

Obesity and Public Insurance is Associated with Increased Time to MRI and Surgery in Adolescent Athletes with Anterior Cruciate Ligament Injury

Jonathan D Gatto¹, Joseph Sliepka², Ananth Venkat Iyer, Mia S Hagen, Gregory A Schmale, Michael G Saper
¹Orthopedic Surgery, University of Washington, ²University of Washington

INTRODUCTION:

In adolescent athletes with anterior cruciate ligament (ACL) injury, ACL reconstruction is recommended to restore stability to the knee. Previous studies have shown that increased time from ACL injury to reconstruction can lead to the accrual of new injuries in the knee, specifically medial meniscus tears. These new meniscal injuries can also become less repairable with longer times between injury and surgery. In addition, increased time from magnetic resonance imaging (MRI) to ACL reconstruction decreases the predictive value of MRI as a diagnostic tool for concomitant injuries. As a result, understanding which factors influence duration from ACL injury to imaging and surgery in young patients is paramount.

METHODS:

The electronic medical records of all patients aged 10-19 years at a single children's hospital who underwent isolated primary ACL reconstruction from January 2017 to June 2020 were retrospectively reviewed. Patients were excluded if they had prior surgery to the ipsilateral knee, multiligamentous knee injury, or had incomplete MRI or operative reports. Time was documented from injury to MRI (T_{IM}), MRI to surgery (T_{MS}), and injury to surgery (T_{IS}). Demographics were recorded including age, gender, body mass index (BMI), race/ethnicity, and insurance type (public, private, or self pay). Multivariable analysis was used to determine if any demographic factor had a significant association with increased time to MRI or surgery after initial injury.

RESULTS:

A total of 196 patients (55% male) were included with a mean age of 15.5 ± 1.5 years. The median T_{IM} was 20 days, the median T_{MS} was 46 days, and the median T_{IS} was 74 days. On multivariable analysis, there were significant associations between both BMI and insurance type with timing of care while holding all other predictors constant. Patients with obese BMI had a T_{IM} that was on average 93.5 (95% CI [3.7, 183.0], $p = 0.04$) days longer than those with normal BMI, and a T_{IS} that was on average 111.0 (95% CI [17.3, 205.0], $p = 0.02$) days longer than those with normal BMI. Patients with overweight BMI had a T_{IS} that was on average 61.3 (95% CI [-4.84, 128.0], $p = 0.07$) days longer than those with normal BMI. The length of time to obtain imaging and surgery as a function of BMI is illustrated in Figure 1. Patients with public insurance had a T_{IM} that was on average 65.5 (95% CI [7.9, 123], $p = 0.03$) days longer than those with private insurance, and a T_{IS} that was on average 73.2 (95% CI [13, 133], $p = 0.02$) days longer than those with private insurance. The length of time to obtain imaging and surgery as a function of insurance type is illustrated in Figure 2.

DISCUSSION AND CONCLUSION:

This multivariable analysis of almost 200 patients from a single hospital demonstrates that adolescent athletes with ACL injuries who are obese or have public insurance experience increased time to MRI and surgical care compared to patients with normal BMI or private insurance. The causes for these delays are likely multifactorial. Further studies are needed to elucidate the causes for these delays with the goal of healthcare equity among children with ACL tears.

Figure 1. Time from Injury to Magnetic Resonance Imaging and Surgery per Body Mass Index.

Figure 2. Time from Injury to Magnetic Resonance Imaging and Surgery per Insurance Type.

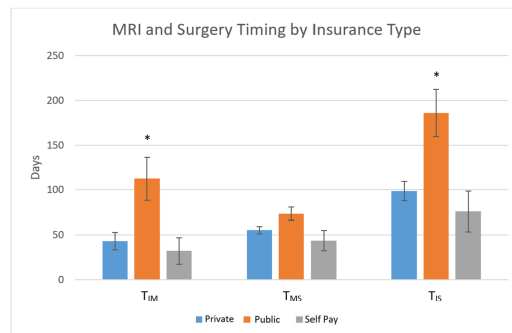
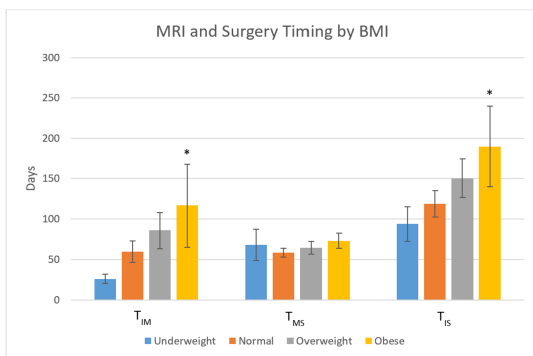


Figure 1. Time from Injury to Magnetic Resonance Imaging and Surgery per Body Mass Index. This figure illustrates the average time in days for each investigated time interval when accounting for BMI. Obese patients experienced significant delays from injury to MRI and injury to surgery. Overweight patients trended toward delays from injury to surgery. T_{IM} : time from injury to MRI, T_{MS} : time from MRI to surgery, T_{IS} : time from injury to surgery. BMI values of <18.5 are underweight, 18.5-24.9 are normal, 25-29.9 are overweight, and ≥ 30 are obese. Values are presented with the 95% confidence interval. * denotes statistical significance. $N = 196$.

Figure 2. Time from Injury to Magnetic Resonance Imaging and Surgery per Insurance Type. This figure illustrates the average time in days for each investigated time interval when accounting for insurance type. Those with public insurance experienced delays from injury to MRI and injury to surgery. T_{IM} : time from injury to MRI, T_{MS} : time from MRI to surgery, T_{IS} : time from injury to surgery. Values are presented with the 95% confidence interval. * indicates statistical significance. $N = 196$.