

# Pediatric Anterior Cruciate Ligament Injury

## Advocating for the Next Generation

*“Your 12-year-old daughter has torn her ACL. As you might know, this has become more common, as younger children are playing sports such as soccer more frequently throughout the year. A generation ago, in many parts of the world, this injury would likely have signaled the end of her participation in her team sport and put her at risk for early cartilage and meniscus damage. The physical and emotional burden of such an injury can be a lot, even for an adult, let alone someone of this age. We, fortunately, now have effective ways to stabilize her knee, and I am sure that you are aware that surgery is just the beginning of a long road to recovery. We will carefully review the surgical risks and benefits, and even after a successful surgical procedure, there can be months of rehabilitation just to get to straight-line exercising; returning to higher-level sports is expected to take 9 to 12 months but can take longer.”*

*“Thank you, doctor. Jane is strong, and she is willing to work hard at every step of the way. She will be so strong that we plan on having her play on 2 soccer teams year-round when she gets back.”*

*“I am sure that she will work diligently, but you should also know the risks of reinjury with that plan. Young athletes who have torn a major knee ligament, such as the ACL, have a greater chance of tearing either their affected or unaffected ACL more than the general population. Some authors have reported that adolescent females returning to pivoting sports such as soccer have a 1-in-3 chance of reinjury. We can therefore discuss measures to limit her chance of reinjury. We will discuss key elements of ACL injury prevention programs that are now incorporated into our postoperative rehabilitation protocols. We will address ways to reinforce areas both inside and outside of the knee joint, and we can also discuss altering the frequency and duration of pivoting sports and even changing her sport altogether.”*

*“Changing anything about her sports or how much she plays them is out of the question. She wants to and is going to play all 4 seasons in the same sport through high school. And about the return-to-sports timing: I would like her back to games at 4 and 1/2 months out from surgery. Jerry Rice and Adrian Peterson did that, and if they could do it,*

*then so can my daughter. This is not our decision; this is what she wants.”*

Conversations like this occur at times in sports clinics. The goals set forth by the family and hence by the (pre)-adolescent athlete are sometimes shaped, unfortunately, by ideals established from media stories about professional athletes. It is the sports surgeon's task to help patients and families navigate through misinformation to get the best available data for the injured athlete.

We are in a unique position of treating sports injuries and, at the same time, hopefully having a beneficial impact on the next generation. Sports clinicians of all disciplines are witnessing the increasing rate of serious injuries in younger children and the hopes and significant demands of the families as decision makers for their children. There are times when surgeons and all sports clinicians must address and balance these issues. Let's look at this dilemma from different perspectives: the shortcomings of the current evidence, the ethical considerations, and the role of the surgeon and the sports community at large in addressing the issues at hand.

The benefits of sports are known and well documented. Sports participation not only affects the physical state and motor skill development of our young generation but is also a vital component of the fight against childhood obesity. The mental and psychosocial benefits of sports are at least as important for the youth population. Greater self-esteem, teamwork skills, stress reduction, and socialization are just a few of the well-studied mental benefits of sports in children.

At the same time, recreational activities are a leading cause of injuries in children. In fact, with more than 60% of the American youth participating in organized sports, it is not unexpected that more than 8 million injuries in need of medical attention happen in this population every year.<sup>13</sup> Worse, this rate is slowly increasing. ACL injuries are a prime example. Year-round single-sport participation, early specialization, and increased awareness of these injuries have dramatically increased the diagnosis of ACL injuries in the pediatric population.<sup>5</sup>

What is not necessarily fully appreciated is the impact of sports injuries on the physical, mental, and emotional well-being of the young athletes and their families, as well as the long-term outcomes. We are better addressing these variables via a variety of validated pediatric patient-reported outcome measures.

As it is with fractures, children have a tremendous recovery potential. Although not perfect, it is evident that the current surgical techniques for ACL reconstruction, meniscal repairs, and other soft tissue treatments are highly successful.<sup>1,11,12</sup> There is a very high rate of

**Keywords:** ACL; pediatric; reconstruction; sports; epidemiology; research

pediatric athletes returning to sports following ACL reconstruction, which at 91% is even higher than for their adult counterparts.<sup>7</sup> This suggests that while the postoperative rehabilitation is oftentimes not as strictly followed in younger athletes, the combination of state-of-the-art surgical technique and impeccable recovery potential in this age group usually makes the initial surgery and recovery successful.<sup>2</sup>

Even with this high rate of return to sports and the impressive number of hours of sports exposure in young athletes, there are high reinjury rates in pediatric athletes, which again surpasses their adult counterparts by a significant margin.<sup>10,14</sup> This information stresses the importance of considering not just additional surgical measures but further rehabilitative prevention measures, activity modification, and focused research on these issues. Identified risk factors for recurrent ACL tear include younger age, earlier return to sports, return to the same high-level sports activity, female sex, and high-risk sports that entail frequent cutting and pivoting activities, such as soccer.<sup>4</sup> Our hypothetical patient, Jane, is a classic “high risk of reinjury” patient because she and her family have goals of multiple teams in a season, year-round sports, soccer, plus a goal of an Adrian Peterson–like return-to-sport timeline of pivoting sports at 4.5 months from the time of surgery.<sup>3</sup> We would like to provide a quantifiable value for each patient; however, we cannot perfectly quantify the reinjury risk at this time.

The current pediatric sports literature has a number of shortcomings. For one, the definition of youth and pediatrics is not uniformly agreed on. In the literature, many studies lump all athletes younger than 25 years into the “young” group. In reality, however, things could not be more different between a 5-foot-tall 11-year-old girl with ligamentous laxity, genu valgum, pes planus, and femoral anteversion who plays soccer and a 6-foot-5-inch-tall 25-year-old man playing football. Researchers should, and now do, stratify different age groups and evaluate not just age but growth plate status, remaining growth, and other features that distinguish younger from older patients.

Another major shortcoming of many sports studies is the widely varying reporting of injury rates. For pediatric patients and their families, for whom sports-related injuries are particularly devastating, it is incumbent upon the sports community to collectively answer questions on sport risk stratification for patients. While individual studies on this topic are useful, further value can be gathered from systematic reviews and meta-analyses that pool data from a variety of sources and patient populations to make results more generalizable to the broader public.<sup>6,12</sup> However, this is particularly difficult given the current literature, where injury data are rarely uniform. Therefore, we implore authors publishing on injury epidemiology to always report the following: total injury counts, mechanism of injury (eg, contact vs noncontact), detailed injury types (eg, grade II ACL sprain rather than “ligament sprain” or “sprain/strain”), method of diagnosis (eg, physical examination, advanced imaging, or operatively), management (eg, nonoperative vs operative), total hours of athlete exposure, and the total number of athlete

exposures (game or practice session). Furthermore, these data should be broken down by individual sports and athlete sex to allow for further risk stratification. Future researchers can then utilize more uniformly reported injury data to better inform the next generation of orthopaedic surgeons, sports medicine physicians, physical therapists, athletic trainers, and epidemiologists on topics important to the broader sports community.

There is also the matter of the goals of pediatric sports surgeons. Our charge and goal are to enable young athletes to return to healthy fitness, hopefully for a lifetime. We strive to bring back the elite or recreational athlete who is devastated after an injury and subsequent surgery to healthy and reasonable fitness. We can at times return athletes to the same sport, but it is not always advisable to return at the same time interval, level, and year-round commitment, or to multiple teams simultaneously. There are times when repeat injuries and/or injury patterns, as well as patient build, alignment, strength-to-weight ratio, and other factors, suggest that athletes are not well suited to the sport in question. While there is a sport or fitness activity that is suited to and beneficial for every child, not every sport is for every child. All clinicians caring for young athletes can help patients and families more fully understand these issues.

There are ethics of medical decision making that pertain to pediatric sports. The best-interest standard of decision making—in which the clinician, rather than the patient and the clinician, makes the best good-faith decisions for infants and for those who cannot make decisions on their own—has limited applicability to pediatric sports medicine. Because there is not a uniform outcome in all cases, it is important to have a shared decision-making process among the pediatric athlete, the family, and the physician.<sup>8</sup> The surgeon should provide current knowledge and note areas where there is a dearth of knowledge regarding pediatric sports injuries, outcomes with different treatments, and the risk of subsequent injuries. Additionally, the preference of the parents and the child and the most probable long-term outcome of each decision should be discussed in detail. The reasonable-choice decision making—which attempts to incorporate all of the aforementioned points and is the standard that a reasonably prudent person or persons would observe—might therefore be the most applicable model in these very young athletes.<sup>9</sup>

For Jane and her family, we are obligated to inform the parents as best as we possibly can of the outcomes of each treatment strategy, the risks as well as the benefits of surgery, the rehabilitation ahead of them, the dissimilar nature of adult and pediatric sports injuries, the strategies and programs to decrease the risk of future injury, the risk of a repeat or contralateral ACL injury, and the long-term outcome of an ACL-deficient/reconstructed knee. This way, the patient, family, and surgeon can agree on decisions that can pave the way for a healthy, fit, and happy young athlete.

Regarding our research that affects these young athletes, the quality of work that is submitted to our journal and presented at our national meetings is now exponentially better than it has been in years past. Despite the

standard of excellence that exists today in the medical literature, we have significant room for greater precision, greater collaboration, and more complete data sets. While authors should strive for innovation and creative thinking, they should also, at study onset, think to purposefully gather epidemiologic data with a significantly higher level of uniformity, completeness, and precision. Demanding high standards will not only provide the best representation of the questions studied but also allow for superior collective systematic analyses in the future. It is a lot to ask, but children deserve it.



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