OMT in the child with growing pains

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Objectives

Lecture:

* Discuss the epidemiology of pediatric growing pains and recent research
* Define diagnostic criteria for Growing Pain
* Review bone architecture and development
* Consider the bio-tensegrity model as applied to the boney architecture

Lab:

* Identify healthy from dysfunctional bone with palpation
* Apply the Fulford percussion hammer in the treatment of children with growing pain –”DRY BONES”
In every case of Disease there was an Abnormality in the Bony structure
To know All of a Bone in it’s Entirety would close both ends of an Eternity
Growing Pains
Epidemiology

* Most common cause of recurrent childhood musculoskeletal pain
* 3-37% of children ages 3 – 12 years
* 32% of children ages 4 – 6 years
* Associated with:
  * Increased prevalence of other pain syndromes
  * abdominal pain; headaches
  * 5% of children with GP are heavier
  * Overuse syndrome
# Diagnostic Criteria

<table>
<thead>
<tr>
<th>Nature of Pain</th>
<th>Inclusion</th>
<th>Exclusions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermittent, some pain-free days</td>
<td>Persistent; increasing in intensity</td>
<td></td>
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<tr>
<td>Nights</td>
<td></td>
<td></td>
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<tr>
<td>Unilateral or Bilateral</td>
<td>Bilateral</td>
<td>Unilateral</td>
</tr>
<tr>
<td>Location</td>
<td>Anterior thigh, calf, posterior knee, in muscles</td>
<td>Joint pain</td>
</tr>
<tr>
<td>Onset of pain</td>
<td>Later afternoon or evening</td>
<td>Pain still present next morning</td>
</tr>
<tr>
<td>Physical Examination</td>
<td>Normal</td>
<td>Swelling, erythema, tenderness, localized trauma, infection, reduced joint ROM, limping</td>
</tr>
<tr>
<td>Tests</td>
<td>Normal</td>
<td>Elevated ESR, X-Rays, Bone Scan</td>
</tr>
</tbody>
</table>
# Growing Pains: Etiology-Theory-Development

(From A. Evans Review Article in 2008)

<table>
<thead>
<tr>
<th>Date</th>
<th>First Author</th>
<th>Sample size</th>
<th>Research design</th>
<th>Findings</th>
<th>New Theory</th>
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</thead>
<tbody>
<tr>
<td>2004</td>
<td>Hashkes, PJ</td>
<td>GP = 44, No GP = 46</td>
<td>Case Control Dolorimeter (pressure)</td>
<td>GP group had lower pain threshold</td>
<td>GP may be a variant of non-inflammatory pain syndrome</td>
</tr>
<tr>
<td>2005</td>
<td>Friedland, O</td>
<td>GP = 39, No GP = 38</td>
<td>Case control; US bone speed of tibia and radius</td>
<td>GP group had reduced tibial bone speed</td>
<td>GP may represent a local overuse syndrome</td>
</tr>
<tr>
<td>2005</td>
<td>Hashkes, PJ</td>
<td>GP = 11, No GP = 12</td>
<td>Case Control Bone Scintigraphy, tibia</td>
<td>GP group did not have altered vascular perfusion</td>
<td>GP is not assoc with altered vascular perfusion</td>
</tr>
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# Research since 2008...

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<tr>
<td>2010</td>
<td>Uziel, Y</td>
<td>GP = 44</td>
<td>5-year follow-up Outcome Trial</td>
<td>GP has a benign prognosis; GP patients did not exhibit other pain syndromes at 5 years</td>
<td>Probably represents a pain amplification syndrome of early childhood</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No GP = 38</td>
<td></td>
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**Findings**

- GP has a benign prognosis.
- GP patients did not exhibit other pain syndromes at 5 years.

**New Theory**

- Probably represents a pain amplification syndrome of early childhood.
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<tr>
<td>2011</td>
<td>Pathirana, S</td>
<td>GP = 33 No GP = 29</td>
<td>Somatosensory Testing</td>
<td>No evidence GP is peripheral neuropathic pain syndrome</td>
<td>A regional pain syndrome; Mild widespread disorder of somatosensory processing</td>
</tr>
<tr>
<td>2012</td>
<td>Pathirana, S</td>
<td>Survey – 1843 twin pairs GP = 88 (at least one twin)</td>
<td>Twin Family Survey Design</td>
<td>85% MZ = GP 36% DZ = GP 47% parents had GP 23% = twin with GP had RLS, while only 8% = twin w/o GP had RLS</td>
<td>• Genetic susceptibility • Genetic relationship with Restless Leg Syndrome (RLS)</td>
</tr>
</tbody>
</table>
So, current hypotheses... after 190 since first described in 1823....

* Continues to be a puzzle
* Literature – plentiful, anecdotal

* Main theories:
  * Anatomical
    * postural, scoliosis, genu valgum, pes planus
  * Fatigue (overuse syndrome)
  * Psychological (pain amplification)
  * Non-inflammatory, regional pain syndrome or disorder of the somatosensory system
  * Genetic component
**Osteoblasts**

* Derived from unspecialized mesenchymal cells
* Basophilic, mononuclear, cuboidal in shape
* Synthesizes and secretes collagen fibers and other organic components
* Build the extracellular matrix of bone tissue; become trapped in their own secretions and become
Osteoblasts becoming Osteocytes embedded in bony matrix

- **Osteocytes**
  - Ellipsoid cell bond, few organelles, are mononuclear
  - Maintain the metabolism
    * Exchange of nutrients and waste with the blood = RESPIRATION!!
  - Possess fine, dendritic processes which project into the matrix
    * gap junctions and communication
Osteoclasts

* Large cells
* 15-20 nuclei
* Derived from fusion of monocytes within bone marrow
* Lie in close contact with bone surface in Howship’s Lacunae
* Function –
  * local removal of bone during resorption via secretion of lysosomes and acids and digests protein and mineral components; VERY ACTIVE PROCESS!!
Coordinated effort of

* **Osteoclasts**
  * Secrete acids and enzymes that secrete the hard bone matrix by tunneling into the bone, creating channels that allow in capillaries and osteoblasts

* **Osteoblasts**
  * Fill the channels with concentric deposits of new bone matrix

* **5-10% of all your bone is dissolved and replaced each year**
* Regulates serum levels of calcium

Video: [http://www.youtube.com/watch?feature=player_detailpage&v=78RBpWSOlo8](http://www.youtube.com/watch?feature=player_detailpage&v=78RBpWSOlo8)

(Video developed by Amgen)
Gross Bony Architecture

Compact Bone
- Dense and strong

Osteons
- Haversian system
  - concentric lamellae with embedded osteocytes
  - Hard Bone, Tightly packed units
  - Surround a central canal thru which a microscopic neurovascular bundle runs
- Separated by a “cement line” (periosteum)
- Endosteum (developed from periosteum) lines the Haversian canal

FOM III p 98
Development of Periosteum/Endosteum

* Periosteum:
  * Nociceptive nerves
  * Provides nourishment to the osteum through the blood supply
  * Attached to bone by strong Sharpey’s fibers (outer and lamellar layers)
  * Acts as the attachments sites for muscles and tendons

* http://www.youtube.com/watch?v=X6E5Rz9tOKE&list=PLRrCFhmVYxNkMN675bc5H17WjN3YizLwt&feature=player_detailpage
Growing Pains Treatment
Only one study

  * GP = 18
  * No GP = 16
  * Children with growing pains who underwent a stretching treatment regimen (Quad, Hams, Gastrocs) showed a more rapid resolution of symptoms over 18 months
Consider the Numerous Biological Waveforms

- Cardiovascular flow
- Lymphatic flow
- Expansion and Recoil of alveoli
- Axoplasmotic flow of nerve conduction
- Cerebral Spinal Fluid fluxuations
- Inherent motility of the cranial system
- BONY REMODELING fluctuations
- And more....
Addressing the Strain via the biological waveforms

- Waves are encoders and carriers of information
- Two waves are
  - “In Phase”
    - When they overlap with peaks and troughs that are the same
    - “Constructive interference”
    - Can enhance the waves
  - “Out of Phase”
    - One wave peaks while the other troughs
    - “Destructive interference”
    - Can dampen down the waves
    - Can negate the strain pattern
Foredom Percussion Massager

First adapted for OMT in WWII by Robert Fulford, DO (1905-1997)

Used the hammer to release restrictions in hard and soft tissue; normalizing potency and fluid fluctuations

Used percussor to:
  * Resonate with strains
  * Counteract strains
  * Nullify the strain
Hands-on Lab

* Patient Evaluation
  * Cranial Rhythm from the lower extremities
    * Boney health
    * Periosteum
    * Fascial Strains
  * Compare above and below the knee on each side
    * Ankle, Knee, Hip, Pelvis
  * Identify SI dysfunctions

* Treatment
  * BLT
    * Fibula
    * Tibia
    * Knee Joint
  * Apply the percussor to the lower extremities
    * Ankle
    * Knee
    * Pelvis
    * Thorax
Osteopathic Assessment

- Either lay your hands on top of the ankles OR
- Lift the ankle
  - Be careful not to inhibit the lower extremity cranial rhythm
- Check for rate and amplitude of internal and external rotation in the cranial field of the extremities
- GP children have poor amplitude and decreased rate
- GP children have tibias that feel like “dry dust”
Unilateral LE Assessment

- Determine if there is a strain above or below the knee
  - Femur or hip strain (above the knee)
  - Knee or ankle strain (below the knee)
- Is one side more misaligned than the other?

AP Compression Test:
- Move up into the pelvis and
- Rule out related IS or SI
- Restrictions to be treated
Fibula BLT
Tibia Assessment and BLT
Treatment of GP with “Fulford” Percussor
References

- Hankinson, D. The Message in the Bones; AAO Convocation March 2012 Lecture Presentation
- Primal Anatomy 3D images via NSU HPD Library Resources