Objectives
Growth arrest resulting in limb length discrepancies and angular deformities are potential complications stemming from ACL reconstruction in children and limit the use of traditional surgical techniques. However, early surgical stabilization over non-operative treatment is now preferred and results in less instability and fewer chondral and meniscal injuries. The specific surgical treatment in children remains controversial. The purpose of this study is to report the outcomes of 13 skeletally immature patients treated for ACL deficiency with an iliotibial band graft (ITB) graft placed via the over the top position.

Methods
This study was approved by the College of Medicine IRB. Between 2010 and 2015, 13 skeletally immature patients were treated for ACL deficiency with an ITB graft by the senior author. Bone age was obtained via hand and wrist radiography for each patient prior to surgery. Preoperative KT-1000 data was also collected on 10 of 12 patients. The remaining 2 patients were too small to be accurately measured by the device. 9 males and 4 females were studied. All patients followed a standard postoperative protocol. Following surgery, all patients were placed in a knee immobilizer and allowed to bear weight as tolerated. At one week, the brace was adjusted to allow 30 degrees of flexion with continued full weight bearing. At 3 weeks patients were allowed to remove the brace while in the home and begin physical therapy. PT continued for 4 months and focused on gait, ambulation and range of motion with the goal of return to pre-injury levels of strength, stability and activity. All patients were monitored for growth disturbances including angular deformity, and leg length discrepancy. At 7 months patients were allowed to gradually return to pre-injury with a sport brace. Lysholm scores were recorded at 1 year.

Discussion
Micheli reported a series of 17 patients using a modified Macintosh technique combined intra-articular and extra-articular reconstruction of the ACL with autogenous ITB graft and reported no limb length discrepancies or angular deformities (Micheli CORR 1999). Kocher expanded Micheli’s series and treated an additional 27 patients with comparable results (Kocher JBJS 2007). Similarly, we report 13 skeletally immature patients treated with the ITB graft with no angular deformity or growth arrest. The Micheli/Kocher method of ACL reconstruction with autogenous ITB graft is safe and reproducible in children; however in 23% of our cases we needed to augment the graft with an allograft due to inadequate ITB tissue at the distal 5cm of the graft.

Results
The average patient age was 12.2 years. All patients had open phases at the time of surgery. The average bone age as determined by hand and wrist radiography was 12.4 years. The average preoperative KT-1000 side to side difference was 5.1 mm compared to the uninjured knee. Six patients went to surgery within two months of injury while the other 7 elected for initial conservative treatment. All patients who elected to first try conservative therapy became surgical candidates within 1 year after repeated instances of instability. Six of 7 patients who underwent conservative care first had an accompanying meniscal injury with their ACL tear. However, only 2 of 6 patients who elected for surgery within two months of injury had a meniscal injury. The average tourniquet time was 90 minutes. Three patients (23%) (Male age 7, female age 13 and male age 13) had ITB grafts of insufficient width at the distal 5cm and therefore the ITB graft was tabularized over a 7 mm allograft. The average duration of follow up was 18 months. The average Lysholm score at 1 year postop was 100. 77% of patients returned to their pre-injury level of sports participation. No complications, infections, graft failure or re-injuries occurred. No change in limb length or angulation occurred.