



## THE PROBLEM

Injury to the Anterior Cruciate ligament (ACL) is a well recognised diagnosis, frequently managed with surgical reconstruction. The majority (70%) of ACL ruptures are non-contact injuries involving a side step or land from a jump. In the past 10 years the diagnosis has become much more recognised in the younger athlete or skeletally immature population. The increasing prevalence may be associated with increased involvement in sports from a very young age. Children competing in skiing, soccer, rugby, GAA, hurling and basketball have significant demands on the ACL.

## NATURAL HISTORY

There is a well-recognized pattern of injury associated with ACL injury in both the short and long term. Acute injury may be associated with cartilage (meniscal) injury and functional instability that often does not allow the patient to return to their pre injury level of activity. In the longer term the patient may continue to struggle with instability and develop secondary damage to cartilage. The long-term outcome of unstable knees is premature osteoarthritis.

## NON-OPERATIVE TREATMENT

A number of studies have demonstrated that non-operative management including physiotherapy, rehabilitation, bracing and reduction of activities is difficult due to poor patient cooperation. Most active children find it difficult to modify their activity levels and it has been shown that most young patients have an unwillingness to modify their behavior.(1)

One patient follow-up study has demonstrated Xray signs of degenerative change in 43% of patients followed up at the end of their second decade without treatment.(2) The risk of further and ongoing damage to the growing knee are strong factors against the option of non-operative treatment.(3)

## OPERATIVE TREATMENT

The controversy in the acute surgical management of ACL injury in the adolescent population group is related to the potential risk to the growth plates (physes) around the knee. Growth plates are areas of developing cartilage tissue near the ends of long bones. When a child becomes full-grown, the growth plates harden into solid bone. Trauma to the growth plates prior to closure could result in leg length difference or angular deformity. On average the growth plate is closing in girls at 12-14 years and in boys aged 14 to 16 years. As the patient approaches skeletal maturity the relative risk of growth related disturbance is reduced.

There has been significant published scientific work in animals looking at the risk of damage of the growth plate when drilling a tunnel and placing a graft in the tunnel. There is no evidence of growth disturbance provided a soft tissue graft is placed in within the tunnel. Evidence suggests that more than 7% of the growth plate has to be damaged to produce a growth arrest.(4) An appropriate tunnel drilling during ACL reconstruction using current techniques involves much less than 7% of the growth plate.

## SURGICAL TECHNIQUE

The specific surgical technique in the skeletally immature patient has been modified to respect the potential risks to the growth plate while ensuring it is placed in an anatomic position to optimize function. Historic reconstructive techniques placed grafts in non-anatomic positions that were less predictable in restoring stability, with graft selection and fixation techniques that crossed the growth plate, which have a significantly increased risk of growth disturbance. Mr. Vioreanu's preference is to use a hamstring graft drilled through the growth plates fixed at either end away from the growth plates. This allows placement of the tunnels in an anatomic location, with soft tissue graft within the tunnel as it crosses the growth plate minimizing risk of growth arrest with proximal and distal fixation away from the growth plate. This surgical technique has been pioneered by Prof. Pinczewski and Dr. Roe at North Sydney Orthopaedic and Sports Medicine Centre, Australia and was awarded the prestigious 2013 Scientific Award at the ISAKOS Congress in Toronto, Canada. Mr. Vioreanu has spent one year in Sydney working with Dr. Roe and Prof. Pinczewski, learning the intricacies of this surgical technique.

Recent reports in the literature confirm that an anatomic reconstruction with modified surgical technique, respecting the growth plate can produce predictable and reproducible good results without evidence of angular deformities or leg growth disturbances.(5-8)

## KEY POINTS

- ACL injury in skeletally immature patients occurs with noncontact pivoting, jumping maneuvers as well as contact mechanisms to a lesser extent
- Delay of time from injury to reconstruction results in an increasing rate of further damage to the knee
- Surgical reconstruction is recommended using appropriate techniques with soft tissue grafts
- Re-injury and further damage to the knee occurs at a higher frequency in the un-reconstructed knee than injury to the growth plates using appropriate surgical techniques

## REFERENCES

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