Overuse Injuries in Youth Sports

Charles J. Gatt, Jr., MD
Chair, Department of Orthopaedic Surgery
UMDNJ Robert Wood Johnson Medical School
New Brunswick, NJ
Case #1

• 14 year old female
• 9th grade cross country runner, 6 weeks into season
• Progressively worsening left shin pain, no trauma
  – Worse after running, occasional pain with ambulation
• Tender to palpation posteromedial tibia at junction of middle and distal thirds
  – No swelling, ecchymosis
Case #1
Management?

• Stop running?
  a. Yes
  b. No
  c. Need further work up to make decision
Case #1
Management?

• How long?
  a. 1 week
  b. 2 weeks
  c. 4 weeks
  d. 6 weeks
Case #1
Management?

- X-ray?
  a. Yes
  b. No
Case #1
Management?

• MRI?
  a. Yes
  b. No
Case #2

- 17 year old female
- 12th grade cross country runner, 2 weeks prior to state championship meet
- Progressively worsening left shin pain, no trauma
  - Worse after running, occasional pain with ambulation
- Tender to palpation posteromedial tibia at junction of middle and distal thirds
  - No swelling, ecchymosis
Case #2
Management?

• Will you clear her to race?
  a. Yes
  b. No
  c. Need further workup
Overuse injury

• Result from repetitive micro-trauma to tendons, bones and joints
Overuse injuries
Are they common?
The Magnitude

- 30 million children participate in organized sports
  *(Source: Safe Kids USA)*

- Participation in high school athletics is increasing, with more than 7.3 million high school students participating annually
  *(Source: National Federation of State High School Associations)*

- Young athletes are specializing in sports (and positions) at an earlier age
  *(Source: Safe Kids USA)*

- Speed and agility training opportunities are exploding
The Problem

- More than 3.5 million children under the age of 14 treated annually for sports injuries. *(Source: Safe Kids USA)*
- Overuse injuries account for **half** of all sports injuries in middle school and high school. *(Source: Safe Kids USA)*
- High school athletics account for more than 2 million injuries annually, including
  - 500,000 doctor visits
  - 30,000 hospitalizations
  *(Source: Centers for Disease Control)*
Stress fractures - adolescent

- Avg age 8.5 yrs (2-16)
- 18 male 14 female
- Proximal tibia most common (38%)
  - Fibula
  - Metatarsals
- 50% sports related
- 7 with underlying medical conditions
- Xray diagnosis, 5 bone scans

Stress fractures - adolescent

- Avg age 14
- 10 male  9 female
- 10/21 tibia (48%)
  - 6/10 diaphysis
  - Associated with start stop sports
- 7/21 poor outcome
  - Symptoms lasted > 6 months
  - 5/7 symptoms >13 months
  - 6/7 were tibia
- Those worked up within 2 weeks had good outcome, >2wks negative outcome

Niemeyer P, Knee Surg Sport Traum Arthrosoc 2006
Growing Up Today Study
  – Prospective cohort study
  – 6831 girls aged 9-15 years

3.9% developed stress fractures

Running, cheerleading, gymnastics, basketball

Increased age at menarche, family hx of osteoporosis
Stress fractures

Eric Nussbaum

National Stress Fracture Survey

Introduction

Thank you for taking an interest in the National High School Stress Fracture Registry. This online registry was established to study the factors associated with adolescent stress injury.

Stress fractures can be troubling injuries for the athlete and athletic trainer. Though much has been written about stress fractures in the past adolescent athletic population, there is less information available regarding these injuries within the adolescent population. It is the intention of the registry to gather pertinent information related to the incidence of stress fractures in order to gain a better understanding of this injury.

In 2006/2007, a pilot study was conducted which involved 25 certified athletic trainers working in the high schools setting in the state of New Jersey. The original study that involved over 15,000 high school students determined that adolescent injuries do occur at a significant rate that is similar to or greater than the collegiate level. This online registry will extend the collection of stress fracture data on a national level by utilizing an online collection format.

Before receiving access to the site, you will be asked to read a statement of inclusion criteria and you will be asked to complete an online registration of collection site demographics. Upon completion, you will be given a private password which will allow you to log onto the site and enter data. We have attempted to make data entry as easy as possible. Each time an athlete at your school suffers a stress fracture, we ask that you log on and register the injury by completing the brief questionnaire.

If you have any questions or problems, you may contact the site administrator at nussbaumj@glass.com or admin@stressfracture.registry.net.

Thank you for your participation with this online stress fracture registry.

Eric Nussbaum, MD, ATC
Site Coordinator
nussbaumj@xel.com

www.stressfxregistry.net

Privacy Notice: Information collected from this survey will be used for educational purposes only. No information identifying student/athletes will be collected or associated with the published data.
High school athletes
75 athletic trainers contributing data.
11 different states
Online database
Quick and easy
263 stress fractures over 2.5 years
Females : Males  1.35:1
Females
– Avg age 15
– First time out for sports
– Decreasing incidence with increased age
Males
– Avg age 16
– 10/11th grade
Interesting findings

- Avg subjective pain complaint 7/10
  - Boys 6.6, girls 7.2
- Track - 65% in tibia
- Younger athletes – proximal pain
- Older athletes – distal pain
- Tibia 3 x more common than any other bone
- 19% indicated they had a prior stress fracture
Help Prevent Sports Injuries

Share sports injury information and prevention tips to help the young athletes in your own community! 

Learn more about the resources we have available.

Tip Sheets:

Browse and download sport- and issue-specific information straight
Clinical conditions
Little league shoulder

- Vague shoulder pain
- “Dead arm”
- Loss of velocity and accuracy
Little league shoulder

- Limit pitching
- Monitor for multiple teams
- Monitor mechanics
- Posterior capsular stretching
Little league shoulder

- Vague shoulder pain
- “Dead arm”
- Loss of velocity and accuracy
Elbow apophysitis

- 9th grade pitcher
- Pain with daily activities
- Unable to throw without pain
Spondylolysis

- Back pain
- Worse with extension
- Tight hamstrings
Femoral neck stress fractures

- Groin pain
- Pain with internal rotation
- Consider SCFE
Femoral shaft stress fractures

- Thigh pain
- Activity related
- Positive fulcrum test
- Activity restriction
Anterior tibial stress fractures

- Pain over anterior tibial crest
- Jumping athletes
- Pain with fulcrum test
Metatarsal stress fractures

- Forefoot pain with activity
- Pain with toe raise
- Plantar and dorsal tenderness
5th metatarsal base stress fractures

- Pain with activity
- Tenderness to palpation over base of 5th metatarsal
- Pain with toe raise
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Case #1

- **History**
  - Running hx - Increase duration and/or intensity
  - Hx of prior stress injury
  - Other sports participation
  - Menstrual history
  - Diet – calcium and vitamin D

- **Physical Exam**
  - Localized tenderness
  - One leg hop test
Case #1

- Radiographs
  - AP and lateral views of tibia
- X-rays usually negative
- Look for periosteal reaction posteromedial tibia at site of tenderness
Stress fractures

• What are they?

• They are not shin splints

1. accumulation of microcracks

1. exaggerated metabolic response
Stress fractures

- Risk factors
  - Military stress fxs associated with lower Vit D levels, low Fe
  - 2000 mg Ca  800 IU VitD versus placebo
    - 3703 female military recruits
    - 27% decrease in stress fractures

Lappe J Bone Miner Res, 2008
Stress fractures

- **Risk factors**
  - Amenorrhea/oligomenorrhea >6mos = increases stress fxs
  - Exercise alone does not cause amenorrhea
  - 5d of inadequate calories
    - Increased resorption markers
    - Decreased formation markers

Loucks, *J Clin Endocrinol Metab*, 2003
Case #1

- MRI
  - Grade 3 stress reaction
Stress fractures

- MRI Grading

Grade I
Grade II
Grade III
Grade IV

- Predict severity or duration?
Correlation of MRI Grading of Bone Stress Injuries With Clinical Risk Factors and Return to Play

A 5-Year Prospective Study in Collegiate Track and Field Athletes

Aurelia Nattiv, MD, Gannon Kennedy, MD, Michelle T. Barrack, PhD, RD, Ashraf Abdelkerim, MD, MBA, Marci A. Goolsby, MD, Julie C. Arends, and Leanne L. Seeger

Investigation performed at the University of California, Los Angeles, Los Angeles, California

The American Journal of Sports Medicine, Vol. 41, No. 8

![Graph showing the time to full return to sport (weeks) for MRI Grades 1-2 and 3-4 with error bars]

- MRI Grade 1 & 2: 13.1 ± 2.0 weeks
- MRI Grade 3 & 4: 23.6 ± 2.4 weeks
Validation of shin pain scoring system

*Nussbaum, Gatt, Bechler, Hosea, Swan*

- IRB approved protocol
- Calculate shin pain score based on history and PE
- Correlate with x-ray and MRI findings

- Potential benefit
  - Decreased use of radiographic studies
  - Aid in return to play decisions
# Shin Pain Questionnaire and Evaluation

**ID:**

**Grade:**

**Age:**

**Sport(s):**

**Position:**

**Events:**

**Medical Conditions:**

- **Height:**
- **Weight:**
- **BMI:**
- **Abnormal BMI (High/Low):** 1 pt

Please check all that apply:

1. **In the last 6 months you are participating in this sporting activity?** 2 pt
2. **Do you participate in more than one sport season?** 2 pt
3. **Sports Activities:**
   - **Basketball**
   - **Soccer**
   - **Tennis**
   - **Running**
   - **Swimming**
   - **Other**
4. **Have you ever had a knee injury?** 2 pt
5. **Do you suffer frequent athletic injuries?** (Hernias)?
6. **Are you participation limited?**
7. **Absence of, or angular reconstruction**
8. **Have you been diagnosed with a stress fracture?** 2 pt

1. When do you have shin pain?
   - **Early during running or sports activities:** 1 pt
   - **During running, sports activities & afterwards:** 2 pt
   - **Pain during sports, while walking around and after:** 3 pt

2. How long have you had shin pain?
   - **Less than 1 week:** 1 pt
   - **1-3 weeks:** 2 pt
   - **3 weeks or longer:** 3 pt

3. Rate your worst pain during activity on a scale 1-10:
   - **1-3:** 1 pt
   - **4-6:** 2 pt
   - **7-10:** 3 pt

4. Are you sleeping at any time?
   - **No, Not at times:** 0 pt
   - **Only at night or practices:** 1 pt
   - **Yes, only when running or doing sports:** 2 pt
   - **Yes, when running and when walking:** 3 pt

## Shin Pain Evaluation:

**Palpation:**
- **Palpation over tender area:**
- **Palpation over fibula:**
- **Localized pain over bone:**

**Motion:**
- **Loaded Distraction:**
- **Right:**
- **Left:**

**Stress Tests:**
- **Palpate Tibialis Test:**
- **Palpate Tap Test:**
- **Palpate Bursitis test (tibial, US):**

**Single leg hop test:**
- **Pain with hopping (7+ 10-35 cm, 2-5: 2, 0-7, 0-1 point):**
- **Decreased landing time:**
- **Decreased jump height:**

**Total Page 1:** (27)

**Total Page 2:** (34)

**MD Initials:**

**Exam:**

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**Scoring Results:**

**Score >35** — Highly suggestive of Bony Stress injury.

**Test Explanations:**

- **Fulcrum Test:** Using heel of hand, apply force perpendicular to leg while grasping midline and moving opposite to applied force.
  (pt. overlying test for knee, only done on lower leg)
  A positive test produces pain.

- **Tap Test:** Using two fingers, the examiner taps down the entire length of the tibia fibula.
  A positive test increased pain on bone.

- **Single Leg Hop Test:**
  - Patient is asked to hop on one leg x 10.
  - Examiner notes difficulty completing task, notes increased landing time, and decreased jump height when comparing to unaffected side.
  - If both legs are affected, then examiner assesses jump height ability/landing time based on expected norms.

- **Tibialis Stress Test:**
  - Patient faces wall and places feet on ruler.
  - They are asked to **dorsiflex** their ankle until their knee touches the wall, keeping their heel on the ground.
  - They progressively move their foot away from the wall.
  - Until their knee can not hit the wall without their heel raising from the ground.
  - Measure the distance from the front of the big toe to the wall.
  - If there is a difference in distance between the injured leg and the non-injured leg, then it should be scored as one point on the scoring sheet.
Stress fractures

**Treatment**

- Xray negative - activity modification
- Xray neg + MR pos, < GrIV - activity modification
  - Pool running, non-impact aerobic training
  - Competition only
  - Symptoms MUST NOT WORSEN
  - COMMUNICATION
- Xray positive or Grade IV MRI
  - Rest, potential protected weight bearing, immobilization
Stress fractures

- **Treatment**
  - Pulsed ultrasound, pulsed EM, calcitonin
  - No good data to support use

- Rue, et al 2007
  - 43 tibial stress fx
  - Randomized, blinded pulsed US vs placebo
  - No difference in symptom relief, return to play

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Stress fractures

- Prevention
  - Dietary
  - Preseason training
  - Develop new training regimens
  - Identify athletes at risk
  - Communication
  - Early diagnosis
Thank you