The unique challenges of pediatric ACL tears

By Jennie McKee

Preoperative assessment of maturity is crucial to reduce risks


“The literature clearly documents poor outcomes with non-surgical treatment,” he noted, “but surgical intervention can cause iatrogenic physeal injury, resulting in leg length discrepancy or angular deformity.”

These management decisions are further complicated, said Dr. Anderson, “by deficiencies in basic science knowledge related to physeal response to injury, and the methodologic limitations of clinical studies that have evaluated the safety of surgical techniques for repairing pediatric ACL tears.”

The standard of care, he said, should be a surgical treatment approach appropriate for each patient’s potential for growth disturbance.

Assessing maturity and risk

The consequences of growth disturbance may be severe in children who have a great deal of growth remaining, but these consequences can be mitigated by careful preoperative evaluation of the patient’s skeletal and sexual maturity, noted Dr. Anderson.

“In general, chronologic age is an excellent predictor of maturity; however, because two children of the same age could have different skeletal ages, chronologic age alone is insufficient to predict how surgical treatment may disturb growth,” he said (Fig. 1).

Skeletal age may be predicted with radiographs or magnetic resonance imaging. One common method uses the Greulich-Pyle Atlas of Skeletal Maturation and compares radiographs of the left wrist and hand to a reference population. Physiologic age may be estimated using criteria developed by Tanner, which classifies sexual maturity from stage 1 (prepubescent) through stage 5 (adult) (Table 1). Basic science studies may also provide some evidence that can aid in assessing risk factors for growth disturbance; however, much of the data are from animal models and are not entirely applicable to humans.

“In general, the risk for growth disturbance is associated with the extent of damage to the cross-sectional area of the physis,” said Dr. Anderson.

Conservative or surgical treatment

A conservative treatment strategy for pediatric ACL tears may present several problems, cautioned Dr. Anderson.

“It’s difficult to keep kids out of sports for years,” he said, “and they may be injured in free play.”

In addition, he said, the literature provides compelling evidence that nonsurgical treatment is associated with a high probability of long-term knee impairment. Patients often experience recurrent instability, meniscal damage, and sports-related instability.

“The risks of nonsurgical treatment are greater than the risks of surgery,” he said. “Consequently, the standard of care, in my opinion, should be surgical reconstruction for pediatric patients.”

Surgical options

For children with the highest risk of bone growth disturbance—those classified as being at Tanner Stages 1 or 2, with open epiphyses and no development of the tibial tubercle—either a transepiphyseal or modified physeal-sparing procedure should be considered.

“Transepiphyseal reconstruction uses a quadruple hamstring graft, with an endobutton and washer inserted proximally, and a screw and post used distally,” he said.

For patients in early Tanner Stage 3, said Dr. Anderson, the same procedures may be recommended as for patients at Tanner Stages 1 or 2, although this is a gray area.

Children rated as Tanner Stage 3, a time of accelerated growth, or Stage 4, when the physeal plates begin to close—are considered to be at intermediate risk.

For patients with a low risk of