Pediatric Jones Fractures

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Introduction

Fifth metatarsal fractures are common injuries across all age groups. Jones fractures are a specific type of 5th metatarsal injury, originally defined as a fracture ¾ inches from the base of the fifth metatarsal.[1] However, many definitions have been used in the literature, including a fracture within 1.5 cm of the 5th metatarsal tuberosity, fractures within 1.5 to 3 cm from the base of the 5th metatarsal, and any fracture just distal to the 4th and 5th intermetatarsal articulation.[2] Regardless of definition, these fractures often result from sports such as basketball or soccer after a twisting or inversion injury, leading to acute pain and swelling.[3,4]

In non-athletes, Jones fractures are typically managed non-operatively with an initial non-weightbearing period to ensure union.[5] However, past work predominantly in adult male athletes has suggested that operative management decreases non-union rates and results in a quicker return to sports.[6,7,8] Therefore, the goal of our study was to describe injury and treatment characteristics of pediatric patients with Jones fractures to provide physicians with information on management options and outcomes.

Methods

This was a retrospective case-control study of pediatric patients who were treated for a fracture of the fifth metatarsal at a high-volume tertiary care center between 1/2014 and 12/2019. Patient records were reviewed to collect basic demographic information as well as details on fracture characteristics, management, and outcomes. To separate from other fracture types, Jones fractures were defined as those occurring between 1.5 and 3 cm from the base of the fifth metatarsal. A control cohort of patients with avulsion fractures of the fifth metatarsal was matched by sex and age (within 2.5 years) to patients with Jones fractures. Analyses were performed using IBM SPSS Statistics, Version 26.0 (Armonk, NY). Descriptive statistics were reported for baseline variables, while case and control groups were compared using Chi-Squared and Fisher's exact tests for categorical variables and Independent t-tests for continuous variables using an alpha of 0.05 for all tests.

Results

Of 958 patients seen at our institution for fifth metatarsal fractures, 24 sustained a Jones fracture and 193 sustained an avulsion fracture. Twenty-three of the patients with Jones fracture (mean age 14.7 years, 43.4% female, Table 1) were then matched 1:1 to the control group of avulsion fracture patients (mean age 14.4 years, $p = 0.754$). The most common sports at the time of injury for Jones fracture patients were football (4 patients), and basketball, running, or dance (3 patients each), while most avulsion fracture patients did not specify a sport ($p > 0.05$ for all sports). There was no difference in body mass index at injury for Jones fracture patients (27.6 vs 24.2, $p = 0.072$) versus patients with avulsion fractures. Inversion injuries were the most common mechanism of injury for both groups and accounted for 33.3% and 45.8% of Jones and avulsion fractures, respectively ($p > 0.05$ for all mechanism comparisons). Two Jones fracture patients were treated operatively with cannulated screw fixation, whereas all other Jones and avulsion fractures were treated conservatively with a CAM walking boot or casting. 14 patients with Jones fractures and 7 patients with avulsion fractures had adequate follow-up imaging to assess healing and return to activity. For patients with Jones fractures, the average healing time was 14.4 weeks and return to sport took 15.8 weeks versus 11.0 weeks to union ($p = 0.140$) and 12.2 weeks to return to sport ($p = 0.061$) for avulsion patients.

Discussion

This study serves as one of the first to analyze demographics, management, and outcomes for pediatric patients with Jones fractures. Compared to patients with 5th metatarsal avulsion fractures, there were no significant differences in baseline demographics, gender, or injury mechanism. There were no differences in body mass index between groups, suggesting that heavier patients may not be at higher risk of suffering a Jones fracture. Despite non-operative management in nearly all Jones fracture cases, time to fracture union and return to sport were in line with previously reported rates.[3]

The management of Jones fractures is highly debated, particularly due to varying definitions in the literature. Previous studies

Table 1. Comparison of Patients with Jones Fractures and Avulsion Fractures

Variables	Jones Fracture (n = 23)	Avulsion Fracture (n = 23)	P-value
Age	14.7 ± 3.6 years	14.4 ± 2.8 years	0.754
Female	10 (43.4)	10 (43.4)	1.000
BMI	27.6 ± 7.4	24.2 ± 4.4	0.072
Mechanism of Injury	5 (20.8)	1 (4.3)	0.141
Contact	6 (25.0)	10 (43.5)	0.187
Fall	8 (33.3)	11 (45.8)	0.216
Inversion/Twist	2 (8.3)	0 (0)	0.369
Jumping	3 (12.5)	1 (4.3)	0.489
Other/ Unspecified			0.608
Sport			0.938
Basketball	3 (12.5)	2 (8.7)	1.000
Dance	3 (12.5)	0 (0)	0.233
Football	4 (16.7)	1 (4.3)	0.346
Running	3 (12.5)	1 (4.3)	0.608
Soccer	2 (8.3)	0 (0)	0.489
Volleyball	1 (4.2)	0 (0)	1.000
Time to Union (weeks)	14.4 ± 5.5	11.0 ± 2.8	0.140
Return to Sport (weeks)	15.8 ± 4.2	12.2 ± 4.9	0.061

have suggested that due to their watershed location, patients should be considered for surgical intervention to limit the risk of re-fracture and decreased healing resulting from poor perfusion.[9-11] Two large meta-analyses of Jones fractures in mostly high-level male athletes have favored operative over non-operative management, reporting significantly faster time to fracture union and time to full activities.[3,4] Kerkhoffs et al further found that non-operative management of 5th metatarsal avulsion fractures led to rapid time to healing (7.1 weeks) and return to sport (7.5 weeks). While the majority of studies on Jones fractures have been in adult athletes, Herrera-Soto et al studied fifth metatarsal fractures, including Jones fractures, in pediatric patients and recommended that younger patients can be treated conservatively with initial non-weight bearing followed by progressive return to activity, while older patients should be considered for surgical intervention to limit delayed healing.[12] In our study, there were no differences in healing or return to sport times between patients with Jones versus avulsion fractures, perhaps indicating that conservative management in children can be as effective in certain cases.

This study is limited due to its relatively small sample size as we adhered to the precise, technical definition of Jones fractures to only include fractures between 1.5-3 cm from the 5th metatarsal base. Future studies in pediatric patients would be aided by a consensus definition of a Jones fracture, which would allow for the inclusion of more patients to increase statistical power. Moreover, a significant proportion of our patients were lost to follow-up after conservative management, limiting our ability to understand the natural history of this fracture and optimal treatment.

Conclusions

Overall, we did not identify baseline demographic risk factors for the occurrence of a Jones fracture in the pediatric population. Further, there were no differences in healing times or return to sport when compared to patients with 5th metatarsal avulsion fractures.

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