

Will BEAR become bull?

Encouraging results emerge from initial trial of the Boston Children's hospital BEAR surgery, but more data is needed guarantee long-term results.

Colleen Dowling has a unique perspective when it comes to ACL injuries. In the middle of her studies to become a physical therapist, she tore her own anterior cruciate ligament, or ACL, in a lacrosse game her first year of grad school.

"I knew pretty much right when I went down," she said. "My brother's torn his three times, my dad tore his twice. Even my dad said, he was in the stands, 'As soon as I saw you go down and clutch your knee, I knew what happened.'"

Her studies prepared her to care for others facing a torn ACL, but she soon discovered they also prepared her to be a knowledgeable patient. "We had our exam on how to test for ACL tears on Friday and I tore it the next day..." said Dowling. "As the trainer was doing everything, he said 'I'm just testing your knee,' and I said 'I know exactly what you're doing and I know it's positive!'"

The ACL is a crucial ligament to stabilize the knee, but it can't heal itself. Dowling underwent a surgery that replaced her torn ACL with tissue from her own body, the most common choice for the young and the active. While the reconstruction surgery fixes the ACL issue, taking a graft weakens other muscles and ligaments, which can cause long-term pain and adds difficulty to the recovery.

So, a team at Boston Children's Hospital is testing a new procedure that avoids removing tissue and instead utilizes the body's own healing ability. Known as the bridge-enhanced ACL repair (BEAR), the surgery stitches the ends of the torn ACL to a scaffold soaked in the patient's

blood which provides a “bridging link” that fosters healing of the ligament according to BEAR team members Sam Barnett and Rachael Henderson. No graft is needed, which significantly reduces the additional injury to the knee. This past March, the BEAR team published two-year results in the *Orthopaedic Journal of Sports Medicine* after monitoring the first ten patients to go through the procedure.

“The initial results look promising,” said Braden Fleming, PhD, who was involved in the trial development. Compared with ACL reconstruction surgery using a hamstring graft, the BEAR technique produced comparable results in terms of knee stability and significantly higher hamstring strength.

The hope is that the BEAR surgery will mitigate some of the problems with the current reconstruction surgery. Harvesting a graft, either from the patient’s thigh, hamstring, or patella, can cause even more trauma to an already injured knee. The harvest site can cause significant pain at the graft site, slowing down recovery and sometimes becoming chronic. Even without these complications, a normal recovery is long and incredibly difficult, especially for an athlete who were used to being active.

“Six months in I think was the hardest,” said Dowling. “Day to day things were okay, but I couldn’t walk faster than a certain speed or every now and then you’d feel a twinge and you’d be reminded that you’re still not better.”

Even if patients recover fully, they could face problems later in life, as there is risk for developing arthritis after an ACL injury. In an interview with the *New York Times*, Dr. Mininder Kocher of the Boston’s Children Hospital estimated that the risk of developing arthritis within ten years after the injury is greater than 50 percent.

ACL injuries are also on the rise, particularly among children and adolescents. In the United States, there are approximately 100,000 ACL reconstruction surgeries performed every year. One study published in *Pediatrics* reviewed data from insurance agencies over the past 20 years for all ACL tears, with or without surgery. They estimate that ACL tears in patients six to eighteen have increased by 2.3% every year. Even more dramatic is a study from the *Orthopaedic Journal of Sports Medicine*, which indicated a 924% increase in ACL reconstruction surgery for patients under fifteen between 1994 and 2006.

Doctors and physical therapists say that young athletes are playing at more competitive levels at a younger age, and playing all year long, rather than just one season. According to Michelle Goodrich, an athletic trainer at MIT who works with ACL patients, athletes are specializing a lot younger, and “If you are in a sport that has a high incidence of tears like field sports or basketball, and now you’re spending more time in those sports, that’s just going to result in higher rates.”

So for a twenty-two-year-old athlete who tears her ACL, what does that mean when she’s thirty-two? Dowling, the physical therapy student says she isn’t worried about arthritis even with her injury. “Arthritis is a term that is thrown around to basically anyone over the age of 35 and people think it’s a death sentence for activity. Resistance training and continued physical exercise can actually reduce the symptoms of arthritis...”

However, the risk for developing arthritis is still one of the problems researchers hope BEAR will solve. Although earlier trials that performed BEAR on pigs showed success, Dr. Fleming stressed the limitations of this initial human trial. Given such a low sample size and how recent the operation was, researchers can’t predict if the BEAR patients will have a lower risk for arthritis or continued ACL stability in the long term.

Other doctors are even more cautious, citing past attempts to repair ACLs that showed promise in the early stages, but then failed as the patient aged.

While the recent science developments that back the BEAR technique look promising, “usually history tends to repeat itself,” according to Sean Hazzard, a physician’s assistant at the Massachusetts’s General Hospital.

In the 1980s, surgeons tried to directly stitch the ACL back together, and while the initial results looked good, the re-tear rate later in life was “unacceptably high”. The next development in ACL surgery in the 80s and early 90s was synthetic grafts to avoid trauma of taking a graft, but those were abandoned quickly due to poor results.

So, the BEAR technique will need solid data and long-term success in thousands of patients before truly becoming accepted, said Hazzard. “People love fancy and new but it doesn’t necessarily mean it’s better... It’s important to look at the objective facts carefully.”

According to Barnett and Henderson, there are two more studies of BEAR underway at Boston Children’s. Other hospitals will soon join the effort, but as for the first patients that underwent the BEAR technique, researchers plan on monitoring them for at least ten more years to look at long-term stability. But what determines if this trial was a success?

In an email, Barnett and Henderson said that “if the data from this study shows that this new repair technique when performed for the first time has similar outcomes to the standard surgery that has been perfected over 30 years, it would give us hope that this less invasive procedure might be part of the future for ACL surgery.”

*A note about sources: The people listed below were interviewed directly by the author (via phone, email, or in-person) for this article. This article was originally written as if it would be published in a magazine or as a feature newspaper article, and thus sources are cited in text and not formally as in MLA style or in another style.

Interviewees:

Colleen Dowling (phone)

Sam Barnett and Rachael Henderson (email)

Braden Fleming (phone)

Michelle Goodrich (in-person)

Sean Hazzard (phone)