

# What are the Causes and Consequences of Delayed Surgery for Pediatric Tibial Spine Fractures?

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**Purpose:** The uncommon nature of tibial spine fractures may result in delayed presentation, diagnosis, and treatment. Elucidation of the contributing factors to such delays may provide an opportunity to improve patient care. The purpose of this study is to evaluate risk factors for and perioperative consequences of delayed surgical treatment of pediatric tibial spine fractures.

**Methods:** We performed a retrospective cohort study of tibial spine fractures treated surgically at 10 institutions between 2000 and 2019. Demographic and preoperative data were collected as was information regarding intra-operative management and findings. Attention was focused on delays in evaluation and treatment, which were treated as both continuous and categorical variables. Surgery  $\geq 21$  days after injury was considered “delayed.” Univariate analysis was followed by purposeful entry multivariate regression to adjust for confounding factors.

**Results:** A total of 368 subjects (mean age  $11.7 \pm 2.9$  years) were included. The median time between injury and surgery was 11 days (interquartile range 13 days). In multivariate analysis, patients that underwent delayed surgery had 2.3 times higher odds of having seen another provider before the treating surgeon (95% CI 1.1-4.8,  $p=0.02$ ) and 3.8 times higher odds of having undergone

magnetic resonance imaging (MRI; 95% CI 2.1-6.9,  $p<0.001$ ). These subjects were also 2.4 times more likely to have public insurance (95% CI 1.3-4.2,  $p=0.003$ ). Children that had a surgical delay were 3.8 times more likely to have been diagnosed with a tibial spine fracture later than one week after injury (95% CI 1.1-14.3,  $p=0.04$ ) and were 5.8 times more likely to have obtained MRI more than one week after injury (95% CI 1.6-20.8,  $p=0.007$ ). Finally, patients that underwent delayed surgery had 3.3 times higher odds of their procedure lasting greater than 2.5 hours (95% CI 1.4-7.9,  $p=0.006$ ). Surgical delay did not result in increased concomitant meniscal or chondral injuries.

**Conclusions:** Public insurance and visiting multiple providers prior to surgery led to treatment delays. Delays in initial diagnosis and MRI were also contributing factors. While a surgical delay of  $\geq 21$  days did not result in more concomitant injuries, it was predictive of longer surgical time, possibly reflecting the greater complexity of these cases. These results provide an opportunity to optimize care for children that are at highest risk for delayed treatment.

**Significance:** This is the first study to identify risk factors for and immediate consequences of delayed surgery for pediatric tibial spine fractures. These results can be used to optimize care for at-risk children.