RESEARCH ABSTRACT

Comparing Snowboarding & Skiing Injuries

Western Journal of Medicine. 1996; 164: 231-237.
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INTRODUCTION

Snowboarding's popularity has undergone significant growth over the past 20 years. Several distinct differences exist between snowboarding and skiing, including but not limited to differences in boots and bindings, the absence of poles in snowboarding, and the athlete's stance.

METHODS

This study examined four winter seasons at the Mammoth and June ski areas in the eastern Sierras. Data were collected from the medical staff and the ski patrols at the resorts. Injuries were classified by body region and sub-classified by experience.

RESULTS

Snowboarders were twice as likely as skiers to sustain a fracture (27 percent vs. 13 percent). However, they were less likely than skiers to sustain sprain/strain injuries. Rates of dislocations (5 percent) and concussions (3 percent) were identical between the two groups. Among equipment choices, soft-shelled boots without releasable bindings were used by 90 percent of injured snowboarders.

Inexperience was the greatest predictor of snowboard injuries.

Inexperience was the greatest predictor of snowboarding injuries, with nearly 56 percent occurring among beginners/early intermediates. When body region of injuries were subgrouped according to experience levels, 44 percent of injuries among inexperienced snowboarders were wrist injuries. As snowboarding experience increased, the frequency of wrist injuries dropped to 17 percent, but foot/ankle injuries increased to 27 percent.

A related study (Kirkpatrick et. al., 1998) focused on the prevalence of snowboarding foot and ankle injuries. A specific type of foot/ankle fracture was found to be more common in snowboarders than in the general public. This fracture of the lateral process of the talus – called the "snowboarder's fracture" – occurred at a rate of 2.3 percent, representing 34 percent of all snowboarding-related foot/ankle injuries. In contrast, snowboarder's fracture comprises less than 1 percent of all foot/ankle injuries in the non-snowboarding public.

	SNOWBOARDERS (%)	SKIERS (%)
Upper Extremity		
Shoulder/Arm	15	11
Wrist	19	2
Hand/Thumb	4	5
Total	**38**	**18**
Lower Extremity		
Knee	17	39
Lower Leg	5	9
Ankle/Foot	16	6
Total	**38**	**54**
Axial Skeleton		
Head	10	14
Spine	4	4
Chest/Rib	2	1
Pelvis	1	1
Clavicle	2	1
Total	**19**	**21**
Other	5	7

CONCLUSIONS

This study highlighted the importance of several safety precautions that can be taken to decrease the rate of snowboarding-related injury. Appropriate safety measures in the form of wrist guards, helmets and formal instruction were proposed as effective means to decrease the risk of injury, as was the use of releasable snowboarding bindings. The use of soft-shell vs. hard-shell boots was debated. Although hard-shell boots potentially could decrease the risk of snowboarder's fracture, their use suggests a higher rate of knee injuries.

REFERENCES

Kirkpatrick, D.P., Hunter, R.E., Janes, P.C., Mastrangelo, J., Nicholas, R.A. "The snowboarder's foot and ankle," American Journal of Sports Medicine. 1998; 26: 271-277.

– Article by Rich Willy

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COVER STORY

Snowboarding vs. Skiing: Slope Supremacy

With snow season upon us, many Americans again are hitting the slopes. But more and more of them are descending on snowboards rather than skis, making snowboarding the country's fastest-growing winter sport.

While this "extreme" sport initially was dominated by a small group of thrill-seeking athletes, snowboarding's popularity has spread to the broader population. Its rise is evidenced by the increasing popularity of ESPN's X Games and the sport's becoming an Olympic medal event in 1998. Today, snowboarders account for approximately 30 percent of all lift tickets and season passes sold in the United States.

DIFFERENCES FROM SKIING

Differences in equipment and technique make snowboarding an entirely distinct experience from skiing – including when it comes to injuries.

Equipment

The biggest difference between skiing and snowboarding is that snowboarders use a single wide board for both feet, whereas skiers use two narrow boards, one for each foot.

Snowboarders' feet face sideways, allowing them to maneuver forward and backward. Skiers' feet face forward, limiting them to forward maneuvers.

With snowboarding, both feet are firmly attached to the same board, protecting the knee from excessive rotational forces.

Unlike skis, snowboard bindings don't release in the event of emergency. This is considered a safety feature given the potential danger caused by a board hurtling downhill.

Snowboarders do not use poles, which skiers use to maintain balance and aid in propulsion.

Body Mechanics

Skiers maintain a center of gravity within a base of support created by both skis. By staying in the center of this base of support, the skier glides down a mountain slope rather easily, mostly because of gravity. Ski turns are initiated through the hips. Skiers must shift the skis away from their body's center of gravity or vice versa, with the force of the turn applied to the inside of the downhill leg. Skiers often adopt a forward flexed posture to improve downhill speed.

DIFFERENCES IN EQUIPMENT AND TECHNIQUE MAKE SNOWBOARDING AN ENTIRELY DISTINCT EXPERIENCE FROM SKIING – INCLUDING WHEN IT COMES TO INJURIES.

Body positioning is much different in snowboarding. To balance properly, snowboarders are upright but also maintain their center of mass over the base of support. Typically, the left foot is forward on the board and the right foot behind, or what is called "regular-footed." (Some snowboarders prefer a right-forward, left-behind position, known as "goofy-footed.")

Transferring weight onto the front foot starts the downhill glide. A subtle weight shift backward creates a left turn; a forward lean creates a right turn. The right turn is considered more difficult to perform as riders have a greater tendency to fall when leaning forward.

Turning on a snowboard is considered easier than on skis as it is accomplished by a simple weight shift through the torso. Skiers have to rotate their hips under a stable torso and have an incorrect tendency to rotate the trunk and hips together. A snowboarder's knees flex and extend together, which is easier to control. However, skiers can move their legs independently, allowing them more degrees of freedom.

Injuries

With skiing, the knees are exposed to high rotational forces during falls. This increases the risk of sustaining a serious knee joint injury, such as an anterior cruciate ligament tear or rupture.

With snowboarding, both feet are firmly attached to the same board, protecting the knee from excessive rotational forces.

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However, beginner snowboarders often use their upper extremities to break a fall. As a result, they (more often than skiers) injure their wrists, elbows and shoulders. For a beginner, a wrist fracture is a classic snowboarding injury. Wrist sprains, elbow dislocations and rotator cuff injuries in the shoulder are common. Though less common, collarbone fractures, concussions and other head and neck injuries also may occur.

Finally, there is the "snowboarder's fracture," which is a fracture of a bone in the middle of the ankle joint, called the talus. It typically occurs with forced ankle dorsiflexion and eversion during a fall. It is most common in more advanced snowboarders after landing from high airborne jumps. (See the Q&A and Case Study for more on snowboarder's fracture.)

EXERCISE TO REDUCE INJURY

Sport-specific exercise can reduce the risk of injury. The most important of these is the double leg press exercise (or squat), which targets the thigh and core musculature. Snowboarders can orient their feet as they do on their board to better simulate the snowboarding experience. Generally speaking, functional core stabilization exercises are paramount for skill development and prevention of injuries.

Calf raises can help, too, as foot muscles are used more in soft boots than in hard boots. Balance and proprioception exercises – with both feet on a balance board – can help tune a snowboarder's responses to changes in terrain.

To stay in shape during the off-season, many snowboarders cross-train. They surf, wakeboard and skateboard – sports that closely mimic the mechanics of snowboarding.

Of course, it is well advised to take a few lessons to reduce the learning curve associated with snowboarding – and to reduce the risk of injury. After all, with snowboarding or skiing, the goal remains the same: to enjoy a fun, safe day on the slopes.

SAFETY EQUIPMENT CHECKLIST

- Wrist guards help to prevent wrist injuries, which are prevalent among novice snowboarders.
- Helmets, knee pads and hip pads offer protection during falls. Make sure the helmet doesn't block peripheral vision. In the event of a hard fall, the helmet should crack (this protects your head); however, cracked helmets should be replaced immediately.
- Polycarbonate goggles or sunglasses protect eyes and will not shatter during a fall.
- Hats, gloves, sun block and lip balm protect exposed skin from the sun, glare and wind.
- A safety leash is a must. It attaches the board to the snowboarder's leading leg and is required at most ski areas.

– Article by Joaquin Barrios

Q&A Snowboarder's Fracture of the Talus

WHAT IS A SNOWBOARDER'S FRACTURE?

It is a fracture of the lateral part of the talus bone in the ankle joint.

WHERE IS THE TALUS AND WHAT IS ITS FUNCTION?

The talus is an irregularly shaped bone that sits on top of the heel bone (calcaneus). The talus articulates with the lower leg and allows for dorsiflexion and plantarflexion of the ankle joint.

HOW DOES THE LATERAL ASPECT OF THE TALUS FRACTURE IN SNOWBOARDING INJURIES?

Research suggests the fracture occurs when a foot undergoes high loading in the presence of ankle dorsiflexion and eversion (inward rotation). This position can occur in snowboarding when the leading foot lands after an aerial trick or coming off a jump.

HOW IS THIS FRACTURE DIAGNOSED AND DOES IT OFTEN REQUIRE SURGERY?

Because of its location, the lateral talar dome fracture is hard to diagnose with an X-ray. A CT scan often is needed to provide a definitive diagnosis. No surgery is indicated if the fracture is non-displaced and there are no loose fragments. If the fracture is displaced, surgery is performed and the broken pieces of bone are screwed back together. At the same time, all small bony chips are removed.

WHEN CAN SOMEONE WALK AGAIN AFTER FRACTURING THE LATERAL TALAR DOME?

When there is no surgery, the patient often is able to start immediate partial-to-full weight-bearing using crutches and a fracture boot. When surgery is needed, the patient might be non-weight-bearing for the first few days but progress to partial weight-bearing as soon as possible.

IS PHYSICAL THERAPY REQUIRED AFTER SUSTAINING THIS TYPE OF FRACTURE?

Yes. Immediately after the fracture, physical therapy can help reduce swelling around the joint. Physical therapy also can help maintain joint range of motion and mobility while the fracture heals. Once cleared by a physician, the patient can begin weight-bearing exercises to regain strength and balance. These exercises will progress to challenge the patient and prepare him for a return to sport.

HOW LONG DOES IT TAKE TO HEAL AND RESUME RIDING?

Fracture healing typically takes 12 weeks. Most individuals are back to snowboarding in four to six months.

WILL THIS FRACTURE CAUSE OSTEOARTHRITIS IN THE ANKLE?

Fractures that are diagnosed and treated early have better long-term outcomes than those in which treatment is delayed. Regardless, research suggests the patient may experience early degeneration of the ankle joint.

WHAT STEPS CAN BE TAKEN TO PREVENT THIS INJURY?

Short of not snowboarding, prevention is unclear. This injury can occur at any skill level. There is no evidence to suggest that hard boots reduce the risk of fracture, nor do slope conditions (powder vs. ice) appear to affect the incidence of fracture.

– Article by Brian Noehren

CASE STUDY

Talus Fracture While Snowboarding

PATIENT HISTORY

The patient is a 19-year-old male competitive snowboarder who sustained a forced dorsiflexion injury to his left foot while landing from a jump during a competition. He initially was treated in the emergency room. His X-rays normal, he was immobilized and referred to an orthopedist. A CT scan showed a displaced, partially comminuted fracture of the lateral process of the talus – known as a "snowboarder's fracture." He was immobilized for six weeks status post-surgery and then referred to physical therapy.

PHYSICAL EXAM

The patient presented to physical therapy on crutches and was unable to bear weight on his left foot secondary to pain. He rated his pain at 7/10. There was no visual increase in foot or ankle edema. Atrophy was noted in the distal leg. The patient was tender to palpate along the left anterior/lateral aspect of his foot and ankle complex and along his plantar fascia. Active range of motion (ROM) was within normal limits (WNL) for plantar flexion, inversion and eversion, and dorsiflexion was 25 degrees from neutral. Passive dorsiflexion was to five degrees from neutral. Strength was rated at 3/5 for dorsiflexion and 4/5 for all other planes of motion.

Aggressive proprioceptive (see photo below), agility and plyometric activity in the later stages of therapy is warranted to prepare a patient for a return to an "extreme" sport such as snowboarding.

TREATMENT

The patient initially was treated with a warm whirlpool, active and passive dorsiflexion ROM, and weight-bearing/gait training activity. Within two weeks, he was riding a stationary bike, performing proprioceptive exercises and lower extremity progressive resistive exercises (PREs). The patient was ambulating without the use of any assistive devices, although his gait remained antalgic. He had 10 degrees of passive dorsiflexion. He lacked an appropriate heel strike with gait and was unable to toe off properly. After five weeks of rehabilitation, his progress had reached a plateau, and he remained in pain with weight-bearing activity. He was referred back to his orthopedist.

SURGICAL INTERVENTION

The orthopedist put the patient's therapy on hold, and placed the patient back in a non-weight-bearing immobilizer for another six weeks. At almost four months from the date of initial injury, he was diagnosed with a non-union fracture of the talus. He was scheduled for an ankle arthroplasty, upon which the non-union segment was excised. The patient again was immobilized in a post-operative, non-weight-bearing cast for four weeks and transitioned to a surgical boot at the fourth week, at which time he was allowed to begin weight-bearing activity.

At six weeks post-surgery, he reported to physical therapy with no brace and was ambulating without any assistive device. He rated his pain at 5/10 when walking more than five minutes, when negotiating stairs, and while lifting/carrying heavier objects. He had some residual edema along his talocrural joint and down into his forefoot. No palpable tenderness was noted. He had five degrees of active dorsiflexion and 25 degrees of plantar flexion. Inversion and eversion ROM was WNL. Manual muscle testing was assessed at 4-/5 in all planes. His gait was mildly antalgic with a decreased stance time noted.

REHABILITATION AND RETURN TO SPORT

The first two weeks of his therapy consisted of restoring his full, active ROM, decreasing his swelling, increasing his strength, decreasing his symptoms, and restoring his normal gait. By the fourth week of therapy, the patient had no complaints of pain, and his swelling depended upon his volume of weight-bearing activity. His strength was reassessed to be 5/5 and his gait was WNL. His active dorsiflexion ROM was 10 degrees and remained limited compared to his non-involved extremity. Lateral movement and other agilities were added to his treatment routine. By this time, he was ambulating on the treadmill for 10 minutes at a fast walk. He was seen for a total of 24 sessions over the course of two months. Prior to being discharged, he was sprinting and performing plyometric activity. He returned to competitive snowboarding nine months after his initial injury.

SUMMARY

This case demonstrates the vulnerability of the talocrural joint in jumping sports such as snowboarding. This injury can be debilitating, and a successful outcome is directly correlated to early diagnosis and proper joint congruity. Once this is established, success often depends upon restoring normal ankle ROM, particularly dorsiflexion and normal gait. Gradual loading is paramount, as well. Simulating snowboarding activity in an outpatient rehabilitation setting can be difficult. However, the use of aggressive proprioceptive, agility and plyometric activity in the later stages of therapy is warranted in order to prepare a patient for a return to an "extreme" sport such as snowboarding.

– Article by Craig Sechler