Common Musculoskeletal Injuries

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Objectives

• List the differences between pediatric and adult bony injuries.
• Discuss the assessment of common injuries seen in children’s playground injuries.

Skeletal Survey

• There are differences between pediatric and adult bones. Which statement is correct regarding pediatric bones and fractures?
Skeletal Survey

A. Pediatric bones are harder and fracture easier

B. Children's bones have a thicker lining around the bones (periosteum) that causes minimally displaced fractures

C. Pediatric fractures always involve the growth plate with resultant limb deformity

D. All of the above
Skeletal Anatomy Differences

- More porous

- More elastic
  - Permit > degree deformation
  - So deform but no fracture

Plastic deformation

Skeletal Anatomy Differences

- More porous

- More plastic
  - Bone buckle but do not fracture
  - Torus fracture or Buckle fracture
Torus Fracture

Bone Structure Differences
- Displacement less likely
  - Fracture of cortices
  - Greenstick fracture
Greenstick fracture

Bone Structure Differences

- Periosteal sleeve thicker in children
  - Tubular bone reforms within sleeve
  - Child’s bone innate ability to heal itself

4 year old pushed from the slide
One week later

Four weeks later

Six Months later
Epiphyseal Injuries

How to describe a fracture patient

1. Age
2. Mechanism
3. Date/time of injury
4. Bone involved
5. Location within bone
   - diaphyseal
   - metaphyseal
   - epiphyseal
How to describe a fracture patient

6. Pattern of fracture
   - transverse
   - oblique
   - spiral
   - comminuted

How to describe a fracture patient

7. Physeal involvement (±)
8. Articular involvement (±)
9. Soft tissue/skin:
   - open versus closed
   - swelling
   - neurovascular examination

Fracture not Sprain

Ligaments and tendons

> immature bones.
Skeletal Survey

- Which fracture pattern is seen in both children and adults?
  
  A. Angulated  
  B. Greenstick  
  C. Buckle  
  D. Growth plate

Playground Equipment Injuries

- >200,000 injuries each year treated in ER  
- 70% were 5-12 yoa peak at 6 1/2 years  
- Fall leading MOI >75%  
- Fracture most common injury >35%  
- Upper extremity injured in nearly 90%  
- 1/3 were at school

Associated Problems

- Muscle contracture  
- Contusions of the soft tissue  
- Bleeding  
- Pain  
- Swelling
Playground Injuries

• Stable or unstable
• Emergent, urgent or routine care
• Circulation intact or impaired
• Nerve Changes

Boney Bon Bon

• Angulated and open fractures are always emergencies--call an ambulance for these.

Skeletal Survey

• Jumping off the merry go round resulted in a painful wrist injury for 7 year-old Jessica. The school nurse carefully checked pulses, temperature, capillary refill and sensation in both Jessica’s hands with no noticeable difference. However, the range of motion was limited by pain. Which is correct?
Skeletal Survey

A. There is probably not a fracture.
B. Jessica should see a doctor, but it is not an emergency.
C. You should call an ambulance.
D. Give it some time, the pain may go away.

Injuries from a fall on outstretched hand

- Dislocated proximal interphalangeal joint—2nd
- Buckle fracture of radius
- Fractured radius and ulna—most common
- Supracondylar fracture
- Epiphyseal fracture
- Fractured clavicle

How many P’s?

- Six P’s” including pain, pressure, paralysis, paresthesia, pallor, and pulselessness”
- P-Poikilothermia, or cool extremities or
- P-Polar
- P-Point of tenderness
  - [Harvey, 2006] as found in Ignativicius & Workman (2010), Medical-Surgical Nursing Patient-Centered Collaborative Care (6th ed), p. 1181.
Skeletal Surveys

A 13 year-old on the wrestling team has injured his elbow while you happen to be present. His team mates tell the Grant to "work it out, move it around..." Which is correct?

A. You should never move an injury.
B. His buddy’s are correct.
C. An injured elbow is always an emergency.
D. The injury should be assessed prior to testing range of motion.

Skeletal Surveys

Wrist and Ankles

- Assess function distal to injury site
  - Is it warm
  - Is there a pulse
  - Is the capillary refill < 3 seconds
  - Is there any numbness or tingling

If any of these are impaired (vascular or neuro) it is an orthopedic emergency.
Boney Bon Bon’s

• Compare if you dare!

Skeletal Survey

• One of the teachers injured her ankle when her foot slipped off the edge of the sidewalk in front of the school. The toes distal to the injury are cool to the touch, and the pedal pulse distal to the injury seems diminished. Which is correct?

Skeletal Survey

A. The injury to the ankle has caused circulatory impairment and requires emergency treatment.
B. She should try bearing weight on the foot.
C. You better check the other foot; maybe she has cold feet and normal pedal pulses that are hard to find.
D. Pedal pulse and temperature are not useful assessments.
On the playground...

- Do the scene size up
  - Is it a safe place to be?
- Start with the ABC’s
  - Are they responsive- Are you OK?
  - Do they have a heart beat?
    - If layers, check inside cuffs
  - Are they breathing?

Skeletal survey

When you respond to the scene of an injury under the climbing bars, you are shocked by a crying child who has a gruesome open fracture of the lower leg.

Skeletal survey

In the items listed, which is the top priority?
A. Stop the bleeding.
B. Stabilize the fracture.
C. Count the respiratory rate.
D. Stabilize cervical spine.
Boney Bon Bons

- You should also mobilize additional resources in this setting by calling 911, and then go on to the “C, A, B’s” and treat the bleeding.

Sprain, Strain or Fracture?

Stable versus unstable?

Skeletal Survey

You have checked the capillary refill, pulses, temperature and sensation distal to a musculoskeletal injury with no significant results. However, range of motion is not possible due to extreme pain.
Skeletal Survey

After splinting, you decide to call the parent to arrange transport to urgent care. Which would be the best way to describe the injury to the parent?

A. "The injury is probably either a fracture or a bad sprain."
B. "I have no idea how bad the injury is because I don't have x-ray equipment."
C. "The injury is very unstable."
D. "The injury is minor because circulation and sensation are normal."

After the injury

- Do the 5-6-7-8 p's first
- Apply splint to support
- Repeat the 5-6-7-8 p's
Splinting

- Correct splinting of an injury involves immobilizing the joint above and below the site of an injury.
- In case of a joint injury, then the bone above and below the joint must be immobilized.

Splinting

- Self-splinting
- When selecting a splint, think about the three "C"s: Comfort, Conform and Compact.

Sling
Skeletal Survey

• A school nurse finds that he often tries to guess the severity of stable wrist injuries when choosing treatment and transport options. Which of the following might be a better approach?

Skeletal Survey

A. Stable wrist injuries can be treated with a sling and swathe and observed throughout the day so parents can be advised of their options.
B. No guesswork: send all injured wrists to the emergency department for X-ray.
C. No guesswork: let the parent decide what to do without your advice.
D. Some guesswork; it is just part of our liability.

Skeletal Survey

• Six year old Luke, has an injury to his right wrist caused by a fall. Pulse, capillary refill, and sensation are normal but pain limits his range of motion. He lets you cradle the injury with your hands and place it on a pillow, but is afraid of the splints. Which is correct?
Skeletal Survey

A. The boy must be forced to accept the splint for his own good.
B. Hands on stabilization is completely acceptable while you build rapport and trust with the child.
C. You should call an ambulance.
D. This is probably not a fracture so Luke may go to class with a sling.

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Skeletal Survey

• Small children are often quite frightened by the idea of a splint, but placing the injured limb on a soft pillow is something they are more willing to do. How can you apply this information the next time a small child has an unstable injury?

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Skeletal Survey

A. A pillow is comfortable but it is a poor splint.
C. The pillow can be gently wrapped around the injury and secured for an effective splint.
D. The pillow may be comfortable, but a proper rigid splint will have to be applied soon.
E. Comfort is not important; what is important is that a hard, rigid splint preserves the function best.
Splinting Ankles and Legs

- If unable to bear weight, probably unstable
- Sock and shoe off to check NV
- Manual traction femur fracture

Skeletal Survey

- You respond to football practice where a player is in extreme pain following a hit. He can not move his toes due to sharp pain in the middle thigh. Capillary refill, pulses and sensation are normal in the same foot (no numbness or tingling). Which is correct?

Skeletal Survey

A. You should call an ambulance.
B. There is no neurovascular impairment so this is not an emergency.
C. It would be okay if he tries to "walk off" the pain with assistance.
D. He should not walk, but may ride to urgent care in the back seat of a car with his leg extended and positioned as tolerated.
My _______ hurts.

- **W** -- Words to describe Pain
- **I** -- Intensity (0-10) of Pain
- **L** -- Location(s) of Pain
- **D** -- Duration of Pain
  - Does it hurt all the time, when did it start?
- **A** -- Aggravating/Alleviating Factors
  - What makes the pain better?
  - What makes the pain worse?

Overuse Disorders

- Osgood-Schlatter
- Patellofemoral pain syndrome
- Stress Fractures
- Varus Overload of the elbow
  - Little league elbow
- Proximal humeral epiphysiolyis
  - Little league shoulder

**Characteristics of Benign Conditions**

- Pain relieved by rest and worsened by activity
- Pain at the end of the day
- Nocturnal pain relieved by simple analgesics and massage of painful areas
- No objective joint swelling
<table>
<thead>
<tr>
<th>Characteristics of Benign Conditions</th>
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<tbody>
<tr>
<td>• Hypermobile joints</td>
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<tr>
<td>• No bony tenderness</td>
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<tr>
<td>• Normal strength</td>
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<tr>
<td>• Normal growth pattern</td>
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<td>• No constitutional symptoms</td>
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<th>Characteristics of Serious Conditions</th>
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<tbody>
<tr>
<td>• Pain or stiffness in the morning</td>
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<tr>
<td>• Pain relieved by activity and present at rest</td>
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<tr>
<td>• Nocturnal pain not relieved by simple analgesics</td>
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<tr>
<td>• Stiff joints</td>
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<td>• Bony tenderness</td>
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<th>Characteristics of Serious Conditions</th>
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<tr>
<td>• Muscle weakness</td>
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<tr>
<td>• Poor growth, weight loss</td>
</tr>
<tr>
<td>• Fevers, malaise</td>
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<tr>
<td>• Child limits activities</td>
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Signs of Abuse

• Femur Fractures
• Humeral shaft fractures
• Scapular fractures
• Rib fractures especially posterior

Signs of Abuse

• Bruises, swelling, scars, welts, burns over any part of the body
• Incompatibility between the history and the injury is probably the most important criteria on which to base the decision to report

The STOP Program

A comprehensive public outreach program developed by the American Orthopaedic Society for Sports Medicine (A OSSM)

Focus:
• Importance of sports safety (especially overuse and trauma injuries)
• Injury reduction
• Highlighting how playing safe and without overuse can:
  – Further a young athlete's career;
  – Improve teamwork;
  – Increase fitness;
  – Reduce obesity, and
  – Create lifelong love of exercise/healthy activity

Goal:
• Keep young athletes out of the operating room and on the playing field
Why The Need for This Program?

Tremendous rise in the number of youth participating in sports

Epidemic rise in number of injuries associated with
- Sports specialization
- Year-round sports overuse and increased trauma
- Parental and social pressure

Youth Sports Statistics

30-45 million youth athletes in the United States[^1]

High school athletes account for approximately 2 million injuries/year[^2]
- 500,000 doctor visits/year
- 30,000 hospitalizations/year

According to “Safe Kids USA”[^3]
- 3.5 million children ages 14 and under receive medical treatment for sports injuries each year
- 30% of parents reported their child had been injured in team sports
- 50% said they had been injured more than once


Contact Sports?

- Down Syndrome
  - atlanto-axial (cervical) instability
  - Appears in up to 30% of children with Down
- Rheumatoid Arthritis
  - increased incidence of cervical (neck) instability
- Upper cervical anomalies
Obesity

• Growth plates deformed or damaged by excess body weight
• Obesity in kids 6-11
  – ↑ from 6.5% to 19.9%
• Obesity in kids 12-19
  – ↑ from 5% to 18.3%

Obesity

• Are you a good role model?
  – Start a lunch bunch walk
  – Make sure healthy options available for meals
  – Multivitamin/Vitamin D grant
  • Do you drink milk or water at school?

Boney Bon Bons

• If they won’t crawl or walk on it, it is probably fractured!
• However, just because they will crawl or walk on it, doesn’t rule out a fracture
• Somebody has to remain calm, you are the nurse—you are elected!
Soccer broken leg

Review

• Fractures common-upper>lower
• Bow rather than break
• Greater ability to heal/remodel
• Growth plate fractures concerning
• Fracture > sprain
• Child abuse happens in any socioeconomic group
• Be a role model

Open Fractures

• ? Not an emergency any more?
Ultrasound
• interruptions of cortical line which indicates fracture of epiphysis
• secondary signs of fractures like periosteal reaction and hematoma

Do not touch!
• There is no need for everyone to poke the sore spot!
• Have child point to the place where it hurts and wiggle finger or toes
• Can you give Tylenol or Motrin with a small sip of H2O?

References
• Centers for Disease Control and Prevention (CDC) Report, 2008
References