

Lower Extremity Stress Fractures in the Pediatric Population: A Case Series and Assessment of Patient-Reported Outcomes

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BACKGROUND

- Stress injuries (stress reactions/fractures) are relatively common overuse injuries that are especially common in repetitive high impact sports (running, soccer, cheer, etc.)
- Stress injuries account for 1-20% of athletic injuries, with 80% occurring in the lower extremities and feet [1,2]
- Usually a clinical diagnosis with a history of localized pain and involvement in repetitive impact sports, as well as physical exam findings of point tenderness, swelling, and/or decreased range of motion (ROM)
- Radiographs aid in the diagnosis of stress injuries; however, sensitivity is low: about 15-35% for earlier injuries, 30-70% for later injuries; MRI is very sensitive and can be used in equivocal cases or to confirm a diagnosis [3]

PURPOSE

- There is a lack of descriptive case series of stress injuries in both athletic and non-athletic pediatric patients; therefore, this study was designed to develop further insight into aspects of diagnosis and treatment of these injuries in pediatric populations

METHODS

- Searched the charts of patients under the age of 18 at a tertiary children's hospital, including all patients with imaging (x-ray or MRI) that confirmed a stress injury; demographic data, mechanism of injury, physical exam, radiographic findings, treatment, & outcomes were collected
- Called patients to obtain lower extremity functional score
- Descriptive statistical analysis was then conducted on the data collected

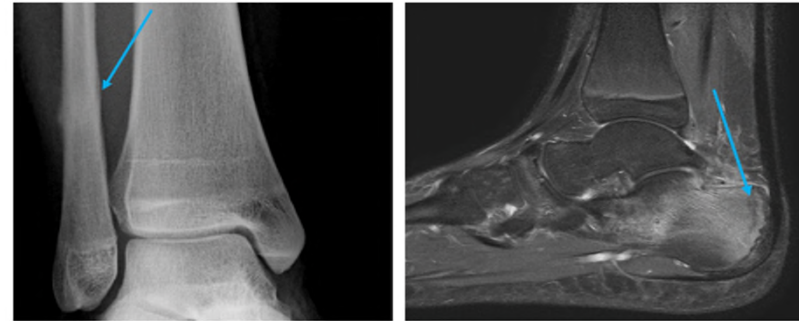


Fig. 1:
Left image – Right Ankle X-ray, AP view - Periosteal reaction with accompanying sclerosis and cortical thickening along the distal right fibular diaphysis, all common findings of stress fractures on x-ray
Right image – Left Ankle STIR MRI, sagittal view - Hypointense band of sclerosis indicative of a stress fracture; there is surrounding edema throughout much of the calcaneus as well

Table 1: Demographic Data

Location of Injury	Number of Patients	Mean Age (range)	Male/Female	Mean BMI kg/m ² (range)
All Groups	97	11.7 (1.1-18)	51/46	21.9 (13.4-44.0)
Calcaneus	8	8.3 (1.3-14.7)	5/3	21.0 (13.4-30.7)
Cuboid	24	5.5 (1.1-14.9)	14/10	17.1 (13.4-21.6)
Cuneiform	4	14.1 (9.4-17.8)	3/1	22.4 (19.1- 25.7)
Femur	10	14.2 (12.3-15.9)	7/3	22.9 (17.4-36.4)
Fibula	9	11.9 (1.8-15.8)	4/5	22.2 (16.0-29.2)
Metatarsal	28	13.6 (2.2-18)	11/17	22.4 (14.1-31.3)
Tibia	33	12.7 (1.3-17.8)	18/15	24.2 (16.1- 44.0)

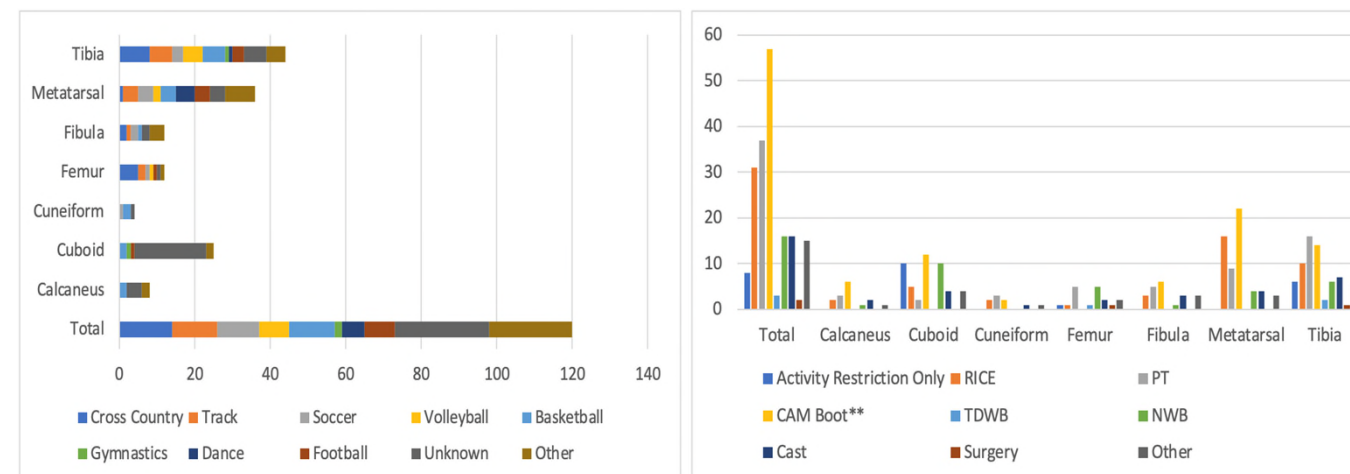


Fig. 2 and 3:
Left graph – Number of patients involved in certain athletic activities based on location of injury. Right graph – Number of patients receiving type of treatment based on location of injury

RESULTS

- A total of 97 patients were included, with an avg. age and BMI of 11.7 years and 21.9 kg/m²
- Most common athletic activities related to stress injuries were cross country (n=14, 14.4%), track, and basketball (both n=12, 12.4%), but had a large percent (n= 25, 25.8%) with an unknown origin (no involvement in sports)
- The cuboid had a large number (n=19) of those with an unknown origin, with an avg. age of 5.5 years
- MRI was used in 32% of patients which delayed diagnosis an avg. of 2.4 weeks
- Treatment was mostly conservative, with the use of CAM walker boots (n=57, 58.6%) and PT (n=37, 38.1%) for most patients. Only 2 patients (2.1%) needed surgical intervention
- Average return to activity time was 11.4 weeks, with the fibula taking the longest time (17.4 weeks) and cuboid taking the shortest time (4.5 weeks) to recover
- Avg lower extremity functional score (LEFS) was 73.8 out of 80

CONCLUSION

- The number of pediatric patients involved in high impact sports was similar to literature, however, there was a large number of younger patients with no reported involvement in athletic activities
- Waiting on an MRI can cause a delay in diagnosis which could lead to delayed treatment and prolonged activity restrictions
- Conservative management was the mainstay of treating these injuries, with the LEFS showing no clinically important difference from full functionality after treatment
- Stress injuries should be considered in the differential for lower extremity pain, even in those who may not be involved in athletic activities, as delays in diagnosis could lead to prolonged delay in return to activity times

REFERENCES

- [1] Snyder RA et al. (2006) Clinical Sports Medicine
- [2] Kahanov L et al. (2015) Open Access J Sports Med.
- [3] Marshall RA et al. (2018) Radiographics