Complex Common Pain Problems

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Disclaimers & Objectives

• Primary Care Provider perspective
  – Commonest complaint
  – Enormous system cost
    • Dollars spent >$300B; wasted maybe $150B
    • Practice dissatisfaction
    • Patient dissatisfaction

• Limited training
• First: Understand the complexity of common chronic pain disorders
• Then: Identify and treat pain more effectively with improved outcomes
Pain is Complex

- Fusion of “Mind/Self” to “Embodied Brain”
  - Homeostatic requirement
    - Physiologic state of living tissues to remain within survivable range
  - Autobiographical self
    - Sensations recall emotions and context
    - Mirror neurons: Learn from Listening and Observing

- Successful care requires provider empathy and listening to the *Patient’s Narrative*

- Pain medication only reduces pain by <50%
By its very nature, pain is therefore difficult to assess, investigate, manage, and treat. Figure 1 illustrates the mixture of factors that we know influence nociceptive inputs to amplify, attenuate, and color the pain experience. We know also from more recent data how a painful experience can occur without a primary nociceptive input (Derbyshire et al., 2004; Eisenberger et al., 2003; Raij et al., 2005; Singer et al., 2004), further complicating the story but perhaps providing an alternative explanation for how pain might arise in difficult clinical cases where the organic cause is not obvious. What is clear is that many factors influencing pain percepts are centrally mediated, and our ability to unravel and neuroanatomically dissect their contribution has only been feasible since neuroimaging tools allowed us noninvasive access to the human CNS.

Determining the balance between peripheral versus central influences and ascertaining which are due to pathological versus emotional or cognitive influences will clearly aid decisions regarding the targeting of treatments (i.e., pharmacological, surgical, cognitive behavioral or physical rehabilitation). Understanding how complex behavioral influences such as anxiety, depression, belief states, and cognition change the pain experience in animals is difficult to assess due to the lack of sophisticated behavioral paradigms and overdependence on threshold or withdraw measures. However, a greater emphasis is now being placed on measures of spontaneous pain behaviors as well as on developing and utilizing animal models of pain that more clearly mirror specific chronic human pain conditions (Blackburn-Munro, 2004; Lindsay et al., 2005; Schwei et al., 1999). Additionally, animal pain models now routinely take into consideration the genetic background, age, gender, and stress levels of the animal as these have been shown to potentially have a significant impact on the pain phenotype observed in animals as well as humans (Boccalon et al., 2006; Craft et al., 2004; Mogil, 1999; Mogil et al., 1997, 2006). Indeed, a more integrated approach for translating knowledge bidirectionally between human and animal studies is already proving beneficial, as recently demonstrated in the unexpected identification of the potential central role of GTP cyclohydrolase (GCH1), the rate-limiting enzyme for tetrahydrobiopterin (BH4) synthesis, as a key modulator of peripheral neuropathic and inflammatory pain in animal models and humans suffering chronic pain (Tegeder et al., 2006).

**Basic Neuroanatomy of Central Pain Processing and the ''Cerebral Signature'' for Pain Perception**

Beyond the peripheral nociceptor and dorsal horn, nociceptive information ascends to the thalamus in the contralateral spinothalamic tract (STT) and to the medulla and brainstem via a spinoreticular (spinoparabrachial) and spinomesencephalic tracts. These tracts serve different purposes related to both their lamina origin in the dorsal horn and final central destination (Dostrovsky and Craig, 2006).

Spinal projections to the brainstem are particularly important for integrating nociceptive activity with homeostatic, arousal, and autonomic processes, as well as providing a means to indirectly convey nociceptive information to forebrain regions after brainstem processing. The capacity for projections to the brainstem to directly influence both spinal and forebrain activity clearly suggest these pathways play a direct role in affecting the pain experience; data from animals, healthy subjects, and patients increasingly confirm the central role that the brainstem plays in mediating changes in pain perception.

Functional and anatomical divisions of the thalamus, the main relay site for nociceptive inputs to cortical and subcortical structures, have been made on the basis of their connections to specific spinal cord laminae in various animal species and in humans (Craig, 2003b; Pralong et al., 2004). Lamina I STT neurons largely project to the...
Sensitization of entire **Pain System**

From: D’Mello 2008, Mendell 2003, Ossipov 2010
Peripheral Sensation

Normal transduction

Sensitized from chronicity

From Woolf 2010
From Boorsook D., 2010
Acute Pain ≠ Chronic Pain

• Acute Pain is different from Chronic Pain
  – Transition becomes well established after ~ 90 days
• Pain becomes *a disorder unto itself*
• Evaluation and Treatment approach differ
  – Imaging predicts less and less
  – Biopsychosocial context *fully* engaged
  – Special management issues
    • Tolerance
    • Dependence
    • Abuse
Case 1

36 yo woman with 4 years of fatigue, headache, painful “joints”, disturbed sleep, mood and concentration
Fibromyalgia Pathophysiology

• Both peripheral and central contributions
  – Reduced thermal and mechanical pain thresholds across the full neuraxis
  – Increased temporal summation and reduced frequency of stimulation to maintain pain
  – fMRI data demonstrates reduced stimulus threshold, widespread CNS activation, and dependence on maintained peripheral input

• *Not* theological diagnosis requiring “belief”
Fibromyalgia Clinical Presentation

• Characteristic history
  – FIBRO: Fatigue, Insomnia, Blues, Rigidity, Ow!
    + headache and sleep problems
  – Pain insidious onset or post trauma
  – Frequent co-morbid chronic pain disorders
  – Family history of chronic pain often present
  – “All my tests are negative”
  – “My doctor thinks it’s all in my head”
The Patient’s Pain is Mostly in the Brain

Correlation map between subjective pain scores and brain activations in fibromyalgia

“Pain is what a patient says it is.”

Margo McCaffery, 2000

Pujol 2009
Fibromyalgia Diagnostic Criteria 2010 Revision  
(Wolfe et al Arthritis Care & Research 2010; 62: 600-610)

<table>
<thead>
<tr>
<th>Criteria</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>A patient satisfies diagnostic criteria for fibromyalgia if the following 3 conditions are met:</td>
<td></td>
</tr>
<tr>
<td>1) Widespread pain index (WPI) ≥7 and symptom severity (SS) scale score ≥5 or WPI 3–6 and SS scale score ≥9.</td>
<td></td>
</tr>
<tr>
<td>2) Symptoms have been present at a similar level for at least 3 months.</td>
<td></td>
</tr>
<tr>
<td>3) The patient does not have a disorder that would otherwise explain the pain.</td>
<td></td>
</tr>
</tbody>
</table>

**Ascertainment**

1) WPI: note the number areas in which the patient has had pain over the last week. In how many areas has the patient had pain? Score will be between 0 and 19.

<table>
<thead>
<tr>
<th>Area</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder girdle, left</td>
<td>Hip (buttock, trochanter), left</td>
</tr>
<tr>
<td>Shoulder girdle, right</td>
<td>Hip (buttock, trochanter), right</td>
</tr>
<tr>
<td>Upper arm, left</td>
<td>Upper leg, left</td>
</tr>
<tr>
<td>Upper arm, right</td>
<td>Upper leg, right</td>
</tr>
<tr>
<td>Lower arm, left</td>
<td>Lower leg, left</td>
</tr>
<tr>
<td>Lower arm, right</td>
<td>Lower leg, right</td>
</tr>
</tbody>
</table>

2) SS scale score:

- Fatigue
- Waking unrefreshed
- Cognitive symptoms

For each of the 3 symptoms above, indicate the level of severity over the past week using the following scale:

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>no problem</td>
</tr>
<tr>
<td>1</td>
<td>slight or mild problems, generally mild or intermittent</td>
</tr>
<tr>
<td>2</td>
<td>moderate, considerable problems, often present and/or at a moderate level</td>
</tr>
<tr>
<td>3</td>
<td>severe: pervasive, continuous, life-disturbing problems</td>
</tr>
</tbody>
</table>

Considering somatic symptoms in general, indicate whether the patient has:*  

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>no symptoms</td>
</tr>
<tr>
<td>1</td>
<td>few symptoms</td>
</tr>
<tr>
<td>2</td>
<td>a moderate number of symptoms</td>
</tr>
<tr>
<td>3</td>
<td>a great deal of symptoms</td>
</tr>
</tbody>
</table>

The SS scale score is the sum of the severity of the 3 symptoms (fatigue, waking unrefreshed, cognitive symptoms) plus the extent (severity) of somatic symptoms in general. The final score is between 0 and 12.

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* Somatic symptoms that might be considered: muscle pain, irritable bowel syndrome, fatigue/tiredness, thinking or remembering problem, muscle weakness, headache, pain/cramps in the abdomen, numbness/tingling, dizziness, insomnia, depression, constipation, pain in the upper abdomen, nausea, nervousness, chest pain, blurred vision, fever, diarrhea, dry mouth, itching, wheezing, Raynaud's phenomenon, hives/welts, ringing in ears, vomiting, heartburn, oral ulcers, loss of/change in taste, seizures, dry eyes, shortness of breath, loss of appetite, rash, sun sensitivity, hearing difficulties, easy bruising, hair loss, frequent urination, painful urination, and bladder spasms.
Fibromyalgia Widespread Pain Index

Check each area you have felt pain in over the past week.

- Shoulder girdle, left
- Shoulder girdle, right
- Upper arm, left
- Upper arm, right
- Lower arm, left
- Lower arm, right
- Hip (buttock) left
- Hip (buttock) right
- Upper leg left
- Upper leg right
- Lower leg left
- Lower leg right
- Jaw left
- Jaw right
- Chest
- Abdomen
- Neck
- Upper back
- Lower back
- None of these areas
Fibromyalgia Clinical Evaluation

• History
  – Use measurement tools:
    • Fibromyalgia specific www.fmnetnews.com
    • AMDG guidelines/tools www.agencymeddirectors.wa.gov/opioiddosing.asp

• Physical
  – Widespread tender-point exam, still needed?:
    • ≥11/18 bilateral above and below waist, including axial spine

• Work-up: “No other disease accounts for symptoms”
  – CBC, CMP, U/A, iron, TSH, PTH, CRP, CK, vitamins B-12, D, folate

• Diagnosis: 2010 provisional ACR criteria:
  • Widespread pain ≥7/19
  • 3 Symptoms/severity (0-3)
    – FATIGUE, AWAKEN REFRESHED, COGNITION
    – Plus overall rating of somatic complaints (0-3)

Consider tender point exam on all chronic pain patients to assess for widespread hyperalgesia
Fibromyalgia Treatment

• Medication
  – Tricyclic Antidepressants
  – SNRI Antidepressants
  – Anti-Epileptic Drugs
  – Rarely opioids
    “Disconnect the brain from the feeling of the rest of the body”

• Non-pharmacologic
  – Cognitive Behavioral Therapy (or Training)
  – Exercise
  – Acupuncture
Case 2

48 yo man with back and neck pain, headache, positional vertigo at 4 months after “minor” MVA (with no head injury)
Myofascial Pain Disorders

• Whiplash
• Local soft tissue hyperalgesia

• Reduced threshold in uninjured tissue
• Anesthetics raise mechanical threshold
• Afferent triggers, even low level, maintain sensitivity
• Spread of pain sensitivity to deep uninjured tissue
Myofascial Pain Treatment

- Medication
  - NSAIDs
  - TCAs
  - SNRIs
  - AEDs
- Trigger point injection
- Acupuncture

- Non-pharmacologic
  - Structured PT
    - Individualized plan
    - Limited duration
    - Self-directed
  - CBT
    - Biofeedback
    - Relaxation
Case 3a & 3b

a. 56 yo woman with chronic low back pain
   • Widespread discomfort lumbosacral spine
   • Buttock, but no leg pain

b. 56 yo disabled man s/p lumbar discectomy and later 2-level fusion
   • Chronic axial spine pain
   • Chronic radicular leg pain (non-dermatomal)
CLBP and Spinal Pain Syndromes

*MRIs don’t count*

**Asymptomatic**

- HNP: 25-50%
  - Extruded: 1-18%
- Degeneration of disc: 25-70%
- Vertebral endplate changes: 10%
- Annular fissure: 14-33%

From Carragee 2005
Surgery for Low Back Pain

Indications:
- Unstable spine
- Post-traumatic, infectious, neoplastic, developmental, or acquired
- Radicular (non-axial pain) conforms to specific imaging finding
- Neurologic deficit: fixed or progressive
- Uncontrolled pain after reasonable “conservative care”*

*Must include psychological, physical rehab assessment and engagement

No Psychosocial Comorbidities
- Good Outcomes
- Poor outcomes

Active Psychosocial Problems
- Mixed Outcomes
- Poor outcomes

Poor outcomes also with:
- Tobacco/Alcohol
- Comorbid Chronic Pain Syndromes
Spine Pain Treatment

• Medication
  – NSAIDs if nociceptive
  – Steroids
    • ? Oral
    • Image guided interventions
  – TCAs/SNRIs
  – AEDs
  – Occasionally and selectively opioids
    • Rarely MED > 120mg

• Interventional
  – Spinal Cord Stims
  – IT opioid ± baclofen pumps

• Non-pharmacologic
  – CBT
  – Structured rehab
    • Aquatic
  – Acupuncture
Case 4

26 yo woman with lower abdominal cramping pain, urinary frequency, and situational stress

- Multiple Adverse Childhood Experiences
- Adverse life/health risk behaviors
Visceral Pain Syndromes

- Irritable Bowel Syndrome
- Non-cardiac Chest Pain
  - Increased esophageal hypersensitivity
- Pelvic pain syndromes
  - Interstitial Cystitis
  - Vestibulitis
  - Chronic prostatitis

Mayer, 2011
Brain-Visceral Interactions

From: Mayer, 2011
Descending Noxious Inhibitory Control

Abnormal “DNIC”

- Adverse childhood experiences
- Irritable Bowel Syndrome
- Fibromyalgia Syndrome
- Chronic Low Back Pain
- Chronic headache
- Gender and menstrual cycle variability
- Sleep deprivation
- Hypnosis responsive

Goodin 2009.
van Wijk 2010.
Case 5

22 yo woman with 10 years of episodic unilateral pounding headache, preceded by visual scintillations/scotoma, associated with nausea and vomiting
Migraine Headache

- Common disorder
- Acute relapses of chronic condition

"POUND" (as in "a pounding headache") is one way to remember symptoms consistent with migraine headache:
- Pulsatile quality of headache described
- One-day duration (duration < 4 hours suggests tension-type headache)
- Unilateral location
- Nausea or vomiting
- Disabling intensity.

From: Wilson 2007
Headache and the Trigeminal Nerve

TRIGEMINAL NERVE:
- Facial structures
- Blood vessels within head
- Anterior tongue

OCCIPITAL NERVE:
- Posterior head and neck
- Upper cervical structures

From Pietrobon 2003

From Packard 2002
Aura

Corresponding cortical spreading depression

From Pietrobon 2003
Neurobiology of Migraine
More headache workup?

- Change in usual pattern or tempo
  - Sudden explosive onset
  - Daily headache
  - Pain awakens from sleep
- Neurologic changes
  - Vertigo, syncope, discoordination
  - Personality or mental status change
- Fever and/or meningeal signs
- Onset after age 50
- Significant BP increase
- Tender temporal artery
Tension type headaches

From Packard 2002
Treatment of Migraine

• Avoid
  – Alcohol, caffeine, MSG
  – Sleep deprivation
  – Analgesics

• Episodic Medication
  – Triptans
    • IM/PO
  – Ergots
    • IV/IN
  – NSAIDs
    • IV/PO
  – Steroids
  – Opioids
  – Antiemetics
  – O₂

• Medication for Prevention
  – β- blockers
  – AEDs
  – TCAs
  – SNRIs
  – Botox
  – Magnesium
  – Feverfew

• Nondrug
  – CBT
  – Biofeedback
Case 6a & 6b

a. 58 yo diabetic man with burning pain in both feet

b. 58 yo woman with painful skin 3 months after acute VZ (“shingles”)
Neuropathic Pain

- Common Disorders
  - Diabetes
  - Post-chemo
  - HIV
  - Post herpetic

- Medication options
  - TCAs
  - SNRIs
  - AEDs
  - Topical lidocaine
  - Marijuana?
Case 7

78 yo man with progressive unilateral hip and knee pain
Arthritis Pain

**Osteoarthritis**

- **Diagnosis**
  - Joint line pain and crepitus
  - AM Stiffness <2 hours
  - No warmth
  - Passive ROM pain
  - Deformity

- **Imaging**
  - Limited correlate of pain intensity to structural findings
  - Use only to exclude other diagnosis
  - Meniscal tears are common in OA but usually not cause for pain

**Inflammatory Arthritis**

- **Diagnosis**
  - Elevated CRP, ESR
  - Swollen and warmth
  - Abnl aspirate
  - Stiffness >2 hours
  - Nighttime awakening
  - Young age onset

- **Imaging**
  - MRIs useful for SIJ abnl
Treatment of OA

- Obesity management
- Exercise
  - Non weight bearing
    - Aquatic if necessary
  - Structured PT for confidence and specificity
- CAM
  - Acupuncture
- Medications
  - Acetaminophen
  - NSAIDs
    - Topically?
    - Caution re long-term use
  - TCAs/SNRIs
  - Rarely opioids
    - Activity dependent
- Intra-articular injections
  - Steroids cautiously (>q4 months)
  - Hyaluronan for knee
    - Probably helps short-term
Pain Management in the Elderly

• Rx Low and Slow
• Age biases: family, staff, patient
• Common conditions
  – Osteoarthritis
  – Diabetic and Post-herpetic neuralgia
  – Spinal stenosis
  – Malignancy
  – Post-stroke
Special Issues in Geriatric Pain Management: Pharmacologic issues

• Dose adjustments
  – Poly-pharmacy
  – Low and Slow
  – Metabolic slowing with age

• Effect of medical illnesses
  – Renal insufficiency
  – Cardiopulmonary disease
  – GI motility
  – GU obstruction and incontinence

• Exaggerated side-effects
Spectrum of Widespread Pain Disorders

Central sensitization

CSS

Yunus 2007
Common Challenging Clinical Scenarios

**Inherited Pain Patient**
- Establish rapport
- Reevaluate history, exam, response to treatment
- Educate self and patient
- Encourage change, if needed
- Engage in redirected treatment
- Add/delete medications
- Add non-pharmacologic measures

**New Patient Requesting Refill of Chronic Opioids**
- Assess for new serious condition requiring urgent evaluation
- Obtain prior records
- No obligation to provide opioids on first visit
- After assessment, determine indication for opioids (and at what dose)
- Add non-pharmacologic measures
Conclusions

• *All* chronic pain is complex
  – Patient’s life experience with chronic illness
  – Pathophysiology of sensitization

• Treatment is based on diagnosis
  – Evaluate using measurement based instruments
  – Manage according to outcomes

• Rx effects alone limited to <50% improvement, so need more than just medications
Selected References

**General**

**Fibromyalgia**

**Back Pain**
Selected References

**Headache**

**Arthritis**

**Neuropathic Pain**

**Visceral Pain**

**Pain in Elderly**