

Lecture 16

Thursday, July 15, 2021 00:25

Finishing Nociceptors, Beginning Injuries

- Injuries, Rehab, and Conditioning
- Ionotropic glutamate receptors
- AMPA (Na) and NMDA (Na *and* Ca) receptors
 - o NMDA - because of Ca, looking at long-term potentiation and long-term depression
- Metabotropic glutamate receptors
- Lipolysis - cell signaling
- CIPA
- TrkA - nerve growth factor binds to TrkA
- Arachidonic acid
- NSAIDs and cortisone
- Opioids and cannabinoids
 - o Inhibiting nociception pathway
- Types of nociceptors: A (myelin) and C (myelin-less)
 - o C fibers respond to mechanical stimuli (and heat and stuff)
 - Also respond to chemical stimuli (e.g., H⁺ ions, capsaicin)
 - o Some fibers are "silent" or "sleeping" nociceptors; will only transmit signals after they've been woken up by tissue injury
- Nociceptors are sensitive to many compounds [depolarizing] (ATP, prostaglandins, bradykinins, histamines)
 - o CGRP/substance P released from the nerve and will vasodilate (dilate the blood vessels)
 - o Substance P is part of nausea response in brain
 - o Massive inflammatory response from substance P
 - o Bradykinins initiate pain
- Allodynia - experiencing pain when pain shouldn't be felt
- Hyperalgesia - exaggerated pain response
- Peripheral vs. central sensitization
 - o Periphery vs. dorsal horn - a lot of peripheral activation can alter synapses at the dorsal horn
 - Ex: substance P causes activation of central NMDA

receptors

- Chronicity of pain is thus affected

- Injuries, rehab, etc.
- Level 1: leaf rake
 - o Indication:
 - o Contraindication:
 - o Dislocation:
 - o Subluxation:
 - o Sprain vs. strain
- Optimal loading characteristics: too much = destructive force, too little = weakness
- Level 2: bow rake
- Macrotrauma or microtrauma
- Classifying injuries:
 - o Acute
 - o Subacute
 - o Chronic
 - o Acute on chronic
- Level 3: long-handled cultivator
- Injuries and healing
- Step one: you get injured
 - o Blood vessels and lymphatic vessels are disrupted
- Step two: plug up the wound
- Step three: now site is stable, begin cleaning it up
 - o Clinical signs (inflammatory response):
 - 1) Redness (blood)
 - 2) Pain (bradykinins, prostaglandins)
 - 3) Heat
 - 4) Swelling - water following
 - May also observe a loss of function
- Immune cells are laser-focused, plugggggged in
- Step four: laying collagen down (once it's all clean)
- First deposit a bunch of scaffolding-like collagen III - then get collagen I which is good for structural integrity
 - o Gradually that provisional matrix is replaced with stuff that resembles non-injured tissue
- If applied the right amount of stress and right kind of collagen has been laid, you are healed :) (more or less)
- [over TIME] injury --> bleed --> clot --> clean --> repair --> heal -->

- Level 1: [TIME] injury → bleed → clot → clean → repair → heal → function or dysfunction
- Level 4: pointed ploughing spade
- Injure yourself - disruptions to injury site
 - Internal clot = provisional matrix
 - Provisional matrix = weak fibrin-fibronectin clot
 - Fibrin is a fibrous protein involved in blood clots
 - Fibronectin is a glycoprotein that binds to stuff
- Lymph is a bunch of interstitial fluid (clear, watery stuff bathing cells); it collects in lymphatic vessels and eventually dumps into the subclavian vein, where it gets mixed with blood flow
- Among the components of blood and lymph
 - FIBRINOGEN
 - FIBRONECTIN
 - PROTHROMBIN (plasma protein) gets converted to thrombin (soluble; enzyme)