



Hurt, Harm & Injury

Common (and some not so common)
Martial Arts Injuries

2nd Degree Black Belt Thesis

Written by
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Outline
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Introduction

Martial Arts are in the most literal sense of the term, ‘war arts’ or ‘combat arts’. Their original goals were to, as quickly and efficiently as possible, repel, disable, incapacitate or kill your opponent. Various forms developed long ago and across many different cultures as means to train for self protection and combat.

In modern society, the “martial” aspects of the arts have been modified to a more sport oriented pursuit or to put more emphasize on the self-defense aspects. Those changes haven not altered the fact that the martial arts are still a strenuous activity involving, at times, intense physical contact.

With any strenuous physical activity, there are risks for injuries. The martial arts multiply those risks with the fact that the intended purpose is to overcome your opponent in a combat situation. Methods and techniques are taught to actually cause physical harm. A martial artist should have knowledge of the kinds of injuries that can be delivered and well as the kinds that could be sustained. Utilizing that knowledge will not only make it safer to participate in the martial arts but it will also enhance the effectiveness of techniques when they are needed.

This thesis will look at some of the martial arts injuries that have been documented. It will start with an explanation of some of the medical term needed to describe various injuries. It will then continue by looking at injuries involving the head and work down. Since a basic understanding of human anatomy will be essential for the understanding of these injuries, an Appendix is included with reference diagrams for the basic skeletal, muscular and nervous systems.

With an understanding of martial art injuries, training can be optimized to prevent and avoid unnecessary injury. Any injury that is sustained can be more quickly recognized and evaluated to ensure that the proper triage, emergency care, and treatment can be implemented to facilitate a faster and more successful recovery.

Definitions and Medical Terms

Many times there is confusion and misunderstandings concerning the nomenclature used to explain injuries. In order to get a better understanding of the types and degrees of injuries that can occur in the martial arts, knowledge of the common definitions and medical terms that are used to describe such injuries is very useful.

Abrasions (grazes)

Abrasions are superficial wounds in which the topmost layer of the skin (the epidermis) is scraped off.

Anterior

Front.

Concussion

Concussion is defined as trauma-induced, transient disruption of brain activity. It is suggested that it involves a complex cascade of trauma-induced chemical and metabolic events. Rotational forces can cause shearing stresses across brain cells causing damage, but concussion injuries may also involve fluctuations in intracerebral pressure.

Concussion symptoms can include unconsciousness, headache, nausea, visual disturbances, amnesia, cognitive disturbances, emotional outbursts, loss of coordination, and trouble with balance. The symptoms correlate with the area of the brain that is injured. In general, most adults require 7 to 10 days for recovery from a concussion, but symptoms can last for weeks.

The most dreaded complication of a concussion is called second impact syndrome. A second traumatic injury to the brain while it is still healing from a previous concussion can cause rapid cerebral edema, brain stem herniation and death.

Contusions

Contusions are defined as trauma-induced damage to soft tissues. These are more commonly identified as “bruises”. Contusion can involve capillaries at the level of skin, subcutaneous, muscle or bone. Trauma to these tissues can cause damage and breakage of small blood vessels which allow blood to seep into the surrounding tissues resulting in the characteristic “black and blue” coloration. Most contusions will heal on there own in 1- 2 weeks. Muscle contusions can cause significant injury to muscle cells and are similar to Grade 1 muscle strains. Mild injury to a bone can cause micro fractures and are classified as a bone contusion or a “bone bruise”.

Crepitus

Crepitus is a term to describe the grating, crackling or popping sounds and sensations experienced under the skin and joints.

Dislocations

Dislocations are a separation of two bones where they meet at a joint. Dislocation may involve additional ligament, vascular or nerve damage.

Distal

Located far from a point of reference such as an origin, point of attachment, or midline of the body.

Ecchymosis

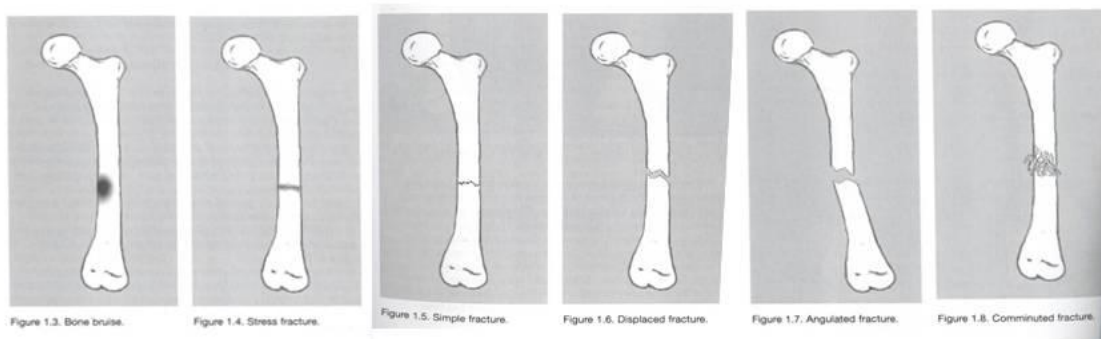
Ecchymosis is the medical term for a purplish, flat bruise larger than 1 cm that occurs when blood leaks out into the top layers of skin.

Edema

Swelling; an accumulation of fluids in tissue.

Fractures

A fracture is a medical condition in which there is a break in the continuity of a bone. Fractures can be caused by trauma or chronic overuse. The nomenclature of fractures depends on the type of fracture.



[Fig 1] Types of Fractures

Bone Contusion: Trauma to a bone resulting in micro fractures (**Bone Bruise**)

Stress fracture: Chronic overuse causes a bone to become progressively weaker due to the development of micro fractures. If left unchecked these small fractures will coalesce into a larger fracture.

Simple/Closed: Fracture line transversing the bone

Displaced: Fractured bones are separated

Angulated: Fractured bones are no longer in alignment

Comminuted: Fracture with multiple bone fragments

Compound/Open: Broken bone penetrates the skin

Avulsion: Ligament separates from bone pulling a bone fragment with it

Hematoma

A hematoma is defined as a localized collection of blood outside the blood vessels, usually in liquid form within the tissue.

Hemorrhage

A hemorrhage is the loss of blood (bleeding) from ruptured blood vessels.

Incisions or incised wounds

Incised wounds are caused by a clean, sharp edged object such as a knife, razor or glass splinter.

Lacerations

Lacerations are irregular tear-like wounds caused by some blunt trauma. The term is commonly misused in reference to incisions.

Myositis Ossificans Traumatica

Myositis ossificans is a calcium formation in an injured muscle. It is a complicated injury that may require extensive healing time and possible surgical removal of calcium deposits. Risk factors include repeated trauma to an injured muscle, aggressive stretching of a muscle contusion and premature strength training of a muscle contusion.

Pain

“Pain is defined as an unpleasant sensory and emotional experience, which is associated with actual or potential tissue damage, or is described in terms of such damage” is the strict scientific definition that was given to pain by the International Association of the Study of Pain. The American Academy of Pain Medicine defines it as “An unpleasant sensation and emotional response to that sensation.” But for most everyone, pain is simply an unpleasant sensation that hurts. It is a subjective feeling that everyone learns through their own experiences. Each individual has their own tolerance for pain based on physical, emotional and psychological tendencies.

Pain can be **acute** - lasting only a short while - or **chronic**, lasting for a much longer duration. It can be divided into different types according to the mechanism involved (nociceptive and neuropathic pain), and further by the part of the body affected by it.

Nociceptive pain is caused by stimulation of peripheral nerve fibers (nociceptors), that respond only to stimuli approaching or exceeding harmful intensity. Different types of nociceptors are sensitive to different types of stimuli. The most common categories being “thermal” (heat or cold), “mechanical” (crushing, tearing, etc.) and “chemical” (ex. iodine in a cut, chili powder in the eyes). Nociceptive pain may also be divided into

"visceral," "deep somatic" and "superficial somatic (cutaneous)" pain. **Visceral** pain originates in the organs and often is extremely difficult to locate. Nociception from some visceral regions may produce referred pain, where the sensation is located in an area distant from the site of the stimulus. **Deep somatic** pain is initiated by stimulation of nociceptors in ligaments, tendons, bones, blood vessels, fasciae and muscles, and can be an aching or sharp, localized pain. Examples include sprains and broken bones. **Superficial** pain is initiated by activation of nociceptors in the skin or other superficial tissue, and is sharp, well-defined and clearly located. Examples include minor wounds and burns.

Neuropathic pain is caused by damage or disease affecting any part of the nervous system involved in bodily feelings. Peripheral neuropathic pain is often described as "burning," "tingling," "electrical," "stabbing," or "pins and needles." Bumping the "funny bone" or striking the radial nerve elicits peripheral neuropathic pain.

The ability to experience pain is essential for protection from injury, and recognition of the presence of injury. Episodic analgesia may occur under special circumstances, such as in the excitement of sport or battle, where no pain may be felt for several hours after a traumatic injury. Similar experience can occur with certain narcotic use. Indifference to pain can also rarely be present from birth; these people have normal nerves on medical investigations, and find pain unpleasant, but do not avoid repetition of the pain stimulus.

Penetration Wound

Penetration wounds are caused by an object entering and coming out from the skin.

Posterior

Back; rear

Proximal

Nearer to a point of reference such as an origin, a point of attachment, or the midline of the body.

Puncture Wound

Puncture wounds are caused by an object puncturing the skin, such as a nail or needle.

Sprains

Sprains are an injury to a ligament. Ligaments are tough, fiber-like tissues that hold bones together across a joint. Because ligaments have a limited blood supply, healing is usually prolonged. Ligament injuries usually include pain and swelling.

Ligament injuries are usually classified in three grades with Grade 3 being the most severe. Grade 1 sprains involve microscopic ligament tears with no change in length. Grade 2 sprains involve larger partial ligament tears with increased ligament length. Grade 3 sprains involve complete ligament rupture. These most severe sprains can cause permanent joint instability. Grade 3 sprains can have significant swelling but,

surprisingly, may have less pain than a Grade 2 sprain due to the fact that the ligament is ruptured and under less stress.

Strains

Strains are muscle and tendon injuries. The most common cause of a strain is the forceful lengthening of a muscle or tendon when the muscle is contracted. This is called “eccentric elongation”. Muscle strains rarely cause joint instability and can be quite painful with inadvertent stretching.

Similar to sprains, strains are also graded by severity and extent of tissue damage. Grade 1 strains involve microscopic tears of fibers but no loss of strength. Grade 2 strains involve tears in tissue with significant swelling and pain that reduces strength. Grade 3 strains involve complete rupture of the muscle or tendon. This is a serious injury that requires medical care and possible surgical intervention.

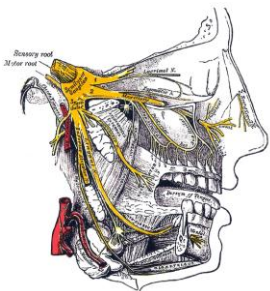
Acute muscle and tendon injuries are usually associated with continuous pain. Muscle and tendon injuries caused by chronic overuse usually have pain that will go away during training only to return a few hours after training.

The Knockout

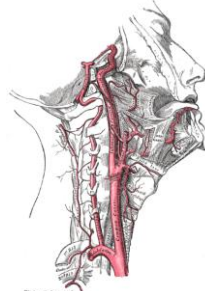
One of the most dramatic conclusions to a fight is when someone is knocked out. A knock out is defined as loss of motor control or unconsciousness. Although it may seem to be simple head trauma, there are a number of different suspected mechanisms.

A strong blow to the chin can result in a sudden loss of consciousness or motor control. Most trained fighters keep their chin tucked in and protected to avoid a direct hit. The hypothesis is that the loss of consciousness associated with blows to the chin is caused by a transmission of force through the jaw to the brain stem. This is known as a **Brain Stem Knockout**.

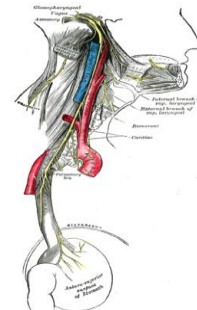
A second target that can cause a sudden loss of consciousness is the angle of the jaw or just below the ear. When this area is struck with a rotational force it can cause a knockout by one of four proposed mechanisms: twisting of the brain stem with disturbance of the reticular activating system (which controls “wakefulness” and the sleep/wake cycle), diffuse axonal injury (damage to the brain occurring over a widespread area due to shearing rotational forces), stimulation of the trigeminal nerve (a main facial nerves responsible for sensations in the face), or stretching of the carotid sinus (explained later).



[Fig 2] Trigeminal Nerve
(yellow)



[Fig 3] Carotid Sinus
(at branch of internal carotid)



[Fig 4] Vagus Nerve
(yellow)

Stimulation of the trigeminal nerve in the face, the vagus nerve (also called the pneumogastric nerve, responsible for signals to and from the organs) in the neck or the carotid sinus in the neck can cause a reflex drop in heart rate, dilation of peripheral blood vessels and constriction of vessels in the brain, leading to a sudden drop in blood pressure and unconsciousness. This type of knockout is called a **Neurovascular Knockout**. A neurovascular knockout can also occur with blows to the ribs (intercostals nerves), abdomen or exposed parts of the liver. Strikes to the abdomen can cause pain and lead to the stimulation of the vagus nerve. Because of the cascade effect of neurological and cardiovascular reactions, there may be a slight delay between the strike and loss of motor control or unconsciousness. Blows to the eye socket can cause a similar type of knockout due to an oculocardiac reflex.

A **Flash Knockout** is a momentary collapse or loss of motor control after a blow to the head. Recovery occurs very quickly, with no sign of brain injury or concussion. The

actual cause of this knockout is not fully known but it is speculated to involve a momentary disruption of the parts of the central nervous system that sense balance and body positions (vestibular and proprioceptive respectively).

After a series of blows to the head, a person may develop a disassociated, confused state with no loss of motor function. This is termed as being “out on your feet” or otherwise known as a **Pummeling Knockout**. The mechanism behind this type of knockout most likely involves a trauma-induced disruption of neuronal activity and should be considered a form of concussion.

Head and Facial Injuries

Head and facial injuries are some of the most common and visible injuries occurring within the martial arts mainly because the head is one of the prime targets. Head injuries can also constitute some of the more dangerous and steps should be taken to recognize the extent and severity of these injuries.

Brain injuries can range from slight concussions to life-threatening, acute traumatic brain injury including cerebral contusions, epidural hematoma (bleeding outside of the brain dura, the first of three membranes surrounding the brain), subdural hematoma (bleeding under the brain dura), and traumatic subarachnoid hemorrhage (bleeding between the arachnoid, the second membrane and the pia, the third membrane).

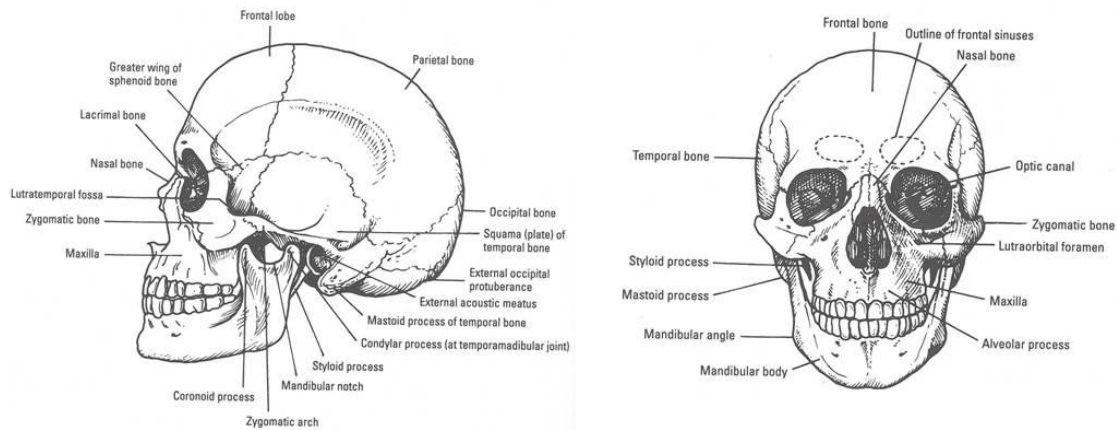
Subdural hematomas account for most deaths from a fight related brain injury. Symptoms of a subdural hematoma include prolonged unconsciousness, headache, visual changes, lethargy and confusion. Similar to concussion, the symptoms will present with more severity. Severe subdural hemorrhage can cause increased intracranial pressure and cerebral edema. This can cause the brain to herniate through the bottom of the skull which can cause compression of the brain stem and death. The physical finding of one dilated pupil in an unconscious individual is a grave sign of significant brain injury.

Some fighters after a significant head trauma may appear fine at first followed by a sudden worsening of symptoms and even death. This is the reason why anyone that has sustained significant head trauma should be watched closely.

A cerebral contusion is another type of acute brain injury. It occurs when the brain is suddenly shifted with the skull or significant forces cause sudden changes in intracranial pressure. If the contusion occurs on the side of the blow it is called a coup injury. If on the opposite side it is called a contracoup injury. Symptoms include headache, nausea, vomiting, unconsciousness, visual disturbances, lack of coordination, amnesia, irritability, and lethargy.

Rotational forces from a blow to the side of the head can cause shearing forces across brain cells. This can result in injuries to widespread areas of the brain and is known as diffuse axonal injury. Rotational forces can also cause the under surface of the brain to

be injured as it shears across the rough edges of the skull. The injuries to brain tissue are linked to chronic traumatic brain injuries.



[Fig 5] Skull

Skull fractures may be caused by a heavy blow to the head, especially on impact with a hard surface. It is a myth that the temple is extremely vulnerable to any blow. Without any evidence it was supposed that the skull was fragile at this point. The opposite is true; the skull is thicker at this area than in other parts of the head. It is vulnerable to a strike just as any other part of the head would be that could result in a underlying brain injury. The lower part of the skull may be fractured by landing heavily on the base of the spine or when falling from a height and landing heavily on the feet. Always keep in mind the possibility of a neck injury when there is a significant head injury.

Eye injuries during martial arts can range from mild corneal abrasions to vision threatening retinal tears to complete loss of an eye in if severely gouged. Repetitive contact to the eye can cause damage from increased intraocular pressure. Abrasive forces can cause tears of the iris, cornea and extraocular structures. The cornea is a thin layer of transparent tissue that covers the pupil and lens. It is delicate and can easily be scratched by abrasive forces. Although mild abrasions usually heal quickly, disruption of the epithelial layer can leave the cornea open to infections. Symptoms of a corneal abrasion include pain, sensitivity to light and tearing. Trauma to the eye can also cause injury to the iris, the color part of the eye. Inflammation can cause the iris to constrict and local blood vessels to dilate. This causes a distinctive red border around the iris with a small pupil. A hyphema is caused by bleeding into the front chamber of the eye just behind the lens. If there is a large collection of blood, vision may be completely obscured. The most dreaded complication of eye trauma is damage to the retina with retinal detachment. Rapid changes in ocular pressure can cause the retina to be torn away from the back of the eye. Symptoms of retinal detachment include vision loss, light flashes, and floaters.

The most common ear injuries involve either the eardrum or the cartilage that form the visible part of the ear. Rupture of the eardrum can occur when the ear is struck from the side and air forced into the ear canal. Symptoms of a ruptured eardrum include a sudden loss of hearing, sharp pain, and bleeding from the ear canal. Contusions can occur to the external ear. Such trauma can cause bleeding between the skin and cartilage.

Chronically trapped blood can calcify and cause a deformity known as cauliflower ear. Symptoms include mild pain and edema. Chronic untreated injuries cause deformities of the external ear that harden but do not cause pain.

Facial lacerations (cuts) can occur when the skin and subcutaneous tissues are compressed against the facial bones. Some areas are more prone to lacerations, such as the brow and cheek. It is important to note that facial laceration start under the skin and usually involve more damage than is shown on the surface. Considerations for evaluating a laceration include location (eyelid, corner of eye, over a nerve), depth (muscle and nerves), and the type of bleeding (a torn artery is hard to control).

Fractures of the facial bones and jaw can cause permanent damage. The jaw (mandible) can be injured by direct blow or sandwiching between two hard surfaces. Mandible fractures often involve more than one fracture site. Symptoms of a mandible fracture include pain, speech difficulty and difficulty opening the mouth.

Fractures of the cheek can occur with heavy blows to the side of the face. The fractured bone is usually rotated backwards and downward, causing a flattening of the cheek and downward slanting of the outer eye. Orbital fractures can occur from blows to the eye socket, most commonly the orbital floor and are known as blowout fractures. Symptoms of a blowout fracture include double vision, pain and numbness just below the eye socket.

Nose bleeds can occur as a result of minor trauma. The central division between the nostrils is known as the septum. The region has a rich blood supply and is easily damaged. Nasal fractures are a very common facial injury. Only the bridge of the nose is composed of bone, the remainder is cartilage. Symptoms of a nasal fracture include pain, tearing, bleeding, edema, and obstruction of air flow. Edema usually peaks at 72 hours and ecchymosis may occur under the eyes. Nasal fracture complications include arterial laceration, bone fragments protruding from skin, septal hematoma and sinus fracture. One myth about a nasal fracture is that the nasal bones can be driven into the brain and cause death. The small bones in the nose are more fragile than the surrounding skull structure. A heavy blow would break the nasal bones more readily than it would the skull. Fortunately, there is no space for the bones to enter the brain case. So while it is possible to deliver a fatal blow by striking the nose, death would not result from nasal bones entering the brain, but from a damaging brain injury.

Neck Injuries

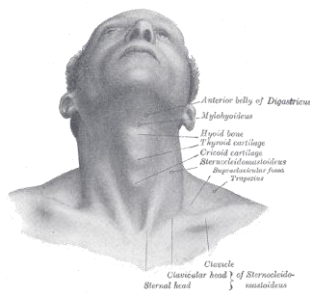
The neck is a complex structure of bones, ligaments, muscles, tendons, blood vessels, and nerves. Cervical injury, injury to the vertebrae and surrounding tissues in the neck, is the most concern with a neck injury as the spinal cord runs through the vertebrae. A cervical injury should be assumed to have occurred in any unconscious participant. It is imperative to immobilize the injured person until a cervical injury is ruled out to prevent severe and permanent spinal cord damage.

An impact to the head with a flexed cervical spine can compress the spinal cord. Not an uncommon occurrence in wrestling or other grappling arts. Repeated impacts to the head while the cervical spine is flexed can lead to cervical stenosis (narrowing of the spinal canal), straightening of the normal cervical curve, and arthritis. Over flexing of the cervical spine utilizing various holds can also cause similar injury. In addition, when the head is forced back quickly and rotated by a blow or grappling move, a fatal rupture of the vertebral artery may occur. Warning signs of severe cervical injury include severe neck pain, rigid cervical spasm, severe cervical tenderness, prolonged unconsciousness and pain with range of motion or gentle isometrics.

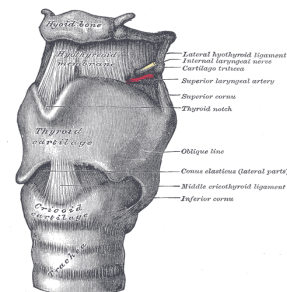
Cervical cord neuropraxia is a transient spinal cord injury caused by the pinching of the spinal cord during severe neck flexion or extension. Temporary paralysis can present itself. Symptoms include pain, numbness and weakness in the arms, legs, the arm and leg on one side, or all four extremities. Symptoms can last anywhere from 10 minutes to 48 hours.

Cervical strains, sprains, contusions and joint dysfunction are considered after spinal cord injury has been ruled out. Cervical strains are injuries to the neck muscles or tendons which most commonly occur with forced stretching of contracting neck muscles. Cervical and upper thoracic muscles have a high ratio of fast-twitch fibers and have an increased risk of injury. Symptoms include aching pain, decreased range of motion and stiffness that may increase for up to 72 hours after the injury occurred.

Injuries to the throat can occur from both strikes and holds. The structure of the throat is maintained by a cartilage skeleton known as the larynx (containing the vocal cords) and trachea. Since cartilage is less strong than bone, the area is particularly vulnerable to compression injuries and fractures. Crushing injuries of the larynx and trachea can severely obstruct the airway and become life threatening. A blow to the throat may not cause any immediate symptoms of damage, but as with any soft tissue, the throat may begin to swell causing difficulty in speech and breathing.



[Fig 6] Throat



[Fig 7] Larynx

Trauma to the carotid artery can cause a rupture, blood clot, or dislodged piece of plaque, all of which can cause a stroke. There are reported cases of fainting, delayed neurological symptoms and even death from carotid artery trauma. Although rare, it is important to keep in mind injury to the neck's vascular structures.

Any discussion of neck injuries in the martial arts must include choke holds. There are two types of choke holds, vascular holds and airway holds. Vascular holds involve bilateral compression of the carotid arteries that run up both sides of the neck. People are under the misconception that the loss of consciousness associated with this type of choke hold is due to the disruption of blood flow to the brain. It is actually very difficult to completely stop blood flow to the brain because there are four arteries (two carotid arteries and two vertebral arteries) that supply blood to the brain.

The physiology behind the loss of consciousness is actually a complex sequence of neurovascular events. The most effective vascular choke involves bilateral compression of the carotid arteries directly over a small neurosensory organ called the carotid sinus. The carotid sinus is responsible for monitoring blood pressure to the brain. Compression of the carotid sinus induces a slowing of the heart and dilation of the blood vessels. The combined effect is a sudden drop in blood pressure. Just before the drop in blood pressure, the cerebral vessels constrict which magnifies the decrease in brain blood supply and results in a rapid loss of consciousness. Those who are proficient with the vascular choke will also have the opponent slightly rotate the head. Rotation of the head can reduce the vertebral artery blood flow. Compression of the carotid sinus alone can cause loss of consciousness in 10 to 15 seconds. When blood flow is reduced in one of the vertebral arteries as well, unconsciousness can occur in as little as 6 seconds. Upon release from the hold, consciousness is usually regained in 10 to 20 seconds. Complete recovery is usually achieved in 1 to 2 minutes. Prolonged compression of the carotid sinus shows no adverse injury, although it is more likely to induce convulsions, involuntary defecation and urination, and dilated pupils.

The other type of choke hold involves compression of the larynx/trachea to cut off the airway and induce unconsciousness. It is an interesting fact that, in many cases, the mechanism for the loss of consciousness is bilateral compression of the carotid sinus just as in a vascular choke. There is, however, an increased risk of injury to the larynx and trachea. If the hold is released quickly and there is no damage to the airway, recovery should occur in 30 seconds. If the airway is compressed for too long, hypoxia (lack of oxygen) occurs to the brain with the possibility of permanent brain damage or death.

Shoulder, Elbow and Forearm Injuries

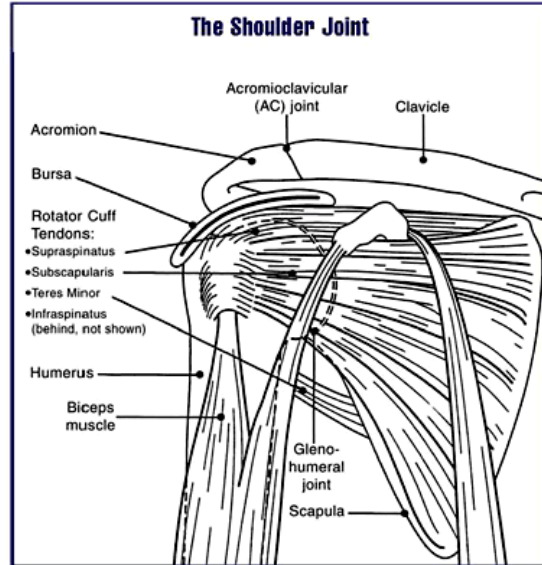
The shoulder joint enables free motion in of the upper arm in multiple planes. Unfortunately, this freedom of motion results in less stability than most other joints. This combination makes the shoulder particularly vulnerable to injury.

The rotator cuff is the group of muscles and their tendons that act to stabilize the shoulder. Injury to the rotator cuff can range from mild tendon inflammation (tendonitis) coming from overuse to acute muscle and tendon tears from excessive stress or trauma.

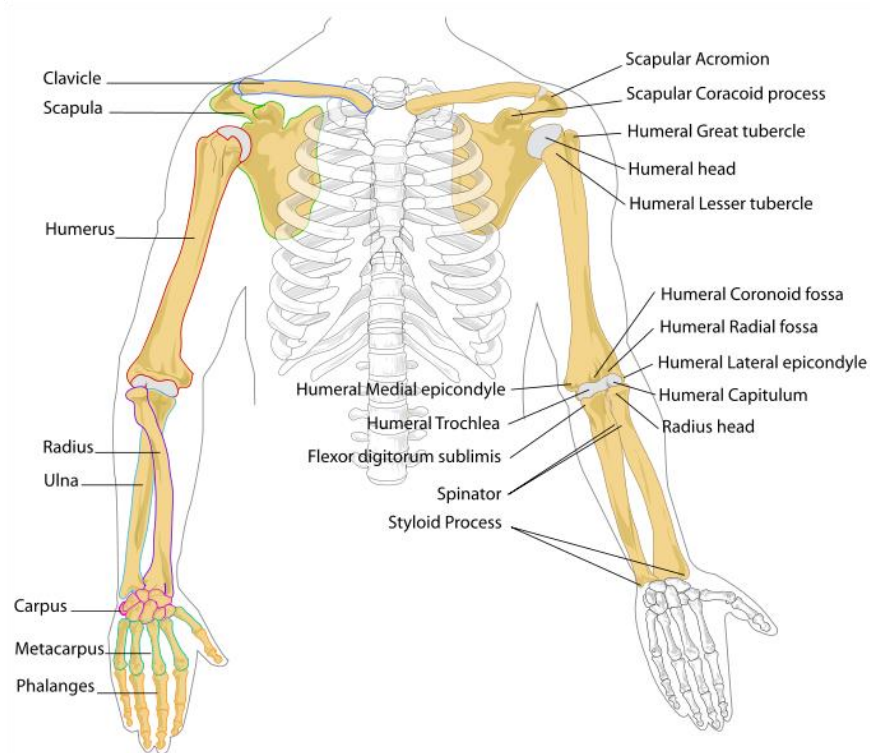
Rotator cuff tears are classified as either partial or full-thickness. Partial tears involve only part of the tendon. The most common symptoms of a rotator cuff tear are pain and

weakness. Rotator cuff tendonitis and impingement have similar symptoms but no loss of strength. Someone with a rotator cuff tear usually has a distinctive posture, with the injured shoulder slightly elevated and the arm held in front of the body. Having them try to raise the arm will usually be painful and the whole shoulder will lift toward the ear in compensation for the torn tendon.

Injuries can also occur to the acromioclavicular joint (AC joint). This is the small joint located along the distal clavical. The joint is composed of the clavical, acromion, joint capsul, and the acromioclavicular and coracoclavicular ligaments. This joint is prone to injury from the constant pushing motion involved in punching. Symptoms include aching pain that increases with pushing motion, crepitus, and edema.



[Fig 8] Shoulder joint



[Fig 9] Shoulder and Arms Bones

Acromioclavicular joint separation can occur from a fall on the tip of the shoulder. These injuries involve tears in the acromioclavicular joint ligaments. Joint separation is

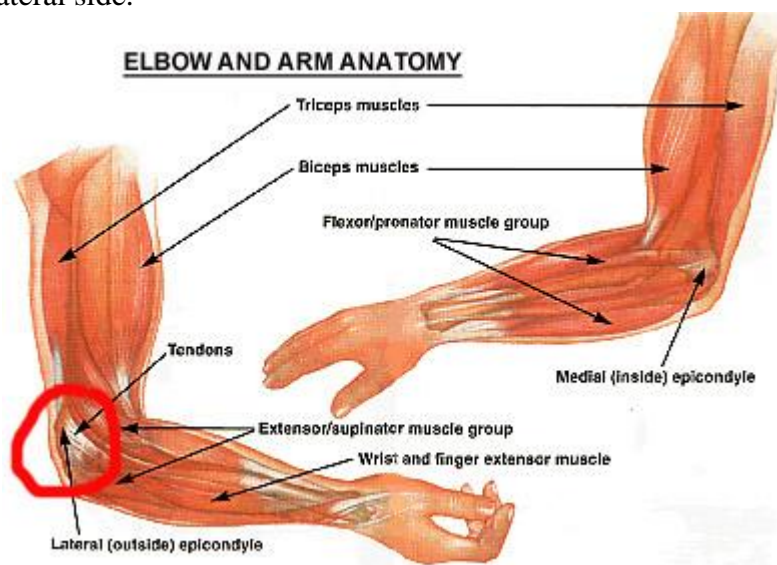
classified by degree (1-4) of ligament rupture and displacement. Symptoms include pain, deformity if type 3 for 4, and decreased shoulder movement.

Strikes to the clavicle or falls on the shoulder can cause clavicle (collarbone) fractures. Symptoms of clavicle fracture include pain, edema, and crepitus (cracking sound) over the site of the fracture. Displaced fractures can result in an obvious deformity. Fracture of the proximal clavicle are rare but can be serious if bone fragments injure the subclavian artery or vein. Midclavicular fractures are less worrisome. Distal clavicular fractures are subdivided into three types. Type I does not involve the AC joint. Type II are displaced and involve the AC joint. Type III involve the surfaces of the AC joint but are not displaced.

Shoulder dislocations involve glenohumeral joint (the ball-and-socket joint). The rim of the glenohumeral joint has a rim of cartilage called the labrum which can be damaged or tear during a dislocation. The most common type of shoulder dislocation involves anterior displacement of the humerus. Symptoms of a shoulder dislocation include intense pain, immobility of the shoulder, a bulge deformity in the front of the shoulder, and a deficit in the back of the shoulder.

The humerus (upper arm) is relatively strong but fractures, although rare, can occur from a direct strike or the result of a fall. The area near the elbow is particularly susceptible to an injury when falling on an outstretched hand. A martial artist may not realize that a fracture has occurred because the arm stays fairly stable as a result of the action of the large muscles that pull along the line of the upper arm. Care does need to be taken with this type of fracture because pieces of bone can pose a threat to the arteries and nerves that pass close to the elbow joint. Symptoms of a humerus fracture include pain, tenderness to the touch, edema, ecchymosis, and possible inability to straighten the arm.

The inside of the elbow, closest to the body, is the medial side and the outside of the elbow is the lateral side.



[Fig 10] Elbow and Arm

Repetitive stress involving wrist extension (the wrist bent backward) can strain the proximal wrist extensor tendon. This is called lateral epicondylitis (tennis elbow). The initial stages of this injury involve inflammation but later stages can result in tissue scarring. Symptoms of lateral epicondylitis include aching pain along the lateral side of the elbow that increases when lifting with the palm facing the ground. Repetitive stress involving wrist flexion can strain the proximal wrist flexor tendon resulting in medial epicondylitis (golfers elbow). It is common with those involved in heavy weight lifting and grip strengthening exercises. Symptoms include aching pain along the medial side of the elbow that increases with gripping motions.

The ulnar collateral ligament (UCL) attaches the medial ulnar bone to the distal medial humerus. The UCL is commonly injured in martial arts arm locks. Symptoms of UCL sprains include aching pain, edema, ecchymosis, and limited motion. Severe tears can result in elbow joint instability.

Elbow dislocation is another possible injury to the elbow joint. Posterior dislocations are more common than anterior dislocations. The usual cause of a posterior dislocation involves falling on an outstretched hand while the arm is extended. A blow to the forearm while the elbow is flexed can cause an anterior elbow dislocation. Elbow dislocations have a high incidence of neurovascular injury. Symptoms include severe pain, edema, ecchymosis and deformity.

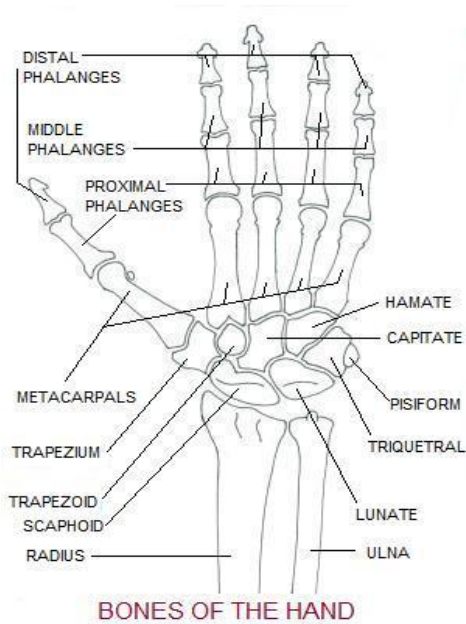
Hyperextension of the elbow joint can cause a stress injury to the olecranon bone at the proximal end of the ulna (more commonly known as the “funny bone”). This can also occur because of a combination of weight bearing across the elbow and sudden extension forces. Olecranon bone injuries can range from early swelling in the bone marrow to complete fractures. Acute traumatic fractures can occur from a fall on an outstretched hand or from an overzealous elbow lock. Symptoms include pain, edema and limited motion.

Radius and ulna bone fractures commonly occur from falling on an outstretched hand, but they can also occur from arm locks and blows to the forearm. The most common cause of a distal radius fracture is a fall on an outstretched hand with the wrist bent backward. Symptoms of radius fractures include pain, edema, and ecchymosis on the wrist and distal forearm. Fractures involving the shaft of the radius with a dislocation of the distal radioulnar joint (DRUJ) are called Galeazzi’s fractures. This injury can occur from a direct trauma to the outer wrist. Direct blow to the forearm or falling on the ulnar side of the arm can cause an ulna bone fracture. These are sometimes called “nightstick fractures” because they have been reported to occur from nightstick blows to the forearm.

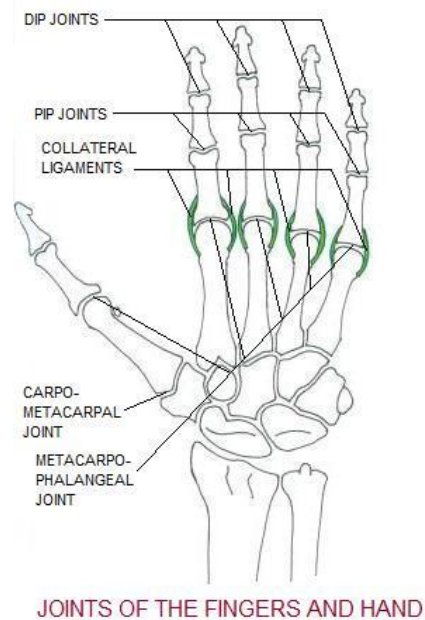
Wrist and Hand Injuries

The wrist joint is made up of the two forearm bones (the radius and ulna) with eight bones within the palm of the hand (the carpals). Many ligaments join to these bones together and act to stabilize the joint and allow for a wide range of movement. This also

makes it the target of a variety of wrist locking techniques. It is easy to see why it is one of the more commonly injured joints.



[Fig 11] Wrist and Hand Bones



[Fig 12] Hand and Finger Joints

A sprained wrist can be sustained by falling on to an outstretch hand or by excessive bending which can occur when wrist locks are applied. Wrist locking maneuvers that push the wrist into extension and then twist are especially likely to cause injury to the scapholunate ligament. Symptoms include pain and edema directly over the scaphoid and lunate bones.

Wrist locking maneuvers can also be damaging to the distal radioulnar joint (DRUJ) ligaments and the triangular fibrocartilage complex (TFCC). The DRUJ is located between the distal radius and the ulna bones. Symptoms include pain over the dorsal ulnar side of the wrist that increases with rotation of the forearm. The TFCC is the cartilage at the head of the ulna. This cartilage absorbs 20 percent of the axial load from the wrist to the forearm. Most injuries to the TFCC involve hyperextension and rotation. Symptoms include aching or sharp wrist pain that increases with wrist extension or heavy wrist loading.

Scaphoid bone fractures are the most common wrist fractures. They are usually caused by trauma to the wrist while it is flexed back and toward the outside of the elbow. Symptoms of scaphoid fractures include aching radial wrist pain and decreased motion. Edema is rare.

Martial artists that practice breaking boards and bricks have an increased risk of hamate fractures which is a small wrist bone at the base of the hand on the ulnar side. There is small protrusion from the hamate bone that can be injured with direct trauma to the ulnar side of the wrist from a punch or kick.

The hand takes a great deal of punishment in the martial arts. Direct blows to the knuckles can cause contusions, sprains, fractures, and joint capsule inflammation in the metacarpophalangeal joint (MCP). Martial artists have used a number of methods to try and harden the knuckles and avoid injury. The best known method is called makiwara training. A makiwara consists of a flexible piece of wood that is fixed at one end and padded at the other. The martial artist will practice striking the padded end repeatedly in an effort to strengthen the wrist and knuckles. Some individuals have attempted to use this method on inflexible objects. The result is MCP injury, fractures or both.

Boxer knuckle is a term applied to injury of the metacarpophalangeal joints (MCP) which are the large knuckles of the hand. Irritation of the MCP can be caused by direct trauma or by repetitive use without recovery. Splitting of the MCP joint capsule can also occur with blunt trauma. Symptoms of metacarpophalangeal joint capsule injury include pain, edema, loss of motion, and ecchymosis. The MCP extensor mechanism is composed of the joint capsule, the ulnar and radial band, and a central tendon called the extensor digitorum communis. This complex enables the finger to be straightened and can be damaged by punching incorrectly.

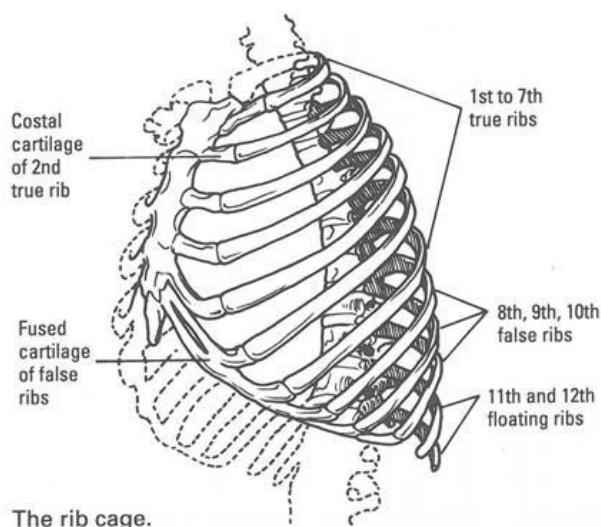
Traumatic blow to a partially flexed thumb can cause dislocation of the thumb carpometacarpal (CMC) joint. This can occur when the thumb makes contact during a missed punch. Symptoms of thumb CMC dislocation include pain over the base of the thumb, limited range of motion, and edema. Thumb CMC dislocations can be associated with the first metacarpal base fracture. If the fracture is Y- or T- shaped, it is called a Rolando's fracture. This was first described in 1910 by Silvio Rolando. (I threw that in for you Norm)

The five hand bones are called metacarpal bones. Each bone has four parts. The base is the part closest to the wrist. The shaft is next and is the longest. The neck is the angulated part just before the MCP joint. The head makes up part of the joint. They are numbered 1 through 5 starting with the thumb. Fifth metacarpal neck fractures are referred to as "boxer's fractures" but fractures of the second through fourth are more common. Boxer's fractures occur from improper punching technique. Symptoms of metacarpal fractures include pain, edema, loss of motion, and possible physical deformity. The more common mechanism causing fractures of the metacarpals are a direct force to the back of the hand from a kick, elbow or punch.

The fingers have three joints: the metacarpophalangeal joint (MCP), the proximal interphalangeal joint (PIP), and the distal interphalangeal joint (DIP). Each joint has ligaments on the side called collateral ligaments and a palm side ligament called the volar capsular ligament. Trauma to the finger joints can cause tears to any of these ligaments. Injury to the ulnar collateral ligament (UCL) of the thumb MCP joint can occur when the thumb is caught and forced away from the hand. Dislocations are also common injuries to the finger joints. These are mainly caused by falling on the hand or blocking a strike, especially if there is a direct blow to the finger tip.

Chest, Abdomen and Back Injuries

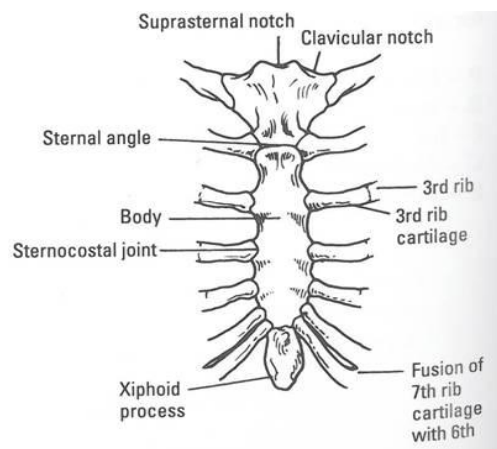
The chest is well protected by the skeletal structure of the ribs and sternum. The ribcage is comprised of 12 pair of ribs which protect the organs of the chest, the lungs heart and major arteries and veins and to some degree the kidneys, liver and spleen. The last two pairs of ribs are known as floating ribs because they are not connected to the sternum.



[Fig 13] Rib Cage

Although the ribs do a good job protecting the chest, they can sustain injuries from direct trauma. Burised ribs are a common injury. The intercostal muscles and ligaments of the ribs can also sustain contusions. If the trauma is severe enough, ribs fracture will occur. With any rib fracture there is a risk that a fractured rib-end will cause damage to a lung, kidney, liver or spleen. If the lung cavity is pierced, the lung will collapse making breathing very difficult because only one lung will be functioning.

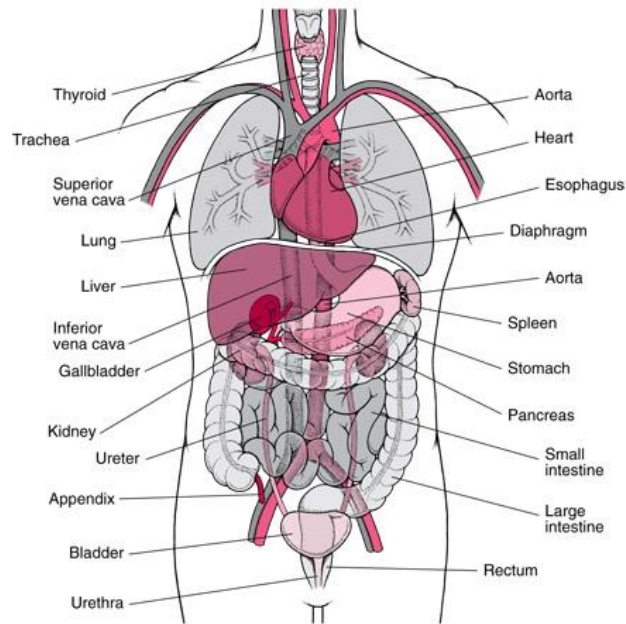
The center of the chest is protected by the sternum, to which, the first seven ribs directly attach. The sternum develops in three parts; the manubrium, the gladiolus, and the xiphoid process. The xiphoid process at the bottom of the sternum starts as cartilage but turns to bone as a person gets older. A strike to the bottom of the sternum may cause the xiphoid process to separate from the sternum and be driven into the liver causing a life threatening injury.



[Fig 14] Sternum

An unexpected blow to the abdomen without the opportunity to tense the abdominal muscles

can cause the diaphragm to spasm making it difficult to breathe normally. It usually resolves itself quickly.



[Fig 15] Organs

Although the liver and spleen are protected by the rib cage, the spleen is the most commonly damaged abdominal organ. It is particularly susceptible to blow to left lower chest. It has a tendency to bleed profusely and as such an injury can result in becoming severely compromised and shocked. Likewise a blow to the right lower chest can injure the liver.

The kidneys lie in the back and are somewhat protected by the rib cage as well. It is possible to injure the kidneys by blows to the lower back. Injuries to the kidney can be serious, one feature of which is passing blood in the urine.

Less commonly, the bladder can be injured with blows to the lower abdomen. Blood in the urine would be a sign of such and injury.

Although intercostals muscles and ligament injuries usually occur along the side of the rib cage, they can also occur in the thoracic part of the back. Such injuries are usually caused by twisting trunk motions. Symptoms include sharp pain in the upper back that increases with breathing in, radiates along the ribs, and decreases with immobility.

The lower back is particularly vulnerable to strains and sprains during rapid flexion and rotation motions that occur during punching and grappling. Symptoms of lumbar strain and sprains include aching pain in the lumbar spin that increases with bending forward and decreases with bending back. The pain may radiate into the buttocks or hamstring area.

Hip and Leg Injuries

The bone structures in the hip and upper leg are very strong in a healthy person and can only be broken with considerable force. The hips and legs also contain significant musculature. Many hip and groin injuries have overlapping symptoms and involve more than one structure.

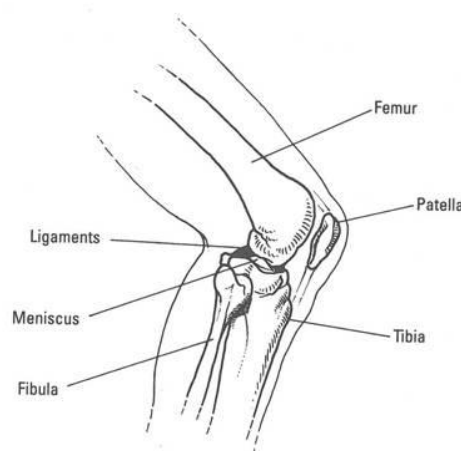
The hip abductor muscles control the movement of the leg toward the center of the body. Hip abductor muscle and tendon strains can cause considerable discomfort, frustration and may require significant healing time (up to six months). Hip abductor strain symptoms include aching groin pain radiating to the inner thigh. It is usually known exactly when the strain occurred. The typical history is acute pain followed by aching for hours to weeks.

The hamstring muscles help stabilize the hip and contribute to knee flexion and hip extension. Excessive forces can cause avulsion fractures. Hamstring injury symptoms include aching pain along the posterior leg that increases with stretching. Proximal hamstring injuries (those near the buttocks) usually require prolonged healing times.

Quadriceps strains can occur with explosive kicking maneuvers or running. Avulsion fracture can also occur. The main symptoms of quadriceps injury involve aching pain in the anterior thigh that increases with squatting maneuvers and kicking. Contusions can result from forceful blunt trauma to the muscles, such as in roundhouse or Muay Thai kicks to the lateral thigh. These contusions are of concern because they can be complicated by calcium formation in the injured muscle called myositis ossificans traumatica.

The iliotibial bursa is located on the outer portion of the proximal femur. Bursae are fluid-filled sacs that help prevent friction when tendons rub over bone. Both trauma and repetitive hip movement can cause inflammation of the bursa. Symptoms include lateral aching hip pain, decreased hip abduction, and hip tenderness.

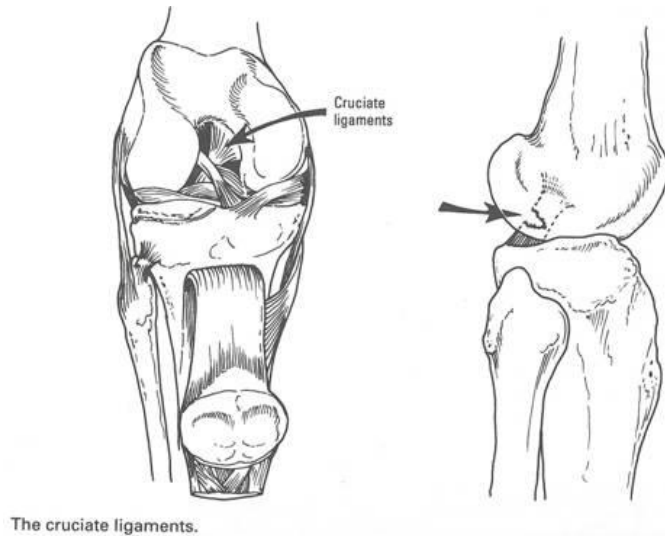
The knee is a hinge joint formed by the lower end of the femur and the upper end of the tibia. It is designed to swing forwards and backwards only. The patella is a small bone at the front of the knee. Repetitive kicking can cause inflammation of the patella tendon. This tendon is usually injured by repetitive, explosive knee extensions. The patella can be fractured or dislocated by direct blows to the front of the knee.



[Fig 16] Knee

Between the lower surface of the femur and the upper surface of the tibia are two

semi-circular piece of cartilage, known as the medial and lateral menisci. They act as shock absorbers for the knee. The menisci can be torn as a result of a sudden twisting of the knee while the foot is stationary on the floor or rotation stress on a flexed knee. Medial meniscus tears are more common than lateral tears. Symptoms of acute meniscus tears include sharp pain with weight bearing, and fluid accumulation within the knee joint, and knee locking. Chronic and subacute meniscus tears can cause intermittent symptoms of sharp pain with certain movements, aching pain and edema after exercise, and a catching sensation.



[Fig 17] Knee Ligaments

Several ligaments act within and across the knee joint to provide stability. Excessive side-to-side movement is prevented by the collateral ligaments, which attach across the inside and outside of the joint. The medial collateral ligament (MCL) is located on the inside of the knee joint and connects the femur to the tibia. The lateral collateral ligament (LCL) is located on the outside of the knee and connects the femur to the fibular head. MCL sprains can occur with lateral knee trauma. Conversely, LCL sprains occur with medial knee trauma.

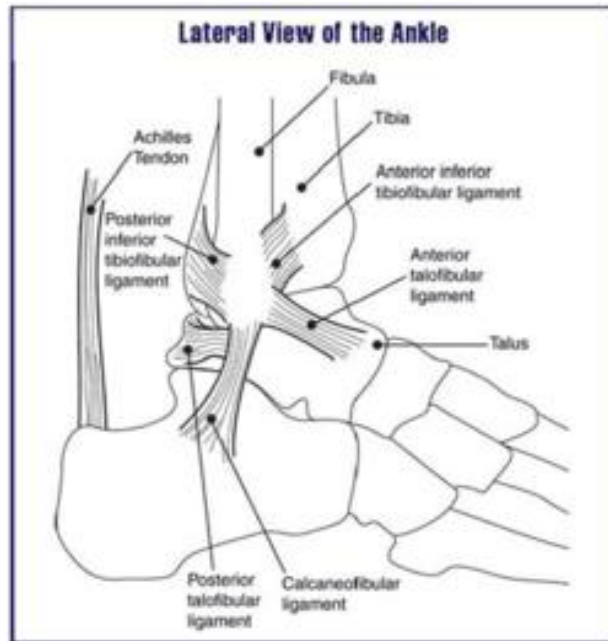
The anterior and posterior cruciate ligaments (ACL and PCL) are within the knee joint and act to prevent excessive movement forward and backward. These ligaments are essential for the stability of the knee. Tearing of these ligaments can result in the knee becoming highly unstable. The ACL is more commonly damaged and is most likely to be injured as a result of twisting the bent knee or as a result of over-straightening (hyperextending) the joint. Symptoms of cruciate sprains include pain, edema, and knee instability.

The tibia is usually only broken by a strong traumatic force. Symptoms would include inability to bear weight, pain, edema and deformity. The tibia is commonly more affected by stress fractures as a result of repetitive activities on hard surfaces. The symptoms for distal tibia bone injury would involve aching pain.

The thinner fibula is a non-weight bearing bone located on the lateral side. It is more easily damaged and can be fractured as a result of excessive twisting of the lower leg. Fractures can also occur from direct trauma to the side of the shin. Fibula fractures can cause ankle instability because the distal fibula is part of the lateral ankle joint.

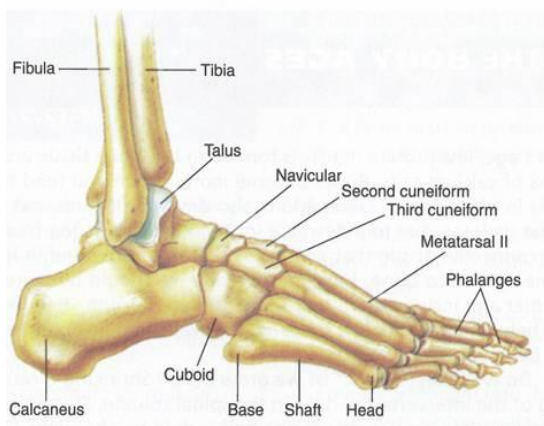
Ankle and Foot Injuries

The ankle joint is a complex joint involving the tibia, fibula, and talus bones. It is a highly mobile joint and must be stabilized by strong ligaments and muscles acting across the joint. A sprain is usually caused by excessive twisting of the ankle which results in injury to the ligaments at the sides of the ankle (collateral ligaments). The most commonly affected ligaments are on the lateral ankle caused by rolling outward on the ankle. Symptoms of both medial and lateral ankle sprains include pain, edema, ecchymosis, inability to bear weight, and instability.

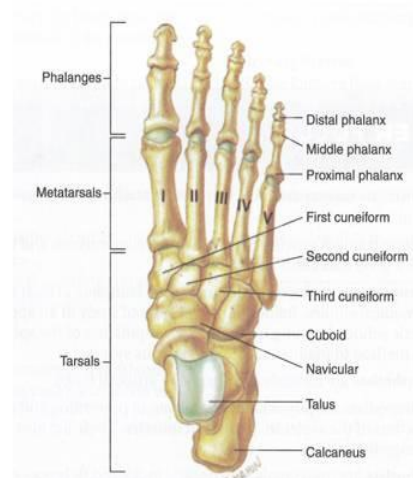


[Fig 18] Ankle Ligaments

Ankle fractures involving two or more ankle bones are unstable injuries that usually require surgical fixation. The foot has a number of neurovascular components and suspected ankle fractures or dislocations should prompt a thorough evaluation. Symptoms of ankle fractures are similar to those of an ankle sprain.



[Fig 19] Ankle/Foot (side)



[Fig 20] Ankle/Foot (top)

The foot comprises over twenty-five small bones. The heel is formed by the calcaneus, the hindfoot by the tarsals bones, and the midfoot is made up of the metatarsal bones. Bones in the foot may be fractured as a result of kicking an opponents elbow or any other hard surface. The foot is also prone to stress factures as a result of training on hard surfaces over long periods of time. Symptoms of a foot fracture include pain, difficulty walking, edema, and possible deformity.

The Achilles tendon is the attachment of the calf muscle to the calcaneus (heel bone). The calf muscles are very strong and exert a great deal of stress on this tendon. Straining of the Achilles tendon is relatively common. The tendon can also tear or rupture completely. A rupture of the Achilles tendon results in sudden, sharp pain at the back of the heel. The injury will prevent the raising up on the toes as the calf muscles are no longer attached to the heel.



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[Fig 21] Achilles tendon

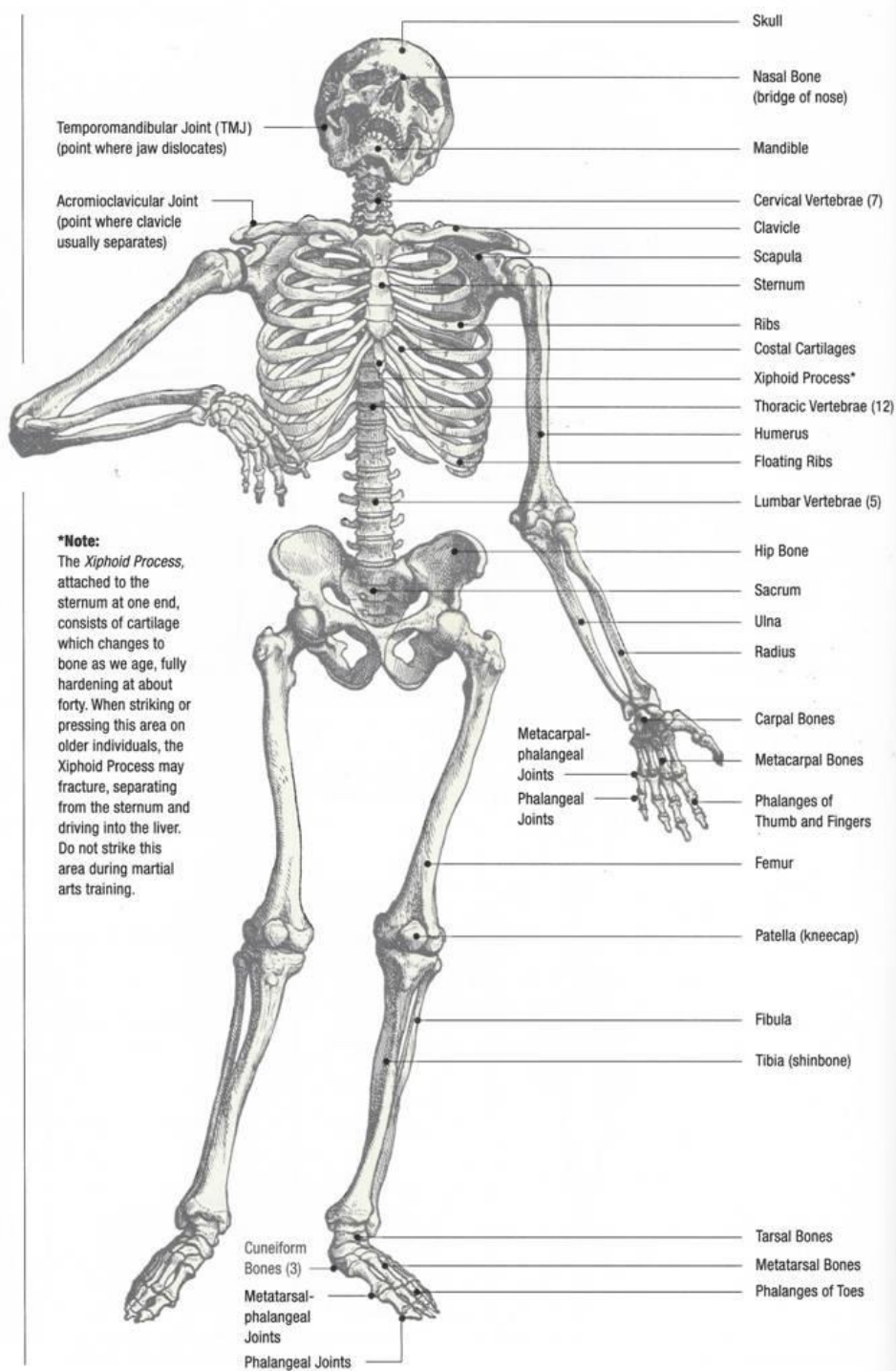
Conclusion

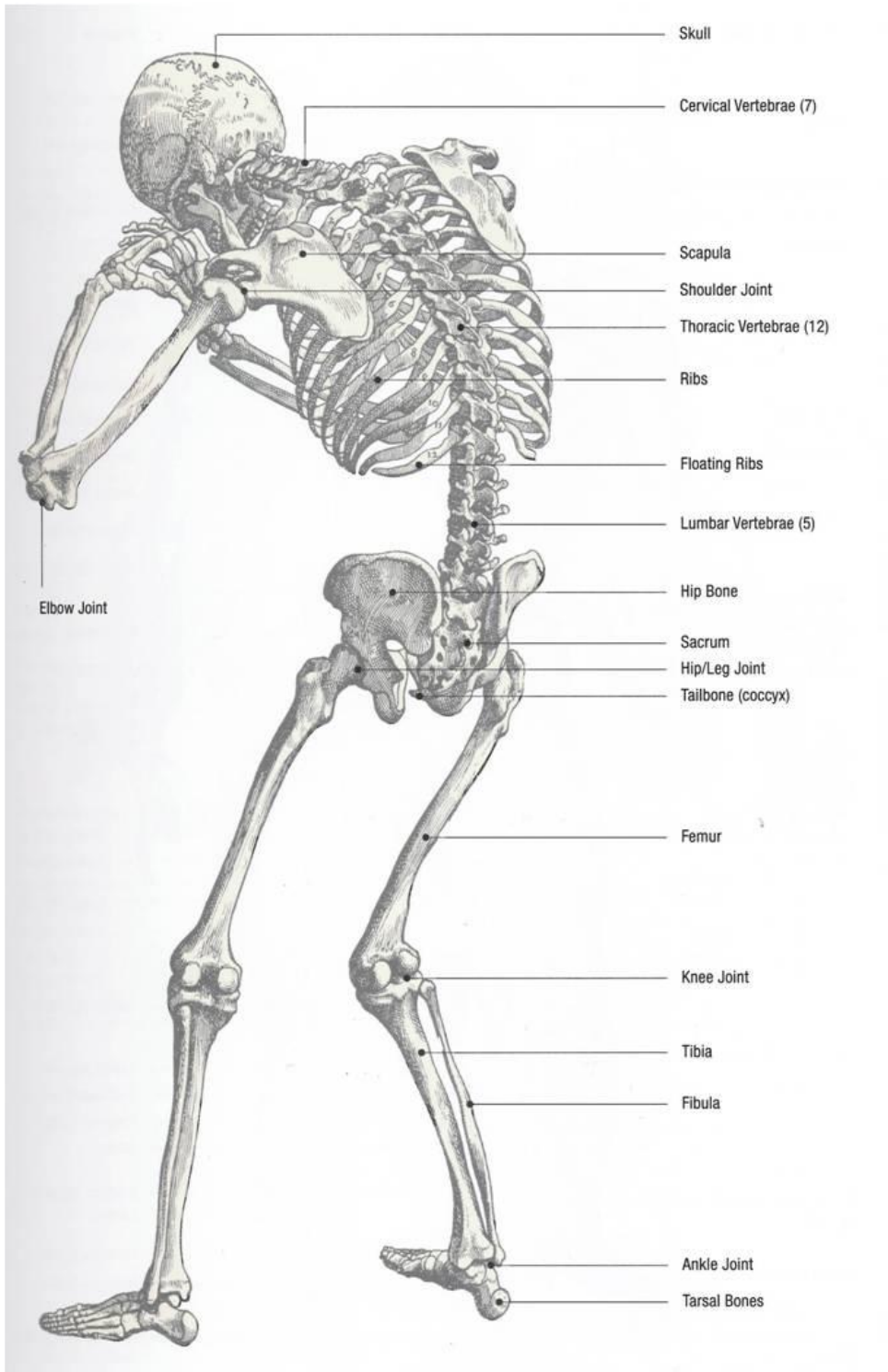
Injuries tend to be an inevitable part of the martial arts. No matter how much training is geared to avoid injuries they will still continue to be sustained. Having knowledge of the type and severity of injuries that can occur will better prepare a martial artist for whatever happens.

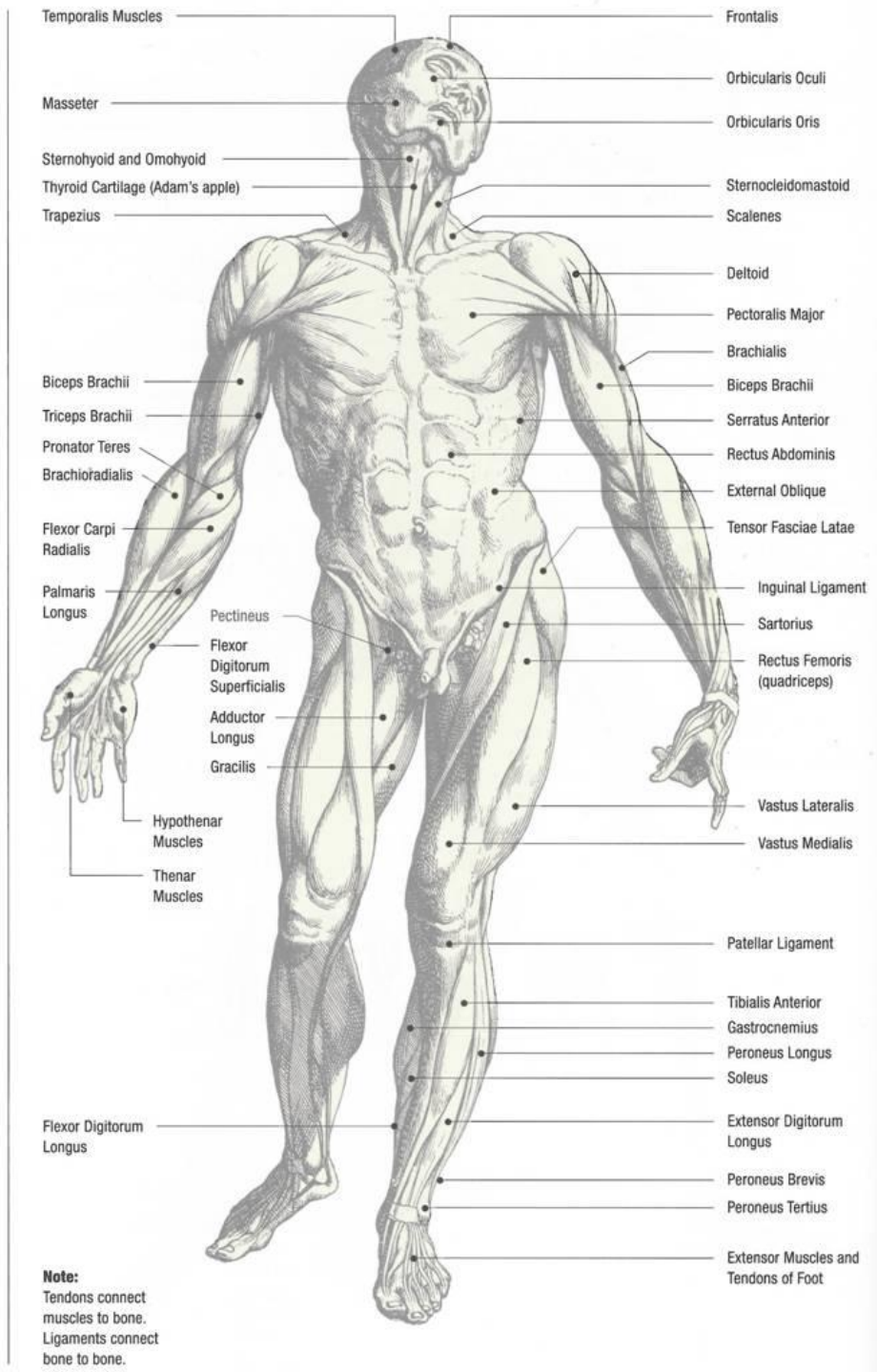
The next step in the understanding of injuries is to obtain the knowledge of how to deal with them. Since injuries are an inevitable part of the martial arts, whether an injury is received or delivered, knowledge of how to appropriately diagnose and treat an injury should be essential. Injury management will need to be more than just the recognition of an injury.

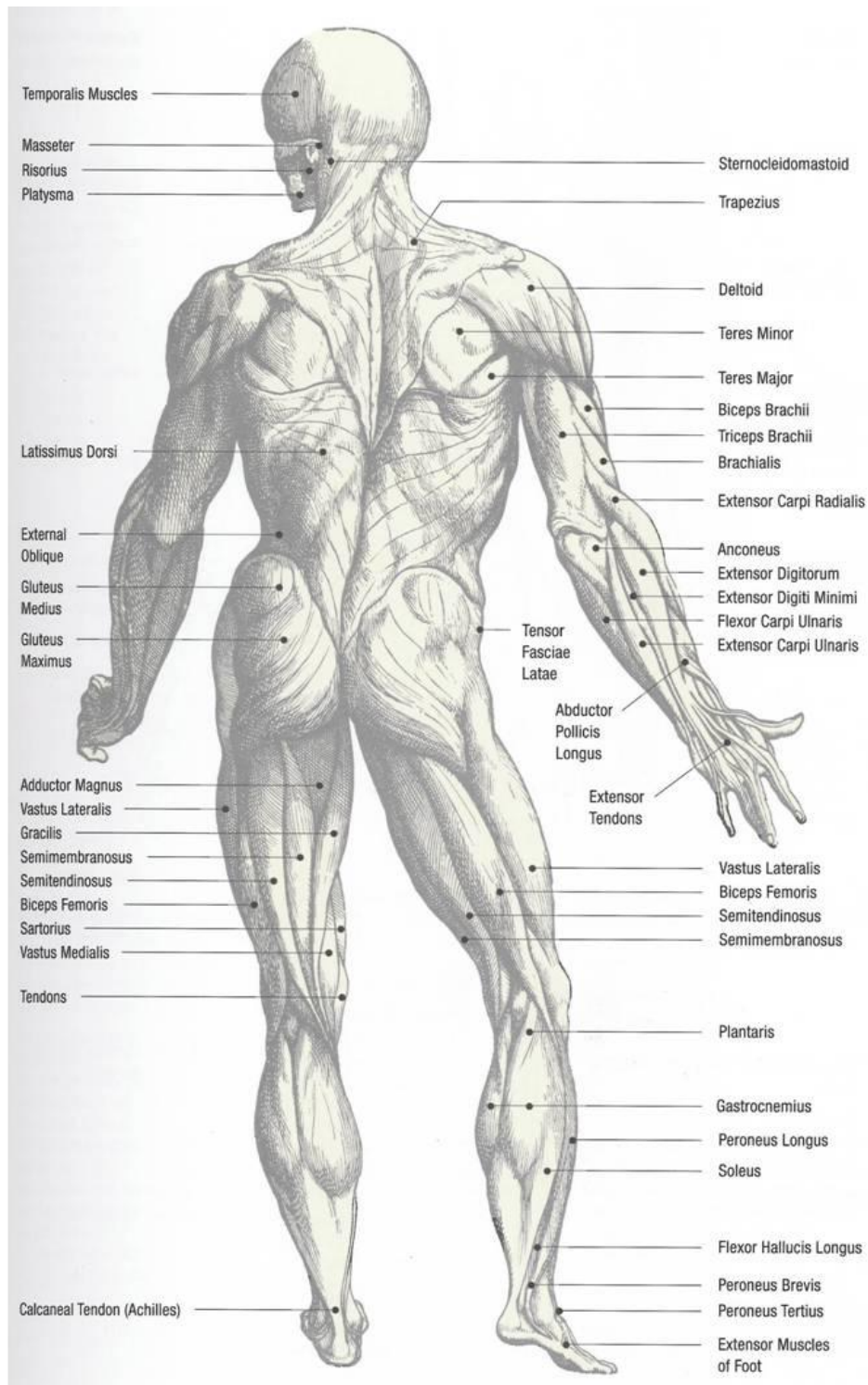
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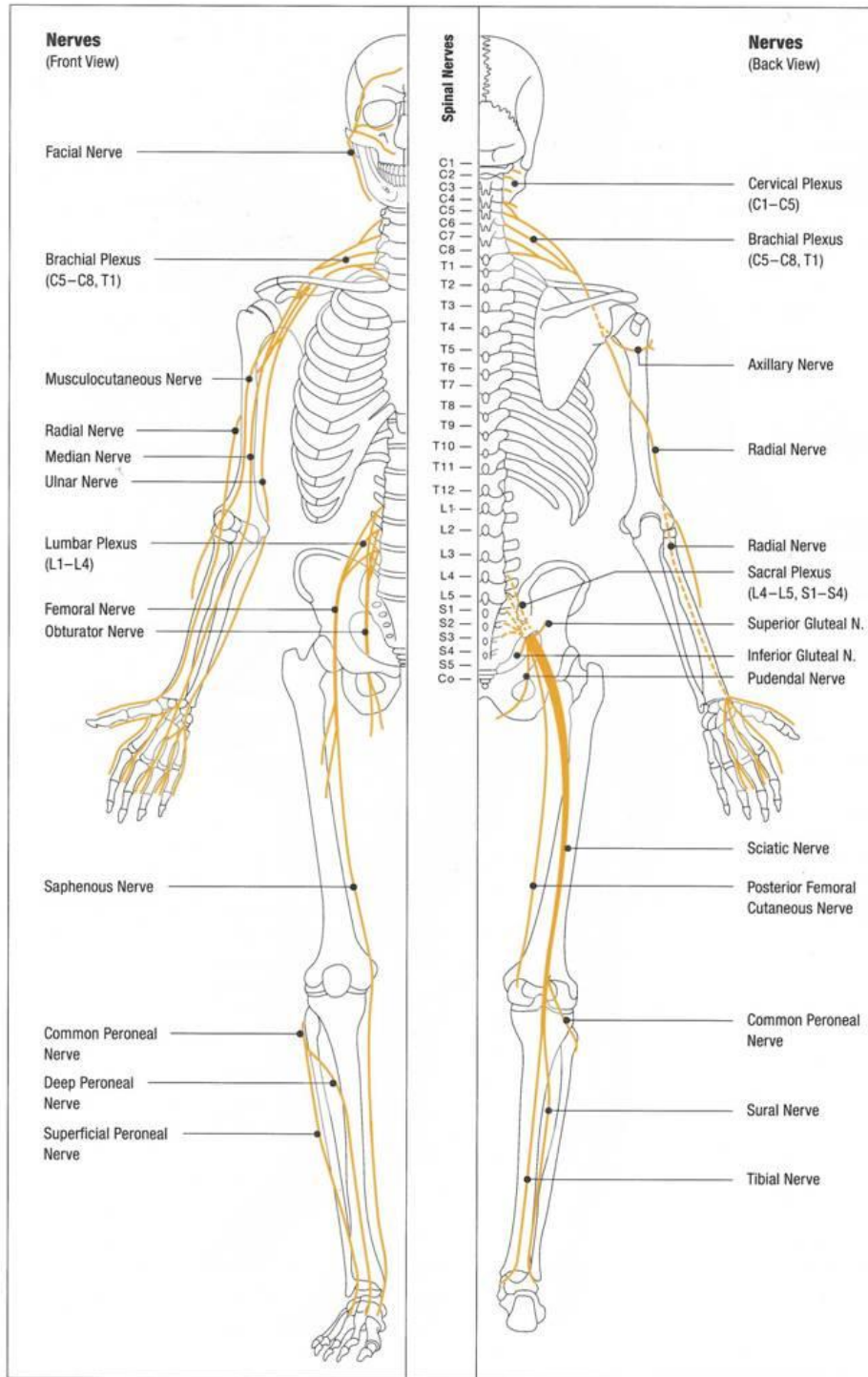
Appendix











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