Mountain Biking and Skiing Injuries

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
• 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
Cycling Associated Trauma:

- Wound 35%
- Bruise 25%
- Strain 15%
- Tendinitis 7%
- Fracture 4%
- Dislocation 3%
<table>
<thead>
<tr>
<th>Anatomical Site</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>50%</td>
</tr>
<tr>
<td>Knees</td>
<td>42%</td>
</tr>
<tr>
<td>Groin/Buttocks</td>
<td>35%</td>
</tr>
<tr>
<td>Hands</td>
<td>31%</td>
</tr>
<tr>
<td>Shoulders</td>
<td>31%</td>
</tr>
<tr>
<td>Back</td>
<td>30%</td>
</tr>
<tr>
<td>Feet</td>
<td>30%</td>
</tr>
<tr>
<td>Thighs</td>
<td>8%</td>
</tr>
<tr>
<td>Elbows</td>
<td>5%</td>
</tr>
<tr>
<td>Head</td>
<td>4%</td>
</tr>
<tr>
<td>Hips</td>
<td>4%</td>
</tr>
<tr>
<td>Ankles</td>
<td>4%</td>
</tr>
<tr>
<td>Achilles</td>
<td>4%</td>
</tr>
</tbody>
</table>
• 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!
Common Features of Concussion

- 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
Tour de France leader Chris Boardman crashed. He was wearing a helmet. He injured his wrist, had severe facial lacerations. He survived.
Italian Fabio Casarteli crashed during the 1996 Tour de France. He was not wearing a helmet. He went into a coma and died.
- Poor positioning of rider on bicycle
- Micro-Whiplash syndrome from trail vibrations
- Management: Correct bike setup, massage, ice, stretching, non-sedating pain relievers
Knee Pain / Tendonitis

- 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
• 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° flexion with foot internally rotated
• Immobilize, Splint, Apply snow to reduce swelling
• 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
Head Injuries

• 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
Backcountry Avalanches
• 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