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## Prevention and Treatment of Injuries

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Houston, Texas

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## Mechanical Injury

- Force or mechanical energy is that which changes the state of rest or uniform motion of matter. When a force is applied to any part of the body results in a harmful disturbance in function and or structure, a mechanical injury is said to have been sustained.

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## Trauma

- Is defined as a physical injury or wound sustained in sport and produced by an external or internal force.

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**Skin Injuries**



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- Friction blister: Continuous rubbing over the surface of the skin causes a collection of fluid below or within the epidermal layer called a blister.
- Abrasion: the skin is scraped against a rough surface - the epidermis and dermis are worn away, exposing numerous blood capillaries.

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**Skin Injuries**



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- Skin Bruise: When a blow compresses or crushes the skin surface and produces bleeding under the skin, also known as a contusion.
- Laceration: a wound in which the flesh has been irregularly torn.



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**Skin Injuries**



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- Skin Avulsion: Skin that is torn by the same mechanism as a laceration to the extent that tissue is completely ripped from its source.
- Incision: the skin has been sharply cut.
- Puncture: skin penetrated by a sharp object.

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## Skeletal Muscle Injuries

- Contusions: a bruise received by sudden trauma - from superficial to deep tissue damage.
- Strains: a stretch, tear or rip in the muscle or adjacent tissue such as the fascia or muscle tendons. Most often produced by an abnormal muscular contraction

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## Skeletal Muscle Injuries

- Muscle Soreness: Overexertion in strenuous muscular exercise often results in muscular pain. The older one gets, easier to achieve soreness.
  - Acute onset soreness: accompanies fatigue - occurs during and immediately after exercise
  - Delayed onset soreness: most intense 24 to 48 hours and the gradually subsides

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## Skeletal Muscle Injuries

- Muscle Stiffness: does not produce pain. Occurs when a group has been worked hard for a long period of time. Muscle becomes swollen, shorter, thicker - resists stretching.
- Muscle Cramps: can be related to hard conditioning. Is a continuous contraction.

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## Skeletal Muscle Injuries



- Muscle Guarding: following an injury, the muscles surrounding the injury contract to, in effect, splint that area - to minimize movement of that injured area.

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## Musculotendinous Injuries



- Myositis / Fascitis: Myositis is inflammation of muscle tissue. Fascia supports and separates muscle tissue and can become inflamed.
- Tendonitis: gradual onset - repeated microtraumas - swelling and pain

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## Musculotendinous Injuries



- Tenosynovitis: inflammation of the synovial sheath surrounding a tendon. Rapid onset - tendons can become thickened with pain and articular crepitus present during movement.

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## Musculotendinous Injuries



- Ectopic Calcification: Ectopic = located in a place different from normal.
  - Voluntary muscles can become chronically inflamed, resulting in myositis.
  - Myositis ossificans can occur in a muscle that lies directly over a bone.

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## Musculotendinous Injuries



- Atrophy and Contracture:
  - Atrophy - Wasting away of muscle
  - Contracture - abnormal shortening of muscle tissue in which there is a great deal of resistance to passive stretch.

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## Synovial Joints



- A joint in the human body is where two bones join together. A joint must also transmit forces between participating bones.

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**Joint Types**



- Synarthrotic - Immovable
- Amphiarthrotic - Semi-movable
- Diarthrotic - Freely movable (also known as synovial articulations)

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**Joint Capsule**



- A bony joint is held together by a cuff of fibrous tissue known as the capsule, or capsular ligament.
- Consists of bundles of collagen and functions primarily to maintain a relative joint position.

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**Ligaments**



- Bundles of collagen tissue that form a connection between two bones.
- Act as protective backups for the joints. Primary protection comes from muscle and tendons.

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## Synovial Membrane and Synovial Fluid



- Membrane: Lining of the synovial capsule which is made up of connective tissue with flattened cells and villi
- Fluid: secreted and absorbed by the synovial membrane and acts to lubricate the joint.

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## Articular Cartilage



- Connective tissue that provides firm and flexible support.
- No Direct Blood or Nerve Supply
- Three Types
  - Hyaline
  - Fibrous
  - Elastic

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## Articular Cartilage



- Hyaline: part of the nasal septum, the larynx, the trachea, the bronchi and the articular ends of bones.
- Fibrocartilage: vertebral disks, symphysis pubis, menisci of the knee
- Elastic: external ear and eustachian tube

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## Articular Cartilage



- Motion Control:
  - The articular cartilage determines what motion will occur.
  - Ball and socket joint - Hip - considered Universal Joint
  - Hinge joint - Moves in only one plane

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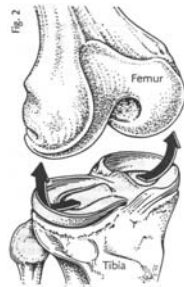
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## Articular Cartilage



- Stability: Depending on the shape of the cartilage, the stability of the joint will vary.



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## Types of Synovial Joints



- Ball and Socket
- Hinge
- Pivot
- Ellipsoidal
- Saddle
- Gliding

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## Types of Synovial Joints



- Ball and Socket - shoulder and hip
- Hinge - Elbow, knee
- Pivot - cervical axis and atlas
- Ellipsoidal - wrist (have an elliptical convex head in an elliptical concave socket)
- Saddle - Carpometacarpal joint of the thumb
- Gliding - carpal and tarsal bones

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## Synovial Joint Injury Classifications



- Sprains:
  - one of the most common injuries seen in sports
  - caused by traumatic twist resulting in stretching or total tearing of the ligament
  - injury to the ligament, articular capsule and synovial membrane
  - Occur in Three Grades of Severity

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## Sprains



- Grade I: some pain, minimum loss of function, little of no swelling, mild point tenderness, no abnormal motion when tested
- Grade II: pain, moderate loss of function, swelling and possible moderate instability

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## Sprains



- Grade III: extremely painful, major loss of function, severe instability, tenderness, swelling.

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## Synovial Joint Injury Classifications



- Dislocations: second to fractures in terms of disabling the athlete.
  - Highest incidence involves the fingers
  - Second Highest incidence involves the shoulder
  - Result primarily from forces causing the joint to go beyond its normal anatomical limits
  - TWO CLASSES
    - Subluxations
    - Luxations

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## Subluxations



- Partial dislocations in which there is an incomplete separation between two articulating bones.
- “Self reducing partial dislocation”

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## Luxations

- Luxations are complete dislocations, presenting a TOTAL disunion of bone between the articulating surfaces.



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## Skeletal Trauma

- Skeletal Bone
  - Provides Shape and support for the body
  - Like soft tissue, it can be traumatized during sports participation
  - specialized dense connective tissue consisting of bone cells known as osteocytes
  - periosteum covers the bone and supplies blood

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## Bones - Functions

- Body Support
- Organ Protection
- Movement
- Calcium Reservation
- Formation of Blood Cells

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## Types of Bones



- Classified according to shape
  - Flat - In the skull, ribs, and scapulae
  - Irregular - vertebral column and the skull
  - Short - wrist, ankle
  - Long - most commonly injured in sports, include humerus, ulna, fibula, tibia, phalanges

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## Load Characteristics



- Long Bones can be stressed or loaded to fail by tension, compression, bending, twisting, and shearing
- Forces can be either singularly or in combination.

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## Bone Trauma



- Periostitis: Inflammation of the periosteum
- Depressed Fracture: most often to flat bones, where as named, bone is depressed

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## Bone Trauma



- Greenstick Fracture: Incomplete break, most often in adolescents, remember a green twig
- Impacted Fracture: Compression of the bone from force directly over long axis



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## Bone Trauma



- Longitudinal Fracture: the bone splits along its length
- Oblique Fracture: received while one end is twisted while the other end is fixed or stabilized
- Serrated Fracture: sharp-edged fracture line that can cause further damage

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## Bone Trauma



- Spiral Fracture: have an S-shaped separation caused by sudden rotation
- Transverse Fracture: straight line fracture site, at more or less right angles



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## Bone Trauma



- Comminuted Fracture: three or more fragments at the fracture site
- Contrecoup Fracture – occurs on the opposite side of the point of trauma, ex: skull



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## Bone Trauma



- Blowout Fracture: occurs to the wall of the eye orbit as a result of a blow to the eye



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## Bone Trauma



- Avulsion Fracture: separation of bone fragment as an attached ligament of tendon is pulled from the insertion.



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## Bone Trauma



- Stress Fracture: Most likely caused by sub-threshold level of rhythmic muscle action performed over a period of time. May take several weeks to show up on X-Ray
  - Swelling, focal tenderness and pain and the major signs
  - pain when active at first, then greater pain after workout into the night
  - Bone Scan - Helpful



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