Joint involvement in orthopedic diseases

PReS Latin America
Basic Pediatric Rheumatology Course 2015
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Prevalence of musculoskeletal pain in children

Population-based studies

11.5% (Netherlands) *Pediatrics* 2006; 117:412-416.
>30% (Germany) *Pediatrics* 2005; 115:152-162.
22% (Argentina) *Arch.argent.pediatr* 2001; 99:105-110.

Health primary care:

6.1% (number of visits, Spain) *Arch Dis Child* 2004; 89 (5):431-434.
Relative prevalence of pain in children and adolescents

Pedro is 3 years old, yesterday he woke up with a limp, he refused to bear weight on his right leg. He had low grade fever and a cold a few days ago.

Nicolás is 13 years old, since 2 months ago, he complains of pain in both knees, mainly in the left, when he runs and jumps.

Juan is 12 years old, recently he has suffered a fracture in his right arm. He is being having pain in his back, hips and feet since last year. He does not practice any sports, he prefers quiet activities.

Julia is 11 years old, last year she began complaining of pain in her knees. The pain is worse at the end of the day, mainly when she comes back from gymnastics class.
What condition Pedro has?

He is 3 years old, yesterday he woke up with a limp, he refused to bear weight on his right leg. He had low grade fever and a cold a few days ago.

He did not look ill, but he referred pain in his groin and knee. The child looked comfortable when the right hip was on flexion, abduction and external rotation. Assessing range of motion: pain with flexion and internal rotation.

An ultrasound revealed small effusion in his right hip. He became well after 4 days of rest and ibuprofen.

Transient synovitis of the hip
Transient synovitis of the hip

- More prevalent in boys aged 3-8 years (2:1)
- Increased chance of relapse
- Bilateral involvement (1-4%)
- Etiology: viral infection
- Ultrasound:
  - hip effusion in a child: 5mm between femoral neck and outer capsule
  - pathologic effusion: 2 mm> compared with the asymptomatic hip

**Transient synovitis of the hip: differential diagnosis**

<table>
<thead>
<tr>
<th></th>
<th>Transient Synovitis</th>
<th>Septic Hip</th>
<th>Legg-Calvé-Perthes Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Trauma</strong></td>
<td>Mild at beginning of symptoms</td>
<td>Mild at beginning of symptoms</td>
<td>Less likely. May be some distance from onset of symptoms</td>
</tr>
<tr>
<td><strong>Onset</strong></td>
<td>Several days (3–5)</td>
<td>Several days (3–5)</td>
<td>Weeks/months/ intermittent</td>
</tr>
<tr>
<td><strong>Fever</strong></td>
<td>No. Sometimes low grade &lt;38</td>
<td>Yes &gt;38.5</td>
<td>No</td>
</tr>
<tr>
<td><strong>Appears ill</strong></td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td><strong>Gait</strong></td>
<td>Limp (sometimes not weight bearing)</td>
<td>Not weight bearing</td>
<td>Limp to normal gait</td>
</tr>
<tr>
<td><strong>Pain</strong></td>
<td>Mild to severe</td>
<td>Moderate to severe</td>
<td>Mild to moderate</td>
</tr>
<tr>
<td><strong>Range of motion</strong></td>
<td>Pain at the end of motion arc</td>
<td>Severe pain throughout motion arc</td>
<td>Guarding, with pain on flexion and internal rotation</td>
</tr>
</tbody>
</table>

*Cook PC. Pediatric Clin N Am 2014; 61:1109-1118*
Nicolás is 13 years old, since 2 months ago, he complains of pain in both knees, mainly in the left, when he runs and jumps. He is a soccer player and he is very concerned because the pain gets worse every time he plays.

Findings on physical exam of the left knee: mild swelling and prominence over the tibial tubercle, and moderate tenderness.

X-ray of both knees: fragmentation of the tibial tubercle of the left knee.

Osgood-Schlatter osteochondrosis
Most common causes of pain in growing bones

Etiology? vascular abnormalities, repetitive trauma, and overuse of the growth plate and surrounding ossification centers

Boys>girls

Osteochondrosis ≠ osteochondritis dissecans (inflammatory)

Areas:
Hip: Legg-Calvé-Perthes (femoral head epiphysis)

Knee: Osgood-Schlatter (tibial tubercle apophysis), Sinding-Larsen-Johansson (inferior pole of patella)

Foot: Sever (calcaneal apophysis), Freiberg (metatarsal head), Köhler (navicular bone)

Elbow: medial epicondyle apophysitis and Panner disease (humeral capitellum)

Back: Scheuermann disease (anterior vertebral end plates)
Soccer-related overuse injuries


- Localization: lower parts of the body (knees, ankles, heels and feet), in mechanically weak points
- In adults: tendons, muscles, and ligaments
- In children and adolescents: osteochondral region

<table>
<thead>
<tr>
<th>Table 2. Result of Physical Examination</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Positive Findings (+)</td>
</tr>
<tr>
<td>Lumbar</td>
</tr>
<tr>
<td>Hip</td>
</tr>
<tr>
<td>Knee</td>
</tr>
<tr>
<td>Lower leg</td>
</tr>
<tr>
<td>Ankle</td>
</tr>
<tr>
<td>Foot</td>
</tr>
<tr>
<td>Heel</td>
</tr>
<tr>
<td>Other</td>
</tr>
<tr>
<td>Positive Findings (-)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3. Results of Radiographic and/or Ultrasonic Examination</th>
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<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Sever’s disease</td>
</tr>
<tr>
<td>Osgood-Schlatter disease</td>
</tr>
<tr>
<td>Bipartite patella</td>
</tr>
<tr>
<td>Sinding-Larsen-Johansson disease</td>
</tr>
<tr>
<td>Spondylolysis</td>
</tr>
<tr>
<td>Symptomatic accessory navicular</td>
</tr>
<tr>
<td>Van-Neck disease</td>
</tr>
<tr>
<td>Osteochondritis dissecans of distal femur</td>
</tr>
<tr>
<td>Arthritis of knee</td>
</tr>
<tr>
<td>Achilles tendinitis</td>
</tr>
<tr>
<td>Arthritis of ankle</td>
</tr>
<tr>
<td>Jumper’s knee</td>
</tr>
<tr>
<td>Shin splint</td>
</tr>
</tbody>
</table>
Biomechanical factors and musculoskeletal pain
Why does Juan´s body hurts?

Juan is 12 years old, recently he has suffered a fracture in his right arm. He is being having pain in his back, hips and feet since last year. He does not practice any sports, he prefers quiet activities (TV, video games, computer).

**Physical exam:** body mass index of 34 (kg/m²).
Musculoskeletal pain in obese children and adolescents


- 61% complained of at least one joint hurting more than once per month.

- Localization: back pain (39%), feet (26%), knees (24%).

- For each one unit increase in BMI, there was a 3% (OR= 1.03, 95% CI:1.01-1.05) increase in the odds of having joint pain.

- Obese children exhibit biomechanical changes in their lower extremities as compared to their normal weight peers. These changes may result in pain due to excessive forces on lower extremity joints.

- Due to changes in balance, obesity may be a risk factor for injuries, and increased risk of upper extremities fractures.
Bad postures and musculoskeletal pain

*Mwaka E, et al. BMC Reseach Notes 2014;7:222*

Schoolbags (backpacks) use

- 30.8% of the pupils carried schoolbags which were more than 10% of their body weight.
- 88.2% of pupils reported body pain especially in the neck, shoulders and upper back.
- 35.4% of the children reported that carrying the schoolbag was the cause of their musculoskeletal pain.
- The prevalence of low back pain was 37.8%.
- There was significant association between low back pain and method of bag carriage (p < 0.0001), long duration of walking (odds ratio 2.67, 95% CI 1.38- 5.16) and the time spent sitting after school (p = 0.02)


Computer exposure

- 436 Finnish adolescents
- Moderate/severe musculoskeletal pain: neck-shoulder (21%), head (20%)
- Moderate/severe inconvenience of everyday life: head (29%), neck-shoulder (21%), low back (16%)
- Computer use ≥14 hours/week was associated with:
  - moderate/severe musculoskeletal pain in all anatomic sites
  - moderate/severe inconvenience of everyday life due to low back pain and head
Child labor and musculoskeletal disorders

Epidemiological survey in Brazil

Population: 3,269 children and teens, aged 10 to 17, of low-income neighborhoods.

Objective: to describe the prevalence of musculoskeletal pain in several anatomic sites, and to investigate the association between work activities and pain.

Table 1. Prevalence of pain in anatomic sites by work activity (N=3,269), Pelotas, Brazil, 1998

<table>
<thead>
<tr>
<th>Body sites</th>
<th>Not currently working (n=2,816)</th>
<th>Non-domestic services (n=110)</th>
<th>Domestic services (n=90)</th>
<th>Retail (n=152)</th>
<th>Construction (n=58)</th>
<th>Manufacturing (n=21)</th>
<th>Others (n=17)</th>
<th>Total (n=3,264)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>21.8</td>
<td>26.4</td>
<td>27.8</td>
<td>18.4</td>
<td>20.7</td>
<td>42.9</td>
<td>23.5</td>
<td>22.1</td>
</tr>
<tr>
<td>Shoulder</td>
<td>9.7</td>
<td>17.3</td>
<td>10.0</td>
<td>11.2</td>
<td>8.6</td>
<td>19.0</td>
<td>5.9</td>
<td>10.1</td>
</tr>
<tr>
<td>Elbow</td>
<td>3.6</td>
<td>4.5</td>
<td>4.4</td>
<td>2.0</td>
<td>6.9</td>
<td>—</td>
<td>—</td>
<td>3.6</td>
</tr>
<tr>
<td>Wrists/hands</td>
<td>16.2</td>
<td>20.0</td>
<td>16.7</td>
<td>17.8</td>
<td>15.5</td>
<td>42.9</td>
<td>11.8</td>
<td>16.6</td>
</tr>
<tr>
<td>Upper back</td>
<td>15.2</td>
<td>13.6</td>
<td>18.9</td>
<td>19.7</td>
<td>19.0</td>
<td>23.8</td>
<td>11.8</td>
<td>15.5</td>
</tr>
<tr>
<td>Low back</td>
<td>13.3</td>
<td>12.7</td>
<td>11.1</td>
<td>10.5</td>
<td>17.2</td>
<td>9.5</td>
<td>—</td>
<td>13.1</td>
</tr>
<tr>
<td>Thigh</td>
<td>9.7</td>
<td>14.5</td>
<td>10.0</td>
<td>11.8</td>
<td>10.3</td>
<td>19.0</td>
<td>—</td>
<td>10.0</td>
</tr>
<tr>
<td>Leg</td>
<td>14.5</td>
<td>13.8</td>
<td>18.9</td>
<td>12.5</td>
<td>15.5</td>
<td>14.3</td>
<td>—</td>
<td>14.5</td>
</tr>
<tr>
<td>Knee</td>
<td>17.5</td>
<td>22.7</td>
<td>25.6</td>
<td>11.2</td>
<td>12.1</td>
<td>19.0</td>
<td>11.8</td>
<td>17.5</td>
</tr>
<tr>
<td>Ankle/feet</td>
<td>9.8</td>
<td>13.6</td>
<td>12.2</td>
<td>7.9</td>
<td>8.6</td>
<td>9.5</td>
<td>17.6</td>
<td>9.9</td>
</tr>
</tbody>
</table>

Julia’s joint pains

Julia is 11 years old, and a very active girl. Last year she began complaining of pain in her knees. The pain is worse at the end of the day, mainly when she comes back from her gymnastics class.

Sometimes, the pain makes her interrupt her activities until the pain goes away.

The joint pain is episodic, sometimes 2 to 3 times a week, and lasts for few hours. Two months ago she experienced a subluxation of her right ankle while walking.

Findings on physical exam: joints without swelling, pain or limitation on motion. Hypermobility of knees, elbows, thumbs, and trunk.
Scores for hypermobility measurements

Carter 3/5
Beighton 4/9 (bilateral)
Passive apposition of the thumb to the flexor aspect of forearm

Passive dorsiflexion of the 5th metacarpophalangeal joint to > 90°

Hyperextension of the elbow >10°

Hyperextension of the knees >10°

Flexion of the trunk with knees straight and both palms resting on the floor
## Relative frequency of joint hypermobility

<table>
<thead>
<tr>
<th>Study</th>
<th>Population</th>
<th>n</th>
<th>Age (years)</th>
<th>Hypermobility (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arroyo I, et al. 1988</td>
<td>schoolchildren</td>
<td>192</td>
<td>5-19</td>
<td>34</td>
</tr>
<tr>
<td>De Cunto C, et al. 2000</td>
<td>schoolchildren</td>
<td>359</td>
<td>6-13</td>
<td>37.3</td>
</tr>
<tr>
<td>Russek C, et al. 2015</td>
<td>college students</td>
<td>267</td>
<td>17-26</td>
<td>26.7</td>
</tr>
<tr>
<td>Sanches SB, et al. 2015</td>
<td>ballet dancers</td>
<td>77</td>
<td>18-40</td>
<td>53</td>
</tr>
</tbody>
</table>
Joint pain in children with hypermobility

Where? lower extremities (90%)
How often? 2 or more days per week (89%)
How long? < 24 hs (60%)
When? evening (90%)
What other joints? temporo-mandibular involvement (30%)

Scoliosis 20%
Sprains and/or subluxations 56%
“Benign” joint hypermobility syndrome

Group 1: subtype with more pain, fatigue, and lower HRQoL. Higher number of painful joints, recurrent joint instability (≥ 3 subluxations) and orthostatic hypotension (dizziness on standing).

Group 2: “athletic subtype”. Higher scores for motor proficiency, exercise capacity and physical activity participation, better HRQoL, less pain and fatigue.

Group 3: “systemic subtype”, recurrent joint instability, skin and bowel involvement.

Group 4: soft tissue injuries, reduced muscle length, greater fatigue, lower HRQoL.

Group 5: higher body mass index (BMI), higher pain.
Julia’s joint pains

Look for other signs and symptoms related to joint hypermobility.

Management recommendations:
Protective soft bracing of ankles and knees
Physical therapy: isometric exercises, proprioception training, and minimizing stretching.

Definition of “benign joint hypermobility syndrome”: a child or young person with musculoskeletal pain and clinical signs of joint hypermobility with no other cause found for their symptoms.

Underlying cause of the pain: biomechanical imbalance.

Armon K. Arch Dis Child 2015; 100(1):1-2
Musculoskeletal pain
Risk factors

Joint hypermobility (controversial)

Intense physical activity (sports, ballet) in a growing skeleton

Biomechanical factors (obesity, weight load, bad postures)

Psychosomatic (headaches, abdominal pain, depression, sleep disorders)

El-Metwally, et al. BMC Musculoskeletal Disorders 2006;7:3 (Epub)
Muito obrigada!

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