

Sports Medicine Monthly

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INFLAMMATION:

The Body's Response to Tissue Injury



As anyone who is, or has ever been associated with athletics or recreation is aware, injuries do occur. While no one desires or longs for anyone to ever get hurt, we are not ignorant of the fact that injuries in athletics are by no means uncommon. However, what many individuals may not fully

understand is the fact that at this time period, directly after an injury has occurred, more than any other time in the injury, healing, and rehabilitation process, accurate management of the injury is vital to ensure for the best possible outcomes in the final capabilities of the damaged tissue. What is done immediately after tissue injury, directly effects the quantity and quality of tissue healing.

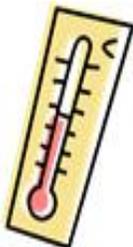
The Five Cardinal Signs of Inflammation:

Anytime tissue damage occurs in the body, all five of the following signs will be present. Whether in great expression or limited, when tissue is injured these cardinal signs are present.



#1. Heat

Any increase in blood flow to an area will always create an increase in heat in the same. This is the very reason we encourage athletes to continue their warm-up time until they begin to sweat. This way, they know their body is warmed up. However, whereas sweating occurs during a natural, non-injured state, injuries to tissues and subsequent injures to surrounding blood vessels allow blood to escape outside of its normal parameters and bring a subsequent increase in temperature to the injury site.



Fractures and Fracture Healing

"It's broken." Two words that no athlete, no coach, and no individual for that matter desires to hear. Sometimes though, 'bad breaks' do occur. The next words that usually follow sound something like, 'How long doc?' Answering this question with a general healing time for all fractures however is like always running the same offense; more often then not, such an answer will not apply. Each fracture's healing time, though somewhat similar, will vary based on severity, placement or displacement of the bony ends, and whether or not that bone is weight bearing.



The Fracture Healing Process:

Step 1: Hematoma Formation (1 Week)

After the immediate injury, whether an incomplete or a complete fracture has occurred, the integrity of the blood vessels, both inside and surrounding the bone, are damaged as well. Blood now begins to pool into the area and form a clot about the fracture site. This is the primary reason why fractures swell, and also the reason for the discoloration that appears on the skin 3-8 days later.



Step 2: Callus Formation (1-2 Weeks)

Once the blood clot has completely shut off the area and swelling has now subsided, bone cells in the area known as osteoblasts begin to lay down bone tissue about the perimeter of the clot, thus creating the external perimeter for a full bony callus to later be formed. Once the perimeter of the callus is in place, both ends of the fracture are now reconnected and the fracture site now has a minimal degree of stability.



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Inflammation Continued...

#2. Pain

Inside each cell in our body are several chemical messengers that relay signals between different intracellular structures. When cells are damaged and torn apart, all structures and substances, including these messengers, are released to areas outside the cell. When one of these messengers comes in contact with a free nerve ending, pain is the resulting sensation.



#3. Swelling

By now realizing that when tissues are injured small blood vessels and cells in the area are now torn and ruptured and their contents are now leaking into other areas, swelling in the area is now very easy to understand. Furthermore, the greater the extent of the injury to area tissues, and thereby blood vessels, the greater the overall quantity of subsequent swelling.

#4. Redness

Likewise, as blood is now leaving the confines of the blood vessels, and moving into surrounding areas, the skin above the injured area will begin to take on the reddish hue of the blood cells beneath it.

#5. Loss of Function

Anytime that tissue is damaged, the function it was designed to fulfill will be affected. The greater the damage, the greater the loss of function. Likewise, pain will also play a very large role in whether or not an individual will be willing to use the injured area. First and foremost due an innate desire to protect the area, and secondly due to the fact that the level of pain usually directly relates to the level of tissue damage.

After injury occurs, immediate and appropriate management is vital. This is why we encourage rest and ice immediately after injury. Ice reduces tissue temperature, and rest and ice together decreases pain, helps keep swelling and redness under control, and prevents any additional loss of function.



Fractures and Fracture Healing cont...

Step 3: Callus Ossification (2-4 Weeks)

Once the perimeter of the callus is formed, the osteoblasts in the area continue to lay down new porous bone tissue from the outside perimeter towards the center of the bone. Therefore, the integrity of the bone is now being strengthened from the outside in.



Step 4: Bone Remodeling (4 Weeks +)

After the integrity of the bone has been re-established with porous (i.e. spongy) bone tissue, osteoblasts begin to remodel the bone tissue by filling in the porous nature of the spongy bone until a true compact bone density is left

Common Challenges With Fractures:

With bone healing, placement is everything. Two bone ends that are in perfect alignment, and with good blood supply, will usually heal tremendously well. However, any angulation of the bone ends, especially more than about 15 degrees, can lead to incomplete bone healing, excessive callus formation, and/or a gross limitation in subsequent range of motion. This is where manipulation, and sometimes surgery is required to re-align the ends of the bone.



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