When Does Acute Pain Become Chronic?

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Disclosure

- Nothing to Disclose
Learning Objectives

- Describe a patient-centered approach to the formulation of the patient with acute pain
- Review risk factors/predictors of chronic pain
- Identify rational treatment approaches to reduce the risk of developing chronic pain
Chronic Pain

- What exactly is it?
Tissue Injury

- Local inflammatory response
- Peripheral nociceptor sensitization
- Altered transduction, increased conduction
- Sensitization of dorsal horn nociceptors
- Modulated by descending efferents
- Mediated by: NMDA, decreased inhibition, wind-up, neuromodulators, synaptic efficacy
Acute Sensitization

- Increases awareness of pain
- Limits damage
- Promotes healing
- Reversible
Pathophysiology of Pain

- Severe nociception
- Persistent inflammation
- Neuronal damage
- Central sensitization
- Nerve cell remodeling
- Modulation becomes irreversible modification!

Definition of Chronic Pain

- Severity (>6-7 out of 10)
- Duration (>3-6 months)
- Impairment (Function/Quality of Life)
New Chronic Pain

- Who develops it?
Case Example

- 45 y/o Korean woman s/p OTJI with foot crushed by heavy equipment for depression & disability
- Immediate reconstructive surgery for stability
- Poor compliance with physical therapy
- High levels of acute pain pre- and post-op
- Treated with SAO’s and acetaminophen
- Prescribed multiple agents for insomnia & anxiety
- After 6 months, referred to Orthopedics for BKA
Typical Risk Factors

- Demographic variables
- Pain characteristics
- Psychological factors
- Contextual details
Demographics

- Age
- Gender
- Education
- Employment
- Health status
Pain Characteristics

- High pain intensity
- Long pain duration
- Radiation of pain
- Prior episodes of pain
- Multiple sites of pain
- Multiple somatic symptoms
Psychological Factors

- Negative emotion
- Depression
- Anxiety
- Anger
- Fear
- Stress
- Distress
- Catastrophizing
- Hypervigilance
- Self-efficacy
- Neuroticism
- Pain sensitivity
- Somatization
- _______________
Context

- Injured at work
- Work safety
- Work satisfaction
- Compensation
- Litigation
- Social support
- External attributions of responsibility
Hopelessness of New Chronic Pain

- **Severity** → Too little!
- **Duration** → Too late!
- **Impairment** → So what?
Hopelessness of New Chronic Pain

- A tornado
  - You can’t predict it

- Watching a train wreck in slow motion
  - You can’t stop it

- A list of ingredients without a recipe
  - You don’t know what to do
New Chronic Pain?

- How should the case be formulated?
Perspectives of Pain

- Diseases
  - Something you have
- Dimensions
  - Something you are
- Behaviors
  - Something you do
- Life stories
  - Something you encounter
Life Stories: What You Should Do

- Expand the history to include every aspect of the patient’s life
- Understand what it means to the patient to suffer from pain
- Help the patient find an answer to the question, “What good does life hold for me?”
Behaviors: What You Should Do

- Point out problematic behaviors every time they occur
- Insist the patient take responsibility for his choices and acknowledge goals
- Emphasize productive behaviors and reinforce them whenever possible
Dimensions: What You Should Do

- Obtain descriptions of who the patient was before the illness
- Recognize how much of each individual trait a patient possesses
- Match the strengths of each trait with specific tasks to optimize capabilities
Diseases: What You Should Do

- Search for all possible broken parts causing pathology
- Fix as many broken parts as completely as possible to minimize pathology
- Select treatments that will minimize new damage and subsequent pathology
Perspectives of New Chronic Pain

- Diseases
  - Pain sensitization
  - Major depression

- Dimensions
  - Pain modulation
    - Diffuse noxious inhibitory control (DNIC) efficiency
    - Temporal summation
  - Somatic symptoms

- Behaviors
  - Fear and avoidance
  - Substance use

- Life stories
  - Catastrophizing
  - Post-traumatic stress disorder (PTSD)
Risk Factors for New Chronic Pain

- Why does it matter?
Diseases

Syndrome → Pathology → Etiology

Pathophysiology

Pathogenesis
Pain Sensitization

- Attend the *Pathophysiology of Pain* lecture!
Pharmacological Targets in Pain

Ectopic Activity
- Na⁺ channel blockers
- Ca⁺⁺ channel modulators
- GABAergic enhancement
- Glutaminergic inhibition

Terminal
- NSAIDs
- Vanilloids

PNS
- TCAs
- Anticonvulsants
- Local anesthetics
- Opioids

Spinal cord
- CNS

Descending Modulation
- Central α-agonists
- TCAs
- SNRIs
- Opioids/Tramadol

Central Sensitization
- Opioids/tramadol
- Central α-agonists NMDA antagonists
- Anticonvulsants

Peripheral Sensitization

Depression in Patients with Chronic Pain

- Which one really came first?
Longitudinal Relationships

- Majority of the data support the diathesis-stress model (depression is a consequence of chronic pain)
- Treatment of depression improves pain and disability
- Research is sorely needed to understand etiologies
Sample

- Epidemiological Catchment Area project funded by National Institute of Mental Health (Baltimore site)
  - 1980 (wave 1 baseline)  3349 (3381)
  - 1982-3 (wave 2 follow-up) 2747 (2768)
  - 1993-6 (wave 3 follow-up) 1771 (1920)
- 20,000+ adults in 5 metropolitan areas
- Prevalence and incidence of psychiatric disorders in the general population

Longitudinal Relationships

- Depressive disorders at baseline doubled the risk for new onset back pain 13 years later
- Severe depression (impairment) tripled the risk for incident back pain 12 years later
- Major depression + dysthymic disorder (excluding dysphoria) still increased risk for incident back pain 13 years later by 75%

Summary of Negative Analyses

- Current depression did not increase the risk for incident back pain; odds ratio (OR) = 1.70, (0.71, 4.08)
- Depression at baseline did not increase the risk for incident back pain 1 year later
- Back pain at baseline was not associated with depression at baseline
- Back pain at baseline was not associated with incident depression at any time point
Behaviors

Drive → Choice → Learning
Fear and Avoidance

- Can we unlearn what we learn?
Patients With Substance Use Disorder

- What can we learn with a paradigm shift?
Susceptibility To Chronic Pain

- A history of substance use increases abuse of pain medications
- Cold pressor pain tolerance is ↓ in current opiate and cocaine users compared with former users
- Alcoholics and families of alcoholics have ↑ pain sensitivity and ↑ pain reduction with EtOH

Do Opioids Cause Chronic Pain?

- Powerful positive reinforcement for use
- Coupled with negative reinforcement for disuse
- Set up an unreasonable standard for pain control
- Injury not rehabilitation during pain relief
- Intoxication produces psychological comfort but worsening functional disability (palliative care)

Methods

**Subject Pool:** In-Treatment Convenience Sample Addiction Treatment Services Program (N=232)

**Assessment Process:** Four Dates for Data Collection Completed During the Period of 12/18/06 - 1/10/07 (N=228; 98% of the convenience sample)

**Assessment Battery:**
- **Questionnaire Data:** Brief Pain Inventory (BPI), Substance Abuse Tx History, Demographics
- **Treatment Variables:** Methadone Dose, Urine Results, Duration, and Intensity (Step)
Brief Pain Inventory (BPI)

- Patients reporting pain = 61%
- Pain intensity
  - Pain right now 5.1
  - Average 5.8
  - Worst 7.2
  - Least 4.6

BPI Interference

- To what extent does pain interfere with
  - Sleep 6.0
  - General activity 5.7
  - Enjoyment of life 5.6
  - Work 5.6
  - Walking 5.5
  - Mood 5.2
  - Relations with others 4.2

BPI Treatment

- Receiving treatment for pain outside ATS = 14%
- Average relief provided by pain treatment = 51%
- Types of pain treatment being received:
  - Analgesics (NSAIDs, opioids): 12% (89% of treated)
  - Other (PT, blocks, epidurals): 7% (53% of treated)
- No one received adjuvant analgesics (ADs, AEDs)

NSAIDs. nonsteroidal anti-inflammatory drugs; PT, physical therapy; AEDs, antiepileptic drugs. Clark, et al. CPDD. 2007.
Dimensions

Potential → Provocation → Response
Pain Modulation

- How are we different?
Central Pain Modulation

- Endogenous analgesia system (individual trait)
- Capability assessed via the Diffuse Noxious Inhibitory Control (DNIC) test paradigm
- Lower DNIC efficiency is associated with pain
  - Healthy people with pain
  - Chronic pain syndromes
    - Primarily those postulated to be due to central sensitization
    - Fibromyalgia syndrome, multiple sclerosis, temporomandibular disorder, migraine, tension headache, irritable bowel syndrome

DNIC Paradigm

- Difference in pain rating between two identical noxious “test stimuli” (contact heat pain) applied first at baseline and then concomitantly with another “conditioning” remote noxious stimulus.
- Decrease in the “test stimulus” (hot water immersion) pain scores from the baseline indicates efficient pain inhibition expressed as a positive DNIC value.

Granot et al. Pain 2007; Granot Curr Opin Anes 2009
Incidence Of Post-thoracotomy Pain

- 62 patients undergoing thoracotomy
  - 38 men, mean age = 62 +/- 14 years, multiple causes
  - 36 patients → chronic pain, no med/surg predictors
- Mean follow-up = 29 +/- 17 weeks
- Acute post-op pain = 49 +/- 21 (0-100 NPS)
- Chronic post-op pain = 55 +/- 27 (0-100 NPS)
- Acute post-op pain correlated with chronic pain
- DNIC efficiency correlated with chronic pain
- Test stimulus scores: Pre = 58.3 and Post = 43.9

NPS, numerical pain scale.
Predictors of Post-thoracotomy Pain

- Acute postoperative pain intensity (modifiable?)
  - OR = 1.80 (1.28 – 2.77)
  - Change of 10 units on scale of 0 to 100

- DNIC efficiency (dynamic preoperative trait)
  - OR = 0.52 (0.33 – 0.77)
  - Change of 10 units on scale of -100 to +100
  - Probability of chronic post-thoracotomy pain
    - DNIC 0 → 80%; DNIC 40 → 23%; DNIC 50 → 12%
    - No correlation with acute postoperative pain (independent)

Somatic Symptoms

- How do symptoms become chronic?
Somatization

- Expression of personal and social distress through physical symptoms, often accompanied by patterns of illness behavior such as increased medical help-seeking for those symptoms

Somatization ↔ Chronic Pain?

- Prospective population-based follow-up survey
- 1658 people without chronic widespread pain
  - (No pain = 825; Some pain = 833)
- Somatic symptoms, psychological distress, fatigue, health anxiety, illness behavior
- 1404 respondents at 12-month follow-up
- New chronic widespread pain
  - 4.4% of men; 6.8% of women
  - One-third of new cases were men

Predictors of Chronic Pain

- 8% of people with some pain vs 2% w/o pain
- Health anxiety: NS
- Fatigue: OR = 2 (univariate only)
- Psychological distress: OR = 2 (univariate only)
- Somatic symptoms > 2: OR = 4 (1.5 – 7.4)
- Illness behaviors: OR = 4 – 9 (1.8 – 22.2)
  - Frequent healthcare visits for symptoms that disrupt normal activity

How Important Are These Predictors?

<table>
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<tr>
<th>Somatic Symptoms Score</th>
<th>0-4</th>
<th>5-7</th>
<th>8-24</th>
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<tr>
<td>n</td>
<td>New CWP</td>
<td>%</td>
<td>New CWP</td>
</tr>
<tr>
<td>0-2</td>
<td>440</td>
<td>6</td>
<td>1.4</td>
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<tr>
<td>3-5</td>
<td>10</td>
<td>0</td>
<td>0</td>
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</table>

CWP, chronic widespread pain.
Life Stories

Setting $\rightarrow$ Sequence $\rightarrow$ Outcome
Post-traumatic Stress Disorder

- What events are traumatic?
PTSD and Chronic Pain

- Criteria
  - Re-experiencing the event
  - Avoidance of reminders of the event
  - Hyperarousal

- Motor vehicle collisions → whiplash
  - Great variation across countries
  - Decreases if financial benefits are reduced
  - Rare for same magnitude collisions in other contexts
  - No dose effect of trauma intensity and probability

Pain Catastrophizing

- Why are these people so distressed?
Pain Catastrophizing

- An exaggerated negative mental set brought to bear during an actual or anticipated painful experience
- An expectation or worry about major negative consequences from a situation, even one of minor importance
- Multidimensional cognitive construct
  - Magnification: “I am afraid that something serious will happen.”
  - Rumination: “I cannot stop thinking about how much it hurts.”
  - Helplessness: “There is nothing I can do to reduce the intensity of the pain.”

Modifying Outcome

- Catastrophizing predicts
  - Acute pain intensity and sensitivity
  - Development of chronic pain, disability, ↓ QoL

- Treatments for catastrophizing
  - Cognitive behavioral therapy and adaptive coping skills training
  - Distraction, relaxation, and imagery
  - Social support
  - Education

Conclusions

- What can really be done?
Preventing Chronic Pain

- Diseases
  - Repair and Cure
- Dimensions
  - Guide and Strengthen
- Behaviors
  - Extinguish and Expose
- Life Stories
  - Rescript and Remoralize
Treatments of Predictors

- **Diseases**
  - Neuropathic pain and major depression
    - Antidepressants
    - Anticonvulsants
    - Augmenting agents

- **Dimensions**
  - Pain modulation and somatosensory amplification
    - Biofeedback and relaxation
    - Yoga, Tai Chi, Qigong
    - Cognitive-behavioral psychotherapy
Treatments of Predictors

- Behaviors
  - Substance use disorders and fear/avoidance
    - Group-based behavioral psychotherapy
    - Desensitization
    - Active physical therapy

- Life Stories
  - PTSD and catastrophizing
    - Support groups
    - Interpersonal psychotherapy
    - Insight-oriented psychotherapy
Case – Amputation was performed!

- **Diseases**
  - MDD: Sertraline 300 mg/d
  - PAP: Valproate 500 mg BID

- **Dimensions**
  - Introvert: Puppy with training
  - Amputee: Prosthetics + PT

- **Behaviors**
  - SUD: Opioid taper after other txs
  - F&A: Support groups (OT, Amputees, Church)

- **Life Stories**
  - Marital therapy → infidelity → divorce
  - Vocational rehabilitation → RTW
Hope for Preventing Chronic Pain

- Recognizing profiles of risk for new chronic pain
- Preventing the transition from acute to chronic pain
- Treating specific causes of new chronic pain
- Addressing the nature of barriers to restoring health