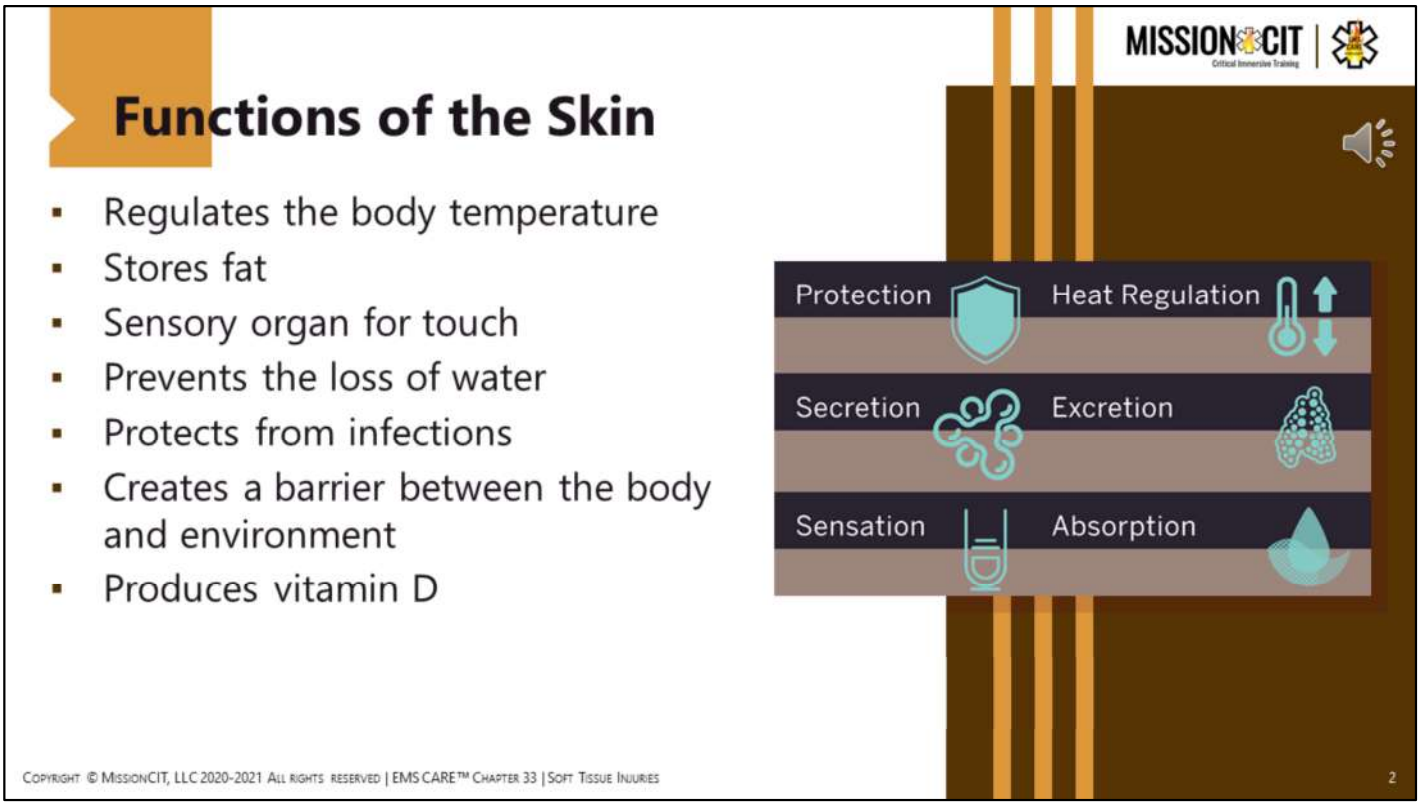


Hello there! Welcome to the first lesson where we'll talk about the physiology of the skin and the open and closed injuries associated with it.

Let's get started!

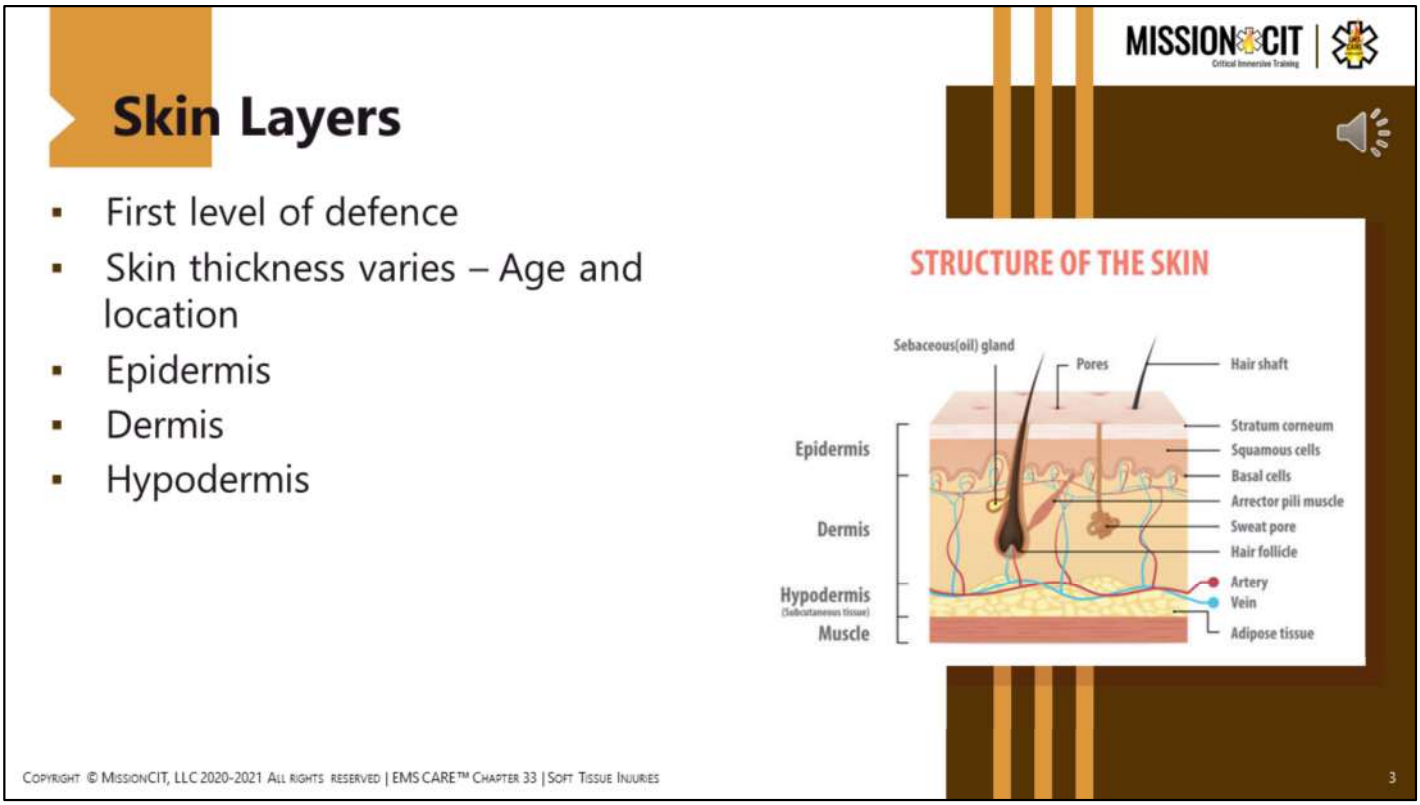


We all know that the skin is the largest organ, but what is its role exactly?

Besides protecting the body from heat and injury, the skin also,

- Regulates the body temperature
- Stores fat
- Contains the touch receptors and acts as the sensory organ for touch
- Prevents the loss of water due to excess sweating
- Protects the body from possible infections through pathogens
- Creates a barrier between the body and its immediate environment
- Produces vitamin D when exposed to the sun

So, how does it manage such a myriad of functions? The physiology of the skin is divided into layers and each layer has a specific role to play.



The skin is your body's first level of defense against any form of infection and external injuries. Its complex structure and cell formation allow it to be quite diverse.

One of its unique features is its thickness and layers. The skin's thickness varies, depending on the patient's age and body location. For example, the skin of young children and elderly, or those on certain medications tends to be thinner than average adults. Likewise, skin is thinner in some parts of the body such as the eyelids, lips, and ears other areas like your feet the skin can be thicker.

Regardless of the location or age of the person, the skin has three layers:

- Epidermis
- Dermis
- Hypodermis

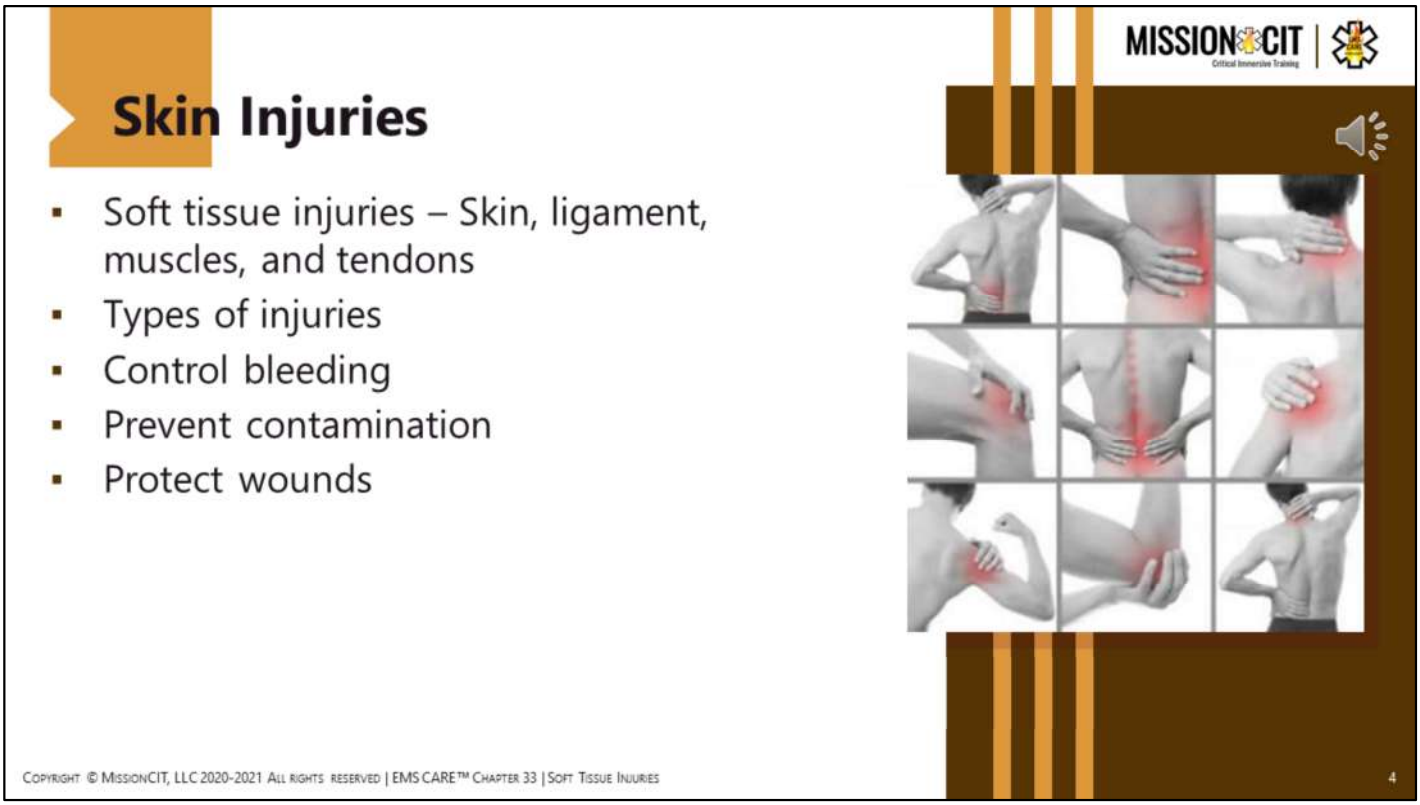
The suffix "epi," meaning above, give the epidermis its name as the thin outer layer of the skin. The epidermis contains three kinds of cells. The squamous cells, the basal cells, and the melanocytes. Squamous cells make up the bulk of the epidermis. Basal cells are found right below the squamous cells. Finally, the melanocytes are responsible for making melanin and give skin its color.

The dermis is the middle layer and is responsible for providing flexibility and strength to the

skin. It contains blood vessels, lymph vessels, hair follicles, pain receptors, sweat glands, touch receptors, nerves, sebaceous glands, and fibroblasts.

The last or the deepest layer is the hypodermis, meaning “below dermis,” or subcutaneous layer. Consists of collagen and fat cells, also called adipose tissue, the primary role of the subcutaneous layer is to maintain the body’s temperature. It also acts as a shock absorber and assists in preventing injury to the body.

Any break in any of these layers can disrupt their working and increase the chance of infection from viruses and bacteria.

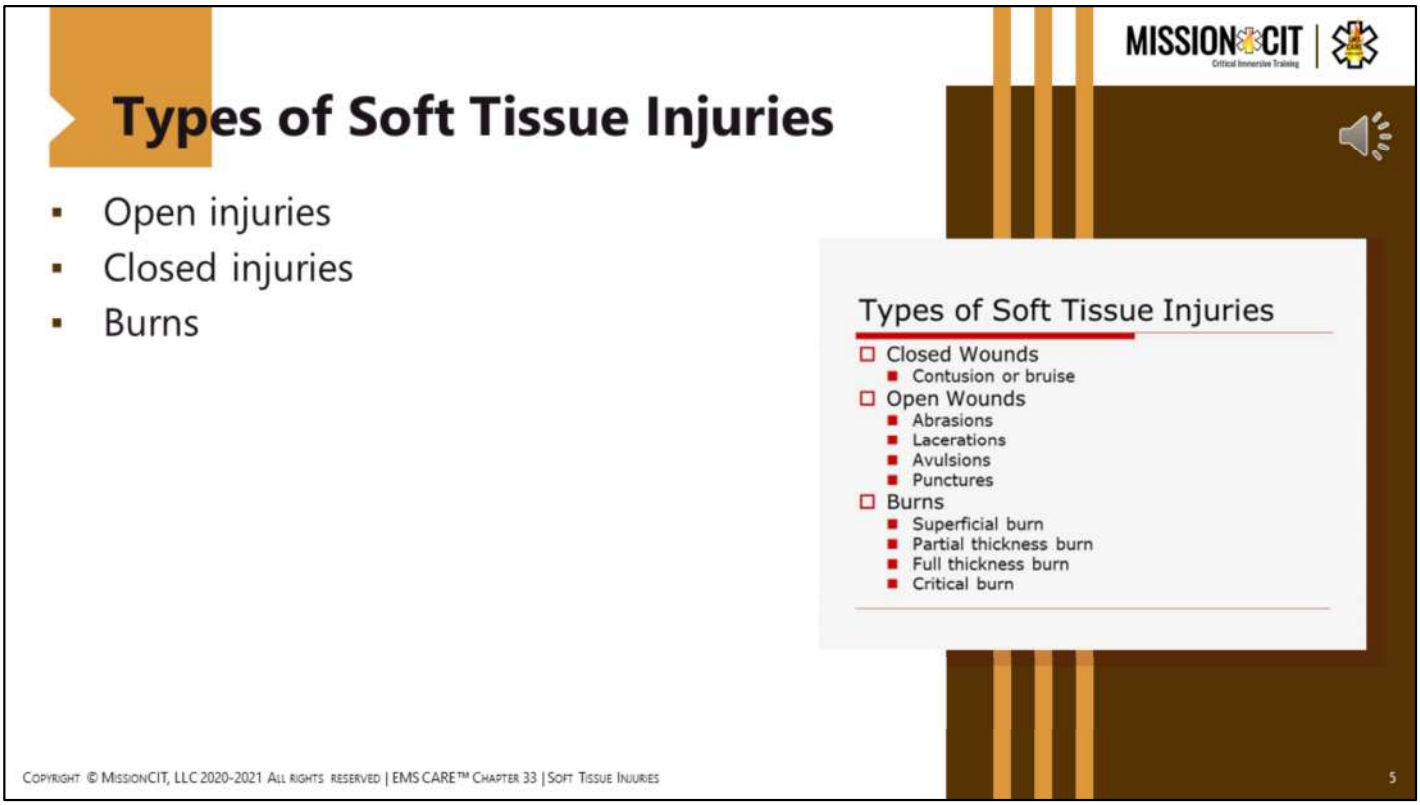


Injuries that occur to the skin, muscle, and tissue around the bones are referred to as soft-tissue injuries. Soft-tissue injuries include any injury to the skin, ligaments, muscles, and tendons. Depending on the mechanism of injury, these soft-tissue injuries can be classified into blunt injury, penetrating injury, barotrauma, and burns.

Most times, these injuries can be prevented or can be treated with simple actions. However, note that some injuries, especially those that cause deep-rooted infections or hemorrhage can cause death.

As an EMT, you must locate injuries, if possible, their potential cause, and the best course of treatment for each injury, and this typically includes,

- Controlling the bleeding
- Preventing further contamination to reduce the risk of infection
- Protect wounds from further damage



Soft-tissue injuries can be classified into three types:

- Open injuries
- Closed injuries
- Burns

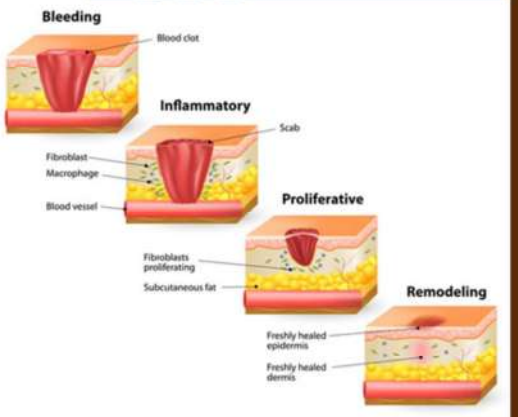
This classification is based on the depth of the injury, the amount of damage sustained. Possible damage to look for would include the skin, the surrounding soft-tissue and the blood vessels.

As the name suggests, open injuries are those that are visible, and they expose the skin and its contents to the outside environment. A good example of an open wound is a penetrating injury. Penetrating injuries may include objects such as knife wounds or other impaled objects. On the other hand, closed injuries are those where there is no break in the skin, and hence it is not exposed to the outside world. Some examples of signs of closed injuries are contusions, hematomas or deep bruising, and crush injuries.

Note that in some situations, you will encounter both open and closed injuries in the same patient. We will also talk about burns and burn injuries later in this section.

Pathophysiology of Open Injuries

- Primary concern – Bleeding
- Next stage – Inflammation
- New cells are formed
- Collagen is produced
- Healing time – Depends on size and depth

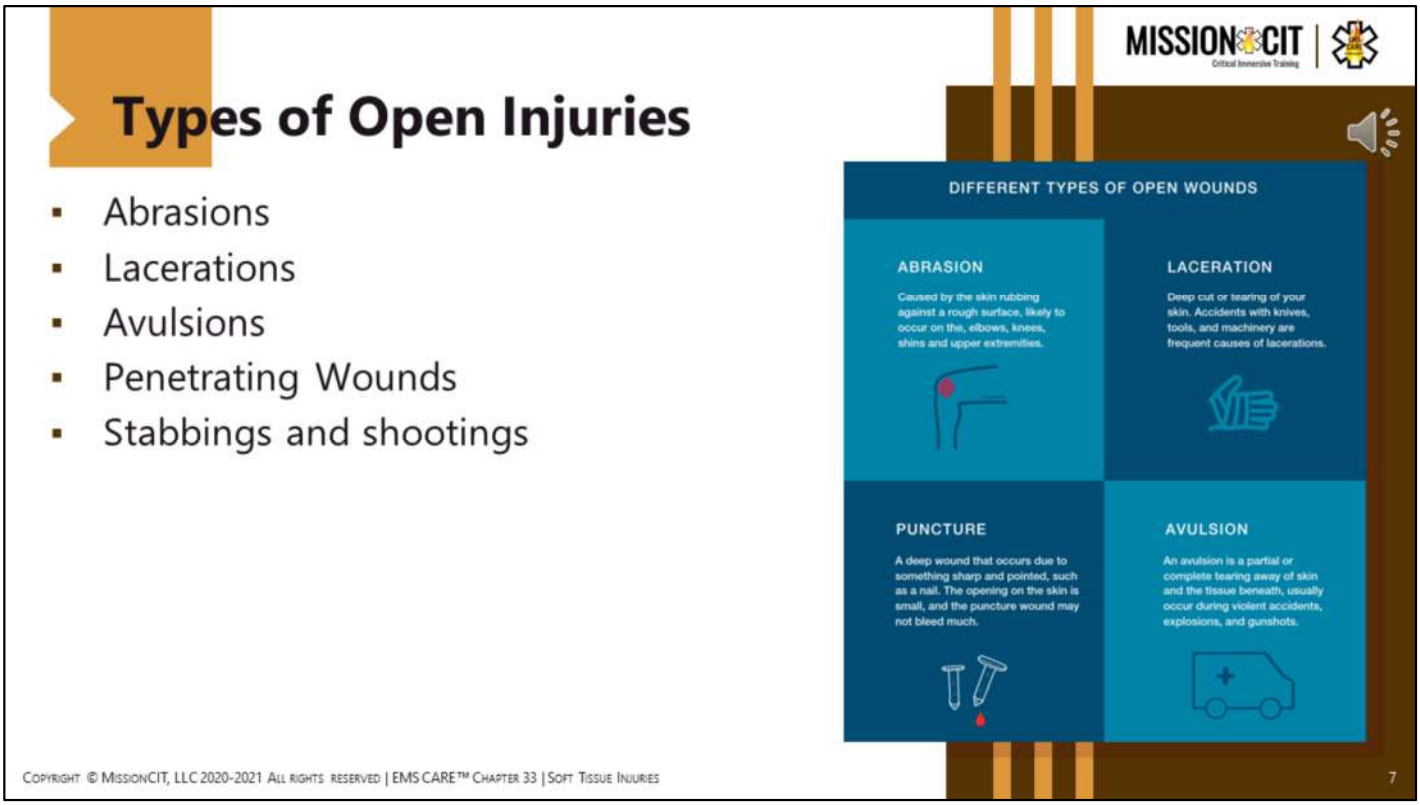


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One of the primary concerns with any injury is bleeding. Too much bleeding will lead to hypovolemic shock and death if not controlled. With open wounds, we are able to see bleeding relatively easily. In closed injuries, the bleeding may be harder to spot. With all injuries, a full assessment is needed, and bleeding control measures or shock treatment need to be taken.

Once the bleeding has stopped, the next stage of healing is inflammation. Soon, the body moves a new area of skin cells to the damaged area and new blood vessels form. Collagen is also produced in this area to provide stability to the damaged tissue, and it also joins the wound borders. Eventually, the marks of the injury are no longer visible.

The healing time for open injuries depends on the size and depth of the injury.



There are four types of open injuries, and they are:

- Abrasions
- Lacerations
- Avulsions, and
- Penetrating Wounds

Abrasions are wounds on the superficial layer of the skin and are caused due to friction, typically when a body part rubs or scrapes against a rough or hard surface. Think “road rash” or “rug burn.”

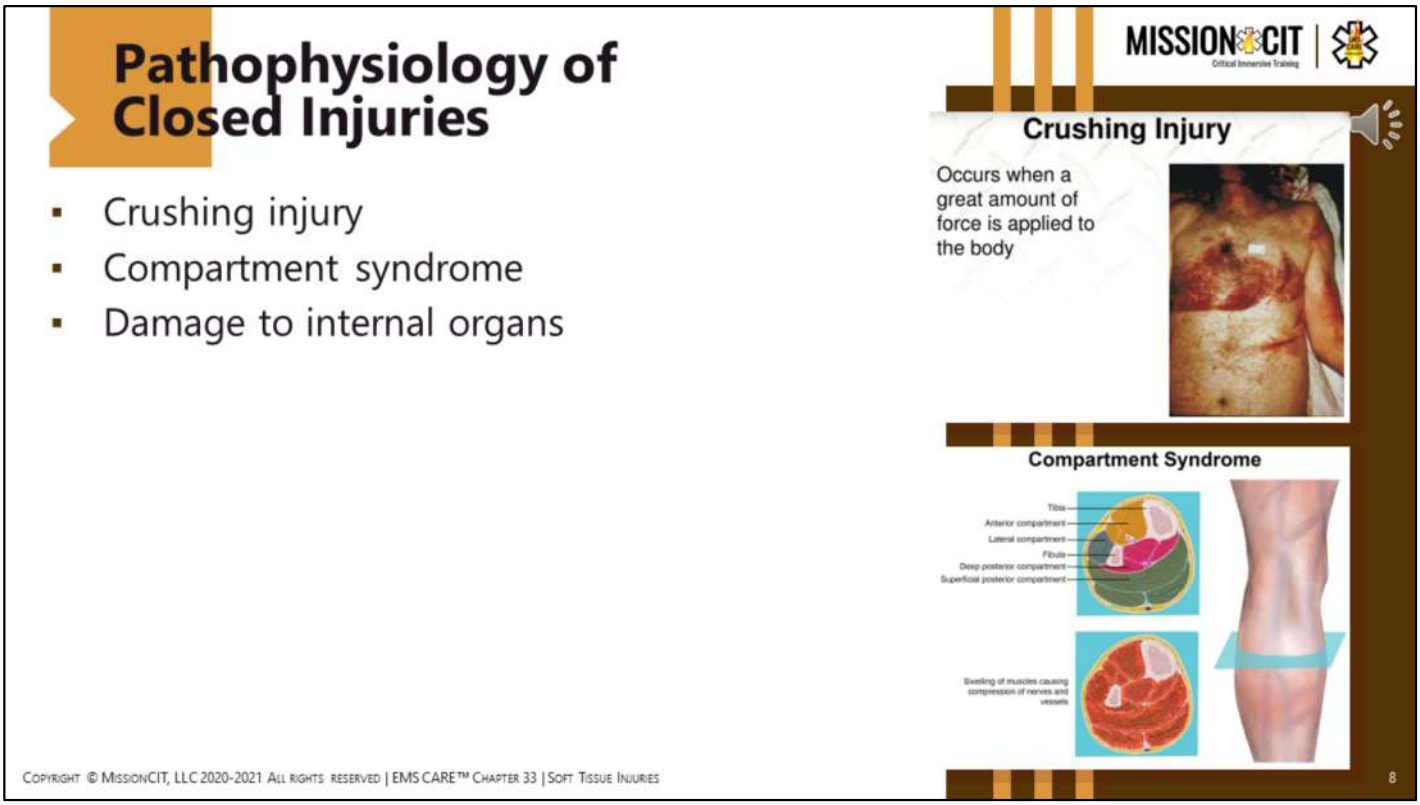
A laceration is often a jagged cut caused when a sharp object or blunt force tares the tissue. Lacerations can be anything from a slashing by a knife to split skin from a shard of glass. Lacerations are split skin, but the skin is not missing just parted open.

An avulsion is a wound that separates the various layers of soft tissue in such a way that they either become completely detached or hang as a flap. A severe form of avulsion is amputation where a part of the body can be completely severed.

The last type of wound is the penetrating wound, which is an injury resulting from the piercing of a sharp object. This force can penetrate to the deepest layers of the skin.

All open wounds can lead to infection if not treated immediately. Depending on the object used to create the open wound the infection may be great. For example, animal bites can become very infected very quickly.

Stabbings and shootings often result in penetrating injuries. Blast injuries can cause open injuries.



As mentioned earlier, closed injuries are contusions and hematomas that can result from blunt forces striking the body. In these injuries, the epidermis remains intact, though the underlying blood vessels, especially the small ones, can become damaged. The blood leaking out of these vessels leads to a build-up and a condition called ecchymosis. When this blood begins to collect within the damaged tissue or in a body cavity, that deep contusion is referred to as a hematoma.

Another kind of closed injury is a crushing injury that occurs when a significant amount of force is placed on the body. This breaks the blood vessels and can lead to an internal hemorrhage. The extent of damage to the deep tissue depends on the amount of force applied and the length of time the force was applied. Crush injuries are particularly troublesome when a body is trapped for more than four hours. With enough force, the muscle tissue begins to break down and a buildup of lactic acid and other wastes that are normally carried away by the blood begins to pool. This compartment syndrome is a painful and dangerous condition where pressure builds up due to internal bleeding or swelling of the tissues. It can cause organ damage including kidney failure.

I hope this has given you a good idea of what open and closed injuries are, and in the next lesson, Missah will talk about how you can assess and treat these injuries in a prehospital setting.