Incidence Of Delayed Anterior Cruciate Ligament Reconstruction In Skeletally Immature Patients With Previous Anterior Tibial Spine Fractures

Justin J. Mitchell, MD
Armando F. Vidal, MD

University of Colorado Hospital Department of Orthopaedic Surgery

2015 AOSSM Annual Meeting
Orlando, Florida, July 9-12, 2015
PURPOSE

• Pediatric avulsion fractures of the anterior tibial spine are injuries similar to anterior cruciate ligament injuries in adults. Sparse data exists on the association between anterior tibial spine fractures (ATSFs) and later ligamentous laxity or injury and need for anterior cruciate ligament (ACL) reconstruction. Understanding that there is a component of intraligamentous injury to the ACL during initial ATSF, and that there is limited ability for the ACL to undergo remodeling of midsubstance fibers, it would stand to reason that this injury could cause weakness in the ACL and lead to delayed instability or injury.
PURPOSE

- This research presents a retrospective review of clinical records and examinations, operative reports, and patient reporting to characterize the incidence of delayed ACL reconstruction in cases of ATSFs in children. The purpose of this study is to better delineate the incidence of delayed instability or ACL rupture requiring delayed ACL reconstruction in pediatric patients with prior fracture of the tibial eminence.
METHODS

• We identified 101 patients between January 1993 and December 2011 who sustained an ATSF and met inclusion criteria for this study. The subjects were aged between 5 and 18 years at the time of injury and were separated by the Myers and McKeever classification into type I, II, and III fractures. All patients had at least two-year follow-up after initially injury by clinical examination and/or via telephone interview. Patients were evaluated with a questionnaire about their post injury course, and all available hospital records were reviewed to evaluate demographics and documented clinical history. If a patient underwent further surgical intervention in the form of ACL reconstruction, further clinical records and operative reports were obtained and reviewed thereafter.

The Myers and McKeever classification of tibial eminence fractures. Type I fractures are nondisplaced, type II fractures are moderately displaced with an intact posterior hinge, and type III fractures are fully displaced.
METHODS

• Differences between categorical variables were assessed using Fisher's exact test. The association between time to revision ACL surgery and surgery and fracture type was assessed by Kaplan-Meier plots. The association between need for revision ACL and age, gender and mechanism of surgery was assessed using logistic regression.
RESULTS

- Nineteen percent of all children evaluated with an prior ATSF underwent delayed ACL rupture requiring ACL reconstruction. Three patients with Myers and McKeever Type I fractures underwent ACL reconstruction (17% of this subgroup) at a mean of 51 months after initial injury. Twenty-nine percent of type II injuries (8/28) underwent delayed ACL reconstruction at an average of 18 months after initial injury. Three of these patients were initially managed non-operatively and converted to ACL reconstruction for recurrent instability. Eleven percent (3/27) type III fractures went onto later reconstruction at a mean of 78 months.
RESULTS

• While there were a higher proportion of ACL reconstructions in type II fractures, there was not a statistically significant difference in the number of patients within each fracture group who went on to later surgery (p=0.28).

• Further, there was not a significant association between fracture type, gender, nor mechanism of injury as it related to progression to later ACL reconstruction.

• However, there was a significant association between age at time of injury and progression to later ACL reconstruction surgery (p=0.01). For every year increase in age at injury the odds of going on to have revision surgery were greater by a factor of 1.34 (95% CI: 0.1, 0.52).
CONCLUSIONS

• Although ATSF is a rare injury, our cohort of patients suggests that a subset of children with all types of tibial spine fractures will require later ACL reconstruction. There is a need to counsel patients that delayed ACL rupture is a potential risk after an ATSF, especially with older children. At this time, it is unclear as to whether these delayed ACL ruptures and subjective instability events are related to the initial injury and intrinsic damage to the ACL, or caused by a secondary event that would have otherwise caused ACL rupture.
SIGNIFICANCE

• To date, this research presents the largest cohort and longest follow-up of delayed ACL failure in patients having previously sustained an anterior tibial spine fracture. These data support the need for further patient follow-up and prospective studies to better evaluate these injuries.
THANK YOU!