

# Soft-tissue Injuries

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# Soft-tissue Injuries

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## INTRODUCTION

Soft tissue is a term that encompasses all body tissue except the bones and includes skin, muscles, vessels, ligaments, tendons, and nerves. Soft-tissue injuries can range from the trivial, such as a scraped knee, to the critical that includes internal bleeding.

## ANATOMY & PHYSIOLOGY

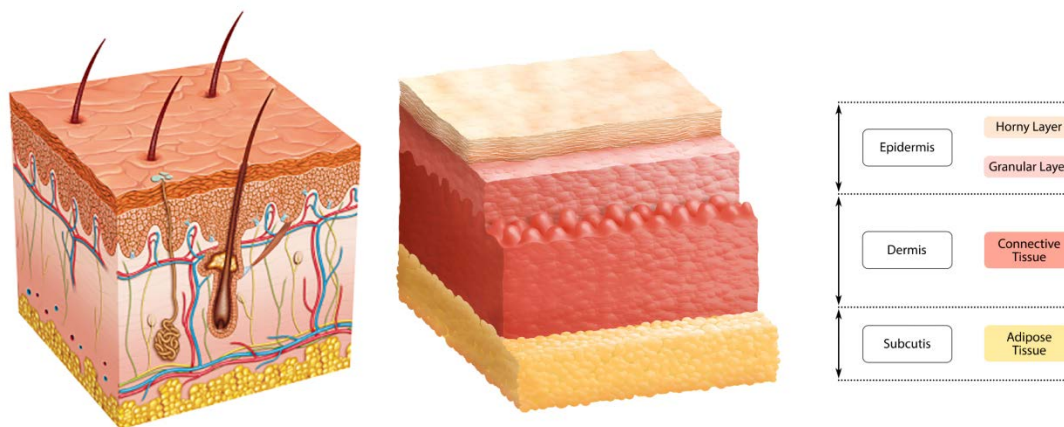
The skin is the largest organ in the body. It protects against heat, light, injury and infection. It also regulates body temperature; provides sensory input for heat, touch and pain; and stores water, fat and vitamin D.

The skin has three layers:

- epidermis
- dermis
- subcutaneous layer

In addition to the skin, other soft tissue includes muscle, fascia, tendons and ligaments and muscles.

### Layers of the Skin



The epidermis is the thin outer layer of the skin. This layer contains cells that continually divide, forming new cells and replacing the old ones that are shed from the surface of the skin.

The dermis is the layer below the epidermis. It contains:

- blood vessels
- lymph vessels
- hair follicles
- sweat glands

The dermis is held together by a protein called collagen that gives the skin its strength and resilience. This layer also contains pain and touch receptors.

The subcutaneous layer is the inner layer of the skin and is made up of a network of collagen and fat cells. It helps conserve body heat and protect internal organs from injury by acting as a shock absorber.

## CLOSED INJURIES

A closed soft-tissue injury is an injury to the tissues beneath the skin where the skin or mucous membrane remains intact. The extent of damage may not be readily visible. Swelling, bruising, immobility and pain at the injury site may indicate a closed injury. You will often find closed injuries in accidents where a significant mechanism of injury was involved.

When assessing trauma, you should always suspect injury to soft tissue and organs beneath the area of impact or observable surface injuries. For example, a baseball bat to the abdomen may cause a bruise over the umbilicus, but this mechanism might also damage the underlying organs such as the stomach, bowel, pancreas, spleen and liver.

Examples of closed soft-tissue injuries include:

- contusion
- hematoma
- sprain
- strain
- dislocation
- crush injury
- edema



Injury to soft tissue from blunt force leads to swelling and edema. Edema is the medical term for swelling as a result of fluid in the skin or muscle. If the swelling becomes great enough it may put pressure on blood vessels and nerves.

Edema is more likely to occur in the lower legs because there isn't much room for the muscles to swell. The muscles in the lower legs are covered by fibrous tissue called fascia that are not very elastic.

## OPEN INJURIES

Open soft-tissue injuries break through the protective barrier of the skin. They include:

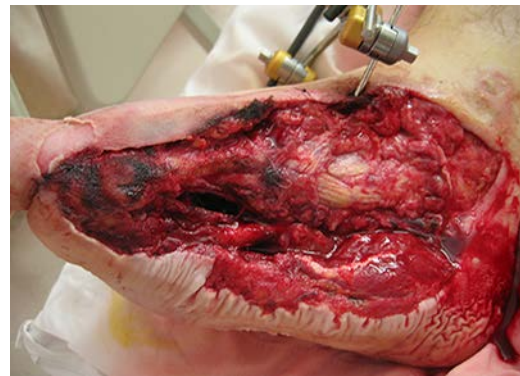
- abrasions: damage to the most superficial layer of the skin, caused by friction
- laceration (jagged cut) and incision (sharp cut): depth may vary
- avulsion: separation of areas of tissue, either completely or partially
- amputation: part of the body is severed
- puncture wounds: penetrating injury from a sharp object

Many of these injuries require specialized evaluation and care, and are described separately below.

Open tissue injuries are recognized by breaks in the skin with bleeding that can range from minimal to life threatening. There may be associated bruising, fractures, or other injuries depending on the mechanism of injury. The patient presentation depends on the severity of the injury.



*Abrasion on hand*



*Avulsion of foot*

Treatment is based on the location and severity of the injury.

Minor lacerations and abrasions may be cleaned and bandaged, but most require no treatment other than watching for infection. However depending on the location, some minor open tissue injuries may require more advanced medical intervention, such as injuries to the face, hands, or genitalia.

Major open tissue injuries dictate a trauma response of controlling bleeding, treating for shock, requesting an ALS evaluation, and rapid transport to a trauma center.

## BURNS

During a burn, soft-tissue injury occurs as a result of thermal heat, chemicals, electricity, or radiation. A burn is often complicated by other injuries such as inhalation injuries or musculoskeletal injuries.



*Thermal – 8 day old, 3rd degree burn*



*Electrical – 2nd degree burn*

## PATIENT ASSESSMENT

### Primary/Secondary Exam

Primary and secondary exams are conducted in a systematic manner starting at the top and working downward (neck-head-to-toe exam). Keep the chief complaint in mind as you inspect and palpate each region of the body. Look for:

- bleeding
- signs of shock (poor skin signs, sustained tachycardia)
- pain and tenderness
- limited movement
- deformity or angulation
- discoloration
- swelling
- crepitus
- absence of distal circulation, motor function or sensation (CMS)

When assessing the ABCs open the patient's airway and examine closely around and in the mouth. In a burn patient, look for singed nasal hairs, facial burns and soot in the mouth. Listen to the lungs for abnormal breath sounds that indicate pulmonary edema or airway damage.

Assess for respiratory compromise caused by heat exposure or trauma. Initiate basic life support and provide oxygen therapy or ventilatory assistance or both, if needed.

If a patient shows signs of shock, assess for other injuries that may cause blood loss. Onset of shock caused by burns usually occurs hours later.

Maintain airway and ventilation, provide high flow oxygen as needed, and treat life-threatening injuries such as bleeding.

Always document baseline vital signs.

When there is a significant MOI or an obvious significant injury, immediately perform a rapid body scan to assess for life-threatening injuries. If time permits, you may conduct a detailed physical exam while en-route.

Consider the possibility of a head or spinal injury when the head is involved and the MOI is significant.



## TREATMENT OF SOFT-TISSUE INJURIES

BLS providers have various treatment options at their disposal for the care of soft-tissue injuries. The following are general guidelines for the care of closed soft-tissue injuries.

- Consider the need for ALS
- Provide supplemental oxygen and/or ventilatory assistance, if needed
- Assess level of consciousness
- Maintain an open airway
- Ensure adequate breathing
- Control external bleeding
- For small bruises, use ice, compression, elevation
- Maintain normal body temperature
- Monitor vital signs
- Stabilize the cervical spine, if indicated
- Treat specific injuries accordingly (see "Conditions")

## Bleeding Control

The vast majority of bleeding can be controlled with standard bandages, dressings, and roller bandages. Standard care of major bleeding includes escalating the amount of pressure needed for controlling blood loss in the following order: direct pressure, elevation, and in rare instances use of a tourniquet as a last resort.

Military style trauma dressings, such as the Israeli trauma dressing or Emergency Bandage, are also effective tools for bleeding control when personnel have been properly trained and local protocol allow for their use.



Do not rub or wash an open wound to remove foreign objects or material. It may cause additional bleeding. However, you may remove loose material to allow for proper dressing.

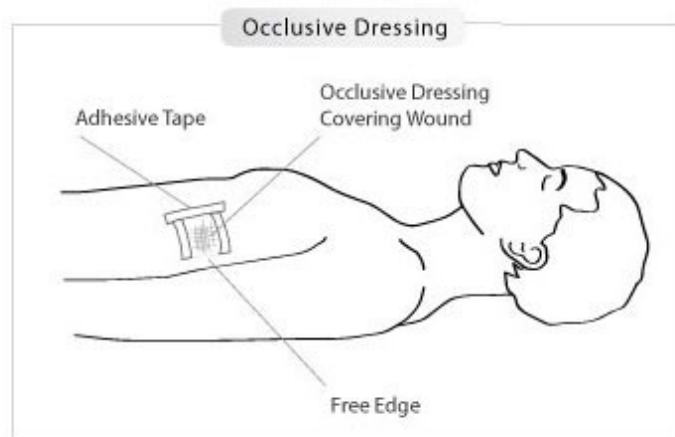
## Dressing and Bandaging

Most wounds require dressing and bandaging. Dressings help control bleeding, protect the wound from further damage and prevent further contamination. The initial dressing used to control bleeding should be sterile. Otherwise, choose a material that is as clean as possible. Cover the entire wound with the dressing. Try to extend the dressing material past the ends of the wound. Do not remove a dressing once applied. If bleeding continues, apply additional dressings over the old ones.

Bandages hold dressings in place. They should not come into direct contact with the wound. Secure the dressing with a bandage that is snug, but does not impair circulation. Wrap the dressing from distal to proximal to help reduce swelling and enhance circulation. If possible, leave the fingers and toes exposed.

## Occlusive Dressings

Use occlusive dressings, such as plastic, to cover open wounds such as an abdominal evisceration. These dressings provide an airtight seal and prevent loss of moisture.



## SPECIAL CONSIDERATIONS



## Pediatric Patients

Be careful when evaluating pediatric patients who have soft-tissue injuries from significant injuries. Their ability to vasoconstrict their peripheral vasculature and increase their heart rates after blood loss, without a decrease in blood pressure, means that early shock is harder to recognize. Furthermore, children have proportionately larger livers and other organs that may be more prone to injury after blunt trauma.

Children's bodies also have a larger surface area compared to body volume, so they are more prone to heat loss after burns or other injuries.

When evaluating a pediatric patient with a soft-tissue injury, be alert to the possibility of abuse. Warning signs include:

- bruises in unlikely places (back, buttocks, face)
- bruises in different stages of healing
- burns in well protected places such as genitalia
- burns that encircle an extremity; cigarette burns
- trauma of any kind to the genitalia

## Geriatric Patients

As people age, their skin becomes less elastic; bruising becomes more common and the skin is more likely to tear. Healing of wounds is also slower, and the immune system may be suppressed, increasing the risk of infection.

In addition, geriatric patients may have more serious internal and external bleeding after trauma. Many geriatric patients are taking anticoagulant medications that may decrease clotting ability. Even a relatively minor injury can cause life-threatening internal and external bleeding.