INTEGRATIVE APPROACHES TO CHRONIC PAIN
(and Chronic Functional Syndromes)

Osteopathic Manual Medicine (OMM)
- Anatomic/Manual Dx and Tx is the primary distinguishing factor in osteopathic undergrad education.
- So we’re on the hunt for Somatic Dysfunction:
  - “The impaired or altered function of related components of the somatic system, including the skeletal, articular, and myofascial structures, and their related vascular, lymphatic, and neural elements.”
  - The ONLY indication for employing OMT
    - And the only Dx with which to associate billing for it > i.e. not “pain”
- OMT – Osteopathic Manual Tx
  - “A comprehensive, noninvasive, hands-on method used by osteopathic practitioners to diagnose, treat, and prevent bodily illnesses and treat injuries. It can be used separately or in conjunction with surgery or medicinal therapies.”
    ([Medical Dictionary](http://medical-dictionary.thefreedictionary.com))

Osteopathic Tenets
- The AOA’s House of Delegates’ approved “Tenets of Osteopathic Medicine” - the underlying philosophy of osteopathic medicine.
  - The body is a unit; the person is a unit of body, mind, spirit.
  - The body is capable of self-regulation, self-healing, and health maintenance.
  - Structure and function are reciprocally interrelated.
  - Rational treatment is based upon an understanding of the basic principles of body unity, self-regulation, and the interrelationship of structure and function.

The Dilemma… SOME PEOPLE DON’T GET BETTER!
- Western paradigm medical education:
  - Theoretical problems > theoretical answers
    - SYMPTOMS = SYMPTOM REDUCTION
      - Prevention = labs + testing + “counseling” (in 5 mins or less)
      - Fever = antipyretics + antibiotics
      - Mood d/o = mood pills + psychiatry
      - Pain = pain pills + imaging + rehab + referrals
    - DO’s – find the SD, fix it, pain goes away
  - Real, human problems ≠ theoretical answers
    - So what’s the problem? What am I missing?
    - Better yet, what is the more accurate CAUSE?
      - Or often, the CAUSE of the CAUSE…?

But if they don’t get “better”…
- More Medications…?
- More, Better Manual Medicine…?
- “Alternative” Medicine…?
  - Acupuncture, thyroid, vit D, heavy metals, nutrition/gluten/dairy, BHRT
- More Imaging…?
- More Injections (of all kinds)…?
- More, Better Rehab…?
- More Referrals…?
- More, Better Surgery…?
40 drivers
Ave 30 career events
Ave 52 car collisions per event
Ave 26 mph (Max 45 mph)

Only 3 drivers reported derby related chronic neck pain

Pictured: Heroic female medic who ignored shrapnel embedded in her shoulder to save SEVEN soldiers during Taliban attack

Chronic Functional Syndromes

Chronic Pain Syndromes
- Migraine headache
- Tension headache
- TMJ syndrome
- Neck pain
- Whiplash
- Fibromyalgia
- Myofascial pain
- Chronic tendinitis
- Repetitive stress injury
- Chronic abdominal pain
- Back/sciatic pain
- Foot pain
- Pelvic Floor Hypertonic D/O

Autonomic Nervous System
- Postural orthostatic tachycardia
- Irritable bowel syndrome
- Functional dyspepsia
- Interstitial cystitis / PBS
- CRPS

Other
- Tinnitus
- Rhinitis
- Insomnia
- Dizziness
- Paresthesias
- Poor memory
- Chronic fatigue
- Hypersensitivities
- Spasmodic dysphonia
- Globus hystericus
- Non-cardiac CP
- Chronic hives
- Restless leg synd.
- Depression
- Anxiety
- PTSD
- OCD
- MVP
“It is not death or pain that is to be dreaded, But the fear of pain or death” - Epictetus

How we got here.....

- Function
- Nociception
- Physical
- Psych
- Social
- Intellectual
- Emotional
- Behavior
- Spiritual
- Occupational
- Financial
- Community

Sorrowing Old Man (At Eternity’s Gate)
Vincent van Gogh

The Common Thread...

- Why do these patients all look the same?
  - Complex & multifactorial
    - Difficult “unhappy” childhood, inferiority, good-ist, PTSD
    - Psychiatric comorbidities are common
      - Depression/Anxiety, “Bipolar”
  - History and Physical Exam:
    - Multiple Sx, wax/wane, migratory, >3months
    - Onset or exacerbation marked by stress
    - Fatigue, sleep, memory, headaches, & mood disturbances
    - Inconsistent exam & testing

Fibromyalgia: a clinical review. Clauw DJ.

How we got here.......

It is more important to know what kind of person has the disease than what kind of disease the person has.
- Hippocrates

Beginnings...

- Pain as the “5th Vital Sign”
- Medicalization of Sx
  - Pain as a diagnosis...?
    - “FEVER” as a diagnosis...?!
  - Diagnoses to identify WITH(?); FM, IBS, IC, CFS
- Why can’t I help them??
  - My own failure to help, and my FEAR of failure; that I’m just not cut out for medicine or OMM;
  - Knowing the answers juxtaposed w/ the frustration and fatigue when they are inadequate.

It is not death or pain that is to be dreaded, But the fear of pain or death” - Epictetus
The Cause...

The Theory

Neuroplasticity: Changes in neural pathways & synapses which are due to changes in behavior, environment & neural processes

"Neurons that fire together, wire together"
"Neurons that fire apart, wire apart."

Brain Plasticity
Pascual Brain Topogi 2011

Is change possible?

Brain structure changes recede when pain resolves
- Nociceptive input OR Consequences of pain OR Both?
The Question
Are we confusing nociception for perception?

What is a Perceived Threat?

Pain: The body’s threat detection mechanism to keep you aware of actual &/or perceived threats.

- **Perception:** A sense something is true by instinct, but not necessarily by fact.
- **Conflict:** Incompatibility between the objectives of two characters resulting in a perceived threat.
- **Anxiety:** A multisystem response to a perceived threat.
- **Delusion:** A false belief held with strong conviction despite superior evidence to the contrary.

What are Symptoms?

- **Sx:** Phenomena that arise from & accompany a particular disease or disorder serving as an indication of its presence.

1) **Tissue Damage**
Noxious stimuli/inflammation that causes an elevation of nociceptive input from the periphery to the CNS

2) **Learned Neural Pathways**
Prolonged nociceptive stimuli from periphery will elicit neuroplastic changes at the cortical level to change its somatotopic organization for the painful site, inducing a central sensitization.

Neural Pathways are Everywhere
Physiologic, NOT Pathologic

Schubiner 2012
People want the truth...

...Until they get the truth they don’t want.

The self-fulfilling prophecy of imaging

What happens when you MRI ~100 pain-free people?

- 36% Normal at all levels...64% Abnormal findings
  - 52% Bulging \( \geq 1 \) level (Increase w/ age)
  - 27% Protrusion
  - 14% Annular defect
  - 8% Facet arthropathy
  - 1% Extrusion

Jensen MC. NEJM. 1994

Predictors of LBP Disability

- Structural & psychosocial risk factors
  - Psychosocial = STRONG
  - Structural (MRI/discography) = WEAK

MindBody

"Tell me one last thing," said Harry. "Is this real, or has it been happening inside my head?"

"Of course it’s happening inside your head, Harry, but why on earth should that mean that it’s not real?" – JK Rowling
**Childhood Trauma → Adult Pain**

**Victimization →** FM, migraine, IC, pelvic pain, & IBS

**Psychosocial Trauma →** Lumbar Surgery Success

1) Physical abuse  
2) Sexual abuse  
3) Parental drug abuse  
4) Abandonment  
5) Emotional neglect

Schofferman Spine 1992

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**ACE Questionnaire**

- Before the age of 18, did you experience…?
  1. Recurrent physical abuse  
  2. Recurrent emotional abuse  
  3. Contact sexual abuse  
  4. An alcoholic and/or drug abuser in the household  
  5. An incarcerated household member  
  6. Family member who is chronically depressed, mentally ill, institutionalized, or suicidal  
  7. Mother is treated violently  
  8. One or no parents  
  9. Physical neglect  
  10. Emotional neglect

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**ACE Results**

- Almost 2/3 of the 17k study participants reported at least one ACE, and > one of five reported three or more ACE.
- The short- and long-term outcomes of these childhood exposures include a multitude of health and social problems.

- Alcoholism and alcohol abuse  
- COPD  
- Depression  
- Fetal death  
- Health-related quality of life  
- Illicit drug use  
- Ischemic heart disease (IHD)  
- Liver disease  
- Risk for intimate partner violence  
- Multiple sexual partners  
- STD's  
- Smoking  
- Suicide attempts  
- Unintended pregnancies  
- Early initiation of smoking  
- Early initiation of sexual activity  
- Adolescent pregnancy

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**ACE Score and Rates of Antidepressant Prescriptions**

Approximately 20 years later

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**ACE Score and Indicators of Impaired Worker Performance**

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6/11/15
PTSD → Pain
Fibromyalgia – 55% had PTSD
- FM+PTSD = More pain, emotional distress, life interference, & disability
PTSD → MORE: Obesity, smoking, IBS, fibromyalgia, chronic pelvic pain, polycystic ovary disease, asthma, cervical CA, & stroke
Twins w/ highest PTSD scale were 3.5 times more likely to report CWP

Anger → Headache, FM
- 171 headache sufferers, 251 controls (Controlled for anxiety & depression)
- Holding anger in was most predictive of HA status

Anger is now understood to be an important factor that influences the impact of anger on physical health.
**Conflict:** Incompatibility between the objectives of two characters resulting in a *perceived* threat.

**Result:** Sx created to distract the conscious mind from dealing w/ a subconscious emotional threat.

**Purpose:** Symptoms absorb attention & serve as a protective distraction.

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**Internal Pressures**

- Overly conscientious
- Sense of duty
- Excessive worry
- Assume external problems
- Overly conscientious & caring
- Self-blaming
- Undeserved joy
- Obligations
- Self-critical
- Exclusionary for doing things for themselves

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**The Symptom Imperative**

- If you successfully treat one MBS...Another will arise serving to distract the conscious mind from the subconscious hurt and anger.

**Simple, yet revolutionary concept...**

- Stress & unresolved emotions create real, physical pain symptoms by:
  - Triggering LEARNED nerve pathways
  - Sx created by conflict arising in the subconscious
  - Changes are PHYSIOLOGIC, not pathologic disease
    - Via the Autonomic Nervous System
  - Pain & other Sx can persist for years
    - Habituation of nerve pathways
  - Mindbody symptoms can be REVERSED, even cured
    - Cognitive & Emotional interventions
The Diagnosis…?

Tension Myoneural (Myositis) Syndrome (TMS)
Mindbody Syndrome (MBS)
Psychophysiologic Disorder (PPD)

**Defined:**
A condition that causes real physical Sx that are not due to pathological or structural abnormalities and are not explained by diagnostic tests. …Sx are caused by… the autonomic nervous system, as a results of repressed emotions and psycho-social stress.

The Treatment…?

A bit more complex…

1. Education
2. Behavioral Intervention
3. Emotional Intervention
4. Life Changes

4-weeks to Reprogram the Brain

- **Education:** Understanding & believing in MBS, confidence in self
- **Behavioral:** Stopping fear, taking control of Sx, challenging triggers, meditation/visualization
- **Emotional:** emotive writing, ISTDP exercises, emotions underlying painful experiences
- **Life Changes:** Acting with assertiveness, love/letting go, meaning in pain, finding peace

Knowledge is Power

- **Education on MBS (Dr, books, web)**
  - The existence of learned “nerve pathways”
    - Ex: Blushing, butterflies, palpitations/sweaty palms
    - Sx may reduce after removal of threat…
      - But in the subconscious unreconciled, autonomically PERCEIVED threats can persist
      - Autonomically HABITUATED reactions
  - Change in understanding leading to self awareness
    - Pathophysiology/neuroanatomy - stress response/ANS
    - Activation by internalized stress/anger, triggers
    - Breach the subconscious through conscious efforts
    - Accept Dx → Internalize it personally → Minimize threat

Knowledge/Power

- **Stress/Emotion** (Subconscious)
- **Knowledge/Power** (Conscious)

Pain
No Pain

Howard Schubiner, MD
www.unlearnyourpain.com

Sarno The Divided Mind 2007
Emotions

“Cutters” and Meditators activate the DLPFC to decrease painful stimuli

(ACC, Amygdala)

Schmah/Auch Gen Psychiatry 2006

Behavioral/Emotional Work

- Addressing the past…
  - “Did you have a happy childhood?”
  - +/- Counseling if severe trauma - infant/child/adolescent

- Addressing the present
  - Adult pressures:
    - External: Work/Relationships/Environment…
    - Internal: Insecurity & unworthy → Perfectionist

- Unresolved past:
  - Yearn for what you did not receive as a child
  - Success is built on insecurity & drive to be good
  - Self-esteem based on caring for needs of others
  - Stop Anger & resentment building in subconscious

History of stressors

Please make a check if the following occurred around the time your symptoms (Syx) began or have occurred recently or are currently present:

1. Illness or death in your family or friends  Occurred when Sx began  Recent or Current
2. Divorce or marital problems
3. Legal problems
4. Accident or injury
5. New relationship or marriage
6. Difficulties at work or change in job or business
7. Gain of a new family member or change in the family structure
8. Change in financial situation
9. Change in living situation
10. Violent experiences
11. Changes in sexual functioning or other issues regarding sex

Personality Traits

Please check if you would describe yourself as:

1. Having low self-esteem
2. Being a perfectionist
3. Having high expectations of yourself
4. Wanting to be good and/or be liked
5. Frequently hostile and/or aggressive
6. Frequently feeling guilty
7. Feeling dependent on others
8. Being conscientious
9. Being hard on yourself
10. Being overly responsible
11. Often responsible for others
12. Having rage or resentment
13. Often worrying
14. Being sad
15. Having difficulty making decisions
16. A rule-follower
17. Have difficulty letting go
18. Cautious, shy, or reserved
19. Tend to hold thoughts and feelings in
Actual Life/Brain Change

- Symptoms → “What am I upset about?”
  - What are Sx communicating? What needs to change?
- Uncover defense mechanisms
  - Buffering words, laughter…
- Laugh at your pain
- Courage to move & move on
- Daily free writing, dialoguing, unsent letters,
- Re-writing stories
- Book (20%), Group (60%), & Individual Rx (20%)

Sarno, The Divided Mind 2007

“The past is just a story we tell ourselves”

-From Her

Dr. Howard Schubiner’s Mind Body Program

75 patients mean age 51
- Pain duration 8.8 years, baseline pain 5.1,
- 57% childhood trauma; mean # of Sx 13.5

>30% Improvement: Post-Rx 64%; 6-mo. 67%
>50% Improvement: Post-Rx 43%; 6-mo. 53%

In his own words…

- Dr. Howard Schubiner
- How MBS/TMS Develops in the Brain
  - http://unlearnyourpain.com/How%20MBS-TMS%20develops
  - https://www.youtube.com/watch?v=W9ZpGZ7ocG4

RCT of women with FM in MBS course vs. the waitlist

- Lower Pain Severity
- Lower Body Tenderness
- Physical/Mental Function
- Locus of Control

Hsu, Schubiner J Gen Intern Med 2010
TO CONCLUDE...

Centralized Pain & MBS/TMS/PPD

- Complex & multifactorial
  - Difficult “unhappy” childhood, inferiority, good-ist, PTSD
  - Psychiatric comorbidities are common
    - Depression/Anxiety, “Bipolar”

- History: Multiple Sx, wax/wane, migratory, >3months
  - Onset or exacerbation marked by stress
  - Fatigue, sleep, memory, headaches, & mood disturbances
  - Inconsistent exam & testing

- Respond to:
  - Education, emotional, & behavior interventions
  - Consider TCA, SNRI, anti-epileptics (gabapentinoids)
  - Avoid opioids & procedures

Schubiner
Claude FM

Barriers

- Stigma about psychosomatic conditions
- Fixed belief on peripheral tissue injury
- Shame of unsettling emotions or extent of peripheral pain workup
- Defense mechanisms
- Cognitive ability
- Emotions too painful
  - Sx initially worsen
  - Not strong enough

Practicalities / “Selling” It

- Reassurance this isn’t “in your head”...
  - Your Sx, and the mind-body connection are REAL...like my sweating right now (blushing, butterflies, tension HA, “heartbroken”, etc, ANS effects)

- ...it’s in their brain.
  - Panier’s dog, Phantom limb pain, Playing instruments. Sx disappear on vacay.
  - “How’s that working for you? (stress, specialists, meds)…” “Think about your thoughts!”

- RESEARCH on LBP
  - MRI≠pain; child trauma = failed surgery

- Contextualize
  - “What do your Sx indicate needs change?”
  - “Other life stress or the time of Sx onset?”
  - “Happy childhood?” “Do you like your life?”

- Give “homework” - 80% retained
  - Handout, videos, websites

- Address Sx – TREAT TO Dx!
  - Internal vs External locus of control

ASK & LISTEN - To your own life and theirs......
Treat nociception, but address, refocus, and facilitate changing perception.

Every patient, as often as you can:
- Manual medicine
- Regenerative medicine
- Standard preventive/primary care
You’ll be surprised…

David Hanscom, MD - “Back in Control”

- DOCC program:
  - A framework that breaks pain into its component parts. There are 3 aspects of a successful outcome: 1) Learning about chronic pain 2) Every aspect of pain must be addressed at the same time 3) The patient takes complete control of their care.
  - The source of pain may be:
    - Structural—identified lesion with matching symptoms
    - Nerve root—degenerate spinal discs, tears, strain, and ligaments have an abundance of pain fibers that can remain chronically inflamed
    - Central nervous system—“brain circuit” and can cause pain without an identifiable source—the Mind Body Syndrome (MBS)
  - The only receptor of course is your brain. The perception of pain is affected by:
    - Sleep
    - Stress
    - Medications
    - Life outlook—chronic pain destroys your ability to look out and up
    - Education—by not having enough knowledge and a plan you feel trapped
    - Physical conditioning

Thank You!
- Many thanks to David Kohns, DO
- Articles referenced in body of presentation.
    - Mindbody Publishing.
    - www.UnlearnYourPain.com
    - www.TMSwiki.com

Further Resources
- www.TMSwiki.org
- BodyinMind.org

PROLOTHERAPY
“Prolotherapy” Defined:

“The purposeful iatrogenic stimulation of the body’s capacity to heal wounds and repair injured tissues. Prolotherapy stimulates healing of ligamentous laxity, chronic enthesopathy, and/or tendinosis by initiating an acute inflammatory response.”

History

- First truly developed by Earl Gedney, DO
  - Published his work developing “a technique for stimulating the growth of new ligament tissue”, 1937

- Advances / Theoretical Development
  - Referred pain 2/2 myofascial triggering and ligamentous laxity (Travell, MD, US)
  - Scar-generated pain (Hunke brothers, Germany)

Enthesis

- A complex juncture of collagen fibers, fibrocartilage, cartilage and bone located at the very site where ligaments and tendons insert into their respective bones.
  - It is a firm union w/ bone; spaying out cartilagenous fibers it incorporates 2-3 x the cross-sectional area of the midportion of it’s respective ligament or tendon.

  “If bone is the focal organ of orthopedic surgery, the enthesis is the organ of MSK medicine and prolotherapy.”

Enthesis

- Blood supply
  - Relatively poor, reflecting the increased tissue strength needed for the tensile forces to which it’s subjected
    - Denser CT = ↓ Vascularity

- Innervation
  - Ligaments
    - The most richly innervated region - A-delta and C pain fibers
    - Leads to local and referred pain w/ enthesis injury
  - Tendons
    - Little or no innervation @ enthesis
    - Most commonly become painful after neovascularization and neoinnervation develop in response to severe or repeated damage
      - TENDINOSIS

Histopathology slice of an enthesis showings the 4 layers of the fibrocartilage (FC) enthesis.
Wound Healing and Tissue Repair

Inflammation is a GOOD thing...!

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**Acute Injury = INFLAMMATION**

- 3 distinct cascading phases of inflammation
  - 1 – *Inflammatory* phase
    - About 100 hrs duration (4-5 days)
  - 2 – *Granulation* phase
    - About 4-5 wks
  - 3 – *Remodeling* phase
    - About 20 wks duration

- Each subsequent phase has a growth factor dependent initiation on its preceding phase
- "Failure or prolongation in any one phase results in delayed or incomplete tissue repair..."

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**Inflammation Phase ~100 hrs**

- Classic S/Sx – rubor, calor, dolor, tumor
- Begins w/ physical tissue disruption
  - Collagen exposure; vascular permeability
  - Plt aggregation > Fibrin clot = "scaffold" for 1st neutrophilic and 2nd monocytic infiltration
  - Chemotactic agents – PGs, IL-1, TGF-B, TNF-a
- Monocytes > Macrophages > neovascularization > Fibroblasts proliferation

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**Granulation Phase ~ 4-5 wks**

- Begins ~48hr after injury, peaks b/w 6-10 days
- Fibroblasts promote tissue growth by collagen production
  - Construct a "permanent" EC matrix
  - Some differentiate into "protomyofibroblasts" which have a cytoskeleton containing muscle actin molecules

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**Remodeling Phase ~ 20 wks**

- Fibroblasts continuously remodel new ECM
- Neighboring ligaments and tendons exert directional stress on new ECM reestablishing *natural intrinsic tissue tension*.
- Myofibros produce aSM actin > adhesion complexes and base for actin contracture.
  - The same way a scab forms and draws tissue back together

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**Enthesopathy**
Incomplete Healing: Trauma vs Chronic Wound Vulnerability

- Incomplete healing > chronic injury +/- laxity
- Decompensation (common): dysfunctional posture, repetitive work, chronically imbalanced/weak/tight muscles.
  - Microtrauma & repeated incomplete remodeling attempts
- Trauma: forces so great as to exceed the body’s natural inflammatory potential
  - Analogous to an overstretched spring
- Pathology facilitated by avascular nature of these CT’s

Enthesopathy is a Pain

- This neural stimulation > persistent muscle guarding of injured and/or lax area.
  - Potentially the cause of things like trigger points, persistent somatic dysfunction, etc.
- Chronically contracting (splinting) muscles, if prolonged, lead to gradual postural decompensation.

Hx

- Hx of trauma?
  - MC = MVA, sports/workplace injury, etc
  - The “old football injury”...
  - Chronic deconditioning, overweight > poor mechanics or posture / ergonomics
- Morning stiffness that improves w/ motion
  - PF, OSD, “sciatica” (SI Jt), tennis elbow, RC “tears”
- A “sense” of joint being unstable
- Often pain is “referred” or radiating

Physical Exam

- Point tenderness, noted while palpating over enthesis, on bony surface.
  - Palpation will reproduce local, and often refers pain.
- Classic joint exams for laxity.

Prolotherapy: Basics and Techniques

“Prolotherapy causes acute localized tissue injury at the site of the enthesis that initiates...natural tissue inflammation and repair processes.”
The Devils is in the Details

- **Location and Marking**
  - Anatomy, Anatomy, Anatomy…!!!

- **Skin Sterilization**
  - Alcohol +/- chlorhexidine
  - Iodine skin prep falling out of favor across the board

- **Skin Anesthesia**
  - For pt comfort when using larger bore needles
    - +/- 25g or larger
  - 1% lidocaine +/- Bicarb or Bacterostatic water
  - Anxiolytic +/- opiate + driver = time savings

Solution - Osmotic Agents

- **Dehydrate cells at injection site**
  - Cause net flow of fluids from IC to EC
  - Causes cell LOCAL death
    - Cellular fragments stimulate wound-healing cascade.

- **Most common agent:**
  - Hyperosmolar glucose (Dextrose)
    - 25% for intra-articular
    - 12.5-15% for peri-articular
    - Generally benign, few to no allergies

Injection

- It is the precisely directed, local bleeding that accomplishes the most Tx benefit in prolotherapy
  - More than the amount or type of proliferant solution.
  - Immune system / growth factors are in the blood!
    - Technique identical for PRP, Stem cell inj

- Target areas “peppered” w/ the needle point, slightly adjusting needle direction to contact the entire enthes – inj 0.5-1cc of solution.

Treatment Practicalities

- **Treat most unstable joint first per PE**
  - Tx of Instability slightly more impt than pain severity

- **Frequency**
  - q 3-4 wks due to wound healing physiology

- **Duration**
  - From 1-3 treatments to notice any improvement
  - From 3-5+ Tx for any “area” to stabilize
  - If no noticeable improvement in 5/5x after 2-3 Tx’s (w/ good Pt compliance), reassess Dx

- **Rehab**
  - Adjunctive therapeutic ex (i.e. PTI) is essential, particularly if the original issue is postural / ergonomic.

After Care

- **Pain Mgmt**
  - 2-4 days of more acute pain,
    - Often mild swelling / bruising

- **ROM / Loading**
  - Move w/ the limits of pain free ROM
  - Avoid regional stress (i.e. reinjury) for 4-10 days
  - Will ↑ pain and muscle spasm, ↓ mobility and circulation

- **Absolutely NO NSAIDs in first 4 days**
  - NSAIDs d/c’d 2-3d prior to Tx
  - Attempt to not resume until at LEAST ~7d post Tx
  - APAP and opiates do not interfere w/ wound healing
Post-Injection Red Flags

- Anaphylaxis spectrum
- Pneumothorax
- Cellulitis
- Joint Infection
- Nerve Injury – pain > paralysis
- Spinal HA if dura punctured
- ↑ pain/discomfort longer than expected (> 1 wk)
  - Hematoma, myositis ossificans, etc
  - Consider imaging if persistent > 2 wks

Reference(s)

- Ligament and Tendon Relaxation Treated By Prolotherapy - 1991
  - Hackett, Hemwall, Montgomery

- Principles of Prolotherapy – 1st Ed.
  - Ravin, Cantier, Pasquarello – 2008

- “What is prolotherapy?” - YouTube
  - Dr. Jose Barreto
  - [https://www.youtube.com/watch?v=n0xXFYCCyvA](https://www.youtube.com/watch?v=n0xXFYCCyvA)