Prolotherapy and Beyond: Treatment Options in an OMT Practice
Osteopathic Manipulative Treatment (OMT)

• It is indicated for the treatment of somatic dysfunction.

• Somatic Dysfunction: Impaired or altered function of related components of the somatic (body framework) system: skeletal, arthrodial, and myofascial structures and related vascular, lymphatic, and neural elements.

• Symptoms: Restricted movement, edema, pain/tenderness, numbness, tingling. In infants it can include rigidity, colic, constipation or IBS, nursing or latch issues, failure to thrive, agitation, and poor sleep patterns.
The Tenets of Osteopathic Medicine express the underlying philosophy of osteopathic medicine:

1. The body is a unit; the person is a unit of body, mind, and spirit.

2. The body is capable of self-regulation, **self-healing**, and health maintenance.

3. Structure and function are reciprocally interrelated.

4. Rational treatment is based upon an understanding of the basic principles of body unity, self-regulation, and the interrelationship of structure and function.
Osteopathic Manipulative Treatment

- 70 y/o male patient referred to me by DDS. Diagnosis of muscular trismus secondary to inferior alveolar nerve block. He had a dental implant and the jaw locked one week later. Initial opening 12 mm. Goal: Eat a submarine sandwich again!

- MRI negative. May 2019 (No meniscal tears)

- Prior treatments: Stretches, spray and stretch, photobiomodulation, hot packs, trigger point injections and muscle relaxants.

- Initial evaluation 07/31/2019. Physical exam: 28 mm opening. (Male normal 40-60 mm) Tightness and bilateral tender points of the serratus posterior superior. Loss of cervical rotation to the left. Tenderness and mild swelling of the right cervical facets and tension of the right masseter.

- Treatment: OMT utilizing strain counterstrain, myofascial release and osteopathic cranial manipulation.

- RTC 813/2019. 44 mm opening and no complaints. Date at Subway!
OMT

• Charlotte is a 6-month-old female infant who is having difficulties breast-feeding and bottle feeding. She is the second child born to her mother. For the mother the PG was very stressful. Mass in baby noted on US. She was born by cesarean section. In NICU had a 1 minute apneic episode. Later the infant had resection of ovarian cyst.

• At 8 days of age she had a tongue tie and lip tie revision. Initially she would only feed from the breast. At 6 months she will not take a syringe, bottle, sippy cup, or other means of drinking. Would not take solids. Only very brief naps. Child had been up 14 times the previous night to the initial evaluation.

• Mother is comfortable with child on her right breast, but feeding on the left breast is painful to mother.
OMT

• Palpation revealed the lumbosacral spine to be rotated and side bent to the right. Thoracolumbar transition area was rotated and side bent left. There was restrictions bilaterally in hip ROM with it being more restricted on her right. There was a right external tibial torsion. She had compression of the left basiocciput. She had tension through the muscles of the floor the mouth. She chops on examiner’s finger when it is placed in the mouth more to her left side.

• Diagnosis: Cranial, thoracic, lumbar and lower extremity somatic dysfunction. Treated with osteopathic manipulation utilizing percussion with myofascial release and cranial techniques. She was then placed on the breast and the mother noted significant improvement of the upper lip function and grasping of the nipple was significantly more comfortable.
OMT

Recheck 1 week later:

- Normal latch and feeding on both sides with no discomfort for the mother.
- Sleeping at night and naps still an issue. Discussed sleep training methods.
- PE: Mild tension in the left basiocciput and thoracolumbar transition area. Corrected with OMT. Follow up as needed.
Movement/Strength evaluation and Exercise Rx

• 17 y/o male, high school senior. College scholarship.
• C/C: Bilateral knee pain. He describes his knee pain as burning with a pins and needles sensation. It is more pronounced on his right. This pain recurred in August of this year. He had pain 3 years ago that eventually went away. He feels fine when he first arises in the morning but has pain throughout day. The intensity varies from 2-10/10. It is aggravated by running cross-country while he notes relief with rest, ice and ibuprofen. He enjoys running and is concerned this will disrupt his ability to perform. He has been treated at PT with stretches, hot packs, ultrasound, ice, electrical stimulation, strengthening exercises and used anti-inflammatory medications. He has had several evaluations from two sports medicine physicians.
Movement/Strength evaluation and Exercise Rx

• Standing forward flexion reveals no abnormal spinal curvatures. His knees extended beyond 180°. He was very tight in his hamstrings.

• Active straight leg raising was positive bilaterally for tight hamstrings. There was no hypermobility noted in his hands or elbows. He had decreased external rotation of both hips. Strength testing revealed marked weakness bilaterally of the hip flexors, abductors and extensors with hip extensor inhibition bilaterally. Palpation of the knees was positive for pain over the lateral joint lines and the posterior lateral corners.
Movement/Strength evaluation and Exercise Rx

• Dx: Bilateral hip weakness with secondary strain of both knees. Especially the peri-patellar connective tissue. He was instructed on prone hip muscle firing retraining and strengthening as well as hip abductor and flexor strengthening.

• RTC 2 weeks later. Strength, pain and function all improved. Ran 4K of a 5K without pain. Knee soreness the last 1K. Prior to exercise he would be painful almost immediately when running.

• Exercises were reviewed and modified. Recheck in one month.

• Take home: Not all PT is done well and we as physicians need to assess strength and movement and review PT to see that patient is actually benefiting from it.
Movement/Strength evaluation and Exercise Rx

- October he ran sectionals and district meets.
- Finished last due to right knee pain.
- PE: Minimal left knee pain and good strength. Persistent right knee pain, hip and leg weakness and with findings consistent with patellofemoral syndrome. Marked 6-12 o’clock peri-patellar tendon pain. Laxity of the connective tissue around the patella, R>L.
- Plan: Prolotherapy and PT. Therapist called and informed of problem and treatment plan discussed.
Pain & Soft Tissues

Effects of neural stimulation include

- Spinal reflex contraction of flexor muscles
- Facilitation of the flexor reflex leading to reflex muscle spasm/tightness
- Inhibition of antagonistic muscles
- Sensitization of nociceptors
Prolotherapy: Definition

- Prolotherapy is the iatrogenic stimulation of the wound repair process by injecting proliferant solutions into damaged ligaments, tendons, and joints.
- “Strengthening the weld of disabled ligaments and tendons to bone by stimulating the production of new bone and fibrous tissue cells” - Hackett.
Common Problems Responding to Prolotherapy

• Joint instability: Ankle, knee, hip, sacroiliac, shoulder, wrist and digits (turf toe, jumper’s knee)
• “Fibromyalgia”, i.e. tendinosis
• Spinal pain due to tendinosis or ligament laxity
• Persistent post MVA pain, occipital headaches
• “Piriformis syndrome”
• Rotator cuff: shoulder and hip.
Some Causes of Ligament Laxity

- Incomplete wound healing
- Recurrent trauma (overuse/repetitive use injuries)
- Overwhelming tissue trauma
- Hormonal deficiencies: Thyroid, estrogen, testosterone or hGh
- Nutritional deficiencies
- Lyme disease? EDS and hypermobility.
Signs of Ligament Laxity

- Pain – local/referred
- Joint hypermobility
- Spasm of associated muscles (muscles that cross the unstable joint)
- Trigger points in associated muscles
- Weakness/atropho of associated muscles
- Somatic dysfunction
- Morning stiffness (it’s not arthritis!)
- “Cocktail party or grocery cart syndrome”
Grocery Cart Cruiser
Why underutilized?

• Poor physical examination and reliance on imaging by physicians.
• No $ made selling dextrose.
• Drs not knowing the difference between tendinitis and tendinosis.
• Lack of understanding of pain generators and referred pain, i.e. it’s not all from a disc or nerve root.
• “Lack” of research
• Not covered by insurers.
Why are so many treatments in general medicine done with not much evidence of benefit and why is dextrose prolotherapy not covered by insurance?

It is important to keep in mind that treatments which are commonly done are considered "customary or usual practice" so they typically do not undergo scrutiny as to their effectiveness.

The second question is more complex, but when treatment is considered for coverage by an insurer, unless it is so common that the insurer has to consider it customary or usual, the insurer will not cover it unless there is level A evidence, which sets the bar quite high, and yes, higher than most treatments given today. That is why researchers in prolotherapy don't expect insurance coverage any time soon. Instead, they focus on slowly building the body of evidence through the dedication of individual young researchers willing to sacrifice their time and money. Meanwhile, researchers expect that more and more doctors (and patients) will become so frustrated with the customary treatments that are covered by insurance, that virtually all new pain physicians will eventually be learning prolotherapy, forcing insurers to cover it.
Prolotherapy

• Inject injured ligaments or tendons
• Encourage moderate activity to stress the lines of force through the tissue
• Avoid NSAIDs and anti-histamines for 4 days pre and post injection
• Analgesics for pain (usually narcotics or acetaminophen for the first three days)
• 3-6 sessions are typical at 3-6 week intervals
• Appropriate rehabilitation is critical
Prolotherapy

Risks and Complications:

- Pain at injection site
- Muscle spasm (responds well to OMT)
- Bruising
- Rare complications/risks: Infection, spinal headache, pneumothorax.
Dextrose Basic Science

- Analgesia
- Chondrogenesis
- Safety in tendon injections
- Thickens ligaments
TMJ Prolotherapy Research

• 42 patients, 54 joints

• 3 monthly injections with 20% dextrose and 0.2% lidocaine followed by as needed injections for 1 year. Controls crossed over at 3 months to prolotherapy treatment.

• Measures: Pain scale, reported jaw dysfunction, and maximal interincisal opening (MIO), % of joints with >50% improvement of pain, function and satisfaction.
Louw

• Closed mouth injection technique

• The point of needle entry was 1 cm below the apex of the zygomatic arch, with a 45 degree cranial and 10 degree posterior angulation measured using a 1-in 30-G needle. If needle contact occurred, it was considered to be condylar contact and a more cranial angulation was used. A 10 degree posterior angulation was used to direct the needle tip most consistently into the superior joint space, as the needle entry point is typically anterior to the condyle. One milliliter of solution was injected in each affected joint, with a free flow of fluid after preinjection aspiration. (Similar to Fouda technique #3)
3 Months

• Controls
  1. Pain decreased by 1.8
  2. Jaw dysfunction decreased by 1.0
  3. MIO decreased by 1.8 mm

• Treatment Group
  1. Pain decreased by 4.3
  2. Jaw dysfunction decreased by 3.5
  3. MIO increased by 1.5 mm
12 Months

• No difference between the 2 groups
• Pain improved by 5.2 points
• Dysfunction improved by 4.1 points
• MIO improved by 2.1 mm
• 70% had at least 50% improvement of their pain
• 72% had at least 50% improvement of their dysfunction
Zygoma Injection
Prolotherapy Research

• Acromioclavicular Osteoarthritis: Conclusions—Ultrasound-guided prolotherapy with a 15% dextrose solution is an effective and safe therapeutic option for moderate-to-severe acromial enthesopathy and acromioclavicular joint arthropathy.

• Knee Osteoarthritis: Conclusions: In terms of pain reduction and function improvement, prolotherapy with hypertonic dextrose was more effective than infiltrations with local anesthetics, as effective as infiltrations with hyaluronic acid, ozone or radiofrequency and less effective than PRP and erythropoietin, with beneficial effect in the short, medium and long term. In addition, no side effects or serious adverse reactions were reported in patients treated with hypertonic dextrose.
Prolotherapy Research

• Osteochondral lesions of the talus: Comparison of Platelet Rich Plasma and Prolotherapy in the Management of Osteochondral Lesions of the Talus:

• Both PRP and Prolotherapy treatments resulted in greater improvement in pain and ankle functions at follow-up periods extending to 1 year (P<0.001) and there was no difference between the groups for the outcomes at follow-up periods (P>0.05). Excellent or good outcomes were reported by 88.8% of the patients in PrT group and 90.9% of the patients in PRP group. Conclusions: Both PRP and PrT are efficient and safe methods in treatment of OLT. PrT offers advantages of less cost and minimal invasiveness.
Prolotherapy Research: Randomized Controlled Studies (RCTS)

- Achilles Tendinopathy
- Hand Osteoarthritis
- Knee Osteoarthritis
- Lateral Epicondylitis
- Low Back and Sacroiliac Joint Pain
- Osgood-Schlatter Disease
- Rotator Cuff Tendinopathy
Prolotherapy: Non-RCTS

• ACL Laxity
• Groin Pain
• Patellar Tendinosis
• Shin Splints
Low Back Pain: Case Study

• 40 y/o female with acute onset of left LBP 11/26/2019 while jumping rope as part of her regular exercise. Constant pain except when lying down although painful to turn over. Aching and stabbing qualities. Initial evaluation: 12/06/19.

• Aggravated by: Valsalva, twisting, standing on one foot and prolonged sitting

• Better with ibuprofen, acetaminophen, TENS or Biofreeze

• PMSHx: Right knee with early OA and obesity. 2 C-sections, Cholecystectomy, vertical sleeve gastrectomy and tummy tuck.

• Prior evaluations: ER, IM and DC. Treatments: Stretches, heat, ice, massage, above meds, DC adjustments.
Low Back Pain: Case Study

- PE: Height 66 inches (167.64 cm) Weight 208.8 pounds (94.71 kg) BMI 33.69 Pulse 75 bpm, Sitting Blood Pressure 126 / 86, Left arm sitting Pain Scale 3 (Scale 0-10).

Active straight leg raising was negative bilaterally. She had good range of motion in each hip. Posterior shear test and FADIR tests were negative bilaterally. She had no pain of the iliolumbar or posterior sacroiliac ligaments. There was no pain through the iliofemoral or ischiofemoral ligaments. She had a tender point of the left iliacus muscle. Her low back pain appeared to be reproduced with palpation of the distal insertion of the inguinal ligament and external oblique on the left pubic tubercle.

3 cc of 0.5% lidocaine were injected at the left pubic tubercle. She was able to turn over and lie on her left side without pain. Next prolotherapy was performed to the area.

- Impression: Strained left internal and external obliques.
Low Back Pain: Case Study

• Reevaluation: 12/31/2019. VAS pain level 1/10.
• Pain only at the end of the day after working at her dental clinic all day.
• PE: Tenderness at the top left of the pubic bone and the pubic tubercle.
• Prolotherapy performed a second time.
• Recheck in one month. Pain resolved.
Platelet Rich Plasma (PRP)

- Platelet-rich plasma (PRP) is an autologous product that concentrates a large number of platelets in a small volume of plasma.
- The blood platelets perform several essential functions in the body, including blood clot formation and the release of growth factors that help to heal wounds.
PRP

• These growth factors stimulate the stem cells to produce new host tissue as quickly as possible, which explains PRP is so effective in the post-treatment healing process.

• This unique property of PRP speeds up the healing process at the cellular level and there is virtually no risk for allergic reaction or rejection because patient's own blood is used.
• PRP has 7 fundamental proteins:
  1. Platelet derived growth factors (PDGF)
  2. Transforming growth factor–β (TGF-β)
  3. Vascular endothelial growth factor (VEGF)
  4. Epidermal growth factor (EGF), and
Platelet Rich Plasma (PRP)


• 20 patients and 32 joints in the study. All had a reducible anterior disc dislocation confirmed by MRI.
PRP Research

• Results: There was a statistically significant reduction in pain intensity and joint sound and an increase in mouth opening in the PRP group when compared to the arthrocentesis group.

• Conclusion: PRP is more effective than arthrocentesis for the treatment of reducible disc displacement of the TMJ.
Platelet Rich Plasma: Research 10/2018

• Abundant high-quality evidence supports the use of LR-PRP injection for lateral epicondylitis and LP-PRP for osteoarthritis of the knee. Degree of DJDx may not effect outcomes.

• Moderate high-quality evidence supports the use of LR-PRP injection for patellar tendinopathy and of PRP injection for plantar fasciitis and donor site pain in patellar tendon graft BTB ACL reconstruction.
PRP: Other Applications and Ongoing Research

- Rotator cuff tendinopathy
- Gluteus medius and minimus tendinopathy
- Degenerative meniscal lesions
- Diabetic neuropathy
- Hip and shoulder labral tears
- Hip and Knee DJDx
- Osteochondral lesions of the talus
- Achilles tendinosis
- Discogenic pain
- Joint tendinosis and joint ligamentous instability
- Sacroiliac joint pain
- TMJ injury
- Medial and lateral epicondylitis
- Plantar fasciitis
Adipose Stem Cell Injections

• The fat collected during a liposuction contains tissue-repairing cells used diversely to erase wrinkles, reconstruct breasts, or treat arthritic joints. These cells, dissociated after enzymatic digestion of the fat, secrete diverse regenerative molecules playing important roles in tissue repair. Results of this study show that keeping the micro-architecture of the fat intact, by physical fragmentation into sub-millimetric units in the absence of enzyme treatment, guarantees optimal maintenance of regenerative cells and dramatically improves factor secretion thereby. These results likely explain the observed therapeutic superiority of micro-fragmented adipose tissue and suggest it should be preferred to routinely used, enzymatically produced single cell suspensions.
This is the first study of its kind to compare clinical outcomes between autologous orthobiologic tissue sources regardless of orthopedic condition. Furthermore, most nonoperative treatments for knee osteoarthritis provide only short-term improvement. These data show that both microfragmented adipose tissue and bone marrow aspirate concentrate injections provide prolonged improvement (>1 year) in pain and function without a difference in the extent of improvement when comparing tissue source.
Indications: Adipose Stem Cells

• Knee osteoarthritis
• Hip degenerative joint disease
• Shoulder degenerative joint disease
• Diabetic neuropathy
• Other: Neurodegenerative, cardiovascular and auto immune diseases
Are Amniotic Fluid Products Stem Cells?

• These are known as particulates

• Contents:

• MSCs could not be identified in the commercial AFPs or the unprocessed amniotic fluid. MSCs could be cultured from the bone marrow aspirates. Nucleated cells were found in 2 products (PalinGen and FloGraft), but most of these cells were dead. The few living cells did not exhibit established characteristics of MSCs. Growth factors and hyaluronan were present in all groups at varying levels.

• Contents: Cytokines, multiple growth factors, and matrix components
Ozone Therapy

• Injection of O2O3
• Analgesic effect, anti-inflammatory effect, treatment of hypoxemia, stimulation of fibroblast activity and
• O₃ breaks down the glycosaminoglycans chains in the nucleus pulposus and reduces their ability to hold water, thereby shrinking the nucleus and subsequently reducing intradiscal and peri-radicular pressure. (Avoid in advanced DDDx)
Ozone Therapy: Indications

• Disc herniations
• Sacroiliac joint pain
• Joint pain
• Primarily used in patients who are not good surgical candidates or choose not to under surgery.
Perineural Injections: Lyftogt Technique

- A series of subcutaneous injections of 5% dextrose following the course of a tender subcutaneous nerve.
- It theoretically works by blocking the TPVR1 receptor of the nerve (capsaicin or vanilloid receptor)
- Small studies have shown ultrasound documented changes in both the Achilles tendon and the plantar fascia with treatment to the saphenous nerve and deep tibial nerve.
- Scholar: Pilot and Validation Studies ISSN: 2689-7644 Volume 1 Issue 1 Pages: 4 – 10 DOI:10.32778/SPVS.71366.2020.24 Lyftogt perineural injection therapy® as a primary treatment for plantar fasciitis: a randomized, controlled pilot with crossover Authors: Eileen Conaway, DO1, Arlene O’Donnell, DO1, Julie Pepe, PhD1, Melissa Pena1 Affiliations: 1) AdventHealth Graduate Medical Education, 7975 Lake Underhill Rd, Suite 210, Orlando, FL 32822
Nerve Hydrodisection

• An ultrasound-guided technique where the painful nerve is visualized and the needle is guided into the perineural connective tissue or sheath and a solution is injected into the sheath releasing adhesions between the sheath and the nerve.

• Most commonly 5% dextrose and utilized although sometimes 10% dextrose is preferred. Corticosteroids may be used with the realization that blood sugars will remain elevated for 5 days and longer for those with a hemoglobin A1c of 7 or greater.
Nerve Hydrodissection: Applications

- Carpal tunnel syndrome
- Ilioinguinal nerve
- Iliohypogastric nerve
- Genitourinary nerve
- Cluneal nerve
- Suprascapular nerve
- Cervical nerve roots
- Gluteal nerves
- Sciatic nerve
- Posterior Femoral cutaneous nerve
- Lateral femoral cutaneous nerve
- Occipital nerves
- Radial nerve

101 Nerve Entrapments: Ultrasound Guided Nerve Hydrodissection  TB Clark and SKH Lam  June 2016
www.mskus.com
Evaluation of Joint Stability

Mark S. Cantieri, DO, FAAO
Corrective Care, PC
Joint Stability Testing

- Perform to determine if joint motion is normal or excessive.
- Compare sides or adjacent segments.
- Evaluate for local tenderness, muscle guarding, tender or trigger points, edema, and loss of passive range of motion.
Shoulder Capsule
Breakaway Pain

- Patient quickly relaxes against resistance testing in order to avoid pain.
- Indicative of tendonitis.
Giveaway Pain

- Patient attempts resistance but is unable to overcome it due to weakness.
- Indicative of ligamentous laxity.
Anterior, Inferior Shoulder Capsule, Subscapularis
Posterior Shoulder Capsule, Infraspinatus
Superior Shoulder Capsule, Supraspinatus
Anterior Shift Test
Posterior Shoulder Capsule
Radioulnar Shift Test
Wrist, Scaphoid Shift (Watson) Test, start
Wrist, Scaphoid Shift Test, finish
Scapholunate Shift Test
Ulnar Collateral Ligament
Cervical and Thoracic Translational Motion Testing
Hip Capsule
Anterior Hip Capsule
Passive Anterior Hip Capsule
Active, Anterior Hip Capsule
Anterior Hip Capsule
Lateral Hip Capsule
Sacroiliac and Iliolumbar Ligaments
Sacroiliac Joint
Sacroiliac Ligament, Gluteus Medius Strength Test
Iliolumbar Ligament
Anterior Cruciate Ligament
Posterior Cruciate Ligament
Posterior Lateral Corner
Medial Collateral Ligament
Lateral Collateral Ligament
Ankle Joint, Drawer Test
Inversion of Ankles
Tibio-fibular Syndesmosis
Posterior Talo-fibular Ligament
Sinus Tarsi
Spring Ligament
Plantar Fascia
Strong ligaments equal strength.