Physiology of Chronic Pain

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GOALS

• What is Pain?
• Physiology of Pain.
• Why do we have Pain?
• What turns Acute Pain into Chronic Pain?
Many Americans Suffer from Chronic Pain

- 86 million Americans suffer from chronic pain
- 66 million are partially or totally disabled
- 8 million are permanently disabled by back pain
- There are 65,000 new cases of permanent disability diagnosed each year
Pain: What is it?
Pain: What is it?

Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage.

- The International Association for the Study of Pain. 1979
The Complexity of Pain

Bonica's Management of Pain 3rd Edition

Nociception

Pain

Suffering

Pain Behavior
What is Nociception?

- Signal from nerves to brain. “DANGER!”
- Protective mechanism
  - Warn us that damage is being done.
  - Let us know how long to rest until damage is repaired.
Complexity of Pain

Nociception

Pain

Suffering

Pain Behavior
Nociception Vs Pain

- Pain, in contrast to nociception, is a Conscious Experience
The Perception of “Pain”

- First process is **transduction**.
  - Signal from injured tissue toward spinal cord
  - Nerves (A-delta/C) transmitting signal to spinal cord
Perception of Pain (2)

• Second process is **Transmission**.
  – Signal from cord to brain
  – **Modulation**: Ability to up/down regulate signal. Volume!
    • Thresholds for signals increase/decrease
    • Recruitment of other nerves (WDR neurons)
• Finale: **Perception**
  - Combined effects excitatory and inhibitory systems that determine final message delivered.

-Melzack and Wall 1965
Why does Acute Pain turn into Chronic Pain?
Perception of Pain (2)

- Second process is **Transmission**.
  - Signal to brain
  - Modulation: Ability to up/down regulate signal.
    - Thresholds for signals increase/decrease
    - Recruitment of other nerves (WDR neurons)
Modulation

- "Neural Plasticity": The brain's ability to reorganize itself by forming new neural connections throughout life.

- Dr Lee; "Ray Charles Effect"
Brain injury
- Neurons don’t recover but brain reorganizes and adapts

J Keller, MCA
- 70 days in coma
  - Relearn walk/talk
  - 344 days in hospital
  - Walked out on his own
Modulation (3)

- **Central Sensitization**: The nervous system goes through a process called “wind-up” and gets regulated in a **persistent state of high reactivity**.
Modulation (4)

- **Placebo Effect:** example of cortical (brain) modulation.

> These capsules are fabulous! When I look at the box, I stop coughing.
Neuromodulation: Curse or blessing?

• “When we wish to perfect our senses Neuroplasticity is a blessing; when it works in the service of pain, plasticity can be a curse”
  –N. Doidge, MD
Is Chronic Pain all in my head?

- Not Faking
- Not intentional

- **But** a portion of Chronic Pain is “in your head”

- Role for
  Pain Psychiatry/Neuro-
  Modulating Meds

“There’s nothing wrong with your computer, I think it’s all in your head.”
THANK YOU

PAIN IN LIFE IS INEVITABLE

SUFFERING IS OPTIONAL