Joint Pain in Children: Initial Evaluation and When to Refer

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Disclosures

- No relevant disclosures
Educational Objective

- Develop a practical approach to joint pain in children
  - Understand differential, emphasis on common causes
  - Discuss rheumatologic causes of arthralgia
  - Develop plans for initial work-up
Musculoskeletal Pain in Children

- Arthralgia is extremely common in childhood
  - 5-30% of children have chronic pain complaints
    - More common in girls
    - May last years
    - Most have benign etiology
Differential of joint pain

• Age dependent
  • 2 year old will not have repetitive use injuries
  • 15 year old will not develop growing pains
• Some gender dependence
  • Adolescent females and knee pain
• Need to keep a broad differential in mind
  • Think thru the differential
  • The work up
  • And then possible referral
Common Causes of Joint Pain

- **Trauma → 30%**
- **Overuse → 28%**
  - Patello-femoral syndrome, Osgood-Schlatter
- **Structural → 18%**
  - Hypermobility syndrome
  - Congenital hip dysplasia
- **Growing pains → 8%**
Systemic Illness & Joint Pain

Arthralgias are common manifestations of systemic illnesses

- IBD
  - Crohn’s disease

Infections

Malignancy

- Childhood Cancer
Arthralgias: systemic disease

- Malignancy
  - Bone/soft tissue tumor
  - Bone marrow cancer (ALL/neuroblastoma)
- Endocrine disease
  - Thyroid disease
  - IDDM
- Gastrointestinal disease
  - Celiac disease
  - IBD
  - Autoimmune hepatitis
- Infectious disease
  - Viral (EBV/parvovirus)
  - Fever
  - Streptococcus
- Genetic
  - Fabry
  - Lysosomal storage disorders
- Rheumatologic
Pre-school child-differential

- Growing pains/Night terrors
- Malignancy
- Toxic synovitis
- Infection/post-infection
- Trauma
- Juvenile idiopathic arthritis
- Other rheumatologic illnesses
  - dermatomyositis
Adolescent- differential

- Growing pains/Malignancy
- Toxic synovitis
- Infection- GC, parvovirus, EBV, mycoplasma, bone/muscle
- Post-infection- Varicella, Streptococcus
- Trauma
- Amplified pain syndromes
- Juvenile idiopathic arthritis
- Other rheumatologic illnesses
  - Dermatomyositis
  - SLE
  - sarcoid
Growing pains

• First described in 1823
• Estimates: 15% (10-35%) of children, onset ages 2-12 years
• Recurrent, self limited pain, often lower extremity
  • Occur in the pretibial area, calf, thigh
  • Bilateral
  • Pain occurring at night or naps, can awaken the child from sleep
  • Often ask the parents to rub the legs
  • No am limp or stiffness
  • Worse on more active days
• Often a positive family history
• Physical exam is normal
Growing pains

- Work up - consider
  - X-ray of leg
  - CBC with diff
  - LDH, uric acid

- Treatment
  - Reassurance
  - May try acetaminophen/NSAID at night, prior to bedtime, on active days

- Prognosis
  - May be associated with headaches and abdominal pain
  - Generally outgrow the symptoms
Case-"Amy"

- 3 year old girl presenting with knee effusion, pain
- Followed for 3 mo by peds ortho who treated with NSAID and obtained “arthritis panel”
  - ANA + 1:80, uric acid normal, RF neg
- Treated for several months with NSAIDs then referred to rheumatology
  - CBC with diff ordered
  - sent for radiographs of knees
  - WBC 3000, Plts 90K,
  - radiographs with periosteal reaction
  - Bone marrow diagnostic
Malignancies presenting with joint pain—younger children

- Bone marrow occupying lesions
  - Acute lymphocytic leukemia
  - Neuroblastoma
- Tumors of bone, muscle, soft tissues (rare)
- Work up
  - CBC with differential
  - Imaging of affected area
  - Referral to peds oncology
Malignancies - older child

- Lymphoma
- Marrow occupying lesions
  - ALL
  - Neuroblastoma (in younger age group)
- Tumors of bone and muscle

- Consider:
  - CXR
  - Imaging of affected area
  - CBC with diff
  - LDH/uric acid
A multicenter case-control study on predictive factors distinguishing childhood leukemia from juvenile rheumatoid arthritis

71 children with ALL who presented to peds rheum; 53 blast negative initially

<table>
<thead>
<tr>
<th>Diagnostic marker</th>
<th>ALL (blast -) n/N (%)</th>
<th>JIA n/N (%)</th>
<th>p value</th>
<th>Sens/Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low WBC (&lt; 4,000)</td>
<td>11/52 (21)</td>
<td>2/205 (1)</td>
<td>&lt;.001</td>
<td>85/83</td>
</tr>
<tr>
<td>Low normal plt (150-250K)</td>
<td>24/53 (45)</td>
<td>5/204 (2)</td>
<td>&lt;.001</td>
<td>82/87</td>
</tr>
<tr>
<td>Low Hgb</td>
<td>34/53 (64)</td>
<td>65/205 (32)</td>
<td>&lt;.001</td>
<td>34/88</td>
</tr>
<tr>
<td>Nighttime pain</td>
<td>33/52 (63)</td>
<td>34/205 (17)</td>
<td>&lt;.001</td>
<td>49/90</td>
</tr>
<tr>
<td>High LDH</td>
<td>34/43 (79)</td>
<td>39/104 (38)</td>
<td>&lt;.001</td>
<td>47/88</td>
</tr>
<tr>
<td>High uric acid</td>
<td>5/30 (17)</td>
<td>2/102 (2)</td>
<td>&lt;.01</td>
<td>71/80</td>
</tr>
</tbody>
</table>

Jones, Pediatrics. 2006 May;117(5)
A multicenter case-control study on predictive factors distinguishing childhood leukemia from juvenile rheumatoid arthritis

<table>
<thead>
<tr>
<th>Diagnostic marker</th>
<th>Blast neg ALL n/N (%)</th>
<th>JIA n/N (%)</th>
<th>p value</th>
<th>Sens/Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 CBC abnormal</td>
<td>41/52 (79)</td>
<td>71/205 (34)</td>
<td>&lt;.001</td>
<td>37/92</td>
</tr>
<tr>
<td>2 CBC abnormal</td>
<td>24/52 (46)</td>
<td>1/205 (.4)</td>
<td>&lt;.001</td>
<td>96/88</td>
</tr>
<tr>
<td>1 CBC + nighttime pain</td>
<td>23/52 (44)</td>
<td>18/205 (9)</td>
<td>&lt;.001</td>
<td>56/87</td>
</tr>
<tr>
<td>2 CBC + nighttime pain</td>
<td>15/53 (29)</td>
<td>0/205 (0)</td>
<td>&lt;.001</td>
<td>100/85</td>
</tr>
</tbody>
</table>

Jones, Pediatrics. 2006 May;117(5)
Benign Hypermobility: Beighton criteria

- Touch thumb to volar forearm
- Hyperextend MCP’s parallel to forehand
- Little finger past 90 degrees
- Elbows extend 10 degrees past 180
- Knees extend 10 degrees past 180
- Touch palms to floor with knees straight

Associated findings:
- **Pes planus**, recurrent patellar dislocation, excessive internal rotation of hip, tight hamstrings

Ref for photos: Magnolia Dysnomia - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=34795460g
Benign hypermobility

- Can be associated with Marfan’s, Stickler’s syndrome, Ehler’s-Danlos, Down’s syndrome
- 8-20% of population, + family history
- More common in girls, Chinese, West Africans
- Decreases with age (peak ages 3-10 years)
- Symptoms often intermittent
- No disability
- Reassurance, PT for joint protection and stretching program, arch supports
Overuse syndromes

- Patellofemoral syndrome
- Plica syndromes
- Stress fractures
- Apophyseal injuries
  - Pelvic
  - Osgood-Schlatter
  - Sinding-Larsen-Johansson
  - Sever’s Disease
Patellofemoral syndrome

- Anterior knee pain
- Girls after menarche most susceptible
  - Change in pelvic geometry
- Weakness of vastus medialis causing abn. patellar tracking laterally
- Often crepitus with flexion/extension
- Pain with flexion/extension of knee, stairs, stand after sitting (theatre sign)
- Pain reproduced with compression of patella and/or palpation along the inferiomedial side, quadriceps weakness, inhibition sign, +/- effusion
- Treatment: PT, icing, NSAIDs

Photo: By BodyParts3D/Anatomography - Anatomography, CC BY-SA 2.1 jp, https://commons.wikimedia.org/w/index.php?curid=35786360
Plica Syndromes

- Mediopatellar plica syndrome most common - incomplete involution of synovial membranes during embryo development
- Adolescents most commonly affected
- Medial knee pain, intermittent aching, increased with activity, knee “giving way” on standing, locking
- Medial thickened band, snapping on motion
- PT, rest, ice
- Resection during arthroscopy often curative
Osgood Schlatter

- tibial tuberosity pain and swelling
- Microavulsion fracture resulting from infrapatellar tendon pulling
- X-rays may be normal, should be done to evaluate for tumor
Amplified Pain syndromes

• Fibromyalgia/ Amplified pain Syndrome
• Chronic Regional Pain Syndrome
  • RSD
Clues to diagnosis of pain syndromes

• Missed school days
• Other evidence of secondary gain
  • Mother quitting work, homeschooling
• Pain may not occur when out of school, when child doing fun activities
• Sleep disturbance
• “A” student, very driven, puts pressure on self
• Anxiety/Depression
Fibromyalgia-epidemiology

- 2% of population (3-6 million)
  - 5-10% of general practice
  - 15% of rheumatology practice
  - 20% of university practice
  - 20% of new ped. rheum. patients
- 85% female
- All ages (mean age onset 50 yrs)
- Family history
Diagnostic criteria: ACR

• Diffuse tenderness
  • 11 of 18 specific “tender points”
  • Now changed to regions of pain
• Widespread musculoskeletal pain
  • >3 months
  • above and below waist
  • axial involvement
  • Bilateral
• Non-restorative sleep

https://commons.wikimedia.org/wiki/File:Tender_points_fibromyalgia.gif
Other Features

- Fatigue
- Paresthesias
- Headaches
- Cognitive dysfunction
- Subjective hand swelling
- Overachievers/perfectionist personality
Associated Syndromes

- Irritable bowel syndrome
- Dysautonomia
- Irritable bladder
- Headaches
- TMJ disorder
- Mood disorder
- Chronic Fatigue Syndrome
- Painful menses
Treatments-Need diagnosis

• Aerobic exercise program
  • Will get worse before improving
  • PT may help

• Sleep hygiene
  • Caffeine avoidance, no TV’s/electronics in room, regular sleep hours

• Counseling for improved coping mechanisms: Cognitive Behavioral Therapy

• +/- Drugs: Lyrica, amitriptyline, NSAID’s
Treatment Guidelines

- Education and reassurance
- Return to work or school
- Goal of therapy is function rather than absence of pain
- Therapies and therapeutic programs should be time limited and goal oriented
- Therapies should foster self-reliance, “no magic pill”
- After diagnosis, expectation is return to PCP
Strep related arthralgia

- Acute Rheumatic Fever:
  - Arthritis (major) or arthralgia (minor) as part of the criteria
  - JONES criteria: Joints, Carditis, Nodulosis, Erthema marginatum, Syndham’s Chorea
    - Plus evidence of streptococcal disease
    - + throat culture (10-20%), elevated ASO/anti-DNAase B

- School aged children may have elevated strep titers
- Jones criteria states rising titers over time, a one time elevated ASO/anti-DNAase B not diagnostic
Arthralgia vs. Arthritis

• Arthralgia (arth = joint, algia = pain)
  • Pain in the joint
  • no signs of inflammation

• Arthritis (itis = inflammation)
  • Intra-articular swelling or ....
Arthritis: loss of motion associated with
Juvenile Idiopathic Arthritis

- Arthritis lasting at least 6 weeks in a child less than 16 years of age
  - No other cause found for the arthritis
  - No diagnostic blood tests
  - Physical exam crucial for diagnosis
  - Essentially a Dx of exclusion
## What’s in a name?

<table>
<thead>
<tr>
<th>JRA: Juvenile rheumatoid arthritis (ACR)</th>
<th>JIA: Juvenile idiopathic arthritis (ILAR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pauciarticular JRA: &lt; 4 joints in first 6 months</td>
<td>Oligoarticular- persistant: stays less than 4 joints</td>
</tr>
<tr>
<td>Polyarticular JRA: &gt; 5 joints</td>
<td>Polyarticular JIA RF negative</td>
</tr>
<tr>
<td>Systemic onset JRA</td>
<td>Systemic onset JIA</td>
</tr>
<tr>
<td>Spondyloarthritis</td>
<td>Enthesitis related arthritis</td>
</tr>
<tr>
<td>IBD associated</td>
<td>Psoriatic arthritis</td>
</tr>
<tr>
<td>Reactive arthritis (Reiter’s)</td>
<td></td>
</tr>
<tr>
<td>Psoriatic arthritis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Other</td>
</tr>
</tbody>
</table>
Sarcoidosis

- Chronic multi-system inflammatory disorder
- Unknown etiology
- Non-caseating granulomas in a wide range of tissues causing morbidity - Tissue diagnosis!
- Typical older presentation: fevers, lymphadenopathy, lung disease, hypercalcemia
- Presentation in childhood often multisystemic
- Elevated inflammatory markers, Angiotensin converting enzyme
- Pre-school sarcoid (Blau’s disease), specific mutation, boggy polyarthritis

www.wikidoc.org
Sarcoidosis

- Sites of involvement:
  - thoracic lymph nodes
  - lungs
  - liver/ spleen
  - eyes
  - bones/joints
  - salivary and lacrimal glands
  - central nervous system
  - skin (papular rash)
- Boys = girls
- Incidence (US) 5/100,000 Caucasians, 40/100,000 in African-Americans
- Southeastern United States is an endemic area.

Juvenile dermatomyositis

- Multi-systemic disease of unknown etiology
- Chronic inflammation of skin and muscle
- Perivascular inflammation
- May lead to post-inflammatory calcinosis
Criteria of Bohan and Peter

- Characteristic rash
- Symmetric proximal weakness
- Elevation of one or more of muscle derived serological enzymes
- EMG demonstration of myopathy and denervation
- Muscle biopsy with necrosis, and inflammation

MUST HAVE CUTANEOUS + 3/4 OTHER CRITERIA
- (rarely no cutaneous, all 4 other criteria = polymyositis)

Bohan A, Peter JB. NEJM 292: 344, 403, 1975
SLE: Classification Criteria

- Malar rash
- Discoid rash
- Photosensitivity
- Oral/nasal ulcers
- Non-erosive arthritis
- Pleuritis/pericarditis
- Nephritis

- Cytopenias
- Encephalopathy
  - seizure or psychosis
- ANA
- Serology
  - anti-double stranded DNA
  - anti-Smith
  - anti-phospholipid Abs

4 OF 11 CRITERIA GIVES 96% SENSITIVITY/SPECIFICITY
Lupus-simplified

- Rashes: oral/nasal ulcers, malar rash, discoid rash, photosensitivity
- Clinical
  - Sz/psychosis; pericardial/pleural effusions; arthritis
- Lab
  - CBC with diff (cytopenias), if anemic consider Coombs
  - Urinalysis
  - ANA, (dsDNA Ab, anti-phospholipid Ab, C3)
A word about ANA

• Non-specific!
  • Up to 20% of normal population has a +ANA
  • If has family member with SLE, increases change of positivity
Work-up of arthralgias

- Broad review of systems
  - Secondary gain/missing school?
  - Night time pain?
  - Localization of symptoms
  - Hypervigilance of parents?
  - Weight loss/gain?
  - Morning stiffness?
  - Any functional ability losses?
  - Change in bowel habits
  - Sleep history
Complete physical exam

• Vitals: Weight loss, poor growth
• Point tenderness
• Weakness? Quick strength exam
• Rash?
• Affect of child (la belle indifference, hypersensitivity, allodynia)
• Arthritis?
Lab work up of arthralgias

- CBC with diff
- **Sed rate, CRP:** CRP up compared to sed rate- infection!
- Consider: urinalysis
- Consider: uric acid/LDH
- Consider: ASO/anti-DNAse B
- Consider: Thyroid studies, Celiac panel
- Consider: Infectious work up
  - EBV, parvo, varicella, measles all arthrogenic infections
Lab work up of arthralgias

• Consider: Angiotensin converting enzyme (sarcoid)
• Consider: ANA, dsDNA Ab, C3, ENA’s (Ro, La, Sm, RNP), anti-cardiolipin Ab, U/A (for work up of lupus)
• Remember, no diagnostic tests for JIA
  • ANA- <50% sensitivity, prognostic marker for uveitis in JIA
  • RF present in <10% of children with arthritis
• Obtain ANA if suspicious for SLE
Refer when:

- There is arthritis on exam
- History, physical and labs consistent with rheumatic disease
  - Lupus, dermatomyositis, JIA, sarcoid
- You need help with an amplified pain syndrome patient
- We are always available for phone consultation!
QUESTIONS?