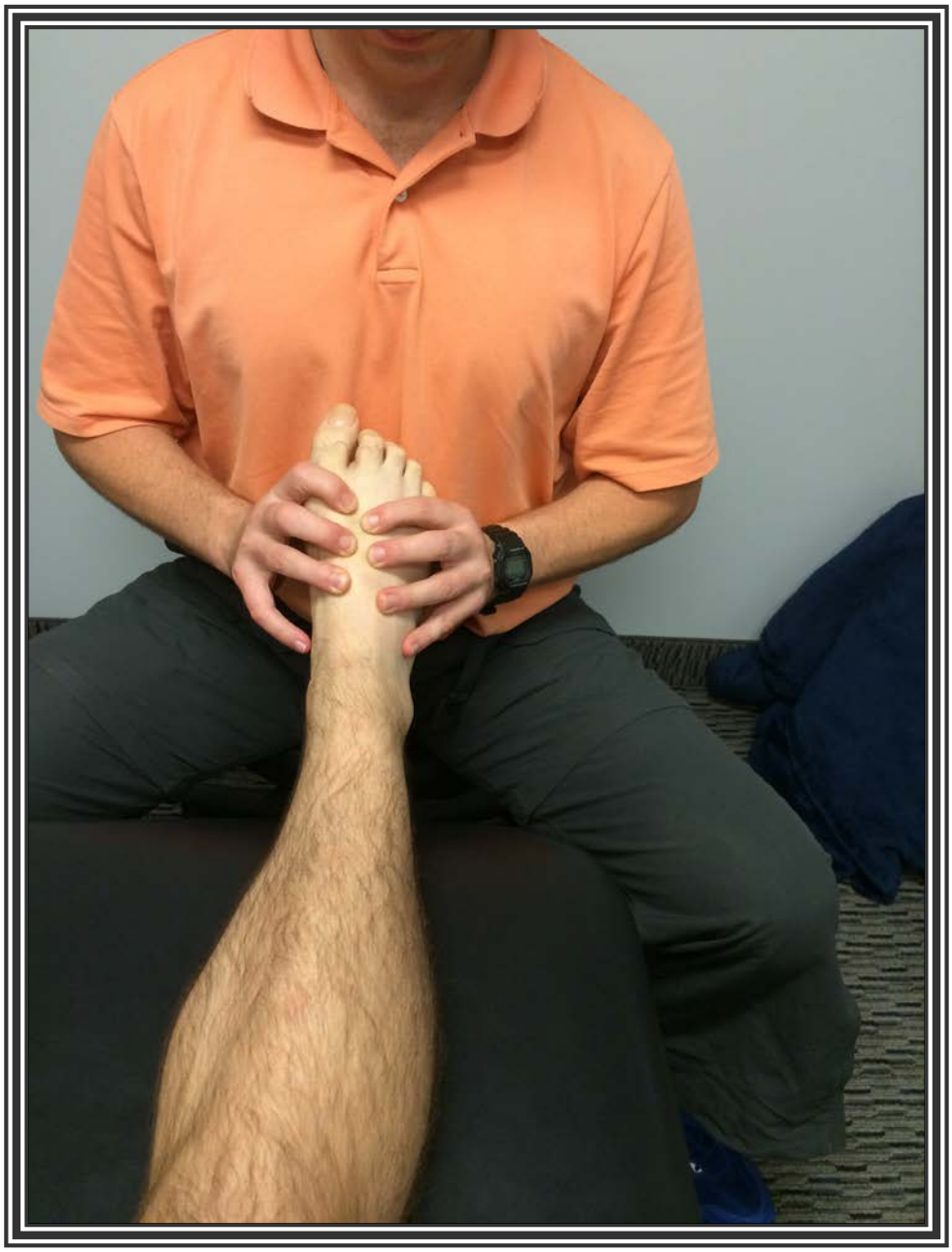
Osteo-Articular Joint Pumping Module



Joint Pumping and Articular Inflammation

(This article was translated and adapted from an article written by Guy VOYER, DO.)

Every day patients/athletes complain of painful inflammation, sprains, tendonitis, arthritis, and rheumatic problems. As practitioners, are we best serving our clients using ice (cryotherapy) all the time?

What is 'Liquid' Articular Pumping?

It is a painless treatment of the tissue which is precise and demands a knowledge of the fascia, the biomechanics, and the PRM or primary respiratory mechanism.

When one works on the synovial liquid the movement can be purely articular but when one works on the ligamentous scarring from a sprain, or synovial tissue (inflammatory arthritis) etc., it is appropriate to respect the integrity of the fasciae.

It is therefore necessary to stimulate the rhythm of the circulation of the liquid within the tubules of collagen, the network of particular fasciae (ligaments, serous bursae, capsules, tendons etc.)

If the quantity of the rhythm is in respect to the PRM, the quality and equilibrium in the connective tissue will be of necessity to stimulate the intensity of the alteration of free water (sol) and bound water (gel) in the colloid structure of the fasciae.

All the movements are in lemniscate fashion.

To stimulate this liquid, it is necessary to use one hand to listen to the tissues and another that acts on the introduction of the fluids in the tissues either by stimulation or by inhibition. Therefore, there is a gradient of pressure, or aspiration, which engenders the movement of the fluid and the necessary hormonal stimulation.

There are approximately 600 different pumping techniques specific to act selectively and efficiently on the necessary joints, articulations. They can be utilized at ANY stage of inflammation- vascular, cellular or restorative.

A word of caution… there are many different joint-pumping techniques. They are not meant to mechanically treat the joint but to treat each individual ligament, tendon, synovium or capsule that comprises the tissue that requires treatment.

To have the best results with these techniques, it is necessary to work to master the technique with respect to the anatomy and biomechanics of the structure. A structured

program has been created to teach these techniques coupled with practical workshops after the formal training where students can work to refine and master their skill.

There are three classic phases of inflammation.

• The vascular phase
• The cellular phase
• The regenerative phase

What is the best therapeutic method against this inflammation?

The vascular phase is characterized by three main processes, including platelet activation, vasodilation, and increased vascular permeability. In the vascular phase (first phase), using ice is interesting as it permits a reduction in the heat, redness and edema (swelling) by way of vasoconstriction; however, this phase only lasts roughly 24-36 hours.

After, it is the liquid mobilization (the movement of the fluids) whereby the blood allows the necessary migration of leucocytes as well as indispensible hormonal function that results in the treatment of inflammation. This appears self-evident; therefore, icing is stopped after the initial phase, unless in its vocation of cutaneous anaesthetic against pain.

What then is the best treatment for inflammation in the secondary phase?

Osteo-articular joint pumping is the best modality for addressing inflammation in the secondary phase, allowing for improved migration of leucocytes and improved hormonal influence towards the articulation; this normalizes the tension(s) in the articular (joint) capsule and the ligaments.

Some Generalizations

The synovial membrane is one of the structures of the organism that is the most accessible in an inflammatory process. We will speak of articular inflammation as the inflammation that results from arthritis, arthrosis, traumatic injuries, and degenerative diseases.

Inflammation can be pathogenic, that is to say, susceptible to contributing to aggravation of lesions and a prolongation of clinical signs.

Cellular Phase

It is necessary to bring leukocytes to the traumatized location in order to fight against the immediate accentuation of inflammation. It is equally important to bring macrophages to improve in the elimination of the inherent waste products of the leucocytic action.

What could be more efficient than the liquid articular pumping to augment the transport of these first defenders against inflammation?

Vascular phase

The vascular phase is divided into two sub-sections. The first sub-section is characterized by the modification of local vasoconstrictors causing a plasma exudate (the type of pleural effusion that results from inflammation or other disease of the pleura itself; it features cloudy fluid - containing cells and proteins) and therefore edema.

Icing is the best therapeutic intervention at this moment.

The second sub-phase asks for a vasodilation of the microvasculature with an increase of heat and redness. It is necessary to prioritize this stage with the liquid joint/articular pumping, **NOT with icing.**

Regeneration Phase

This phase depends on the type of inflammation. It is the arthritis, arthrosis, haemorrhagic, catarrhal, serofibrous or purulent in origin?

This phase permits the principle reconstruction of the synovial membrane where we wish to avoid a harmful development in the articulation, like a pannus, a degeneration of the articular cartilage, or a degeneration of chondrocytes, leading to the destruction of subchondral bone. The rehabilitation of the movement of an articulation can most certainly be made by numerous mobilization techniques- the liquid joint/articular pumping.

Why Liquid Joint Pumping?

We have already observed with interest the migration of polynuclear material in the initial phases of inflammation but it is also necessary to accentuate the transportation of hormonal mediators. It is in this dialogue, between the hands of an osteopath and the inflamed tissues of the articulation, that allows a better communication with the process of healthy healing of inflammation.

What are the Principle Mediators of Inflammation?

The first is Hageman's Factor (Factor XII in coagulation). The activation of Hageman's Factor is produced by contact with various structures, in particular those that have a crystalline surface structure of a para-crystalline anisotrophic surface.

Next is histamine, characterized by its brief yet explosive action causing a vasoconstriction and an increased vascular permeability. This is stimulated by icing.

The contribution of serotonin is complimentary.

The kinins have a fundamental role that is, nevertheless, extremely brief. They trigger a vasodilation, augmenting the vascular permeability and a local arterial hypotension. This is one of the mediators which must be rapidly stimulated by the method of liquid articular pumping.

The prostaglandins intervene in the same sense but with a slight delay, like in a relay race. It is therefore necessary to stimulate their contribution by the articular pumping also.

The compliment participates in both the vascular and cellular phases.

In effect, the mediators of the cellular action have an essential role in the control of the cellular migration and that of phagocytosis. All the mediators that have an equally important role in phagocytosis of the waste products of inflammation must also be activated, stimulated and augmented.

Synovial Joint Fluid Membrane

The synovial membrane acts as a medium for providing metabolic requirements to these tissues. There is a free and rapid exchange between the vessels of the capsule, the synovial fluid and articular tissues. The synovial fluid serves as a lubricant between articular surfaces during function. The synovial fluid helps to minimize the friction resulting from movement.

Pumping is not just for the inflammation caused by an injury.

Yes, that is one goal of the pumping, but it can also be used to

- help improve joint kinematics.
- reduce tension in the structures in link with the joint, for example, joint capsule, improve arterial blood flow.
- remove blockages from scarring, etc., and more.
- speed up the time for post-op rehabilitation (the pumping can be done actively or passively depending on the goal of the technique and the state of the client.

Synovial Membrane

The joint is enclosed by a joint capsule that is lined by a synovial membrane. The membrane is highly vascular and is continuous with the connective tissue of the capsule.

The synovial membrane allows diffusion of a plasma filtrate and components of its own to produce synovial fluid that fills both joint compartments. Its shape alters during functional movement.

The synovial tissue can be divided into three layers:

- the synovial lining or intima is the most intimate with the functional joint surface.

- the sub-synovial tissue, which is similar to the intima but with a more developed connective tissue network.

- the capsule, which is relatively a cellular layer with thick bands of collagen that form the outer boundary of the joint.

Synovial surfaces are not adherent. The cells on the surface bind the underlying matrix, but not to the opposing tissue. Constant movement against opposing surfaces is thought to break down any forming cross-links. Collagenase secretion by the synovial lining cells also helps prevent formation of surface adhesions and ensures that fragmented collagen on the tissue surface does not activate the coagulation cascade.

Synovial tissue has the ability to regenerate when damaged. Synovial fluid is a filtrate of plasma through fenestrations in the sub-endothelial capillaries into the intracellular spaces.

Because there is no epithelium and hence no basement membrane, no barriers exist between the synovial membrane and the fluid present in the joint spaces. Movement is mainly by passive diffusion.

Proteoglycans - they are within articular tissues on the anterior part of the condyle, in the central part of the disc (TMJ), and on the lateral portion of the articular eminence.

The presence and amount of proteoglycans, specifically glycoaminoglycans (GAGs) relative to the collagen matrix in the articular tissues, is a measure of the resilience of the tissue and therefore determines the amount of compressive loading that the joint can withstand.

Proteoglycans are macromolecules found in all the connective tissue and extracellular matrices and on the surface of many cells. They contain a core protein to which one or more GAG polysaccharide chains are covalently bonded.

Glycosaminoglycans

In sufficient concentration the GAGS cause the cartilage to imbibe extracellular water thus producing a cushion of compressive loads. The flexible, hydrophilic nature of the GAG chain and their high concentration of negatively charged fixed groups lead to high swelling pressure while the fine macromolecular mesh of collagen ensures a low hydraulic permeability. GAGS are ideal as a load-bearing material with low surface coefficient of friction.

A reduction in collagen concentration or an increased disorder in collagen orientation would lead to decreases in the degree of cartilage reinforcement and also an increase in local hydraulic permeability. The three requirements for healthy cartilage are:

1. Plenty of water for diffusion of nutrients and lubrication

2. Proteoglycans, which due to their anionic nature, are tremendously hydrophilic thus serving to attract and maintain water molecules.

3. A collagenous mass in which these proteoglycans can bind.

Boundary and Weeping Lubrication

Synovial fluid lubricates the articular surfaces by way of two mechanisms: boundary lubrication and weeping lubrication.

Boundary lubrication occurs when the joint moved and synovial fluid is forced from one area of the cavity into another. They synovial fluid located in the border regions is forced upon the articular surface thus providing lubrication. Boundary lubrication presents friction in the moving joint.

Weeping lubrication refers to the ability of the articular surface to absorb a small amount of synovial fluid. When the articulating surfaces are placed under compressive force, this small amount of synovial fluid is released. Weeping lubrication helps eliminate friction in the compressed but immobile joint. Only a small amount of friction is eliminated as a result of weeping lubrication and prolonged compressive force to the articular surface will exhaust this supply.

Ligaments The function of the ligaments is to hold the skeleton together. Ligaments attach to bone and are made up of collagenous connective tissue, that does not stretch. They act as passive restraining devices to limit and restrict joint movement. They prevent joint laxity. They transfer tensile strength from bone to bone. They are virtually identical to tendons. They have poor vascular supply.

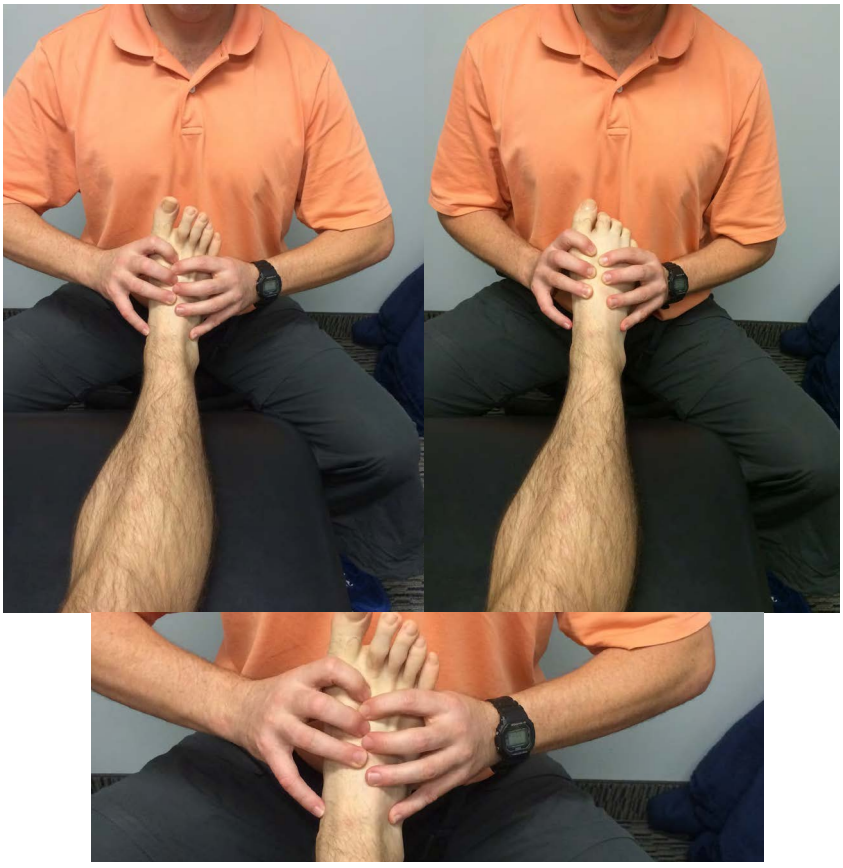
Tendons Tendons are connective tissue that attach muscle to bone. They are composed primarily of collagen. Tendons are non-elastic but flexible. They have poor vascular supply. Tendons are attached to bone via either periosteum or fasciculi of fibers (Sharpy's fibers). Their tensile strength is similar to bone (i.e., half that of steel). Golgi tendon organs are tension sensors located in the tendons. Some tendons are contained within a synovial sheath.

Tendons heal in two stages.

Fibrous Connective Tissue

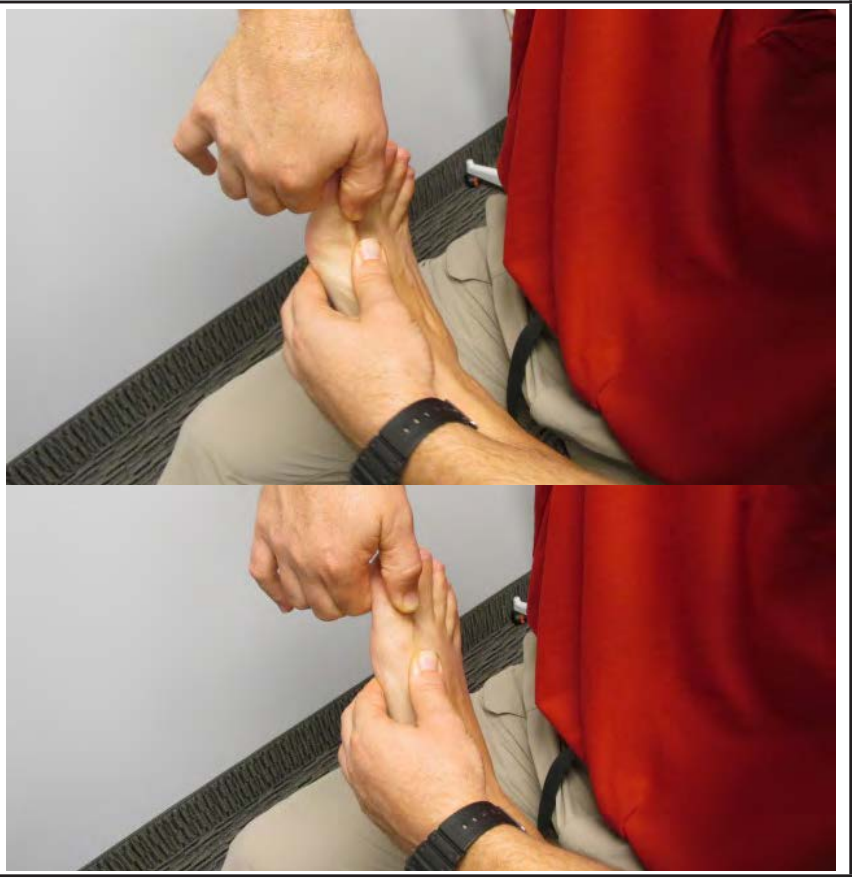
Joint Capsule - joint capsule is made up of fascia that surrounds the joint and fuses with ligaments that connect bones to each side of the joint. What we don't all know is that some short lateral rotators of the hip attach to the capsule and not to the trochanter or femur as shown in our anatomy books. This can be seen clearly in cadaver dissection along with many other variations of the anatomy that don't fit the pictures we have in our minds from the anatomy books that we studied.

FOOT
Pg. of Intermetatarsals

Client Position:	Therapist Position (Tp):
• Supine with foot on the edge of the table.	• Sitting at foot of client. • Hand position: grasp between metatarsals and use butterly technique.
Actions:	**Photos:**
• Active: Client does plantarflexion of the ankle. • Inhale: Tp opens and spreads the metatarsals. • Exhale: Tp maintains the opening of the metatarsals while the client releases the contraction. • Release all.	

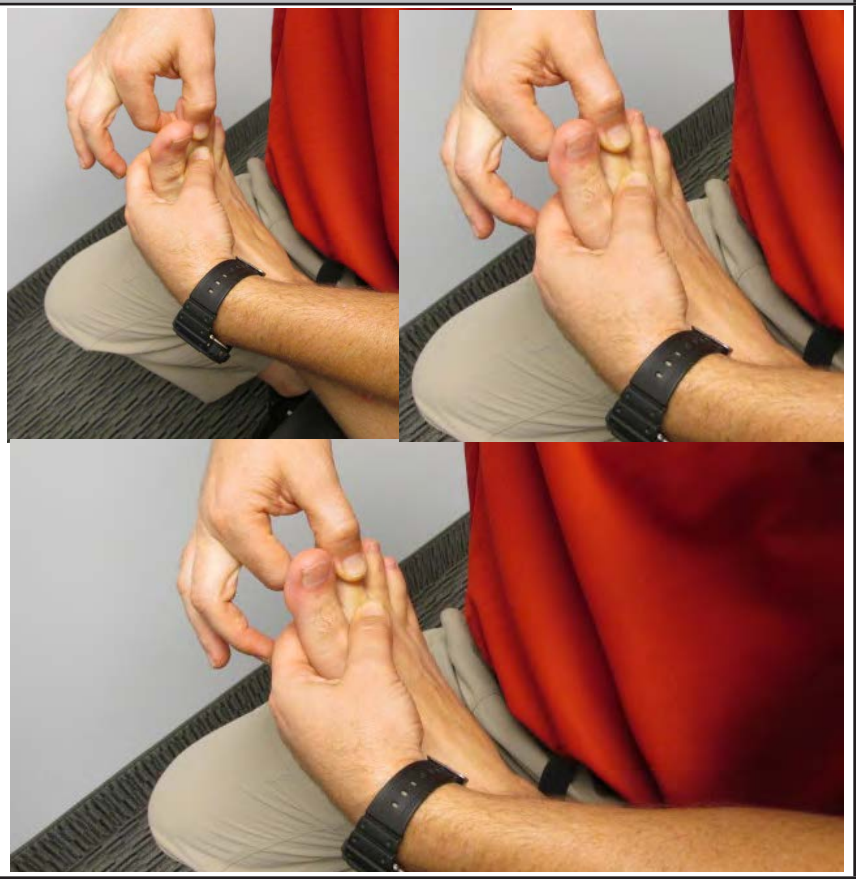
Notes:

FOOT
Pg. of Metatarsophalangeal Joint

Client Position:	Therapist Position (Tp):
• Supine: Foot on edge of table.	• Sitting at foot of client. • Hand position: Hold the metatarsophalangeal joint between both thumbs and 2nd fingers.
Actions:	**Photos:**
• Active: Client FLX toes. • Inhale: Tp distracts the joint and resists FLX of the toes. • Exhale: Tp maintains the distraction while the client releases the contraction. • Release all.	

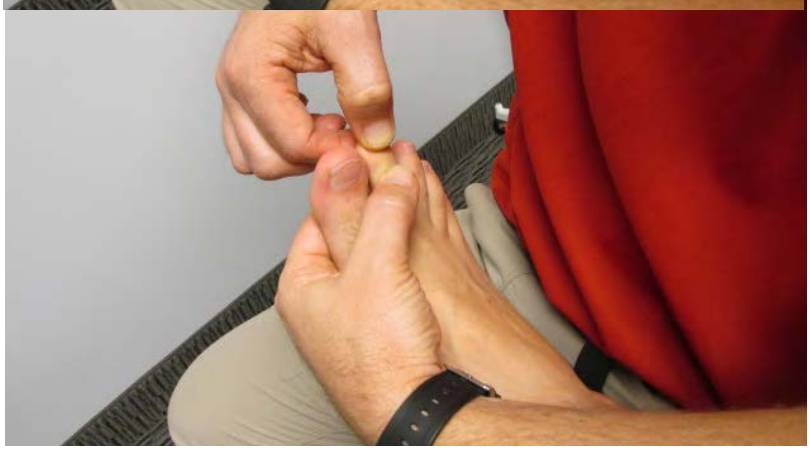
Notes:

FOOT
Pg. of Proximal Interphalangeal Joints

Client Position:	Therapist Position (Tp):
• Supine: Foot on edge of table.	• Sitting at foot of client. • Hand position: Hold the PIP joint between both thumbs and 2nd fingers.
Actions:	**Photos:**
• Active: Client FLX toes. • Inhale: Tp distracts the joint and resists flexion of the toes. • Exhale: Tp maintains the distraction while the client releases the contraction. • Release all.	

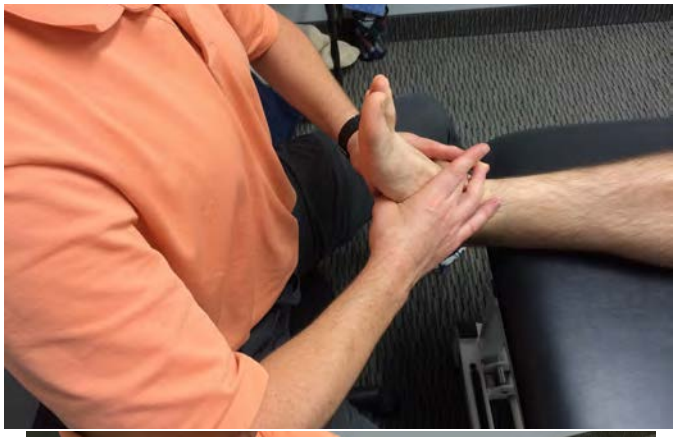
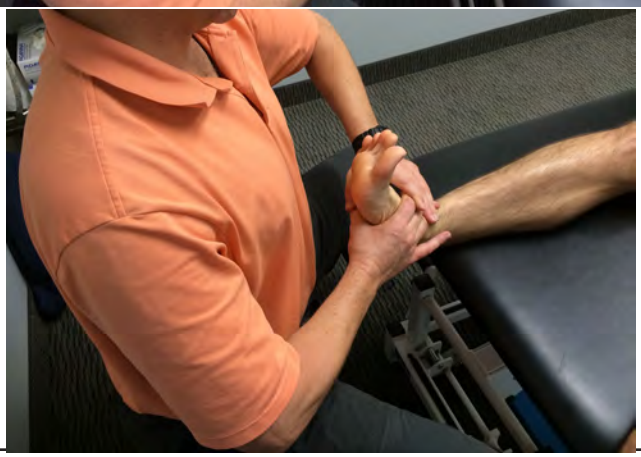
Notes:

FOOT
Pg. of Distal Interphalangeal Joints

Client Position:	Therapist Position (Tp):
• Supine. • Foot on edge of table.	• Sitting at foot of client. • Hand position: Hold DIP joint between both thumbs and 2nd fingers.
Actions:	**Photos:**
• Active: Client FLX toes. • Inhale: Tp distracts the joint and resists FLX of the toes. • Exhale: Tp maintains the distraction while the client releases the contraction. • Release all.	 

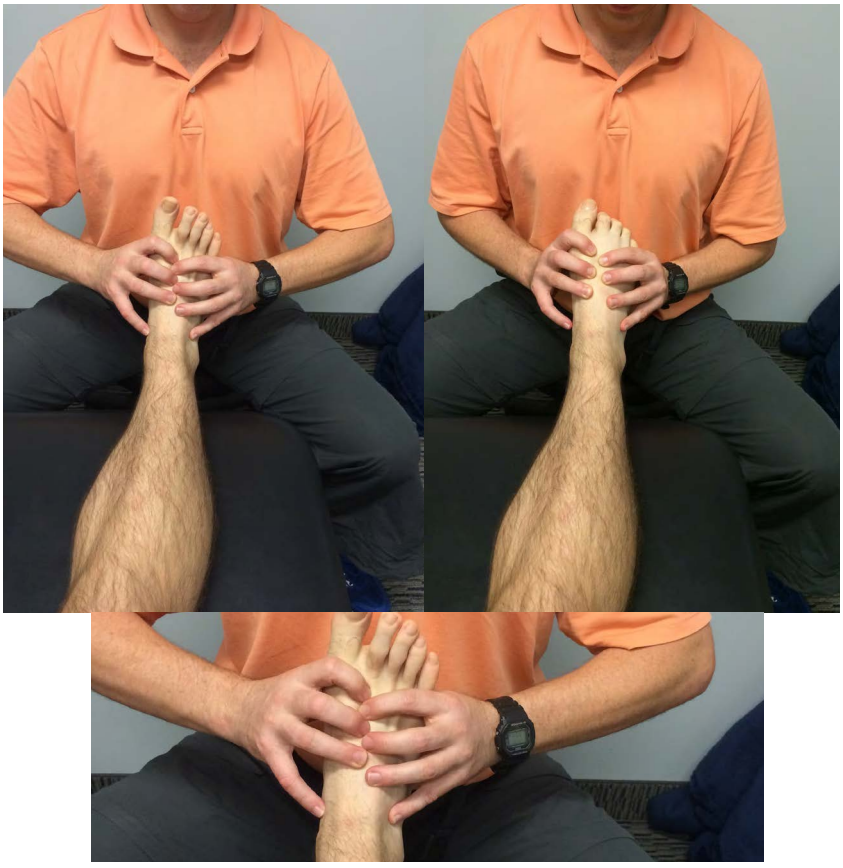
Notes:

FOOT
Pg. of Intermediate Cuneiform

Client Position:	Therapist Position (Tp):
• Supine with leg extended.	• Sitting at foot of client. • Hand position: Both thumbs under foot, 2nd fingers overlap on intermediate cuneiform.
Actions:	**Photos:**
• Active: Client spreads the toes. • Inhale: Tp blocks the upward movement of the cuneiform with the index fingers. • Exhale: Tp maintains the position of cuneiform while the client releases the contraction. • Release all	 

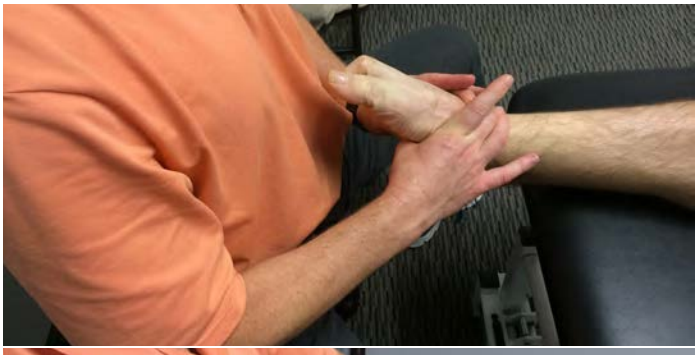
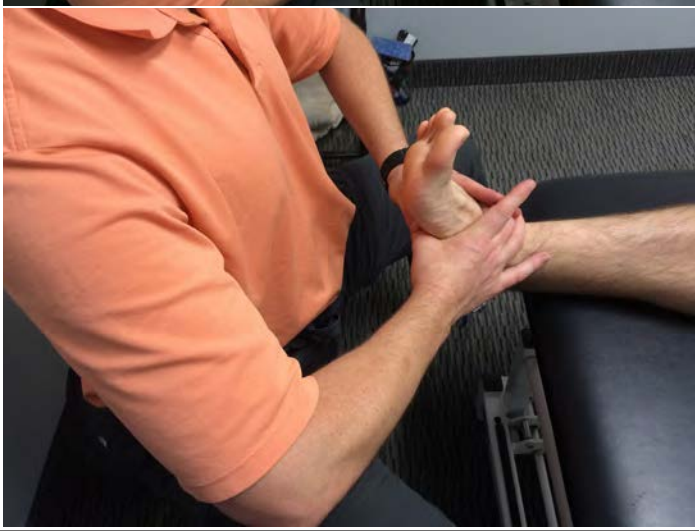
Notes:

FOOT
Pg. of Intermetatarsals

Client Position:	Therapist Position (Tp):
• Supine with foot on the edge of the table.	• Sitting at foot of client. • Hand position: grasp between metatarsals and use butterly technique.
Actions:	**Photos:**
• Active: Client does plantarflexion of the ankle. • Inhale: Tp opens and spreads the metatarsals. • Exhale: Tp maintains the opening of the metatarsals while the client releases the contraction. • Release all.	

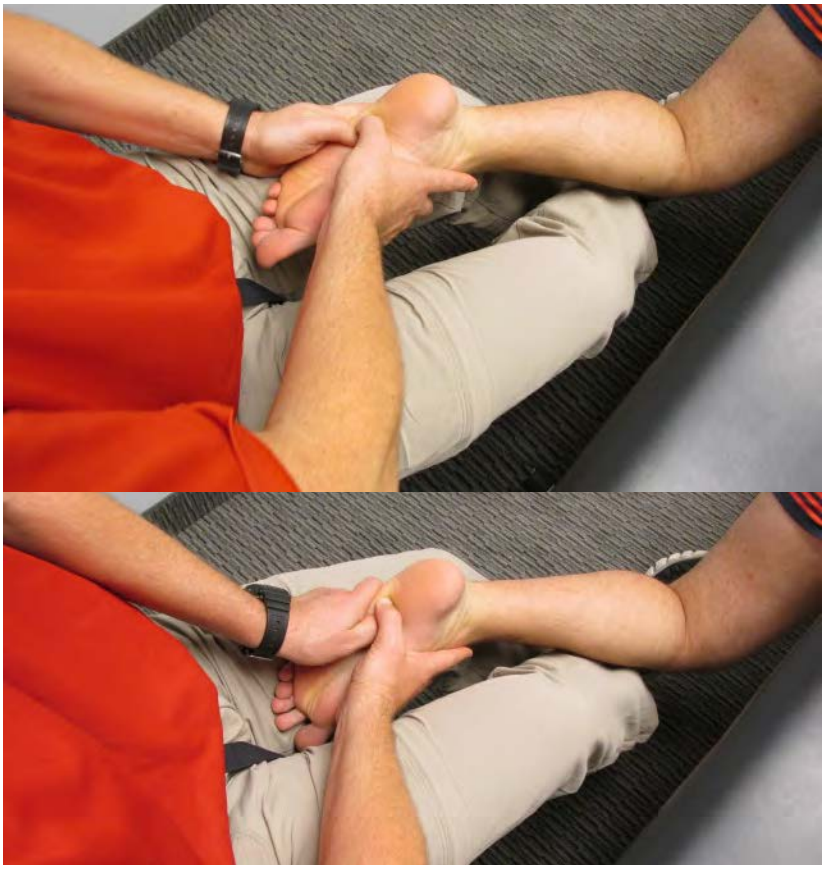
Notes:

ANKLE
Pg. of Navicular Bone in Dorsi-Flexion

Client Position:	Therapist Position (Tp):
• Supine • Leg Extended • Foot off the edge of the table	• Sitting at foot of client. • Hand position: thumbs on plantar surface and 3rd finger on dorsal surface. Hold navicular bone like a sandwich. Use butterfly technique with elbows.
Actions:	**Photos:**
• Client does dorsi-flexion • Inhale: Tp follows medial rotation of navicular bone during dorsi-flexion of ankle. • Exhale: Tp maintains medial rotation of navicular bone while client relaxes contraction. • Release ankle and return to neutral.	 

Notes:

ANKLE
Pg. of the Cuboid in Prone Position

Client Position:	Therapist Position (Tp):
• Prone with knee over the edge of the table resting on Tp lap or lower leg.	• Sitting facing same direction as client, legs crossed, client's knee on lap or lower leg. • Hand position: Both thumbs overlap on plantar aspect of the cuboid.
Actions:	**Photos:**
• Client does plantarflexion. • Inhale: Tp follows ER of the cuboid and plantarflexion. • Exhale: Tp FLX cuboid, allows ankle to return to neutral position. • Release all.	

Notes:

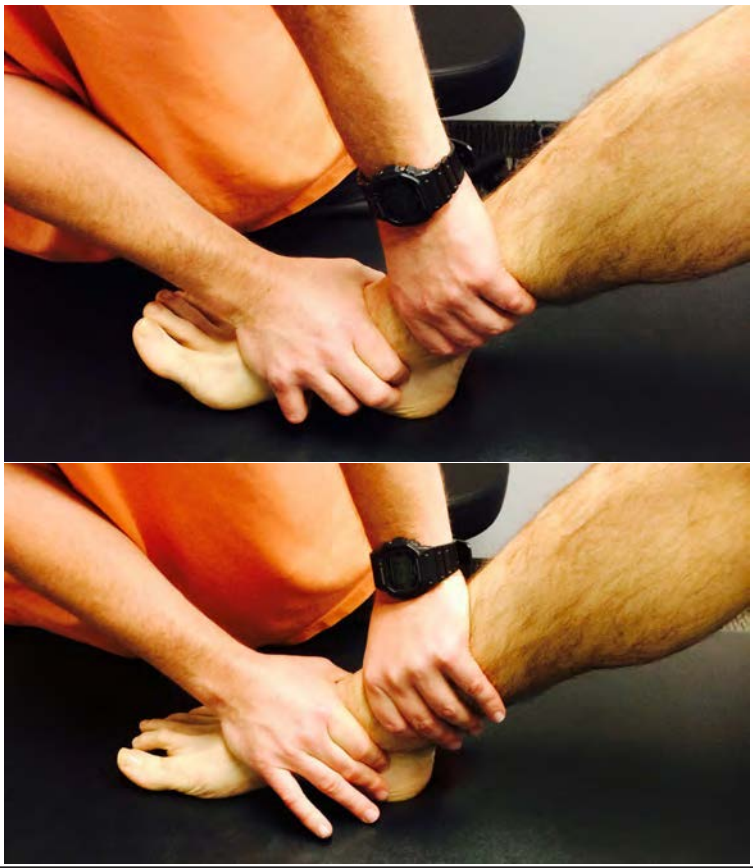
ANKLE
Pg. in Anterior Gliding of Talus

Client Position:	Therapist Position (Tp):
• Supine, knee bent, forefoot against knee of Tp.	• Standing at side of client, knee on table. • Cephalic hand: grabs above malleoli (fixed point) • Caudal hand: cups talus.

Actions:	Photos:
• Active: Client does plantarflexion of the ankle. • Inhale: Tp fixes the malleoli and causes a relative anterior gliding of the talus (anterior drawer) • Exhale: Tp holds the talus in relative anteriorization while the client releases the contraction. • Release.	

Notes:

ANKLE
Pg. in Posterior Gliding of Talus

Client Position:	Therapist Position (Tp):
• Supine, knee bent, heel flat on table.	• Standing at side of client, knee on table. • Cephalic hand: grabs above malleoli. • Caudal hand: cups dome of talus.
Actions:	**Photos:**
• Active: Client does dorsiflexion of ankle. • Inhale: Tp fixes the talus and causes a relative anterior movement of the tib-fib joint (posterior drawer) • Exhale: Tp holds the talus in relative posteriorization while the client releases the contraction. • Release and return to neutral.	

Notes:

KNEE
Pg. in Lateral Translation

Client Position:	Therapist Position (Tp):
• Sitting with knee over the edge of the table.	• Sitting facing client, blocking leg with Tp legs. • Inside hand placed on medial tibia (not fibula) • Outside hand on lateral condyle of femur.
Actions:	**Photos:**
• Active: Client pushes foot laterally (hip adduction) • Inhale: Tp follows lateral translation of the leg. • Tp maintains leg in lateral translation while the client releases contraction. • Release all.	

Notes:

KNEE
Pg. in Medial Translation

Client Position:	Therapist Position (Tp):
• Sitting with knee over edge of table.	• Sitting facing client, blocking leg with Tp legs. • Inferior hand: Placed on lateral tibia (not fibula). • Superior hand: On medial condyle of femur.
Actions:	**Photos:**
• Active: Client pushes foot medially (hip abduction) • Inhale: Tp follows medial translation of leg. • Exhale: Tp maintains medial translation of leg while client releases contraction. • Release all.	

Notes:

KNEE
Pg. of the Knee in Flexion and External Rotation

Client Position:	Therapist Position (Tp):
• Supine with knee bent 90 degreees. • Foot in ER. • Other leg extended.	• Sitting on edge of table facing client. • Gently sit on client's foot. • Inside hand: On posterior tibia resisting FLX of the knee. • Outside hand: Fixes the femur at condyles.
Actions:	**Photos:**
• Client attempts to Flx the knee. • Inhale: Tp resists the FLX of the knee, while adding an ER and posterior glide to the tibia. • Exhale: Tp maintains the ER while the client releases the contraction. • Release all.	

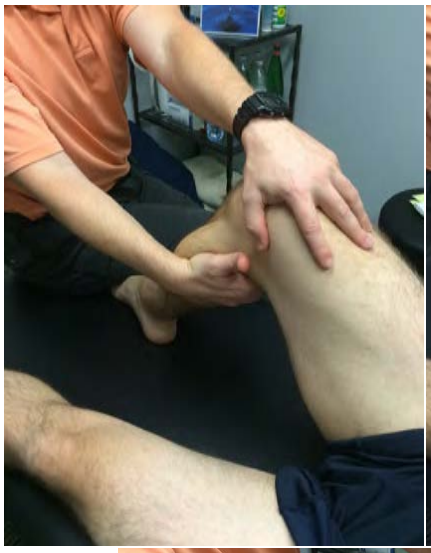
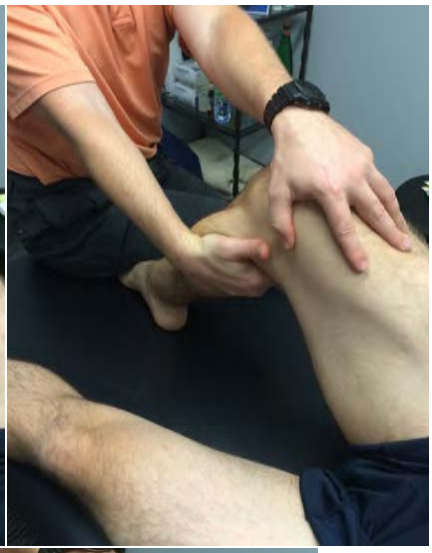
Notes:

KNEE
Pg. of the Knee in Flexion and Internal Rotation

Client Position:	Therapist Position (Tp):
• Supine with knee bent 90 degrees. • Foot in ER. • Other leg extended.	• Sitting on the edge of the table facing client, gently sit on client's foot. • Inside hand: On posterior tibia resisting FLX of the knee. • Outside hand: Fixes femur at condyles.
Actions:	**Photos:**
• Active: Client attempts to flex the knee. • Inhale: Tp resists the flexion of the knee while adding an internal rotation and posterior glide to the tibia. • Exhale: Tp maintains the internal rotation while the client releases the contractions. • Release all.	

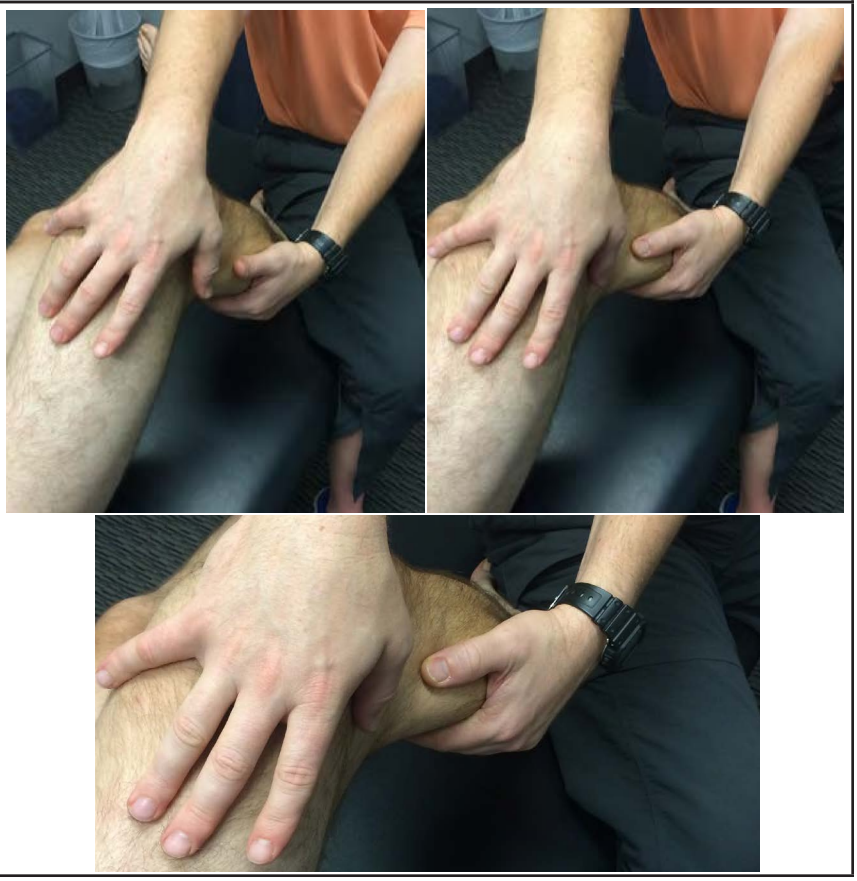
Notes:

KNEE
Pg. of the Knee in Extension and External Rotation

Client Position:	Therapist Position (Tp):
• Supine • Knee bent 90 degrees slightly ER. • Other leg extended.	• Sitting on edge of table facing client, gently sit on client's foot. • Inside hand: Fixes femur at condyles. • Outside hand: On anterior tibia resisting EXT.
Actions:	**Photos:**
• Active: Client attempts to extend the knee. • Inhale: Tp resists the EXT of the knee, while adding an ER and posterior glide to the tibia. • Exhale: Tp maintains the ER while the client releases the contraction. • Release all.	  

Notes:

KNEE
Pg. of the Knee in Extension and Internal Rotation

Client Position:	Therapist Position (Tp):
• Supine with knee bent at 90 degrees, slightly IR. • Other leg extended.	• Sitting on the edge of the table facing client. • Gently sit on on the client's foot. • Inside hand: Fixes femur at condyles. • Outside hand: Behind lateral tibial plateau.
Actions:	**Photos:**
• Active: Client attempts to extend the knee. • Inhale: Tp resists the extension of the knee while adding and IR and posterior glide to the tibia. • Exhale: Tp maintains the IR while the client releases contraction. • Release all.	

Notes:

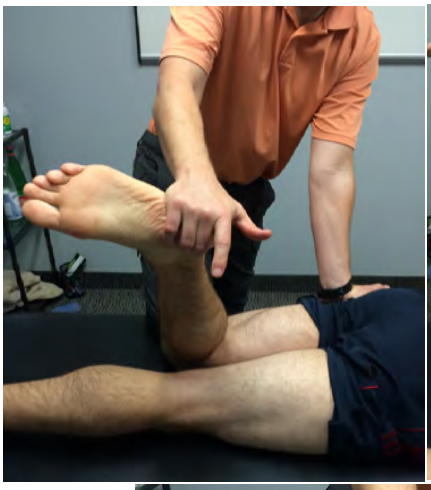
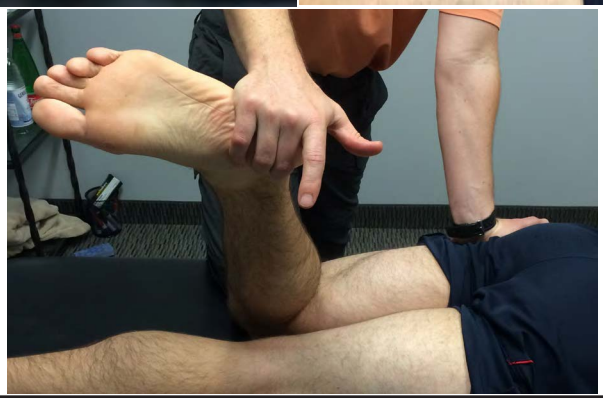
HIP
Pg. Beginning in External Rotation of the Hip

Client Position:	Therapist Position (Tp):
• Prone with knee bent 90 degrees.	• Standing at the side of client, block leg with knee on table. • Cephalic hand: On ischium (trochanter) pressure towards direction of sacrum or SIJ. • Caudal hand: Cups calcaneous (begin in neutral rotation of the hip)
Actions:	**Photos:**
• Active: Does IR. • Inhale: Tp partially resists the IR while pushing the trochanter medially. • Exhale: Tp then follows rotation while pushing the trochanter medially. • Release and return to neutral hip.	 

Notes:

HIP
Pg. Beginning in Internal Rotation of the Hip

Client Position:	Therapist Position (Tp):
• Prone • Knee bent 90 degrees.	• Standing at the side of the client, block the leg with knee. • Cephalic hand: Place on posterior aspect of trochanter (cup femur) • Caudal hand: Cup calcaneus leg (begin in IR of the hip) and maintain the knee flexed at 90 degrees.

Actions:	Photos:
• Active: Client does an ER of the hip. • Inhale: Tp partially resists ER of hip and follows the trochanter up into posteriorization. • Exhale: Tp allows ER of the hip and maintains the trochanter in posteriorization. • Release all and return to neutral position.	  

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