Snowboarder’s Ankle

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Epidemiology

- Upper extremity, wrist and head , most prevalent in beginners.
- Experienced snowboarders :lower extremity injuries
- Mechanism at the beginner : isolated falls
  - wrist guards and helmet use
- More complex biomechanical lower extremity injuries at the experienced level
  - Difficult to establish the preventative measures

(Injuries in elite and recreational snowboarders. Wijdicks Br J Sports Med, 2014)

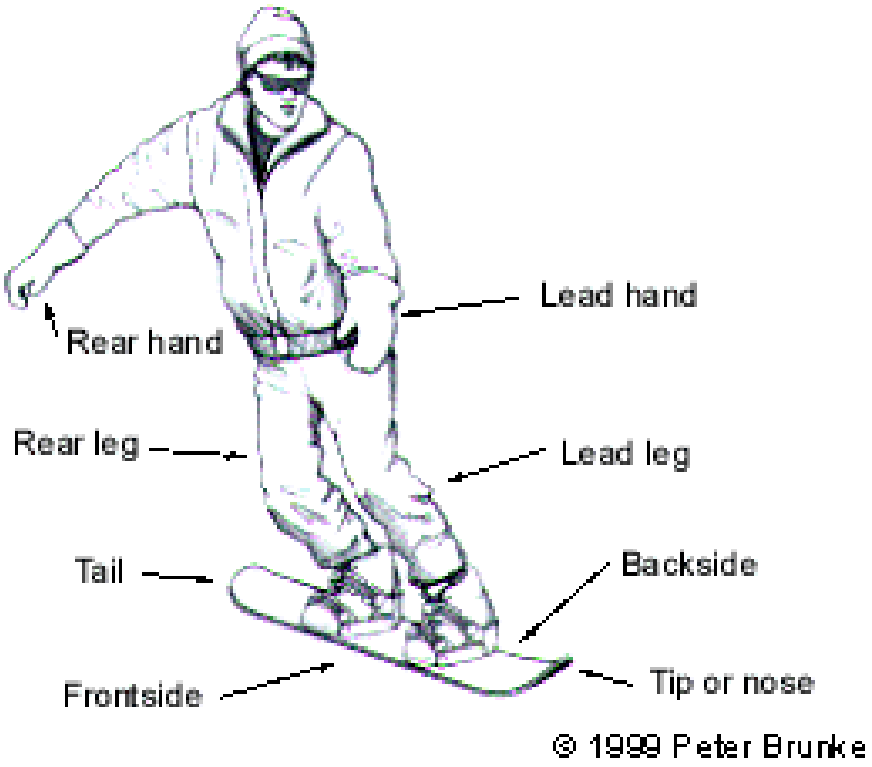
- Injury rate for snowboarding : higher than skiing.
- Knee injury lower for snowboarding ,compared with skiing
- Ankle injuries more common in snowboarding
- landing from jumps
- Fixed position of feet in a snowboard limits lower extremity leg movement , adding stress to ankle

Skill-level-dependent injury patterns

- Snowboard cross
- Training runs
- High-amplitude jumping
  - big air
  - half-pipe
- lower extremities :absorb large impact forces
- Leading leg is injured more than the trailing leg

Ankle Injuries

- Ankle injury incidence in elite snowboarders :7–11% of all injuries.
  - Ankle sprains (52%)
  - Ankle fractures (44%)
    - Medial or Lateral malleoli
    - Lateral process of the talus (FLPT) unique to snowboarding
- Misdiagnosed as an anterior Talofibular ligament sprain
- Less common hard boots.



Snowboarder's fracture

- The injury mechanism:
- Ride with knees slightly flexed and ankles dorsiflexed
- Forward fall parallel to the direction of board
- Leading leg rotates toward the front of the board, everting the dorsiflexed ankle
- Board acts as a lever about the long axis of the foot , increasing torque

❑ Dorsiflexion of the ankle

❑ Eversion or inversion of the hindfoot

❑ Axial loading

- External rotation

❑ Disrupted talocalcaneal congruency, concentrating stress on the LPT

- Soft boots in snowboarding, minimal amount of movement in the ankle
- Stiff ski boots: forces and moments are transferred to the knee joint
- Higher joint loading in the ankle joint in snowboarding
- Higher joint loading in the knee joint in skiing
- In snowboarding steering is controlled by the rear leg.

(Three-Dimensional Lower Extremity Joint Loading ina Carved Ski and Snowboard Turn: Miriam Klous, Computational and Mathematical Methods in Medicine 2014)

- Soft-shelled boots increase injury risk
- Wider range of ankle motion
- Little protection from extreme joint movements.
- Modification of the stiffness of boots

Biomechanical Aspects

- Boot stiffness
- Binding angle adjustments

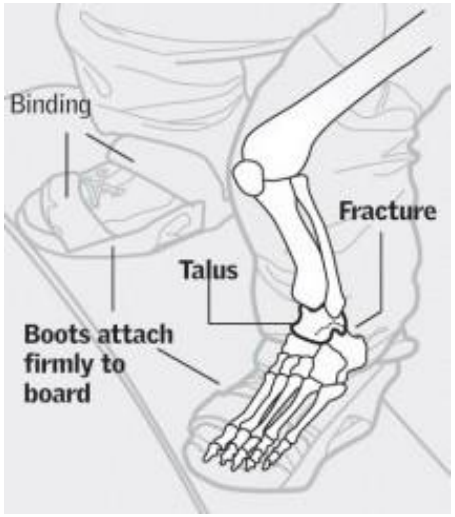
❖ kinematic and kinetic measures at the boot sole and joints

❖ External force

❖ Protective effect of new boots, limiting the degree of subtalar motion.

- Jump dimension

❖ Ground reaction force



(Paul McAlpine. Biomechanical analyses of snowboard jump landings , Annual Conference of Biomechanics in Sports – Melbourne 2012)

Modification of Boots

- Stronger and less flexible hard boots
- Binding technique :stronger connection between boots and the snowboard
- Possible Bending movement between the binding and boots
- Challenges :

✓ Hindered movement of the foot

✓ Compensatory over-movement of the ankle

(Differences in injury distribution in professional and recreational snowboarding
Christian Ehrnthaller
Open Access Journal of Sports Medicine 2015)

The clarification of the exact mechanism and consecutive development of prevention strategies and alternative binding/boot designs should be the target of future studies