AWLS - Advanced Wilderness Life Support

University of Utah
School of Medicine

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- There are 3 ways that bones can break,
  - tension, compression and shear.
  - bones do not normally break due to compression
  - They usually break due to shear or under tension

- A common cause of shear is catching the foot and then twisting the leg while falling.
- A shear fracture often results in a spiral break in which the bone is apt to puncture the skin

- Healthy compact bone is able to withstand a compressive stress of around 25,000 lb/in.^{2}
- Mid-shaft of the femur would support a force of around 12,000 lbs. or 6 tons before fracturing

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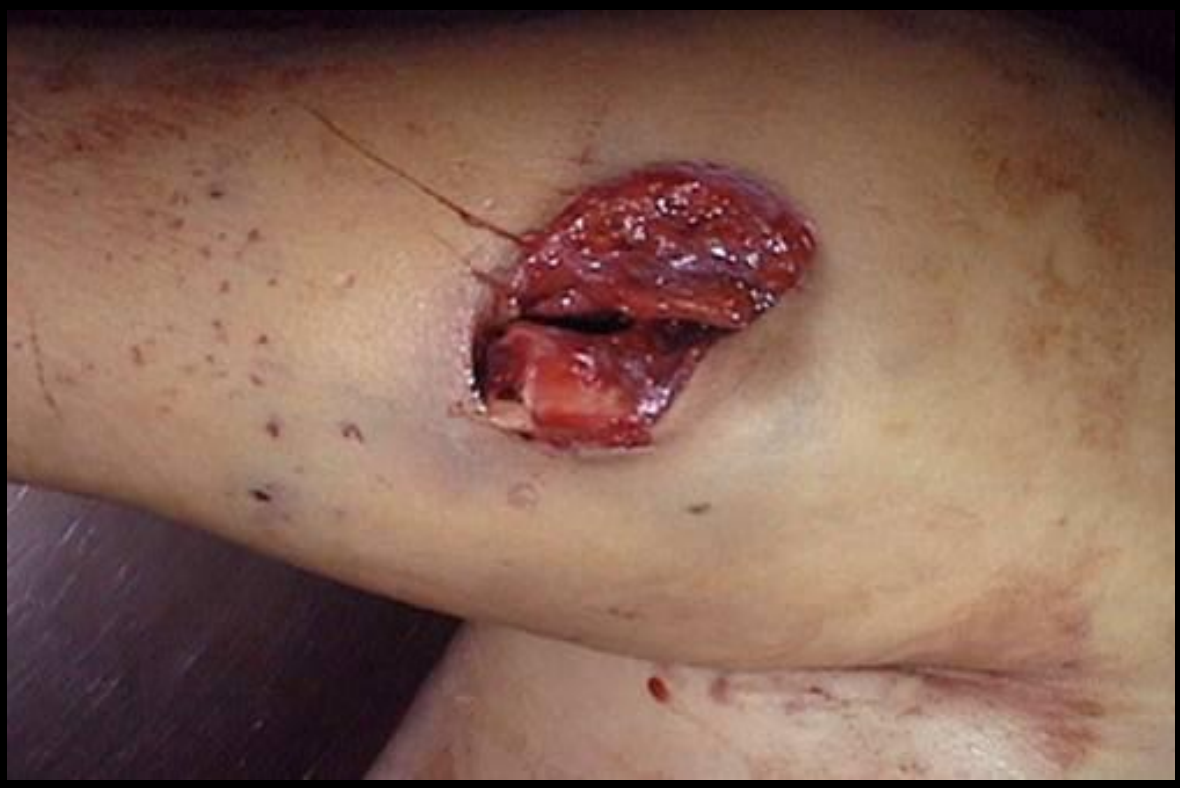
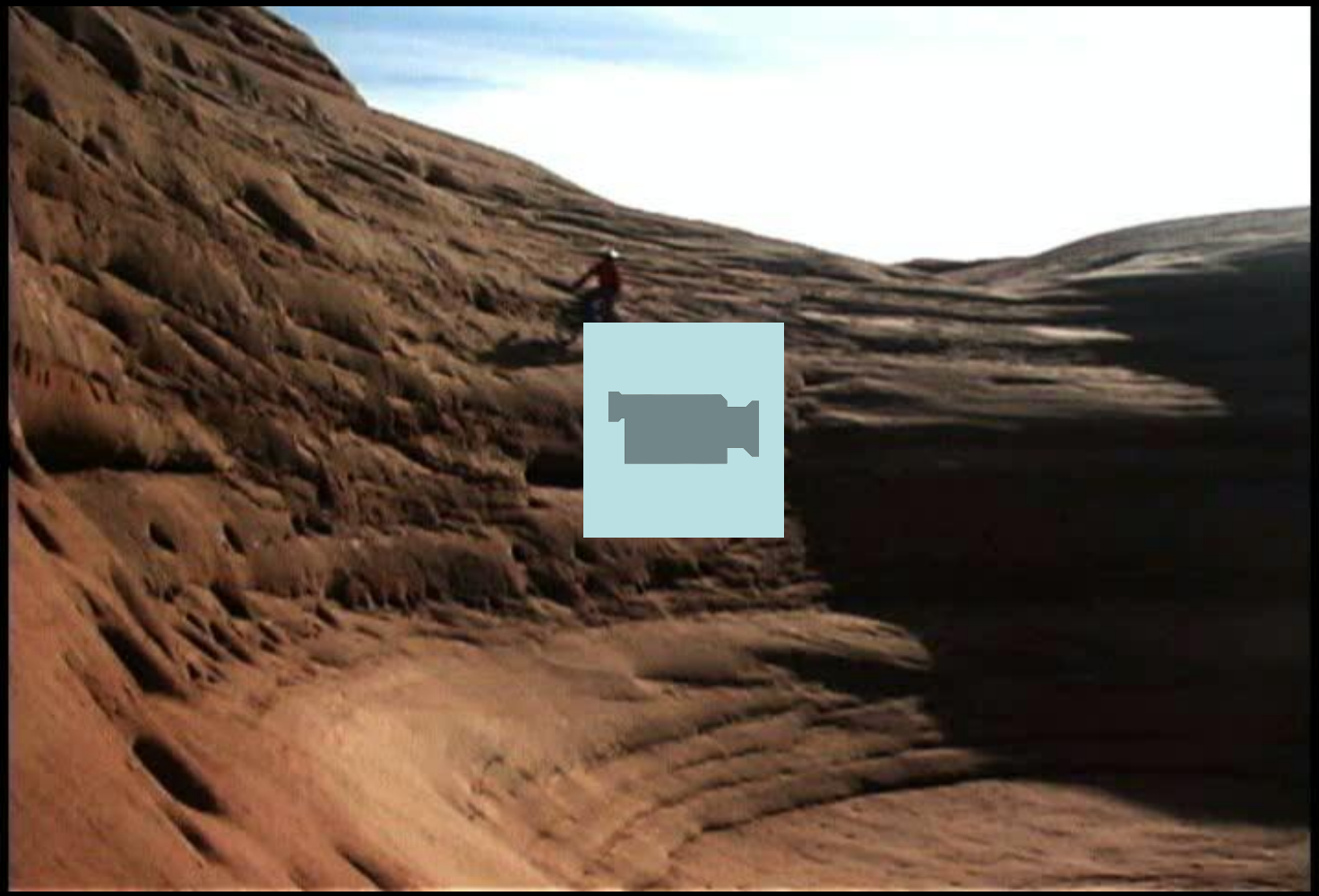


- 52 million bikers in America
- One of the fastest growing competitive sports in the U.S.
- Injuries becoming more common as equipment improves to handle higher speeds and more rugged terrain



- Wound 35%
- Bruise 25%
- Strain 15%
- Tendinitis 7%
- Fracture 4%
- Dislocation 3%

- Neck 50%
- Knees 42%
- Groin/Buttocks 35%
- Hands 31%
- Shoulders 31%
- Back 30%
- Feet 30%
- Thighs 8%
- Elbows 5%
- Head 4%
- Hips 4%
- Ankles 4%
- Achilles 4%

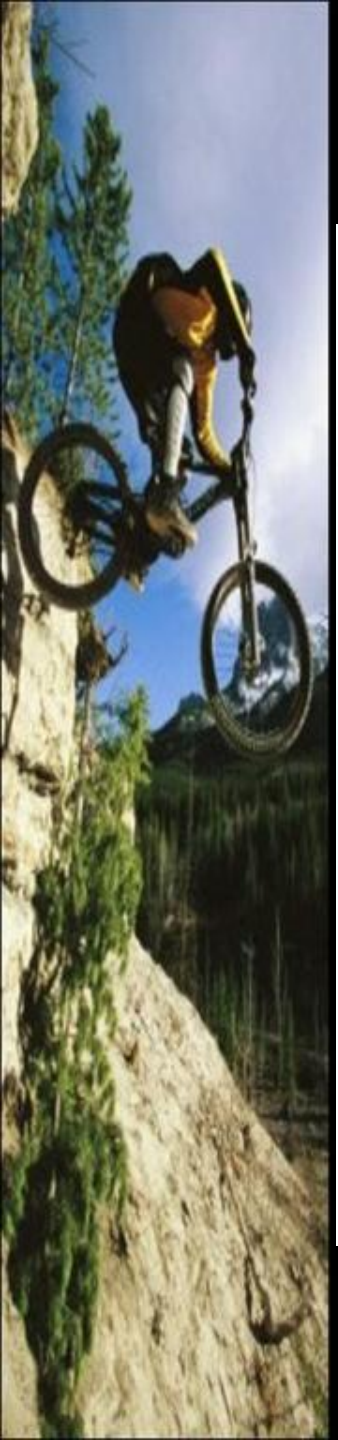
36

36

- Bones of the hand/arm which are subjected to compressive forces
  - Distal radial fracture
  - Clavicle fracture
  - Scaphoid fractures
  - Hamate Fractures

18 year old boy falls from bike injuring his thumb. Note displaced fracture at the base of the thumb.

- Anterior dislocations more common in mountain biking than posterior
- Forces usually come from the front – arms outstretched
- Exquisite tenderness in joint, visible step off and guarding



Left shoulder dislocation of biker who fell on Slickrock trail near Moab, Utah

- High speeds, technical terrain, and proximity of bikers in races all increase likelihood of head injuries
- Concussions are common
- WEAR A HELMET!

- Headache
- Vertigo
- Nausea or vomiting
- Vacant stare
- Delayed verbal and motor responses
- Disorientation
- Slurred speech
- Very emotional
- Memory deficits
- Loss of consciousness
- Confusion

- If symptoms worsen and last longer than 15 minutes, evacuate for neurosurgical consult
- If loss of consciousness occurred, evacuate if other symptoms present themselves as well

- Poor positioning of rider on bicycle
- Micro-Whiplash syndrome from trail vibrations
- Management: Correct bike setup, massage, ice, stretching, non-sedating pain relievers

- Patellar: Pain, swelling, point tenderness
- Worsened by low saddle positioning
- Treatment: RICE, Correct Bike setup, Rest
- Non steroidal anti inflammatory drugs increase rate of recovery

- Saddle Sores
  - Local skin irritation
  - Keep area clean and dry
  - Use seamless shorts
- Compression Injury
  - Pudendal nerve compression
    - Change saddle position
    - Stand intermittently
    - Change type of saddle


liberator

- Problems from saddle that is too high
  - Biceps tendonitis
  - Pudendal neuropathy / impotence
  - Chafing and skin ulcerations
- Problems from saddle that is too low
  - Patellar tendonitis
  - Quadriceps tendonitis

- HEIGHT: Sit on seat with heel on pedal. Adjust height so that leg is straight. This assures proper seat height for a cross-country ride with widest part of foot on pedal. Adjust for different terrain.
- ANGLE:
  - For males, level to slightly elevated in back
  - For females, level to slightly depressed in back

- Bars 1-4 in. below level of saddle.
- Riders nose should be directly over handlebar.
- 1/3 of body weight should rest on arms
- Raising and shortening during long rides can treat neck and back pain

- Skiing and Snowboarding continue to rise in popularity
- High Speeds around trees, other skiers, rocks etc. increase possibility of trauma
- Different snow conditions lead to different types of injuries
- Avalanche factor

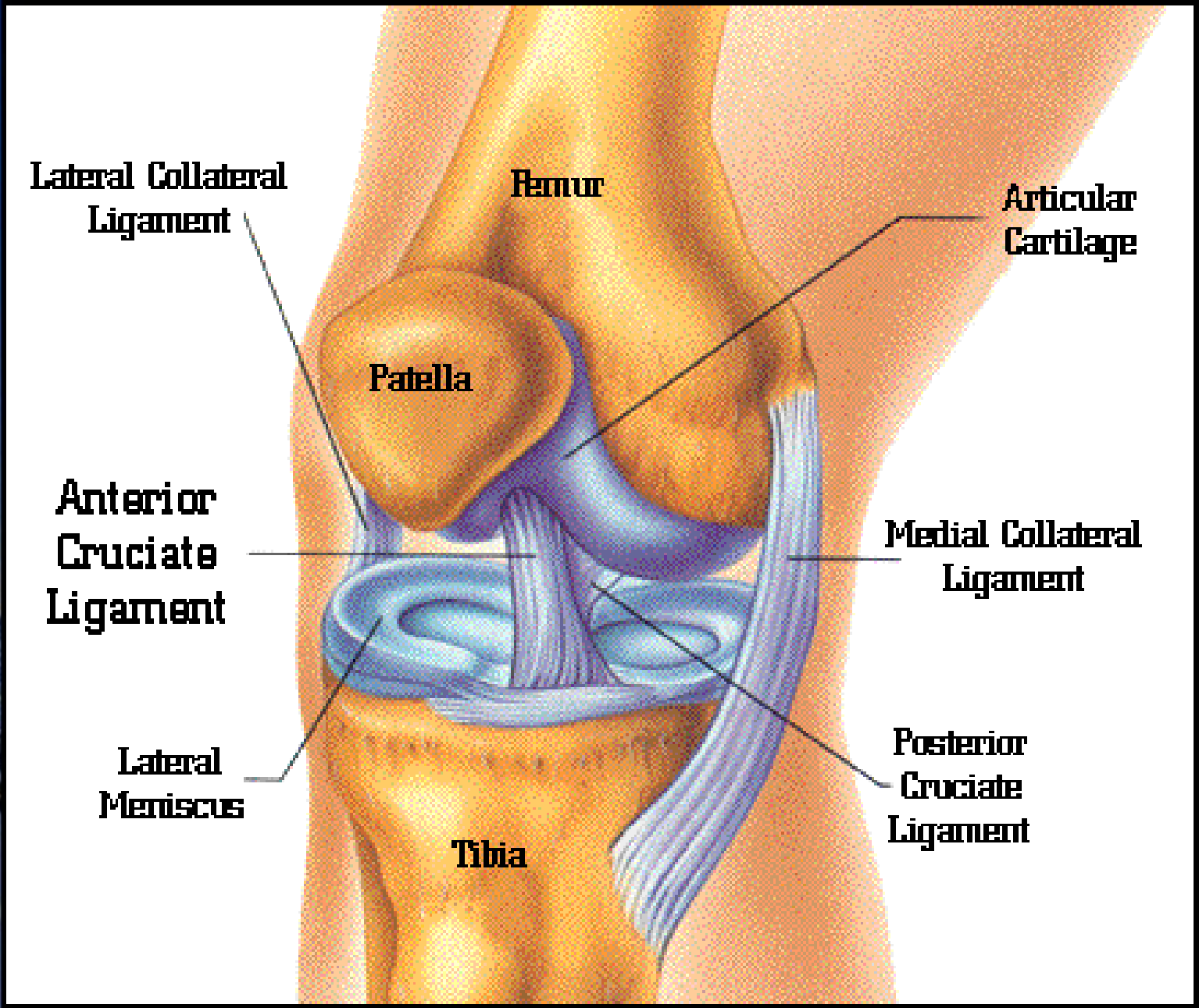
- Since 1970, overall injuries have decreased by 50%
- Decrease in lower-limb fractures
  - development of bindings
  - Progression of hard-shell plastic boots
- Decrease in upper extremity injuries
- Knee soft tissue injuries up 240%
  - Also due to hard-shell boots & binding systems

- Most injuries occur between noon and 4 PM
- 44% of all downhill injuries due to improper equipment maintenance
- Failure of binding release occurs in 70% of lower leg fractures & serious knee injuries

- Very rare, about 2.88 per one million skier days
- Traumatic deaths usually consequence of high-speed impact with a stationary object
  - Most common accident description: “skier lost control, hit tree.”
- 60% of fatal ski injuries involve head injuries
- Victims predominantly male (85%), in their late teens to early 20s (70%)
  - Same group who sustain 74% of fatal car crashes

- Falling- 87%
- Jumping (Unsuccessful landings)
- Collisions
  - 67% of hospital admissions
  - Most fatalities due to collisions
- Deep snow immersion
- Overuse syndromes

- Most common in beginner and low-intermediate skiers
- Skiers usually “snowplowing”
- Assessment: look at dynamics of the fall, valgus stress with knee in 30^{o} flexion with foot internally rotated
- Immobilize, Splint, Apply snow to reduce swelling


Lateral Collateral Ligament
Femur
Articular Cartilage
Patella
Anterior Cruciate Ligament
Medial Collateral Ligament
Lateral Meniscus
Posterior Cruciate Ligament
Tibia

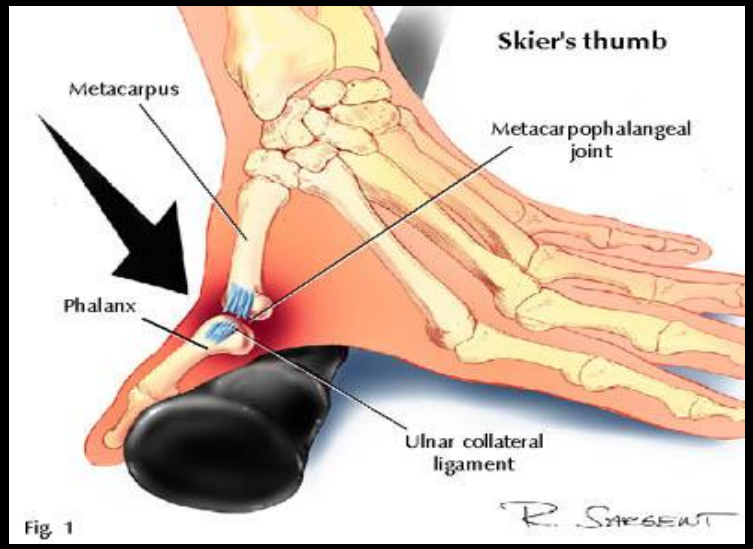
- Represents 33% of all knee injuries
- More common in advanced skiers
- Symptoms: Victim feels or hears a ‘pop’ or a ‘snap’ with knee giving way beneath.
- “Phantom Foot Fall”
- Treatment: Immobilize joint in position of function, splint, apply snow to reduce swelling, transport.

- National Ski Patrol analyzed 14,000 falls
- With all 6 elements of fall, injury to ACL of downhill knee is very likely

- Uphill arm back
- Skier off balance to the rear
- Hips below the knees
- Uphill ski un-weighted
- Weight on inside edge of downhill ski tail
- Upper body facing downhill ski

- More common in icy conditions, common in racers
- Dislocated Shoulders
- Fractured Humerus
- Skier’s thumb
- Injured Wrists (more common in snowboarding)

- Most common upper extremity injury
- Common on hardpack
- Mechanism
  - Pole acts as lever between thumb and index finger, or
  - Thumb catches snow during a fall
- Symptoms: Tenderness, deep throbbing pain.
- Treatment: Splint hand in functional position, use snow to prevent swelling



- Most follow impact with hard object
- Vary from minor bump to major life-threatening trauma
- Look for symptoms of concussion
- Lacerations common
- Helmet use recommended

- The Consumer Product Safety Commission: Helmet use would prevent 11 deaths per year
- 35% of fatally injured skiers & snowboarders wore helmets
- The CPSC suggests that helmets offer little protection beyond 12 mph
  - False sense of security

- Fastest growing snow sport
- Upper limb injuries are very common
- Severe wrist fractures common
- Back injuries common
- 8% of snowboard injuries occur while loading/unloading from lift

- If rider does not get hand out in time:
  - Clavicle fracture
  - Shoulder separation
  - Humeral head contusion or fracture
  - Facial & head injuries
- Falls onto an outstretched hand
  - Fractured wrists
    - 25% off all snowboarding injuries
  - Fractured humerus

- Wrist impacts
- Buttock contusions
- Spinal compressions
- Head injuries

- Very effective at preventing wrist injuries, however they may transfer forces proximally, leading to:
  - Forearm fractures
  - Posterior elbow dislocations
  - Shoulder injuries

- Personal Fitness
- Use proper equipment, set bindings correctly
- Snow conditions
  - Don’t ski alone in very deep powder
  - Avoid crowded runs at the end of the day
- Never consume alcohol before taking to the slopes. Impaired judgment & risk of hypothermia

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