Is the Use of Pretreatment Magnetic Resonance Imaging Necessary Prior to Surgery in Pediatric Tibial Spine Fractures and What Is The Influence of Tibial Slope In Pediatric Patients with a Tibial Spine Fracture

Nicholas Patrick Lopreiato, Kenneth Ierardi, Michael Wilk, Shital N. Parikh[1]
[1]CCHMC Orthopaedics

INTRODUCTION:

Injuries to the tibial spine, also known as a tibial eminence fracture, occur as a result of an anterior cruciate ligament (ACL) avulsion fracture from the intercondylar eminence of the proximal tibia. Such injuries are relatively uncommon, but can occur in pre-adolescent and early adolescent children. Similar to anterior cruciate ligament ruptures, tibial spine injuries are associated with damage to other intraarticular structures such as the medial and lateral meniscus. These associated injuries are often visualized with Magnetic Resonance Imaging (MRI) obtained prior to surgery. In addition, MRI and radiographs have been utilized in pediatric ACL injuries to identify posterior tibial slope as a potential risk factor. The purpose of this study is to describe concomitant injuries visualized by a pretreatment MRI and how this correlates to what is seen at the time of surgery, how obtaining a pretreatment MRI affects time to surgery and length of surgery itself, and to characterize posterior tibial slope in patients who sustain tibial spine injuries.

METHODS: Utilizing an institutional review board approved retrospective study, we identified patients under 18 years of age at the time of surgery who underwent arthroscopic management of a tibial spine fracture from December 31st 2008 to December 31st 2021. Our exclusion criteria were patients with a concomitant ipsilateral lower extremity fracture or with a combined anterior and posterior cruciate ligament injuries, patients with poor imaging quality, and patients with incomplete medical records. Patients were then placed into two groups, those with pretreatment MRI and those without. We evaluated concomitant injuries and posterior slope for both groups, and we compared time from injury to surgery, total room time, and tourniquet time between the groups.

RESULTS:

A total of 85 patients met this inclusion criteria, of which 44 (51.7%) had a pretreatment MRI. There were no significant differences in age, gender, or Myers and McKeever grade between groups. All were treated with arthroscopic reduction and fixation. In the MRI group, there were 30 patients (68.2%) that were identified to have additional meniscal or chondral pathology. The three most common pathologies seen on MRI were lateral meniscus tears (13 patients), medial meniscus tears (6 patients), and intermeniscal ligament entrapment (6 patients). In addition, 28 patients (63.6%) were found to have a bone contusion pattern similar to that seen in ACL injuries and 17 patients (38.6%) showed signs of damage to the ACL fibers themselves. Of those 30 patients with meniscal pathology or entrapment seen on MRI, 17 patients (56.7%) were confirmed to have that pathology at the time of arthroscopy. The percentage of patients with meniscal or chondral pathology seen on arthroscopy was not significantly different between those who received a pretreatment MRI and those who did not (38.6% MRI group vs 41.5% No-MRI group p =0.79). The time from injury to surgery was significantly longer in the MRI group (19.3 days vs 10.1 days p=0.01). Both the tourniquet time (72 min vs 76 min) and operative time (83.5 min vs 90.5 min) were not significantly different(p=0.49 for tourniquet time and p=0.32 for room time).

The posterior slope on radiographs averaged 8.7 degrees, with no difference in slope when comparing patients who had a meniscal tear versus those that did not (9.6 degrees vs 8.5 degrees p=0.19). The medial and lateral compartment posterior slope was measured on MRI to be 5.0 and 3.7 degrees respectively, and this was also not significant between knees that had a meniscal tear and those that did not (medial compartment 5.4 degrees vs 4.8 degrees p = 0.69 and lateral compartment 5.0 degrees vs 3.4 degrees p =0.17).

DISCUSSION AND CONCLUSION:

Over two-thirds of patients who sustained a tibial spine fracture were noted to have concomitant pathology on MRI, with 56.7% of injuries seen on MRI correlating to what was seen at the time of surgery. The use of pretreatment MRI was shown to delay surgery without any significant change in operative time, tourniquet time, or percentage of pathology identified at time of surgery. Previous studies have suggested that a pre-treatment MRI may be helpful in identifying pathology, however we believe this is the first study to determine if obtaining a pretreatment MRI influences operative time, tourniquet time, and pathology identified at time of surgery.

This study is also the first to depict tibial slope, intrasubstance ACL injury, and bone contusion patterns seen in tibial spine injuries. There does not appear to be a statistically significant association between posterior slope and meniscal tears. Future study is needed to determine the role, if any, that tibial slope plays in tibial spine fractures as well as to determine if intraarticular pathology identified on MRI influences longer term patient outcomes.