Chronic pain in children and adolescents: Diagnosis and treatment of primary pain disorders in head, abdomen, muscles and joints

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Learning Objectives

• Review the case of Barbette
• Discuss pathophysiology explaining development of chronic persistent pain
• Explore interdisciplinary rehabilitative and psychological treatment choices
• Appreciated low importance of pharmacotherapy

Case Example: Barbette Payn

• (not a real case): 14-year-old with 4-year history of periumbilical abdominal pain
• Worsened in early September of last year (coinciding with attending new school
• Previous work-up: Several endoscopies, repeated laboratory investigations, and imagery (CT, MRI, ultrasound) - all normal/negative
• Was prescribed numerous medications, all of which where non-helpful, some causing odd side effects
• Has trouble falling asleep - usually sleeps with mum in bed, with dad now sleeping downstairs

Thanks to Neil Schechter
### Barbette Payn

- Mum very well organized (color coded folder)
- Mother attends to her until she falls asleep, or when waking up at night
- Often too much headache and too tired in the morning to go to school, now frequently sleeps until 11.30 am and takes naps in afternoon
- Missed > 35 days at school last school year, usually goes to school nurse x1-2/day
- Constant bi-frontal headache developed 8 months ago with her eyes going blurry, occasionally “blacking out”: workup by ophthalmologist and neurologist, incl. CT, MRI, EEG normal

### Barbette Payn

- Constant neck, shoulder and bilateral knee, ankle pain for > 5 months: work-up by rheumatologist, orthopedic surgeon incl. X-rays, exhaustive laboratory investigations, all negative/normal
- Barbette has been in Emergency Rooms a total of 5 times in last 12 months, resulting in 2 hospital admissions at Mrs. Payn’s “request”
- One out of city clinic diagnosed her with “POTS”, another with “autonomic dysfunction”, a third with Chronic Lyme Disease” (despite negative titers x3)
- Chiropractor found yeast in stool (=prescribed antifungals), clots behind the eyes (=blood thinner), and heavy metal toxicity (=chelation therapy) and performed several adjustments

### Barbette Payn

- Mrs. Payn is worried that a terrible disease is missed by the physicians and is requesting a exploratory laparoscopy
- She herself has been diagnosed with Fibromyalgia and quit her job to stay home with her daughter to care for her
- Three months ago the overwhelming pain and fatigue resulted in Barbette’s inability to attend school anymore and Mrs. Payn has arranged with school for home tutoring / Online school
- Barbette has stopped meeting with friends and attending social activities and sports activity (competitive dancing)
Case Example

What now?

Pain Assessment

(1) Nociceptive Pain:
arises from the activation of peripheral nerve endings (nociceptors) that respond to noxious stimulation
- Somatic (for example, muscles, joints)
- Chronic somatic pain typically well localized & often results from degenerative processes (such as arthritis)
- Visceral (internal organs)

(2) Neuropathic Pain:
resulting from injury to, or dysfunction of, the somatosensory system.
- Central pain: caused by a lesion or disease of the central somatosensory nervous system

(3) Psycho-social-spiritual-emotional Pain / Total Pain

(4) Chronic Pain
- Pain beyond expected time of healing

Chronic Pain in Children

- Pain lasting > 3-6 months: Time definition arbitrary
- Pain that extends beyond the expected period of healing
- and hence lacks the acute warning function of physiological nociception

- Chronic Pain in children is the result of a dynamic integration of biological processes, psychological factors, and sociocultural factors considered within a developmental trajectory. Pediatric Chronic Pain Task Force 2012 American Pain Society
Metaanalysis 2011 (King et al.)

- Chronic and recurrent pain prevalent in children and adolescents
- girls > boys
- increasing with age
- psychosocial variables impacting prevalence: anxiety, depression, low-self-esteem, other chronic health problems, lower socio-economic status

Range
- Headaches: 8-83%
- abdominal pain 4-53%
- musculoskeletal (incl. back) pain 4-49%
- pain combinations 4-49%

Mean prevalence
- Headaches: 23%
- abdominal pain, musculoskeletal pain, and pain combinations: 11-38%

Catastrophizing [“Awfulizing”]
- A set of negative emotional / cognitive processes such as magnification, rumination and pessimism about pain sensations and feelings of helplessness when in pain.
  - Rumination: Parent anxious preoccupation with pain
  - Magnification: Parent amplification of the significance of pain

Significant link between child and parent catastrophizing

- Kids have higher pain ratings, if either child or mother displays high catastrophizing

Fear of Pain
- Plays a significant role in relation to functional disability and depressive symptoms in the context of pediatric chronic pain
- Appears to play both a facilitative and inhibitory role in relation to treatment response:
  - may hinder improvements in disability & depressive symptoms

- declines are strongly associated with positive functional outcomes
- Adolescents with chronic pain less likely to believe benign interpretations of ambiguous bodily-threat information than controls; associated with more disability


Adolescent Chronic Pain
(n=222)

- Highly anxious adolescents were functioning poorly regardless of level of pain
- At low anxiety: higher pain predicted greater disability


Chronic Pain Pathophysiology

- Many different chronic and recurrent pain syndromes, in both adult and pediatric populations, are now considered manifestations of an underlying vulnerability rather than separate disorders


- Considerable evidence, especially from twin studies, points to a role of shared biological sensitivity: "pain vulnerability", "pain sensitivity", or "central sensitivity syndrome".


Chronic Pain Pathophysiology

Biology
Genetics (40-50%)*
Microtrauma
Infection
Injury

Social
Early life stressors = acquired vulnerability (50-60%)*
School
Adverse Events
Parents:
Catastrophizing

Psychology
Anxiety
Depression
Stress Sensitivity

Disordered Pain Processing: Imprecise encoding of threat?
Fear of Pain, Catastrophizing

Functional Primary Pain Disorder

- Stephen McMahon: Neurobiological basis for pain vulnerability. HAOPC Congress 2014

Sleep & Chronic Pain

Majority of children with chronic pain have sleep difficulties; problems with:
- Sleep initiation
- Maintaining sleep
- Early morning awakening

- Insomnia: 12-18 years with chronic pain: 54% (vs 20% control)

- Sleep problems are persistent (50% vs 20%) and associated with negative impact for youths with chronic pain

- Treatment of insomnia in youths with chronic pain may lead to improvements in QoL and reduction in healthcare cost.

Trajectory

- Pain in adolescents: Trajectory over 3 years (general population, 11-14 years, n=1336)
  - 44% painful trajectory (12 % persistent pain)
  - 25% Headaches (5 % persistent)
  - 22% Back pain
  - 21% Abdominal Pain
  - 10% Facial Pain (1 % persistent)
  - Persistent pain: Predominantly female, with highest level of somatization & depression at start & end of study period, least likely to be satisfied with their life

- When adolescents with chronic pain do not perceive friends as providing support, they may avoid these social situations

- Adolescents with chronic pain and depression: increased risk for suicide ideation/attempt
Trajectory

- 17% of adult chronic pain patients reported a history of chronic pain in childhood or adolescence, with close to 80% indicating that the pain in childhood continues today.
- Adults with chronic pain in US: Low household income & unemployment as significant correlates.

- Two birth cohorts showed that children with persistent abdominal pain and headaches go on to suffer more physical symptoms in adult life, more anxiety and more depression than healthy children.

- National Longitudinal Study of Adolescent to Adult Health (n=14,790)
  - Chronic pain in adolescence associated with higher rates of internalizing mental health disorders reported in adulthood.

- Anxiety disorders (21.1% vs 12.4%)
- Depressive disorders (24.5% vs 14.1%)

Functional Primary Pain Disorder

- Chronic pain disorder that after appropriate medical assessment cannot be explained in terms of conventionally defined medical disease based on biochemical or structural abnormalities.
- Associated with significant disruption of everyday life and often incapacitation.
- Not typically responsive to conventional medical therapy but responsible for the consumption of enormous medical resources.
- Often pejorative implication, i.e. pain is not organic and therefore not real or serious.

Primary Pain Disorders

- Primary headaches
- Centrally mediated abdominal pain syndrome (2016)
- Widespread musculoskeletal pain ("fibromyalgia")
  - CRPS?
- Majority of children experience pain at multiple sites

The Porcupine

“I Guess That Explains The Abdominal Pains”
Gary Larson, The Far Side

Primary Pain Disorder

Pain Problem

Medical Workup

Positive

Assume manifestations of underlying vulnerability

Negative

Chronic-on-acute

Referral to:
Integrative Medicine
Mental Health Therapist
Pain Clinic

Medical Treatment
(1) Headaches / Migraines

“Bi-modal” Headache Construct

**Tension-type headache**
- **Infrequent episodic**
  - At least 10 episodes occurring on <1 day/month on average (<12 days/year)
- **Frequent episodic**
  - At least 10 episodes occurring on >1 but <15 days/month for ≥3 months (>12 and <180 days/year)
- **Chronic**

**Migraine: No aura / aura**
1/2:
- Nausea and/or vomiting
- Photophobia
2/4:
- Unilateral
- Pulsating
- Aggravation by/avoidance of physical activity
- Medium-severe pain

Primary Headache = Severity Continuum?

- “Migraine” and “Tension-type” headache are not separate diagnostic disease entities, but rather points on a severity continuum for children, teenagers, and young adults who experience headaches more than 3-4 days per week

- High headache frequency (>15 d/mo) and younger age (<24 years old) were associated with unimodal distributions suggestive of dimensional construct of primary headache
- Lower headache frequency and older age were associated with bimodal distributions characteristic of discrete diagnostic entities

Headaches

**Warning signals requiring further work-up (incl. neuroimaging):**

- Focal or abnormal neurological signs, ataxia
- Papilledema (r/o pseudotumor cerebri)
- Age < 3 years
- “Worst headache of my life”
- Progressive worsening headaches
- VP-shunt
- Neurocutaneous syndrome
- Immunocompromized -> CSF? (check with ID)

Rule out: CO; Obstructive Sleep Apnea

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**Medication Overuse Headaches (MOH)**

**International Headache society [ICHD-II] Criteria, 2006**

- headache > 15 days/month > 3 months
- ergotamine, triptans, or combination analgesics on > 10 days
- or, simple analgesics or any combination of ergotamine, triptans, analgesics, and opioids on > 15 days/month
- MOH can be caused by most, if not all acute headache drug therapies

**Treatment duration?**

- Triptans: 1.7 yrs
- Ergots: 2.7 years

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**Migraine in Kids**

- (2008) Only ibuprofen and sumatriptan are significantly more effective than placebo in the generation of headache relief in children and adolescents
  

- (2013) 7 RCTs: sumatriptan succinate nasal spray and zolmitriptan, eletriptan hydrobromide, almotriptan malate, and rizatriptan benzoate tablets.
  

- **Placebo** were observed in all trials, with pain relief at 2 hours ranging from **53% to 57.5%**.

- (2016) Ibuprofen, Triptans effective
  

- New RCT: amitriptyline and topiramate (Topamax) should **NOT** be prescribed for pediatric migraine
  
(2) Dys-Functional Abdominal Pain

Rome III-Criteria (2006)
At least 1/week for > 2 months:
• Episodic or continuous abdominal pain
• Insufficient criteria for other functional GI disorders (cyclic vomiting, functional dyspepsia, IBS, abdominal migraine, functional constipation etc.)
• No evidence of an inflammatory, anatomic, metabolic, or neoplastic process that explains the patient’s symptoms

Functional Abdominal Pain
Centrally mediated abdominal pain syndrome (2016)

Abdominal Pain
Abdominal Pain

Warning signals requiring further work-up:

- Persistent right upper or right lower quadrant pain
- Pain that wakes child from sleep
- Dysphagia
- Arthritis
- Persistent vomiting
- Perirectal disease
- Gastrointestinal blood loss
- Involuntary weight loss
- Nocturnal diarrhea
- Deceleration of linear growth
- Unexplained fever

Abdominal Pain

Adolescents with IBS symptoms have widespread hyperalgesia

Women with pediatric history of functional abdominal pain may have long-term vulnerability to pain

Functional abdominal pain in childhood and adolescence increases risk for chronic pain in adulthood

- 65 % resolved
- 35 % abdominal pain:
  - most in addition to migraine/tension headache
  - Significant higher risk of chronic musculoskeletal pain

Somatic complaints in childhood functional abdominal pain associated with functional gastrointestinal disorders in adolescence & adulthood

(3) Chronic Musculoskeletal Pain
Warning signals which may requiring further work-up, include:

- Athralgia: Rubor, Calor, Edema
- Pain, stiffness in the morning
- Abnormal radiographic findings
- Pain at rest, relieved by activity
- Pain at night: Worsened by massage, analgesics ineffective
- Bony tenderness
- Poor growth
- Weight loss
- Abnormal CBC, CRP, ESR

Demystifying problem: Pain has lost warning signal

- Often de-conditioned
- Frequently tension at trapezius / paraspinal muscles

Treatment Goal:
- Return to function first
- Pain decreases second (not other way around)
- Rate of change of disability was significantly more rapid than pain.


Musculoskeletal Pain (MSK)

- Systematic review with meta-analysis - Risk Factors
  - Low socioeconomic status is risk factor for onset of MSK pain in studies exploring long-term follow-up (High-quality evidence)
  - Negative emotional symptoms and regularly smoking in childhood or adolescence may be associated with later MSK pain (Moderate-quality evidence)

However, moderate-quality evidence also suggests that high body mass index, taller height, and having joint hypermobility are NOT risk factors for onset of MSK pain.
“Fibromyalgia”

- **Diagnostic criteria** not validated in children and teenagers
- Animal Model: Rats exposed to unpredictable sound stress develop
  - mechanical hyperalgesia in muscle and skin
  - increased anxiety
  - temporomandibular disorder
  - irritable bowel syndrome

Joel Katz (ISPP 2015)

**Transition**

from acute to chronic pain?

**Chronic-on-acute Pain**

- In USA: > 3.7 million children
- At least (?) 5% of children with sickle cell disease, inflammatory bowel disease, rheumatoid arthritis, congenital heart disease, or cancer are expected to display chronic pain in addition to their underlying somatic pain episodes.
Case Example: Chronic-on-acute pain

- Roman (11-years old) Nov 2014 - March 2015
- Single left-ventricle, status post 3 palliative surgeries
- Protein-loosing enteropathy (PLE)
- Significant constant “wandering pain everywhere” (pain score VAS 8-10/10), plus chronic headache plus recurrent severe abdominal pain
- Missed > 40 days of school
- Deconditioned

Chronic post surgical pain (CPSP)

- CPSP after Surgery: last at least 2 months, other causes were excluded
  - Intraoperative nerve transection/ injury!
  - Preventive analgesia can reduce incidence/intensity of adult CPSP
  - Psychological, emotional, social, family/peers might play role in development & maintenance of CPSP in children (lecture 6/16)
- Postoperative pain therapy matters: Percentage of time spent in severe pain: A10% increase in time spent in severe pain day 1 = 30% increase of CPSP incidence at 12 months

- Chronic pain after surgery observed 13-15% of children up to 5 years later


Cochrane analysis (n=1964 patients) with chronic low back pain: strong evidence that intensive multidisciplinary bio-psycho-social rehabilitation with a functional restoration approach improved function when compared with inpatient or outpatient non-multidisciplinary treatments


Interdisciplinary Pain Clinic

- Cochrane analysis (n=1964 patients) with chronic low back pain: strong evidence that intensive multidisciplinary bio-psycho-social rehabilitation with a functional restoration approach improved function when compared with inpatient or outpatient non-multidisciplinary treatments

Outpatient Pain Clinic


How long can we wait?

- Unknown at what point clinical deterioration begins

Interdisciplinary Pain Clinic

Excerpt From “Little Stars” By Moonshine Movies (58Min; 2014)

https://www.youtube.com/watch?v=1381/40k3RqEdMc

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Who do we need?  
Physical Therapy


Who do we need?  
Psychology


Interdisciplinary Pain Clinic


Interdisciplinary Pain Clinic

Children's Hospitals and Clinics of Minnesota
Minneapolis

Team:
- MA/Nurse
- Physical Therapist
- Psychologist
- Social Worker/Family Therapist
- Pediatrician / NP

Pediatric Pain Clinics USA & Canada


The Exit Interview

- Pain is real!
- Positive Expectation = Self-fulfilling prophecy!
- Chronic-on-acute: Close collaboration with specialist of underlying acute condition to ensure no injury will be caused by rehab treatment
  - Pediatrics
  - Rheumatology
  - Gastroenterology
  - Hematology/Oncology
  - Cardiology
  - etc.
Communication with Patient / Family

What is the Hard Work...and non-negotiable...?

- **Physical Therapy**
  - Daily home exercise
- **Integrative Medicine**
  - Self-Hypnosis
  - Biofeedback
  - Progressive Muscle relaxation
  - Daily home exercise
  - Passive Massage/Acupuncture
- **Psychology** (...if missing school)
- **Normalize Life**
  - Sports/Exercise
  - Sleep-hygiene
  - Social: Having daily fun
  - School: Attending full-time (or school-re-entry plan)
- **Family Coaching**
- **Medications...???

Medications?

1. Low-dose Amitriptyline (stimulates)
2. Gabapentin (inhibits)
3. Acetaminophen
4. Ibuprofen (Celecoxib?)
5. Lidocain 5% patch
6. Melatonin
7. Vitamin D 1
8. SSRI 1
9. Co-Q10, Fish-Oil/Omegas 3000, Peppermint oil (coated) [for abdominal pain]

Opioids in the absence of tissue injury or inflammation not indicated!

Exit Interview
Roman - 3 1/2 months later

Further Reading

Conquering Your Child’s Chronic Pain
A Pediatrician’s Guide for Reclaiming a Normal Childhood
Lorrie K. Zeltzer, M.D.
Brendan, Rhode Island, Program, Children's Hospital
and Christina Blackett Schrank
Help Your Child or Adolescent
Regain Power over Pain, Restore Function and Well-Being

PainBytes

Persisted (Chronic Pain)

http://www.youtube.com/watch?v=4b8oB757DKc&feature=player_embedded

Clinicians have historically considered most chronic pain to be largely from peripheral nociceptive input (i.e. damage or inflammation), and now data increasingly suggest this is simply not the case.

Many different chronic and recurrent pain syndromes, in both adult and pediatric populations, are now considered manifestations of an underlying vulnerability rather than separate disorders.

Opioids in the absence of tissue injury or inflammation are contraindicated!

Importance of rehabilitative, interdisciplinary team approach.

Conclusion

- Clinicians have historically considered most chronic pain to be largely from peripheral nociceptive input (i.e. damage or inflammation), and now data increasingly suggest this is simply not the case.

- Many different chronic and recurrent pain syndromes, in both adult and pediatric populations, are now considered manifestations of an underlying vulnerability rather than separate disorders.

- Opioids in the absence of tissue injury or inflammation are contraindicated!

- Importance of rehabilitative, interdisciplinary team approach.

Further Training

10th Annual Pediatric Pain Master Class
- Minneapolis, Minnesota, USA | June 17-23, 2017
  http://tinyurl.com/PedsPMC

Education in Palliative & End-of-Life Care (EPEC): Become an EPEC-Pediatrics Trainer
- Montréal, Québec, Canada | April 28-30, 2017
  http://tinyurl.com/EPECPeds

11th International Symposium on Pediatric Pain (ISPP)
- Kuala Lumpur, Malaysia, July 6-9, 2017
  http://www.ispp2017.org

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