

PREPUBESCENT ANTERIOR CRUCIATE LIGAMENT TEARS

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From the 6 year old child prodigy Motocross rider to the elite 11 year old soccer all-star, child athletes abound. Their training regimens are intensifying as is their exposure to competitions. Their high energy combined with a strong desire to be recognized and succeed has created a scenario for adult-like injuries to occur and occur more frequently. The most important difference being that a prepubescent athlete's physical morphology, or body structure, is not that of an adult, it is still developing and still growing and therefore presents a unique challenge. The prepubescent athlete is defined as still not having had an adolescent growth spurt or any development of secondary sexual characteristics.

The anterior cruciate ligament (ACL) of the knee is one of 4 major ligaments that provide ligamentous stability and protection to the joint surfaces and their interposed cushions or menisci. It is a "checkrein" of sort, that when rendered incompetent allows the lower leg to slide forward, the so called "giving way" of the knee. ACL injuries in children are dramatically increasing; in particular young female athletes are at greater risk. It is a well known fact that attempting to limit and control activities in children with functional knee-ligament instability is very difficult and that frequently repeated injuries of increasing severity are encountered. The ultimate goal in the injured prepubescent athlete with an ACL tear is to prevent these repeated injuries. Historically, activity modification and time have been the mainstays of treatment, both of which may be near to impossible to achieve given the strong desire these athletes possess for competition. Why wait to perform ACL reconstruction has been a question of debate and centers around the child athlete's growth plates. These are linear structures that traverse the ends of long bones in a horizontal fashion and allow for longitudinal growth of the bone and height of the individual (see figure above). One can understand that if a growth plate is damaged and fails to continue growing or

grows improperly, that the consequences can be quite severe, i.e. leg length's that are uneven or angular deformities at the affected joint. Recent literature is now favoring more aggressive surgical management earlier rather than later due to an improved understanding of how to limit growth plate damage during ACL reconstruction while at the same time acknowledging the devastating consequences of repeated injury and the degenerative joint disease that they cause.

Treatment should begin with an MRI evaluation of the knee to assess all structures. The prepubescent ACL tear typically can be classified as a boney avulsion (which can be anatomically reduced and fixed with screws), intrasubstance ACL tears (of which this discussion centers) and a combination of the two. A physical therapy regimen should be initiated for range of motion and swelling control and an ACL brace may be considered. Activity modification should be attempted and should include avoidance of jumping, pivoting, contact or participation on uneven or irregular surfaces. If the child athlete fails these measures and is noted to continually have episodes of re-injury, then a family and physician discussion must be initiated centered on possible surgical intervention.

ACL reconstruction requires the drilling of bone tunnels across both of the major growth plates of the knee. Whereas in adults this poses little to no risk, in the prepubescent patient potential growth disturbance is possible. Historically, techniques that did not require drilling across the growth plates were performed but have since been shown to be inferior. Evidence now exists that supports limited to no growth disturbance when growth plates are violated so long as certain principles are adhered to. These include: the use of soft tissue grafts such as hamstring tendons, small diameter centrally located tibial and femoral bone tunnels, graft fixation that does not cross the growth plates and therefore is distant to them, avoidance of excessive dissection near the growth plates and a careful plan for monitoring future growth as well as addressing possible growth arrest.

For the prepubescent, elite athlete that suffers an ACL tear this need not be a career ending injury or one that eliminates their potential for future scholarships or professional sports participation. A team approach between athlete, family and physician can lead to an excellent outcome.



Coronal MRI image pediatric knee Femoral Growth Plate (Physis) Tibial-Growth Plate (Physis)



Coronal MRI image pediatric knee ACL Femoral Tunnel ACL Tibial Tunnel

