing?
    • Are you having any pain?
  – Check whether the patient has an emergency medical identification device.

Secondary Assessment (1 of 2)
• Physical examination
  – Perform an exam of the entire body.
  – Assess the patient from head to toe looking for DCAP-BTLS.
  – Make a rough estimate, using the rule of nines, of the extent of the burned area.
  – Determine the classification of the burn.
  – Determine the severity of the burn.
  – Package the patient for transport.

Secondary Assessment (2 of 2)
• Physical examination (cont’d)
  – Assessment of the respiratory system involves looking, listening, and feeling.
  – Assess the patient’s neurologic system.
  – Assess the musculoskeletal system.
  – Determining an early set of vital signs will help you to know how the patient is tolerating his or her injuries.

Reassessment (1 of 3)
• Repeat the primary assessment and reassess the patient’s vital signs.
• Reassess the chief complaint.
Chapter 26 - Soft-Tissue Injuries

- Reevaluate interventions.
  - Stop the burning process.
  - Assess and treat breathing.
  - Support circulation.

91 **Reassessment (2 of 3)**
- Reassess interventions (cont’d)
  - Provide rapid transport.
  - Oxygen is mandatory for inhalation burns and large body surface area burns.
  - If the patient has signs of hypoperfusion, treat aggressively for shock and provide rapid transport.

92 **Reassessment (3 of 3)**
- Communication and documentation
  - Provide hospital personnel with a description of how the burn occurred.
  - Describe the extent of the burns:
    - Amount of body surface area involved
    - Depth of the burn
    - Location of the burn
  - Document if special areas are involved.

93 **Emergency Medical Care for Burns**
- Stop the burning process.
- Prevent additional injury.

94 **Thermal Burns (1 of 3)**
- Caused by heat
  - Most commonly, they are caused by scalds or an open flame.
    - A flame burn is very often a deep burn.
    - Hot liquids produce scald injuries.
- Coming in contact with hot objects produces a contact burn.

95 **Thermal Burns (2 of 3)**
- A steam burn can produce a topical (scald) burn.
- A flash burn is produced by an explosion.
  - May briefly expose a person to very intense heat
  - Lightning strikes can cause a flash burn.

96 **Thermal Burns (3 of 3)**
- Management
  - Stop the burning source, cool the burned area, and remove all jewelry.
  - Increased exposure time will increase damage to the patient.
  - All patients should have a dry dressing applied to:
    - Maintain body temperature
    - Prevent infection
    - Provide comfort

97 **Inhalation Burns (1 of 4)**
- Can occur when burning takes place in enclosed spaces without ventilation
  - Upper airway damage is often associated with the inhalation of superheated gases.
– Lower airway damage is often associated with the inhalation of chemicals and particulate matter.

98 Inhalation Burns (2 of 4)
• You may encounter severe upper airway swelling, which requires immediate intervention.
  – Consider requesting ALS backup.
• The combustion process produces a variety of toxic gases.

99 Inhalation Burns (3 of 4)
• Carbon monoxide intoxication should be considered whenever a group of people in the same place all report a headache or nausea.
• Management
  – First ensure your own safety and the safety of your coworkers.

100 Inhalation Burns (4 of 4)
• Management (cont’d)
  – Prehospital treatment of a patient with suspected hydrogen cyanide poisoning includes decontamination and supportive care.
  – Care for any toxic gas exposure includes:
    • Recognition
    • Identification
    • Supportive treatment

101 Chemical Burns (1 of 4)
• Can occur whenever a toxic substance contacts the body
• Generally caused by strong acids or strong alkalis
• The eyes are particularly vulnerable.

102 Chemical Burns (2 of 4)
• Severity of the burn is directly related to three factors:
  – Type of chemical
  – Concentration of the chemical
  – Duration of the exposure
• Wear appropriate chemical-resistant gloves and eye protection.

103 Chemical Burns (3 of 4)
• Management
  – Remove any chemical from the patient.
  – Always brush dry chemicals off the skin and clothing before flushing with water.
  – Remove the patient’s clothing.

104 Chemical Burns (4 of 4)
• Management (cont’d)
  – For liquid chemicals, immediately begin to flush the burned area with lots of water.
  – Continue flooding the area for 15 to 20 minutes after the patient says the burning pain has stopped.
  – If the patient’s eye has been burned, hold the eyelid open while flooding the eye.
  – Conduct proper decontamination prior to loading the patient.

105 Electrical Burns (1 of 5)
• May be the result of contact with high- or low-voltage electricity
• For electricity to flow, there must be a complete circuit between the source and the
ground.
- Insulator: any substance that prevents this circuit
- Conductor: any substance that allows a current to flow

106 Electrical Burns (2 of 5)
- The human body is a good conductor.
- The type of electric current, magnitude of current, and voltage have effects on the seriousness of the burn.
- Your safety is of particular importance.
  - Never attempt to remove someone from an electrical source unless you are specially trained to do so.

107 Electrical Burns (3 of 5)
- A burn injury appears where the electricity enters and exits the body.
- Two dangers:
  - There may be a large amount of deep tissue injury.
  - The patient may go into cardiac or respiratory arrest from the electric shock.

108 Electrical Burns (4 of 5)

109 Electrical Burns (5 of 5)
- Management
  - If indicated, begin CPR on the patient and apply an AED.
  - Be prepared to defibrillate if necessary.
  - Give supplemental oxygen and monitor the patient closely.
  - Treat soft-tissue injuries with dry, sterile dressings.
  - Provide prompt transport.

110 Taser Injuries
- In recent years, law enforcement has increased its use of Tasers.
  - Potential complications for patients with underlying disorders.
  - Use of a Taser has been associated with dysrhythmias and sudden cardiac arrest.
  - Make sure you have access to an AED when responding to patients who have been exposed to Taser shots.

111 Radiation Burns (1 of 4)
- Potential threats include:
  - Incidents related to the use and transportation of radioactive isotopes
  - Intentionally released radioactivity in terrorist attacks
- You must determine if there has been a radiation exposure and then whether ongoing exposure continues to exist.

112 Radiation Burns (2 of 4)
- Three types of ionizing radiation:
  - Alpha
    - Little penetrating energy’ easily stopped by the skin
  - Beta
    - Greater penetrating power, but blocked by simple protective clothing
  - Gamma
• Very penetrating; easily passes through the body and solid materials

113 Radiation Burns (3 of 4)
• Most ionizing radiation accidents involve gamma radiation (x-rays).
• Management
  – Maintain a safe distance and wait for the HazMat team to decontaminate the patient.
  – Call for additional resources to remove the patient’s clothes.
  – Begin ABCs and treat burns or trauma.
  – Irrigate open wounds.

114 Radiation Burns (4 of 4)
• Management (cont’d)
  – Notify the emergency department.
  – Identify the radioactive source and the length of the patient’s exposure to it.
  – Limit your duration of exposure.
  – Increase your distance from the source.
  – Attempt to place shielding between yourself and the sources of gamma radiation.

115 Dressing and Bandaging (1 of 2)
• All wounds require bandaging.
  – Splints can help control bleeding and provide firm support for dressing.
  – There are many different types of dressings and bandages.

116 Dressing and Bandaging (2 of 2)
• Dressings and bandages have three functions:
  – To control bleeding
  – To protect the wound from further damage
  – To prevent further contamination and infection

117 Sterile Dressings (1 of 2)
• Most wounds will be covered by:
  – Universal dressings
  – Conventional 4” × 4” and 4” × 8” gauze pads
  – Assorted small adhesive-type dressings and soft self-adherent roller dressings
• Universal dressings are ideal for covering large open wounds.

118 Sterile Dressings (2 of 2)
• Gauze pads are appropriate for smaller wounds.
• Adhesive-type dressings are useful for minor wounds.
• Occlusive dressings prevent air and liquids from entering (or exiting) the wound.

119 Bandages (1 of 3)
• To keep dressings in place during transport, you can use:
  – Soft roller bandages
  – Rolls of gauze
  – Triangular bandages
  – Adhesive tape
• The self-adherent, soft roller bandages are easiest to use.

120 Bandages (2 of 3)
• Adhesive tape holds small dressings in place and helps to secure larger dressings.
• Do not use elastic bandages to secure dressings.
– The bandage may become a tourniquet and cause further damage.

**Bandages (3 of 3)**

- Splints are useful in stabilizing broken extremities.
  – Can be used with dressings to help control bleeding from soft-tissue injuries
- If a wound continues to bleed despite the use of direct pressure, quickly proceed to the use of a tourniquet.

**Review**

1. A young male was struck in the forearm with a baseball and complains of pain to the area. Slight swelling and ecchymosis are present, but no external bleeding. Which type of injury does this describe?
   A. Abrasion
   B. Contusion
   C. Hematoma
   D. Avulsion

**Review**

Answer: B
Rationale: A contusion (bruise) is caused by direct blunt force trauma. The epidermis remains intact, but small blood vessels in the dermis are injured. The depth of the injury varies, depending on the amount of energy absorbed. Pain and swelling occur as fluid and blood leak into the damaged area. The buildup of blood produces a characteristic blue and black discoloration called ecchymosis.

**Review (1 of 2)**

1. A young male was struck in the forearm with a baseball and complains of pain to the area. Slight swelling and ecchymosis are present, but no external bleeding. Which type of injury does this describe?
   A. Abrasion
     Rationale: An abrasion is a wound of the superficial layer of skin, caused by friction.
   B. Contusion
     Rationale: Correct answer

**Review (2 of 2)**

1. A young male was struck in the forearm with a baseball and complains of pain to the area. Slight swelling and ecchymosis are present, but no external bleeding. Which type of injury does this describe?
   C. Hematoma
     Rationale: A hematoma is blood that has collected within damaged tissue or in a body cavity, associated with large blood vessel damage.
   D. Avulsion
     Rationale: An avulsion is an injury that separates various layers of tissue.

**Review**

2. A compression injury that is severe enough to cut off blood flow below the injury is called:
   A. a contusion.
   B. a hematoma.
   C. a local thrombus.
   D. compartment syndrome.

**Review**

Answer: D
Chapter 26 - Soft-Tissue Injuries

Rationale: Compartment syndrome can occur when a part of the body has been compressed for a prolonged period of time—usually greater than 4 hours. The injured tissue begins to swell, which can impede arterial blood flow and venous return. As a result, the part of the body distal to the compression site becomes hypoxic and metabolic waste products (ie, lactic acid) begin to accumulate.

128 Review (1 of 2)
2. A compression injury that is severe enough to cut off blood flow below the injury is called:
   A. a contusion.
      Rationale: This is a bruise.
   B. a hematoma.
      Rationale: This is blood that has collected within damaged tissue. A hematoma occurs when a large blood vessel is injured.

129 Review (2 of 2)
2. A compression injury that is severe enough to cut off blood flow below the injury is called:
   C. a local thrombus.
      Rationale: This is a blood clot.
   D. compartment syndrome.
      Rationale: Correct answer

130 Review
3. A 45-year-old convenience store clerk was shot in the right anterior chest during a robbery. Your assessment reveals that the wound has blood bubbling from it every time the patient breathes. Your MOST immediate action should be to:
   A. prevent air from entering the wound.
   B. cover the wound with a bulky dressing.
   C. assess the patient’s back for an exit wound.
   D. transport the patient promptly to the closest trauma center.

131 Review
Answer: A
Rationale: Immediate treatment for a sucking chest wound (open pneumothorax) involves covering the wound with an occlusive dressing. This will prevent air from being drawn into the chest cavity. After covering the wound, assess for an exit wound, apply high-flow oxygen (if not already done), and transport promptly.

132 Review (1 of 2)
3. A 45-year-old convenience store clerk was shot in the right anterior chest during a robbery. Your assessment reveals that the wound has blood bubbling from it every time the patient breathes. Your MOST immediate action should be to:
   A. prevent air from entering the wound.
      Rationale: Correct answer
   B. cover the wound with a bulky dressing.
      Rationale: You must use an occlusive dressing.

133 Review (2 of 2)
3. A 45-year-old convenience store clerk was shot in the right anterior chest during a robbery. Your assessment reveals that the wound has blood bubbling from it every time the patient breathes. Your MOST immediate action should be to:
   C. assess the patient’s back for an exit wound.
      Rationale: Do this after the anterior chest wound is covered.
   D. transport the patient promptly to the closest trauma center.
Chapter 26 - Soft-Tissue Injuries

Rationale: Do this after the initial treatment of an open chest wound.

Review
4. What effects will the application of an ice have on a hematoma?
   A. Vasodilation and increased pain
   B. Vasodilation and decreased bleeding
   C. Vasoconstriction and increased swelling
   D. Vasoconstriction and decreased bleeding

Answer: D
Rationale: Applying an ice pack to a closed wound, such as a hematoma, will decrease bleeding, pain, and swelling by causing constriction of the blood vessels.

Review (1 of 2)
4. What effects will the application of an ice have on a hematoma?
   A. Vasodilation and increased pain
      Rationale: An ice pack causes vasoconstriction and will reduce pain.
   B. Vasodilation and decreased bleeding
      Rationale: An ice pack causes vasoconstriction and will reduce bleeding.

Review (2 of 2)
4. What effects will the application of an ice have on a hematoma?
   C. Vasoconstriction and increased swelling
      Rationale: An ice pack causes vasoconstriction and will reduce swelling.
   D. Vasoconstriction and decreased bleeding
      Rationale: Correct answer

Review
5. The primary reason for applying a sterile dressing to an open injury is to:
   A. prevent contamination.
   B. control external bleeding.
   C. reduce the risk of infection.
   D. minimize any internal bleeding.

Answer: B
Rationale: Although prevention of contamination is an important reason for applying a sterile dressing to an open injury, the primary reason is to control the external bleeding associated with it.

Review (1 of 2)
5. The primary reason for applying a sterile dressing to an open injury is to:
   A. prevent contamination.
      Rationale: This is important, but not the primary reason.
   B. control external bleeding.
      Rationale: Correct answer

Review (2 of 2)
5. The primary reason for applying a sterile dressing to an open injury is to:
   C. reduce the risk of infection.
      Rationale: The prevention of contamination will also reduce the risk of infection.
   D. minimize any internal bleeding.
Rationale: Internal bleeding is minimized by the application of a pressure bandage to an open wound.

**Review**

6. The MOST appropriate way to dress and bandage an open abdominal wound with a loop of bowel protruding from it is to:
   A. cover the wound with a dry, sterile dressing and apply firm pressure.
   B. apply a moist, sterile dressing to the wound and apply firm pressure.
   C. apply a moist, sterile dressing to the wound and secure with an occlusive dressing.
   D. carefully replace the protruding bowel into the abdomen and cover the wound.

**Review**

Answer: C
Rationale: Treatment for an abdominal evisceration includes applying a moist, sterile dressing to the wound and covering the moist dressing with an occlusive dressing. Do not replace a protruding bowel back into the wound or apply firm pressure, which may force the bowel back into the wound; these actions increase the risk of infection.

**Review (1 of 2)**

6. The MOST appropriate way to dress and bandage an open abdominal wound with a loop of bowel protruding from it is to:
   A. cover the wound with a dry, sterile dressing and apply firm pressure.
   Rationale: You must use a moist dressing.
   B. apply a moist, sterile dressing to the wound and apply firm pressure.
   Rationale: You should not apply pressure.

**Review (2 of 2)**

6. The MOST appropriate way to dress and bandage an open abdominal wound with a loop of bowel protruding from it is to:
   C. apply a moist, sterile dressing to the wound and secure with an occlusive dressing.
   Rationale: Correct answer
   D. carefully replace the protruding bowel into the abdomen and cover the wound.
   Rationale: Never force a bowel back into the abdominal cavity.

**Review**

7. A 22-year-old male was attacked by a rival gang and has a large knife impaled in the center of his chest. Your assessment reveals that he is apneic and pulseless. You should:
   A. carefully remove the knife, control any bleeding, begin CPR, and transport.
   B. stabilize the knife in place, provide rescue breathing, and transport at once.
   C. remove the knife and control any bleeding, apply the AED, and analyze his rhythm.
   D. begin CPR, control any external bleeding, and transport rapidly to a trauma center.

**Review**

Answer: A
Rationale: As a rule, impaled objects should be stabilized in place. However, if they interfere with the patient’s breathing or your ability to perform CPR, they should be removed. You cannot perform CPR on a patient if a knife is impaled in the center of the chest. Carefully remove the knife, control any bleeding, begin CPR, and transport at once. The AED is not indicated for patients with traumatic cardiac arrest; their arrest is usually caused by massive blood loss, not a primary cardiac dysrhythmia.

**Review (1 of 2)**

7. A 22-year-old male was attacked by a rival gang and has a large knife impaled in the
center of his chest. Your assessment reveals that he is apneic and pulseless. You should:
A. carefully remove the knife, control any bleeding, begin CPR, and transport.
   Rationale: Correct answer
B. stabilize the knife in place, provide rescue breathing, and transport at once.
   Rationale: The knife must be removed to provide effective CPR.

**Review (2 of 2)**

7. A 22-year-old male was attacked by a rival gang and has a large knife impaled in the center of his chest. Your assessment reveals that he is apneic and pulseless. You should:
   C. remove the knife and control any bleeding, apply the AED, and analyze his rhythm.
   Rationale: An AED is not recommended in traumatic arrest, but CPR must be initiated.
D. begin CPR, control any external bleeding, and transport rapidly to a trauma center.
   Rationale: The impaled object must be removed prior to the initiation of chest compressions.

**Review**

8. Which of the following is considered a severe burn?
   A. Any full-thickness burn
   B. 20% partial-thickness burn
   C. 10% full-thickness burn with abrasions
   D. 5% full-thickness burn with a fracture

**Review**

Answer: D
Rationale: Severe burns include the following: full-thickness burns involving the hands, feet, face, airway, or genitalia; full-thickness burns covering more than 10% of the body's total surface area (BSA); partial-thickness burns covering more than 30% of the BSA; burns involving the respiratory tract (eg, smoke inhalation); burns complicated by fractures; and burns on patients younger than 5 years or older than 55 years that would otherwise be classified as “moderate” burns on younger adults.

**Review (1 of 2)**

8. Which of the following is considered a severe burn?
   A. Any full-thickness burn
      Rationale: A full-thickness burn is severe if it covers more than 10% of the body or involves the hands, face, feet, and genitalia.
   B. 20% partial-thickness burn
      Rationale: This burn must be greater than 30% BSA.

**Review (2 of 2)**

8. Which of the following is considered a severe burn?
   C. 10% full-thickness burn with abrasions
      Rationale: This burn must be greater than 10% BSA.
   D. 5% full-thickness burn with a fracture
      Rationale: Correct answer

**Review**

9. A 5-year-old boy was burned when he pulled a barbecue grill over on himself. He has partial- and full-thickness burns to his anterior chest and circumferentially on both arms. What percentage of his body surface area has been burned?
   A. 18%
   B. 27%
Review
Answer: B
Rationale: Using the pediatric rules of nines, the anterior chest accounts for 9% of the BSA (the entire anterior trunk, which includes the chest and abdomen, accounts for 18% of the BSA), and each arm accounts for 9% of the BSA. Therefore, this child has experienced 27% BSA burns.

Review (1 of 2)
9. A 5-year-old boy was burned when he pulled a barbecue grill over on himself. He has partial- and full-thickness burns to his anterior chest and circumferentially on both arms. What percentage of his body surface area has been burned?
   A. 18%
      Rationale: 18% would indicate the patient’s arms only.
   B. 27%
      Rationale: Correct answer

Review (2 of 2)
9. A 5-year-old boy was burned when he pulled a barbecue grill over on himself. He has partial- and full-thickness burns to his anterior chest and circumferentially on both arms. What percentage of his body surface area has been burned?
   C. 36%
      Rationale: The patient’s chest is 9% and both arms are 18%.
   D. 45%
      Rationale: The patient’s chest is 9% and both arms are 18%.

Review
10. Which of the following statements regarding chemical burns is FALSE?
    A. Most chemical burns are caused by strong acids or alkalis.
    B. Fumes of strong chemicals can cause burns to the respiratory tract.
    C. Prior to removing a dry chemical, you should flush the area with sterile water.
    D. You should not attempt to neutralize an acid burn with an alkaline chemical.

Review
Answer: C
Rationale: Dry chemicals should be brushed off the patient before irrigating the wound with sterile water or saline. Failure to do so may increase the burning process and cause further tissue damage.

Review (1 of 2)
10. Which of the following statements regarding chemical burns is FALSE?
    A. Most chemical burns are caused by strong acids or alkalis.
    Rationale: Chemical burns are caused by acids and alkalis.
    B. Fumes of strong chemicals can cause burns to the respiratory tract.
    Rationale: Chemicals are in the fumes and will cause respiratory tract burns.

Review (2 of 2)
10. Which of the following statements regarding chemical burns is FALSE?
    C. Prior to removing a dry chemical, you should flush the area with sterile water.
    Rationale: Correct answer
    D. You should not attempt to neutralize an acid burn with an alkaline chemical.
Rationale: It would take a chemist to perform this procedure. Too much alkaline would cause burning to the patient’s skin.