



# Twist and

Serious knee injuries are now endemic to our sport, sidelining anyone from beginner to World Cup racer.

BY MONICA ANDREEFF

# Shout

**A**s they cut away the plaster cast, a rotten-egg smell filled the room and my knee began to balloon up like a bloated animal carcass after a typhoon. Hopped up on morphine and in mind-blowing pain, the hospital nurse shoved a clipboard in front of me and told me to sign a form giving permission to amputate my left leg above the knee.

Less than one in 1,000 knee surgeries result in infection, and my anterior cruciate ligament (ACL) repair in France and post-operative milk-run insurance flight back to Edmonton had left a fast-moving, gangrene-like staph infection that was headed toward my hip.

Amputation was a lifesaving measure recommended by the emergency-room orthopaedic surgeon, the nurse told me. Two more doctors' signatures were still required.

"But will I ski again?" I asked in tormented confusion as the drugs kicked in. Then I signed away my left leg.

The next two weeks were surreal to say the least. In the plastic surgery ward there were several poor souls having toes, feet, hands and arms removed—usually due to circulatory problems. The nightmare would start in the morning when they'd trolley them out of the room and continue when they were wheeled back a little lighter. Unless things changed quickly, I was next.

Lucid for a moment, I made a hospital-bed vow to return to the ski slopes, whether it was on a sit-ski, using outriggers or God-knows-what contraptions that had yet to be invented. Call me foolish, addicted to adrenaline or just plain crazy—but that's the beauty of skiing. Once you're hooked, you're hooked for life.

Thankfully, the other two surgeons

hesitated to amputate due to my young age (26 years), opting to flood my bloodstream with huge doses of antibiotics and literally carve out the infected tissue, leaving enormous holes around my knee to heal from the inside out.

That was in 1986, after I heard the pop in a slow-twisting fall in heavy spring snow on the last day of a 120-day ski season in France that completely snapped my ACL. Professional advice at the time pointed to a three-day window for repair, so I agreed. It sounded simple: two huge elastic-like ligaments would be stapled back together.

Who knew? The next year was spent in hospitals, full-time physiotherapy and a winter of road-biking rehab in Arizona.

Since then, I've had a dozen knee surgeries, counting arthroscopic "tune-ups" and several more plastic surgeries to fill the ice-cream-scoop-sized holes above and below my knee, followed by an ACL repair on my right, so-called "good" knee and finally, a complete knee replacement a few years ago so I could walk without bone-on-bone pain after 20 years.

In summer shorts my knee scars draw gawking stares, with queries like "What butcher did your knee?" But I've chosen to wear them with morbid pride. Yes, the doctors *did* rebuild me—not quite like the bionic (I wish!) woman. And yes, I'm still skiing.

## THE STRENGTH OF THE ORTHOPOD

No, they don't *all* walk on water to get to work. Today's orthopaedic knee surgeons are more likely to use a carpenter's belt full of tools such as hammers, drills and various practical implements to repair knees, and now there's also intricate sewing and even a few "buttons" involved.

Back when stiff boots and archaic bindings were the norm, so were broken legs—often boot-top fractures. But as softer, higher boots and better bindings hit the ski market, the rate of ACL injuries went through the roof in the mid-1980s.

At first it meant major surgery and a hospital stay to reconnect the ligament from the top of your femur, across the knee and to the tibia below, usually with metal staples. The patient was wheeled out with a plaster cast and handed crutches. If you were over 40 years old, it often wasn't even repaired.

"We now know that the over-40 group tends to recover better than the 20-year-olds because of better compliance with rehabilitation," says Dr. Bob Litchfield, medical director of the Fowler Kennedy Sports Medicine Clinic at the University of Western Ontario.

By the '90s, surgeons had tried replacing ligaments with Gore-Tex and settled on using patellar tendon grafts held in place by titanium screws. Patients were sent home with removable knee braces to work on bending and strengthening and an ambitious physio program.

In the last 10 years, surgeons began harvesting hamstring tendons from the same leg that were secured criss-cross with bio-absorbable pins (like trussing a turkey) until the graft took. Now, Canada's leading knee surgeons are "sewing" four or five hamstring tendons together into a "bundle" that's up to three times stronger than a real ACL ligament. Some surgeons have been using a "button" to attach the graft, sort of like an IKEA-type screw turned sideways to lock into the bone. After a year or so, the collagen in hamstring tendons morphs into an actual ligament structure. ▶

# THE PHANTOM FOOT SYNDROME

So you've cranked a big right-hand turn and all your weight is now on the inside edge of the downhill ski, or your left leg. Today's shorter, curvier skis automatically turn you uphill and if you're in the back seat, chances are your hands have now swung behind your hips. As the ski rotates to the right, your body continues downhill, and although there's little warning, this is where the "phantom foot" emerges—and likely an ACL tear follows.

"It's as if you had a foot pointing in the other direction and that's the tail of the ski," says Jake Shealy, who has conducted extensive research into the biomechanical aspects of skiing for more than 35 years in conjunction with Carl Ettlinger of Vermont Safety Research and Dr. Robert Johnson, University of Vermont, Department of Orthopedics.

A Professor Emeritus at the Rochester Institute of Technology and former head of the Industrial and System Engineering department, Shealy has

specialized in human factors engineering since the 1950s. After he started skiing in the '60s, Shealy turned his skeptical scientist's eye to ACL injuries and analyzing causes and prevention. For Shealy and his partners, it's all about the hard data.

"We saw an alarming rise in severe knee injuries in the early '70s, and by the '80s it was practically an epidemic. Clearly something had changed."

Looking at how bodies work and how the injury occurred, the trio tried to figure out how biomechanical engineering principles could intervene, mitigate or prevent injury altogether. Because a common way to tear the ACL involves the tail of the ski acting as a lever pointing in the opposite direction of the foot (in combination with a hard-backed ski boot), the injury scenario was coined Phantom Foot syndrome.

A number of factors have been working in our favour these days, however, such as changes to ski lengths

and design, boots, slopes as well as the way we ski.

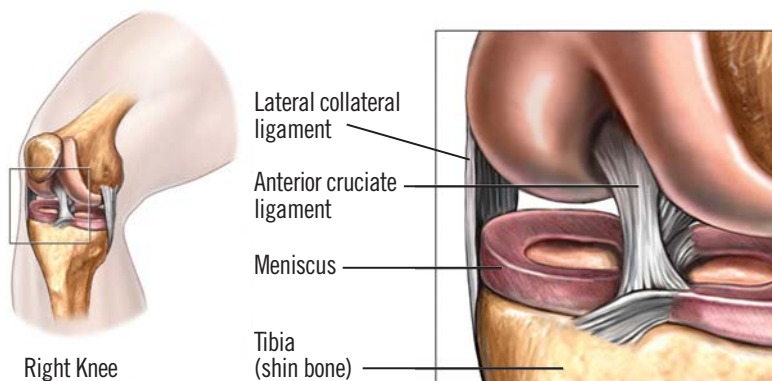
"Serendipitously, there's been this phenomenon that has accompanied the shorter ski. As skis get shorter, the driving mechanism, or the Phantom Foot syndrome, becomes shorter and there's been a 30 to 40 per cent reduction in ACL injuries in the last five years or so," says Shealy.

Someday, he's hopeful that a binding will be developed to release in the event of the Phantom Foot, but currently a twisting load binding cannot sense it because all the action is in the knee. "The ACL injury has nothing to do with the quality of the boot-binding system; the frequent myth is that somehow we had better adjust the equipment."

Prevention is just good ski technique: keep your arms up and forward, centre the hips above flexed knees and centre your weight on the downhill ski.

ACL injuries usually occur when you attempt to recover from an off-balance position, sit down after losing control or try to get up while still moving after a fall.

"If you're down, stay down," says Shealy.



Always on the leading edge, Canada's injured elite ski racers—Jan Hudec, for example—are getting double-bundle grafts, most often a cadaver hamstring, or "allograft," donated from a tissue bank to reduce the trauma to patients' hamstrings and speed recovery.

## BEND, BABY, BEND

Synthetic lubricants for arthritis, tough, light knee braces as well as rehab first—surgery second—schools of thought, improvements in ski equipment, innovative rehab techniques and home aids have meant that more people than ever are getting back to skiing sooner. But there's no quick fix. In fact, you can even set your recovery back by months if you are too aggressive after surgery.

"A lot of people will try to do too much, too soon," says Bridget Hemsted, a Fernie, B.C., physio with 30 years of experience, including 25 years as a professional ski instructor. "The graft in there still has to mature and heal and needs to be protected."

University of Winnipeg orthopaedic knee

surgeon Peter MacDonald used to tell patients they could expect a quick recovery after a scope. But after MacDonald, a skier and runner, had the torn meniscus in his knee repaired, he tried to run a mere eight days after surgery. "And that's a no-no," MacDonald says with a chuckle. "So now I slow my patients down."

Ask around, or ask friends for a name or two, but choose your physiotherapist carefully because you'll be spending a lot of time together. Ask him (or her) how many ACL reconstructions he's seen in the past year, or ask your doctor if there's a ski-specific physiotherapist he likes to work with. You might also ask what continuing education courses your physio has taken after obtaining his degree. Make sure you are a fair personality match and, like speed dating, "be prepared to move on if it's not a fit," adds Hemsted.

Two weeks after your operation expect to go to physio at least twice a week and work daily for an hour on your own at home. Buy, beg, borrow or steal a Cryo Cuff; it'll be

your new BFF (best friend forever, if you're not 15 years old) because it compresses and ices your knee at the same time using a wraparound sleeve. Other inexpensive toys you may want to have at home: a wobble board (stability muscles), Swiss balls (lying down hamstring curls) and therapeutic rubber bands (range of motion and strength).

And if you can, take a short tune-up session with a ski professional "to make sure you're not stressing the knee through poor alignment because of stance," advises Hemsted. Buy knee-friendly skis and beware of too much sidecut or no sidecut at all. "Too much sidecut—or none at all—is not always a good thing; it puts a lot more torque on the knee."

Expect six months in rehab-mode and when you return to the slopes, make medium-to-long turns on gentle groomers and expect to wait a full ski season before you're ready to crank high-speed turns or play any pivotal sport for that matter. Try pool therapy, non-weighted exercise such as stationary bicycles and keep up your general cardio fitness "especially if you're a fitness junkie who goes squirrely while you're injured," advises Hemsted.

## THE SURGERY QUESTION

Surgery isn't the answer for every torn or partially torn ACL. First the knee has to "settle down" before it can be assessed, says Mark Heard, a Banff orthopaedic surgeon who has temporarily quit taking new patients to reduce long wait times for ACL repairs.

Save yourself a lot of time and the expense of an MRI by seeing a sports medicine

professional—not necessarily your family doctor. “Most aren’t skilled at picking up an ACL; it’s easily missed,” explains Heard. The classic mechanical knee assessment is performed with you lying flat on your back on the bed with a bent knee, trying in vain to relax all the muscles in your leg, while the lower leg is firmly tugged sideways to test the looseness of the ACL.

Then surgery depends on how aggressive a skier you are. For people who prefer groomed cruising runs and ski 10 times a year, the best choice may be physio and a custom-fit ACL brace.

“But sometimes you have to get more information. The MRI may show a 99-per-cent torn ACL, but it doesn’t feel that loose or unstable. If you’re a pretty aggressive skier, the next big turn you’re going to pop it,” says Heard. “If it’s really loose and it’s a really active person, I’ll say ‘this knee has trouble written all over it—let’s fix it.’”

### BRACE YOURSELF

While there’s no hard scientific evidence to justify wearing a neoprene sleeve or custom-fit brace to ski for years after your surgery, Dr. Peter MacDonald says that he still wouldn’t trust a new repair to anything less than “a

full-on brace. Skiing is quite ACL dependent.”

Certified orthotist John Rahman has cast thousands of knees in plaster and custom-fit sports braces for skiers in Calgary for more than 20 years. “If it was my knee and I had an ACL repair, then no way on earth I’d want a neoprene sleeve holding my knee together,” says Rahman. “Mechanically speaking, it’s not going to stop tibial movement under the femur.”

Ski braces used to be clunky and heavy, with complicated strapping systems, but new materials such as titanium, carbon fibre and Velcro straps mean braces are stronger, lighter and simpler to wear. With changes in Canadian currency values, the U.S.-made brace prices have remained virtually the same over the last decade. If you’re lucky and fit an off-the-shelf model, you’ll pay between \$900 and \$1,200. A custom-fit brace can cost more than \$1,500. They also come in funky colour options and virtually last forever.

Seek out a Canadian certified orthotist for advice, someone who has had experience fitting knee braces for skiers and the years of extra training. “If you’ve had your knee done and are a high risk for future injury, in my opinion I would recommend wearing it for every risk activity,” Rahman adds. ❧

# THE SKI SHOW

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## CLIP & SAVE

### Avoid high-risk behaviour:

- Don't fully straighten your legs when you fall. *Keep your knees flexed.*
- Don't try to get up until you've stopped sliding. *When you're down, stay down.*
- Don't land on your hand. *Keep your arms up and forward.*
- Don't jump unless you know where and how to land. *Land on both skis and keep your knees flexed.*

### Routinely correct skiing technique:

- Maintain balance and control.
- Keep hips above knees.
- Keep arms forward.

### Recognize potentially dangerous situations:

- Uphill arm back.
- Off-balance to the rear.
- Hips below the knees.
- Uphill ski unweighted.
- Weight on inside edge of downhill ski tail.
- Upper body generally facing downhill ski.

### Response:

- Arms forward.
- Feet together.
- Hands over skis.

An educational DVD and pamphlet produced by Vermont Safety Research can be purchased for home, club or group viewing. Although no legal claims can be made to prevent an ACL injury, education on serious knee injuries certainly isn't going to hinder the rate of on-slope knee injuries. [www.vermontskisafety.com/vsrvideohomeorder.php](http://www.vermontskisafety.com/vsrvideohomeorder.php)

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