



ACL Injuries in Skiers

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For many, the approach of winter brings the excitement of returning to the slopes for downhill skiing. Unfortunately, that also means a risk of injuring the anterior cruciate ligament (ACL) in the knee. Alpine, or downhill, skiing has a long association with ACL injury and treatment.

ACL injuries have been shown to make up a sizable proportion of all ski injuries, with a stable or even increasing prevalence over the last several decades.^{4,9,17} These injuries strike skiers of all levels and ages and both sexes, with conflicting data on whether males or females have a higher rate of injury.^{2,11,15,16} A number of studies have demonstrated no sex based difference in the rate of ACL tears among elite Alpine skiers.^{2,11,16}

ACL injuries most often occur while skiing through a forward, twisting fall, often via the “slip-catch” mechanism.¹ In the slip-catch mechanism, the inner edge of the outer ski catches the snow during a turn, forcing the knee into valgus and the tibia into internal rotation.³ Other mechanisms of injury include landing back weighted and the dynamic snow plow.¹ The loading pattern of the knee in the dynamic snowplow is similar to the slip-catch mechanism, with internal rotation and valgus of the knee.¹ Poor conditions have been shown to be associated with a higher risk of ACL injury for novice and experienced skiers alike.^{7,12} Skiers have been shown to have approximately double the risk for ACL tears if either parent has a history of this injury.⁹ Also, the risk for ACL tear has been shown to vary in association with the menstrual cycle for female skiers, with higher risk in the preovulatory phase.^{4,17,19} Female recreational skiers have also been shown to be at greater risk for on-contact ACL tears on their non-dominant lower extremity.¹³

While there is limited evidence that a subset of recreational skiers may be able to return to skiing without surgery,⁶ patients are usually treated with ACL reconstruction after tearing their ACL, especially if they want to return to the slopes. Autograft is likely preferable over allograft for skiers as in other active patients.⁸ Upon return to skiing after ACL reconstruction, there is an elevated risk for re-tearing the graft.¹⁰ In one series,



hamstring autografts were more likely to re-tear in skiers than bone-patella tendon-bone autografts.¹⁰ Fortunately, there is some evidence that functional bracing reduces the risk of subsequent knee injury in skiers with a history of previous ACL reconstruction.¹⁴

Considerable effort has gone into efforts to reduce the risk of ACL injury among skiers. Bindings designed to reduce the risk of leg and ankle injuries have paradoxically been associated with an increased risk of ACL injury.^{4,9} While at least one study demonstrated that targeted training can reduce the risk of ACL injury in skiers,⁵ there is little data on the

effectiveness of ACL injury prevention programs for this population, which could likely benefit from programs similar to those applied in other sports. Athletes returning to skiing after ACL reconstruction may have the most to gain from prevention efforts.

In summary, skiers are at risk for ACL injury on the slopes. Poor conditions are associated with a higher risk of injury and ACL tears are often treated with surgical reconstruction of the ligament. More effort should be focused on identifying modifiable risk factors for ACL injury among skiers, particularly in skiers with a history of previous ACL reconstruction.



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