

*"I am stunned at the amazing results I've been getting with L.A.S.T.!"*

*"L.A.S.T. is an invaluable set of techniques that have improved outcomes for my patients!"*

*"It was a great course...my patient said it was the best treatment he's ever had!"*



# Canadian Massage Conference 2015

## A Research & Evidence Informed Technique

Presented by Robert Libbey, RMT



L.A.S.T. Ligamentous Articular Strain Technique®™ 2010

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**SMALL** CHANGES

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## Forward Thinking

The information presented in this manual before you, is an opportunity to advance and update the original context first put forth by A.T. Still. This is a wholly different era where evidence informed techniques are sought after in an effort to advance the manual therapy profession to it's highest potential.

Presented here are the same timeless principles viewed through a modern lens. They are applied with the mindset of providing a simple, precise, principle based, evidence informed technique that can be incorporated into techniques already being utilized by the manual therapist.

At the time of writing this, after 20 years of practice and 16 years of research (both historically and scientifically informed), self development and education has lead me to this historically innovative manual therapy technique.

Although the techniques described in this manual seem separate, they are connected through the ability of the therapist to look locally and see systemically. We are an asymmetrical nonlinear feed back system. Everything is connected.

In the book "Movement, Stability & Lumbopelvic Pain", Andry Vleeming uses the term "*Ligamentous Stocking*" to describe the connectedness of fibrous soft-tissue structures of the lumbar vertebrae to the sacrum. In 2009, Jaap van der Wal stated that there is a joint stability system, in which muscular tissue and RDCT (regular dense (collagenous) connective tissue) interweave and function mainly in an "*in series*" situation rather than an "*in parallel*" situation. Thus, in vivo, the periarticular connective tissue is loaded and stretched both by the movement of related skeletal parts and by the tension of the muscle tissue inserting to this connective tissue. Ligaments are considered RDCT's.

I put it to you that this "*Ligamentous Stocking*" is organism wide, connecting not just the vertebral column to the sacrum, but also connecting the various appendicular interdigitations of membranous, capsular, ligamentous and periosteal fibrous tissues to the axial fibrous tissues.

The trend today is to treat separate tissue from other separate tissue with a disconnect from the whole organism. We treat carpal tunnel at the wrist with out looking systemically to find that the wrist was only the last in a chain of events and compensations for something that happened months years, decades ago in a completely different area.

## Canadian Massage Conference 2015 Research Course Manual

Daily we see patients who seem to have been treated by everyone, everywhere, and some how have come to us. We are in most cases the “end of the road” before surgery or they come to us decades after surgery. Their physical body is screaming out information that many do not stop to hear or see. You can see it in their eyes.

We still utilize the ancient laying of hands to help someone in pain and discomfort. We are here to help, to serve, to listen with our hands, eyes, ears, heart, soul and intuition. We are here to connect with another organism.

Going forward, use today's evidence informed science to help you and your patient understand possibly what physiological process is currently occurring; but use your common sense, intuition and most importantly guidance from your patient's physiology to dictate the rate, course and direction of the treatment.

Manual therapy is an ART and a science. Treat the organism rather than the segment. Change your perspective to treating densities and temperatures. Aim for “*ever-changing balance*” in an asymmetrical nonlinear feedback system.

Keep Forward Thinking!



## LIGAMENTOUS ARTICULAR STRAIN TECHNIQUES

### Global Pain Therapies

#### Ligamentous Articular Strain Techniques - A manual treatment approach for ligamentous articular injuries and for the whole body

Robert Libbey, RMT

#### ABSTRACT

*The scope of practice for the treatment of the ligamentous, capsular and fascial tissues by Manual Therapists (Massage Therapy) limits the therapist to utilizing their hands along with active patient participation. There is a wide range of research documenting the types of mechanoreceptors and their locations within the ligamentous/capsular tissues. A lesser-understood ligamento-muscular reflex has also been documented with limited research. The specific mechanoreceptors and ligamento-muscular reflex are responsive to manual stimulation techniques within the scope of practice for manual therapy. Utilizing specific manual techniques can have positive effects in attenuating the development of scar tissue, adhesions, inflammatory processes and proprioceptive and kinesthetic neurological deficits. Combining these specific manual techniques with therapies such as Prolotherapy minimizes the long-term effects from ligamentous articular injuries and accelerates the recovery period for patients.*

*Journal of Prolotherapy, 2012;4:e886-e890.*

**KEYWORDS:** ACL, capsular tissue, fascial tissue, L.A.S.T., ligamentous tissue, massage therapy, Prolotherapy.

“It’s not perverted function but a wrong environment that results in the distorted appearance of function. Function is always true to its environment. Function is dependent upon its environment. Therefore, any change in any part of the environment that is not in tune or balance, will distort the function of the matter so involved.”

- Thomas Schooley, DO<sup>1</sup>

There is a wealth of information concerning the treatment of ligamentous, capsular and fascial tissues within the scope of practice of Medicine, Physiotherapy and Naturopathic Medicine. In the Massage Therapy (Manual Therapy) profession where our scope of practice only allows us to treat utilize our hands along with active patient participation; there is very little information or research.

In this article, I discuss a technique developed in the early 1900’s to which I have applied today’s current research. When combined with therapies such as Prolotherapy, this technique has the potential to accelerate the recovery period for patients suffering from ligamentous articular injuries.

The ligamentous system is part of the fascial tissue referred to as the **Multimicrovascular Collagenic Dynamic Absorbing System**. The role of this rubbery elastic shock absorbing system, found everywhere in our body, is to avoid reaching a threshold of resistance at which the collagen might shear resulting in injury.<sup>2</sup>

Ruptured or injured ligaments are a source of mechanical problems. These injuries cause deficiencies in fine and gross motor controls, lost, altered or impaired sensation, various types of pain/discomfort, joint laxity and can lead to articular surface injury. This dysfunctional state eventually leads to an increased risk of additional injury to surrounding capsules, tendons, neurovasculature and other nearby tissue, can cause a change in sensation thresholds, impaired sensation and impaired reflex muscular activation.<sup>3</sup>

If left untreated or if treated inefficiently, chronic inflammation develops and permanent disability of the affected tissues results. Patients suffer from continual pain, inflammation, neurological implications, muscle stiffness and instability of affected joints, deficient sensation and sensory perception, impaired motor performance, deficient synergy muscle activation, spasms and hyper excitability of the muscular system.<sup>3</sup>

LIGAMENTOUS ARTICULAR STRAIN TECHNIQUE

MECHANORECEPTORS

Ligaments have significant input to sensation and contribute to the synergistic activation of muscles. Afferent mechanoreceptors are found everywhere throughout our connective tissues. They are responsible for kinesthetic and proprioceptive sensation.<sup>3</sup>

The four types of these sensory nerve endings or mechanoreceptors that manual therapists have influence on are:

- Golgi Receptors
- Ruffini Receptors
- Pacini Receptors
- Interstitial Receptors

We will briefly look at these four receptors and the effects manual treatment has on them and the body as a whole. (See Table 1.)<sup>4, 5, 6, 7, 8, 9, 10, 11</sup>

In a study presented at the Third International Fascia Research Congress, Viklund et al. concluded that specific myofascial receptor techniques might have a longer lasting effect than classical (Swedish) massage techniques. They suggested that “therapists might be encouraged to aim their soft tissue techniques to a lesser area where there is known to be high density of mechanoreceptors”.<sup>12</sup>

Manual techniques that target these mechanoreceptors have been proven to affect both the local blood supply and the local tissue viscosity.<sup>11</sup> Research is now confirming the common clinical finding that slow, deep tissue techniques have both local and systemic effects.

LIGAMENTO-MUSCULAR REFLEX

Ligaments are not passive tissue. Ligaments are highly dynamic and non-stationary predictable organs. Afferent mechanoreceptors in ligaments trigger a ligamento-muscular reflex activation of associated muscles. It has been suggested that a reflex might exist between these sensory receptors in the ligaments and surrounding associated muscles. This Ligamento-muscular reflex may directly or indirectly alter the load inflicted on to a ligament.<sup>3</sup>

**Table 1. The four types of sensory nerve endings or mechanoreceptors and the effects manual treatment has on them and the body as a whole.**

<b>Receptor:</b>	<b>Golgi</b>
<b>Location:</b>	<ul style="list-style-type: none"> <li>• all dense connective tissues</li> <li>• peripheral joints ligaments</li> <li>• joint capsules</li> <li>• myotendinous junctions</li> <li>• attachment areas of aponeurosis</li> </ul>
<b>Responds to:</b>	slow stretch techniques
<b>Results in:</b>	a decrease in active muscle tone
<b>Receptor:</b>	<b>Ruffini</b>
<b>Location:</b>	<ul style="list-style-type: none"> <li>• tissues associated with regular stretching</li> <li>• outer layer of joint capsules dura mater</li> <li>• peripheral joints ligaments</li> <li>• muscle fasciae</li> <li>• the deep dorsal fascia of the hand</li> </ul>
<b>Responds to:</b>	constant, slow and deep pressure slow shear forces
<b>Results in:</b>	a lowering of sympathetic nervous system activity
<b>Receptor:</b>	<b>Pacini</b>
<b>Location:</b>	<ul style="list-style-type: none"> <li>• deep portions of joint capsules</li> <li>• deeper spinal ligaments</li> <li>• investing muscular fasciae of antebrachial, crural,</li> <li>• abdominal fasciae, masseter, lateral thigh, plantar and palmar tissues &amp; peritoneum</li> </ul>
<b>Responds to:</b>	<ul style="list-style-type: none"> <li>• rapid changes in pressure</li> <li>• vibratory/oscillatory techniques</li> <li>• HVLA's</li> </ul>
<b>Results in:</b>	an increase local proprioceptive attention and self-regulation
<b>Receptor:</b>	<b>Free/Interstitial Nerve Endings</b>
<b>Location:</b>	<ul style="list-style-type: none"> <li>• all fascial tissue</li> <li>• periosteum</li> <li>• interosseous membranes</li> <li>• tendons</li> <li>• fascial connections to bones</li> </ul>
<b>Responds to:</b>	<ul style="list-style-type: none"> <li>• deep, slow or steady manual pressure</li> <li>• Treatment to periosteum, interosseous membranes, and fasciae connected to bones</li> </ul>
<b>Results in:</b>	<ul style="list-style-type: none"> <li>• autonomic functions: changes in heart rate, blood pressure, respiration, increase or decrease blood pressure, sensation of position and movement, increased vagal activity, global muscle relaxation, alterations in local fluid dynamics and tissue metabolism</li> <li>• plasma extravasation</li> </ul>

The Ligamento-muscular reflex has been shown to exist in most joints of the extremity and in the spine. Muscular activity elicited by this reflex allows muscles and ligaments to work together as a unit in maintaining joint stability. This reflex may play a role in the preservation of joint stability, inhibiting muscles that destabilize the joint or increasing antagonist co-activation to stabilize the joint.<sup>3</sup>





## LIGAMENTOUS ARTICULAR STRAIN TECHNIQUE

For many years we learned in our anatomy classes that ligaments and muscles were separate entities. Even many of our most popular anatomy texts still portray ligaments and muscles as separate tissues running from one bone to another, not connected to any surrounding tissues. In reality though, these and the surrounding tissues are inseparable. In 2009, van der Wal published a paper in which he determined that ligaments are mostly arranged in series with the muscles, not parallel.<sup>13</sup> When you contract a muscle, the ligaments are automatically engaged, assisting in the stabilization of a joint, no matter what its position, during both concentric and eccentric contractions.<sup>14</sup>

## INJURIES

A state of hypertonicity is created in muscles when a ligament has been injured, or replaced. For example, ACL ruptures and replacements can cause one or all of the quadriceps, hamstring and gastrocnemius muscles to become hypertonic as a result of a lack of the ligamento-muscular reflex. This hypertonic state is also due to the removal of the mechanoreceptors of the original ACL. A large percentage of the receptors are located near the ends of the ligaments as they attach into the sub-chondral layer. This remnant is often removed in order to attach the substituted tissue. Although the stability of the joint has been re-established, patients regularly complain of not only having an increase in tonicity of the muscle groups, but also a deficiency in both proprioception and kinaesthetic awareness. The manual therapist is then charged with the task of attempting various treatment techniques to reduce this hypertonicity. Their efforts are rarely successful and both the patient and therapist become frustrated and discouraged. Thus begins the circle of referral from one therapist to another.<sup>5, 15, 16, 17, 18</sup>

## HISTORY OF L.A.S.T.

Ligamentous Articular Strain Technique (L.A.S.T.) was developed to be primarily an Indirect Osteopathic technique. The technique is based on principles and techniques developed by Andrew Taylor Still, DO. The majority of the techniques initially developed were called traction methods, known as "Indirect Techniques." Several of these techniques were Ligamentous Articular Strain Techniques and some of them also formed the basis of myofascial release techniques. Many of the techniques in the early 20th century were modified by therapists that wanted to focus on a quicker, more direct method

of treating. These "Direct Techniques," became known primarily as high velocity-low amplitude techniques.<sup>1, 19</sup>

The author has re-defined the techniques to suite the Scope of Practice for Massage Therapists. "Indirect Techniques" follow the permitted motions of the dysfunctional tissues into the direction of ease. "Direct Techniques" match the reciprocal tension of the dysfunctional tissues taking the tissues only to the first tissue resistance barrier.

## USING L.A.S.T. IN TREATMENT

L.A.S.T. affects the connective tissues of the body, mainly ligaments, joint capsules, fascia, muscles, tendons and indirectly, lymphatic and blood flow and the autonomic nervous system.<sup>11, 20</sup>

L.A.S.T. is a principle-based technique. The basic principles consist of disengaging the dysfunctional tissues from their protective position. The practitioner follows the affected tissues into a position of exaggeration of the injury. This exaggeration leads to a state where all movement within the affected tissues halts. A release of tension within the tissue is felt, allowing the ligaments to draw the articulations back into a more normal balanced relationship.<sup>19</sup>

After an assessment of the affected articular structures, the practitioner palpates for areas of dysfunction or an increased densification within the injured tissues. Slowly disengaging the tissues, (direct or indirect techniques) the therapist exaggerates the permitted motions of the tissues to their end barrier. The reciprocal tension is a tension that is developed between the practitioner loading into the tissue and the tissue reciprocally loading back into the practitioner. The therapist now waits at this point of tissue exaggeration until he or she feels the ligaments draw the articulations back into a normal balanced position. A re-assessment of the permitted motion in the tissues should confirm more suppleness and mobility along with an improvement in kinaesthetic and proprioceptive awareness. (See Figures 1-4.)

## L.A.S.T., TGF-B1 AND THEIR POTENTIAL ROLE IN PREVENTING EXCESSIVE SCAR TISSUE DEVELOPMENT

Solomonow states that the acute inflammation in ligaments sets in within several hours may last several weeks and up to 12 months! Only up to 70% recovery

LIGAMENTOUS ARTICULAR STRAIN TECHNIQUE



Figure 1. Hand placement for treatment of Annular Ligament.



Figure 3. Hand placement for treatment of ASIS attachment for Inguinal Ligament.



Figure 2. Sidelying position for treatment of Iliolumbar ligament.



Figure 4. Hand placement on patient for treatment of C1 dysfunction.

has been documented. Chronic inflammation can build up over several weeks, months or years depending on dose-duration levels. Rest and recovery of as long as two years only allows partial recovery, full recovery has never been reported.<sup>3</sup>

Bouffard et al. published a study documenting the effects of brief static tissue stretch on TGF-β1. TGF-β1 plays a key role in connective tissue regulating the response of fibroblasts to injury, remodelling, scarring, and pathological production of fibrosis.<sup>23</sup> Langevin et al. stated that in cases of minor sprains and repetitive motion injuries, scarring is mostly detrimental since it can contribute to maintaining the chronicity of tissue stiffness, abnormal movement patterns, and pain. Reducing scar and adhesion formation using stretch and mobilization is especially important for internal tissue injuries and inflammation involving fascia and organs.<sup>21</sup>

The results of the Bouffard and Langevin studies showed that brief, moderate amplitude (20–30% strain) stretching of connective tissue decreases both TGF-β1 and collagen synthesis.

Langevin et al. proposed that therapies which briefly stretch tissues beyond the habitual range of motion (eg, massage) locally inhibit new collagen formation for several days after, and thus, prevent and/or ameliorate soft tissue adhesions.<sup>6,7,19,23,24</sup>

Thomas Schooley, DO stated, “Function is dependent upon its environment.” I believe that by utilizing the principles of L.A.S.T in various stages of injury, practitioners have the potential to profoundly affect the course of tissue healing. By changing the neuromuscular physiological environment and decreasing the SNS response to injury, a response of decreased TGF-β1

could lead to decrease in fibrosis and decrease in fascial stiffening of the surrounding and injured tissues. This approach could overall positively affect the functionality of the patient.

#### MY EXPERIENCE WITH L.A.S.T.

In our office, we treat a variety of injuries ranging from acute to chronic. These injuries lead to the symptoms described earlier in this article. Optimally, I prefer to treat in the acute stages of an injury. By attempting to create as optimal an environment for tissue healing as possible, patients have reported being less symptomatic. Combining L.A.S.T with Prolotherapy treatment, administered by our Naturopathic Physician, creates an opportunity to prevent chronic issues from occurring thereby improving the quality of life for the patient. ■

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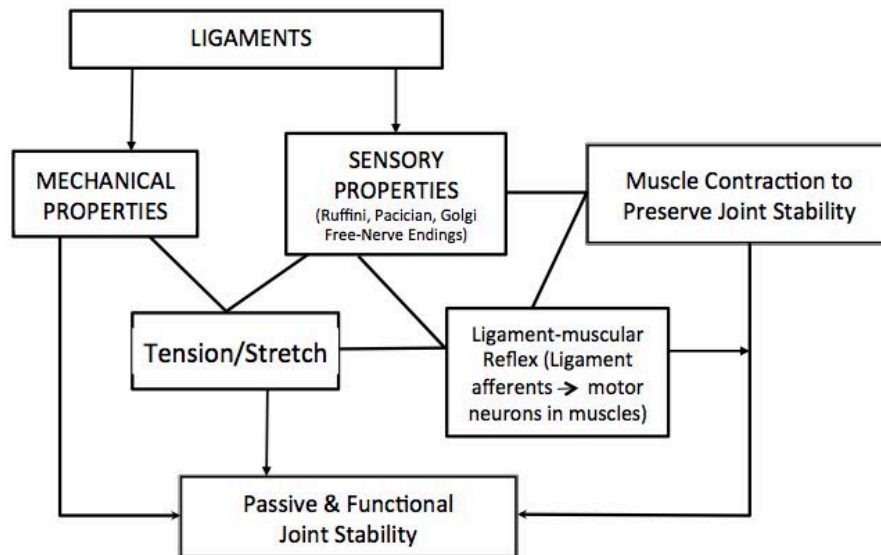
## Ligamento-muscular Reflex

Ligaments are not passive tissue. From the sensory standpoint and from their sensory-motor function, ligaments are highly dynamic and non-stationary, yet predictable organs.

Afferents in ligaments trigger a ligamento-muscular reflex activation of associated muscles. It was suggested as far back as the turn of the last century that a reflex might exist from sensory receptors in the ligaments to muscles that may directly or indirectly modify the load imposed on the ligament.

It has been proven that a ligamento-muscular reflex exists in most extremity joints and in the spine. Muscular activity elicited by the reflex allows synergistic activity of muscles and ligaments maintaining joint stability. This reflex may also have inhibitory effects on muscles associated with the joint. This inhibition action may prevent extremely large forces from developing in muscles, thus preventing undue stress in the ligaments.

This reflex may play a role in preservation of joint stability, inhibiting muscles that destabilize the joint or increasing antagonist co-activation to stabilize the joint. This means that the ligaments, far from being active only at the moment of the greatest elbow extension in your preacher curl, are dynamically active in stabilizing the joint all through the movement, during both concentric and eccentric contraction.



**Figure 1:** How reflexes from ligamentous joint afferents may contribute to the regulation of stiffness of muscles around a joint, joint stability, and movement and position sense.

## Injuries

Ruptured or injured ligaments are a source of mechanical problems. They cause impaired motor function, lost or impaired sensation, pain, joint laxity and articular surface injury. Furthermore, injured ligaments increase the potential for injury to capsule, tendons, nerves and nearby tissue. This impaired state eventually leads to deficient function, risk of additional injury, a shift in sensation thresholds, impaired sensation and impaired reflex muscular activation.

Ligaments are organs in the sensory-motor loop. Once chronic inflammation is allowed to develop, the result is permanent disability causing pain, inflammation, neurological implications, muscle stiffness, weakness of affected joints, deficient sensation, impaired motor performance, deficient synergy/reflex muscle activation, spasms and hyper excitability of the muscular system.

These responses diminish activity of sensory perception and reflexive coordination of muscular activity such as excitation and inhibition, and consequently reflect adversely on joint stability and movement.

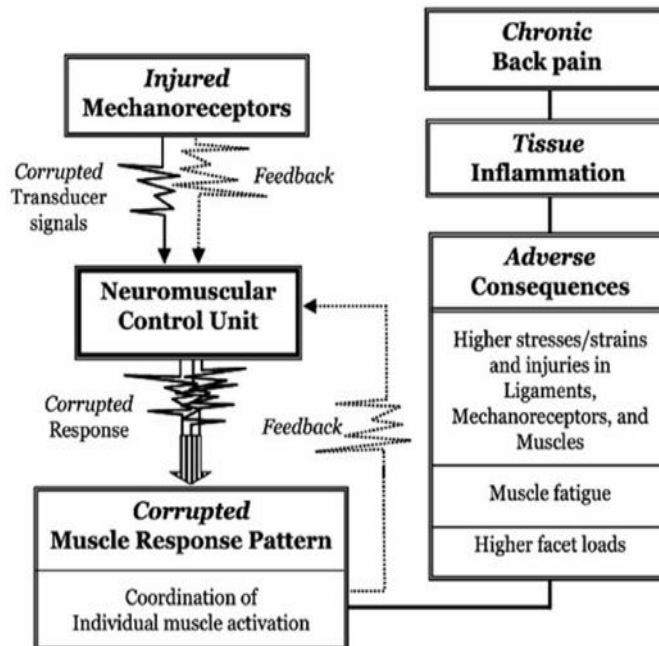


Figure 2: Injured mechanoreceptors and their effect on chronic pain.

## Palpation to Sensing & Perceptive Touch

As practitioners of the Ligamentous Articular Strain Technique, we must transition from palpation to sensing. Our intellect has preconceived ideas based on the familiar process we call palpation (physical sense of touch and position). But in “sensing”, the hands are not palpating, they are not moving about the patient, they are not looking for information that is based on a convention, detecting if the patient has disproportion relative to what is considered normal. Rather, our hands are still, resting quietly, becoming almost transparent. We engage more than just the sense of touch. We bring all of the senses together to more deeply perceive and understand the information available to us.

Your hands are quiet but not frozen in place. If you wish, experiment with moving your hands to another part of the body. How is it different? How does your consciousness change when you move from palpating on the body in order to find a picture of what is happening, to resting there and letting the information come into your hands? Do not use your intention or any preconceived ideas. Do not pick the therapeutic end site, but rather—wait patiently.

## Disengagement

Most clinicians will disengage the opposing articular surfaces of the joint before going in the direction of ease. But we will disengage by going in the direction of ease, and continually working in the direction of ease until coming to a point of suspension.

The disengagement process takes place through all planes of motion, not on a particular axis within a joint. Working with the motion permitted and continually refining the direction of ease, we come to a point of balance, rather than working against a barrier.

## Reciprocal Tension

Reciprocal tension refers to the normal tensile forces within the connective tissue and how they feel. If you push in one direction, the tissue tends to want to go back equidistance in the opposite direction.

## Neutral

Working in the direction of ease, we come to a point of suspension where the reciprocal tension in the tissues can almost not be felt—the tissues feel quiet, suspended, almost floating. The term 'neutral' comes from automotive terminology. When a vehicle's engine is running and NOT in gear, the car is not engaged—but rather it is waiting. Neutral is a point of waiting where the mechanism is not engaged.

There is skill in waiting. We need to empty our minds—we are perceiving health; we're aware of life itself. Waiting can be an extremely peaceful and full experience. Just be still and quiet and let the information come to you.

Wait for the innate forces to make the correction, and know that the therapeutic end point is the still point that permeates the whole patient. Don't let your end point just be a matter of tissue releases that are secondary to the force you put in.

Treating in this unhurried, receptive way is like being in a meditative state. It is difficult to train people to do this for any length of time because many of us want to proceed to the end point, have a sense of completion and move on. Transitioning to treating in a more receptive way can be a huge step. It can be frustrating. Part of this frustration results from the psychological tempo of practice in today's world. People are caught up in a time frame that almost forces us to be efferent. We think we need to get to the point, remove the problem and then move on to the next patient.

Treating receptively allows you to explore something new and to find that sense of wholeness in another person.

## Fulcrums

By applying a modest increase in pressure at a fulcrum to cause a slight degree of compression through the tissue, we will initiate the kinetic energy that will allow the structure-function of the stressed area to begin to let its pattern be reflected back to their touch.

Learn to read these changes from the fulcrum point or points established. Feel the pull and tug of the tissues deep within them; feel the patterns of mobility & motility and become conscious of the fact that there is a quiet point, a still point within the stress pattern.

The application of the principle of the fulcrum is as varied as the list of complaints that walk into your office. Each case calls for its own application, and each practitioner must develop their own approach.

With the development of this type of touch, feeling through the structure-function patterns manifesting their changes under our hands, we gain knowledge that increases understanding. This touch opens the door as to why this patient is experiencing the complaints they are expressing. Even when laboratory tests fail to reveal the source of the complaints, the practitioner's trained touch can bring this understanding.

## Perceptive Touch

Perceptive touch is a form of palpation one might call an alert, observational type of awareness for the functions and dysfunctions from within the patient, utilizing the motive energy deep within the tissues themselves. A perceptive touch is essential because there are subtleties of tissue functioning and dysfunctioning that cannot be explored by any other means than that of a skilled, sensitive, knowing sense of awareness through the use of this type of touch



## Breathing

Utilizing breathing as a technique when performing manual techniques is greatly underutilized by a majority of today's therapists. Therapists that utilize concepts from techniques such as CST are familiar with incorporating breath into their treatments; but why not more of us.

Evidence supports a link between breathing difficulties and back pain. Since trunk muscles perform both postural and breathing functions, disruption in one function can negatively impact the other.

Altered breathing mechanics changes respiratory chemistry causing smooth muscle constriction, altered electrolyte balance and decreased tissue oxygenation. These changes can profoundly impact any body system. Increased excitability in the muscular and nervous systems may be most relevant to a manual therapist. (McLaughlin L, et al., Breathing evaluation and retraining as an adjunct to manual therapy, *Manual Therapy* (2010), doi:10.1016/j.math.2010.08.006 )

Breathing is unquestionably a key function of the human body; it sustains life by providing oxygen needed for metabolism and removing the by-product of these reactions, carbon dioxide. Breathing, however, has other functions apart from the ventilation of air and the maintenance of oxygen and carbon dioxide. Breathing affects motor control and postural stability and plays several roles in physiological and psychological regulation. Breathing can influence homeostatic functions in other systems including the autonomic nervous system, the circulatory system, chemical regulation and metabolism.

Breathing becomes dysfunctional when the person is unable to breathe efficiently or when breathing is inappropriate, unhelpful or inefficient in responding to environmental conditions and the changing needs of the individual.

Impairment of the functions of breathing affects people's lives, challenging homeostasis, creating symptoms and compromising health. The efficiency with which breathing fulfills its various functions can be diminished because of musculo-skeletal dysfunction, disease, chronic psychological stress or other factors that affect respiratory drive and respiratory control. The neurological control of breathing shows high levels of neuroplasticity as shown by its ability to adapt to a wide range of internal and external conditions.

Breathing therapy generally aims to either correct dysfunctions of breathing or enhance its functions. Breathing, unlike most physiological functions, can be controlled voluntarily and it can serve as an entry point for physiological and psychological regulation. (International Journal of Osteopathic Medicine Volume 12, Issue 3 Pages 78-85, September 2009)

Quite simply, with diminished function of breath, our physiological systems cease to function at their maximum potential. As this process becomes chronic, the physiological environment becomes more acidic, functioning in a more sympathetic, fight, flight state slowing the recuperative processes of our immune system.

There are an abundance of instructional books, videos and classes educating us on the importance of breath and its physiological effects on all our systems.

Simply put, without it, we cease.

## Breathing Techniques

There are various opinions on how, when and where to breath. As always, L.A.S.T. primarily looks to change the environment that the dysfunctional tissues are attempting to function within. There are 2 ways that we change the environment with LAST, holding of inhalation or exhalation by the patient.

### Inhalation Instruction:

Once you have disengaged and exaggerated the injured tissue(s) from their dysfunctional holding position, instruct the patient to breath in as deep as possible utilizing as much of their lungs and diaphragm as they can. Once they reach the top of the breath, they are to hold this breath as long as comfortably possible before exhaling. This process can be repeated if necessary to create the effected change.

### Exhalation Instruction:

Once you have disengaged and exaggerated the injured tissue(s) from their dysfunctional holding position, instruct the patient to breath out as deep as possible. Once they have comfortably forced all the air out of their body to their fullest extent, they are to hold this as long as comfortably possible before inhaling. This process can be repeated if necessary to create the effected change.

“The quieter the mind  
The stiller the hands  
The less movement we make  
The more we are able to perceive involuntary movement”  
- James Jealous, DO

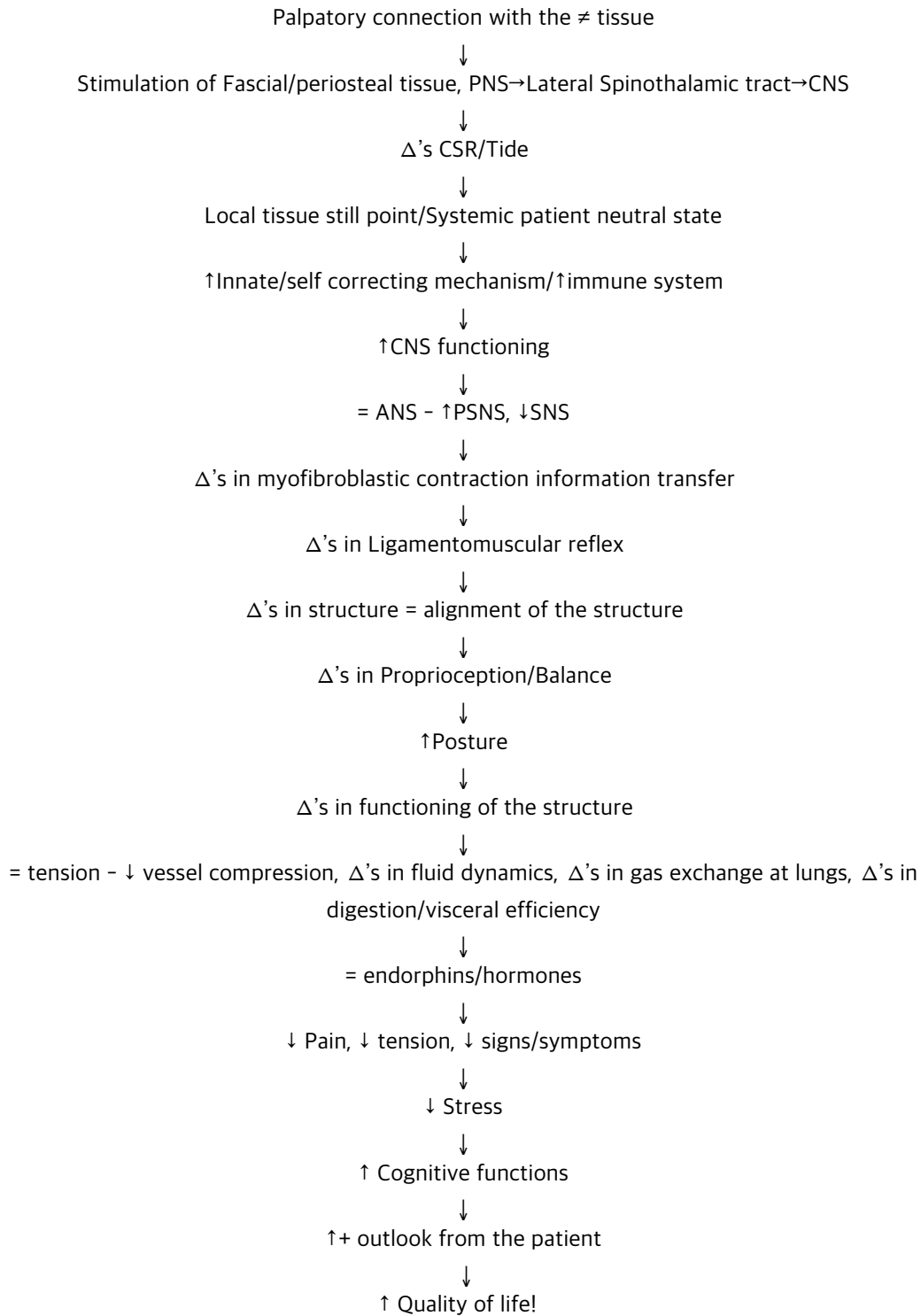
“It’s not perverted function but a wrong environment that results in the distorted appearance of function. Function is always true to its environment. Function is dependent upon its environment. Therefore, any change in any part of the environment that is not in tune or balance will apparently distort the function of the matter so involved.”

- Thomas Schooley, DO

## L.A.S.T. Flow Chart

The following flow chart depicts how L.A.S.T. may improve a patient's quality of life.

Δ's = changes



## Clinical Principles

### Contraindications

acute fracture, acute instabilities - dislocations, immediate acute sprain/strains, acute periosteal tears, acute RA, infection, acute systemic conditions

### Precautions

general health of the patient, stages of healing post-injury, medications, recent injectable medications, plates/pins, degeneration of various stages, fractures, various degrees of sprains/strains, fusions, instabilities, periosteal tears

### Indications

decreased AROM/PROM, pain, tension, stiffness, discomfort, acute/sub-acute/chronic sprain/strains, carpal tunnel, numbness, tingling, vascular changes

### Direct and Indirect Techniques

Through manual manipulation, we can perceive changes in patients' tissues that originate in the afferent mechanoreceptors within the tissue. By gently, yet firmly loading into the specific tissue, we feel for the reciprocal tension of the tissue pressing back into our hands. Instead of forcing through the barrier of tissue directing a release as we see fit, we come to just before the barrier and allow the tissue to release in the direction of ease (Indirect Technique).

In some circumstances, however, the tissue requires that we match the reciprocal tension in the tissue and wait for the balance to occur (Direct Technique).

When do we use one or the other? The tissue determines the course of treatment and in many cases; both indirect and direct techniques are utilized in order to bring balance to the tissue/system.

## The Application of L.A.S.T.

L.A.S.T. is a principle-based technique: Disengage, Exaggerate, and Balance.

Find the reciprocal tension and motion permitted within the membranes.

*Disengage* the tissue (using direct or indirect techniques, or a combination of both) through all planes of motion, not on any particular axis, within a joint in the direction of ease. This is known as an *Exaggeration*.

Hold the position until you come to a point of suspension: a neutral position or *Balance*. Wait in that position until a softening of the tissues occurs.

Once the tissue has completed balancing, re-assess the motion permitted within the joint.

# Post Treatment

No change

Better

Worse

No better

No worse

Better later

Worse later

## Common Mistakes/ Do's and Don'ts

### Don't

Do not think that this is a cure.

We are just changing the environment of the body to increase it's functioning.

"It's not perverted function but a wrong environment that results in the distorted appearance of function. Function is always true to its environment. Function is dependent upon its environment. Therefore, any change in any part of the environment that is not in tune or balance will apparently distort the function of the matter so involved."

- Thomas Schooley, DO

### Do

Remember your principles:

Disengage, Exaggerate, Balance

Acute, Sub-acute, Chronic

Listen and follow the tissues/body

### Don't

Over treat your patients with this technique tomorrow.

Risk of harm

Can be too much change for the patient in one session

### Don't

Rush through the barrier.

### Do

Direct and Indirect Techniques

Listen and feel for the RECIPROCAL TENSION in the tissues.



## Don't

Work quickly.

## Do

Slow down!

“The quieter the mind

The stiller the hands

The less movement we make

The more we are able to perceive involuntary movement”

- James Jealous, DO

## Don't

Treat on hardware you have never seen before  
get x-rays, CT/MRI reports

## Don't

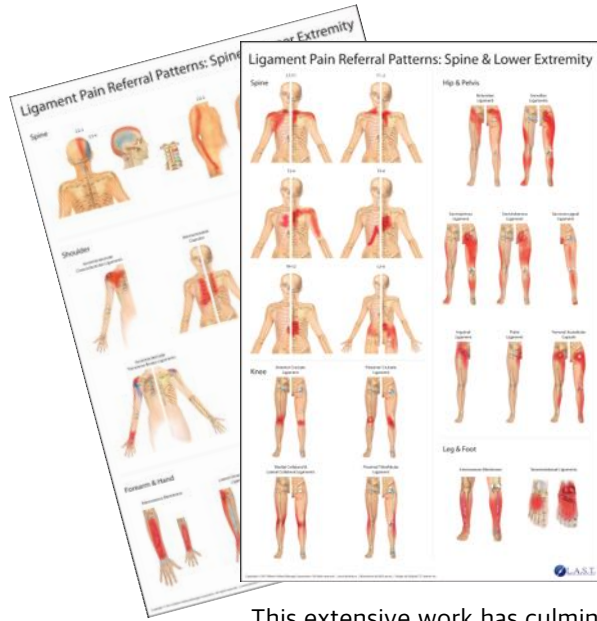
Think you will be proficient in this technique immediately!  
It takes time and Patients! LOTS of patients - 500-1000!

## Do you feel Overwhelmed?

### 1<sup>st</sup> Thing to do!

Incorporate 1-2 techniques/patient/treatment to start.  
Don't over treat - It can be too much for the patient to handle!

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Bowstring & Diaphragms

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Thorax Techniques

Techniques for Shoulder

Techniques for Hip & Pelvis

Techniques for Foot, Leg & Knee

Techniques for Sternum

## Online Courses

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Techniques for Knee

Techniques for Hip & Pelvis

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# The clinical observation of muscle energy techniques and ligamentous articular strain in 2 cases of cervical disc herniation with thoracic outlet syndrome

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## CASE REPORT

### The clinical observation of muscle energy techniques and ligamentous articular strain in 2 cases of cervical disc herniation with thoracic outlet syndrome



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#### KEYWORDS

Thoracic outlet syndrome;  
Cervical disc herniation;  
Muscle energy technique;  
Ligamentous articular strain

**Abstract** This case report presents two successful treatment outcomes of cervical disc herniation (CDH) with thoracic outlet syndrome (TOS) treated using manual therapy technique of the muscle energy technique (MET), ligamentous articular strain (LAS) and additional herbal medicine intake, acupuncture and pharmacopuncture sessions. Significant improvements were reported in the outcome measures at admission and at discharge for Visual Analogue Scale (VAS) and Neck Disability Index (NDI) scores and physical examinations followed by approximately three weeks of hospital admission. The successful outcomes suggest that integrative conservative management focused on muscle energy techniques (MET) and ligamentous articular strain (LAS) are effective in contributing to the conservative management of cervical disc herniation (CDH) with thoracic outlet syndrome (TOS). © 2014 Elsevier Ltd. All rights reserved.

#### Introduction

Thoracic outlet syndrome (TOS) is a relatively rare condition prevalent in 8% of the general

population<sup>1,2</sup> whereas cervical disc herniation (CDH), a leading medical concern in the adult population,<sup>3–5</sup> has a prevalence of over 3.3 cases per 1000.<sup>6</sup> In CDH, neurological symptoms typically present concurrently with TOS,<sup>2</sup> making diagnosis difficult and demands both objective and subjective examinations.<sup>7–9</sup> CDH causes structural anomalies and medical imaging is often beneficial

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In establishing the diagnosis, TOS is defined as a complex condition involving the compression of either neurological or vascular elements passing through the thoracic outlet. The subclavian vein, artery and lower part of the brachial plexus are often involved<sup>10-13</sup> manifesting symptoms including pain, numbness and other related symptoms.<sup>10</sup> These symptoms are often aggravated by movement of the shoulder, cervical spine and head or by raising the upper limbs.<sup>10</sup>

Anatomically, the subclavian artery, subclavian vein and the lower part of brachial plexus travel through the thoracic outlet<sup>14</sup> and different clinical signs are observed depending on the affected site. Neurogenic TOS mostly presents with neurological symptoms, such as paraesthesia, weakness in the upper extremities, and pain. In cases where vascular elements are involved, symptoms of pallor, paraesthesia and coldness are often present due to arterial ischaemia in arterial TOS, and swollen upper extremities and cyanosis due to subclavian vein obstruction are observed in venous TOS.<sup>15</sup>

The overlapping signs and symptoms of CDH and TOS lead to issues with the differential diagnosis in

many cases, as well as issues with the selection of treatment approaches. No reports have been presented on the effect of Muscle Energy Technique (MET)<sup>16</sup> and LAS (Ligamentous Articular Strain)<sup>17</sup> for the treatment of CDH with associated TOS. The two cases in the present paper had previously undergone injection therapies, medications and other medical treatments for their CDH with associated TOS. Although no improvement was reported with these medical approaches, significant improvement was observed with manual therapy using MET and LAS. This case report presents two cases of the management of CDH with TOS using these two techniques.

## Clinical history

### Case 1

A 49-year-old female presented complaining of posterior cervical pain with right arm pain and numbness (Fig. 1) following an accident that

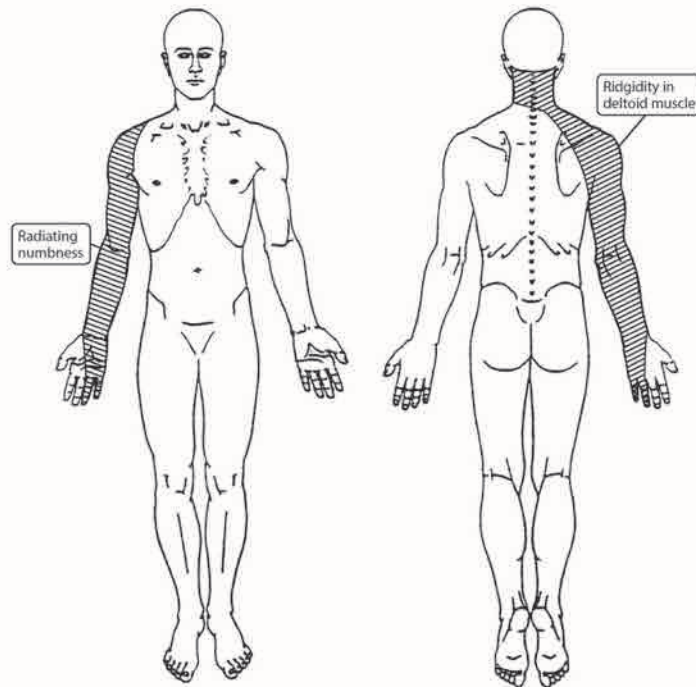


Fig. 1 Body chart – case 1.

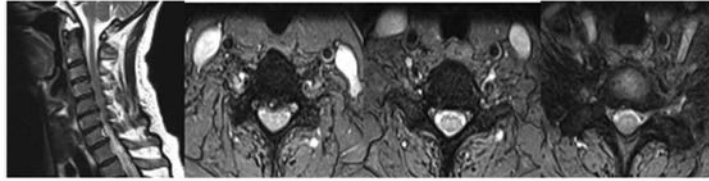


Fig. 2 C-spine MRI: C3/4/5/6/7 HVD & stenosis.

involved bumping into a glass door which occurred 10 months prior to her initial visit. The cervical spine x-ray, CT and MRI scans revealed CDH with stenosis at C3/C4, C4/C5, C5/C6 and C6/C7 (Fig. 2). She was hospitalised at a local hospital for 3 days where she received traction therapy, injections, medications and nerve block injection therapy. Some improvements were observed initially but the pain remained. The patient was subsequently admitted to Jaseng Hospital of Korean Medicine<sup>36</sup> for 21 days. At admission, the patient reported a VAS score of 10 and a NDI score of 30. Cervical spine range of motion (ROM) testing revealed restrictions in right lateral bending of 20° (normal >45). She complained that her pain was worse at night and indicated on the NDI that she was averaging 4 h of sleep per night. Positive findings in all three physical examinations were reported (Spurling test, Adson's test and Roos test). Cervical spine x-ray (Fig. 3) revealed a narrowing of the disc space, posterior marginal spurring and degenerative endplate change at C4/5, C5/6 and C6/7. At discharge, the patient reported a VAS score of 2 and a NDI score of 21. Normal c-spine ROM and negatives in all physical examinations were reported. At discharge, she reported

significant reduction in pain and her sleep was no longer affected. The c-spine ROM was reported as normal and all physical examinations reported negative.

### Case 2

A 35-year-old male patient presented with posterior cervical pain left arm numbness and pain (Fig. 4) which was worse at night. The symptoms were initially triggered spontaneously from daily life, three months prior to his first visit to a local hospital. C-spine MRI revealed CDH and he received physiotherapy for 20 days, three times at the hospital. Then he was hospitalised and received 3 sessions of nerve block injection therapy and traction therapies. The pain remained and he was admitted to Jaseng Hospital of Korean Medicine<sup>36</sup> and received the treatment for 24 days.

At admission, the patient reported a VAS score of 10 and a NDI score of 30. C-spine ROM reported a limitation in left lateral bending of 35° (normal <45°). A positive Spurling test, Roos test and a positive on the left side in Adson's test were also reported. C-spine x-ray (Fig. 5) revealed straightening of the c-spine. The c-spine MRI scan (Fig. 6)

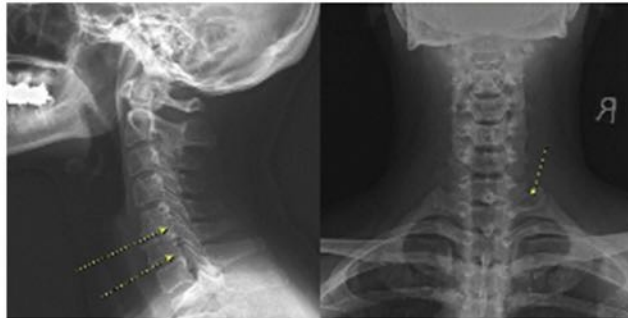


Fig. 3 C-spine x-ray (lateral): disc space narrowing, posterior marginal spurring and degenerative endplate change at C4/5, C5/6 and C6/7.

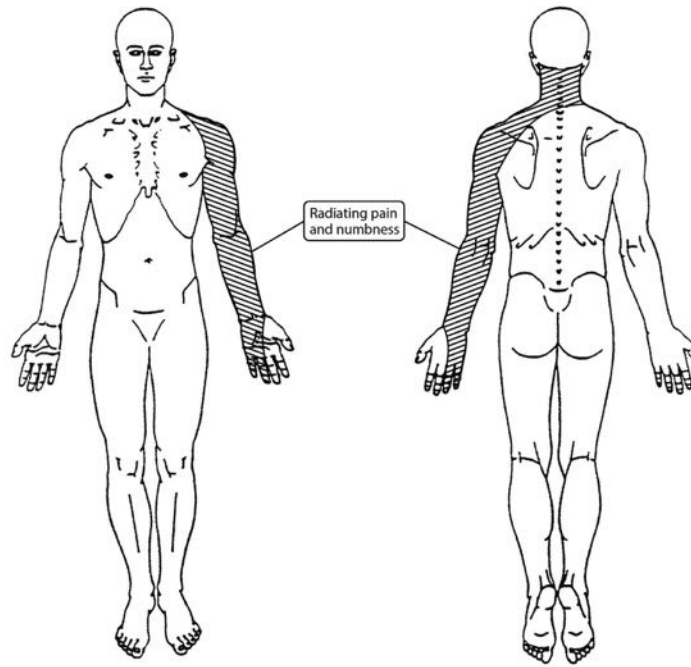


Fig. 4 Body chart – case 2.

revealed disc herniations at C-2/3, C3/4, C4/5 and C5. At discharge, the patient's VAS score was 2 and the NDI score was 27. Negatives were reported in all three physical examinations (Spurling test, Adson's test, and Roos test).

**Examinations**

There are no definitive guidelines for the diagnosis of TOS and as such, a combination of both physical examination and diagnostic imaging may be

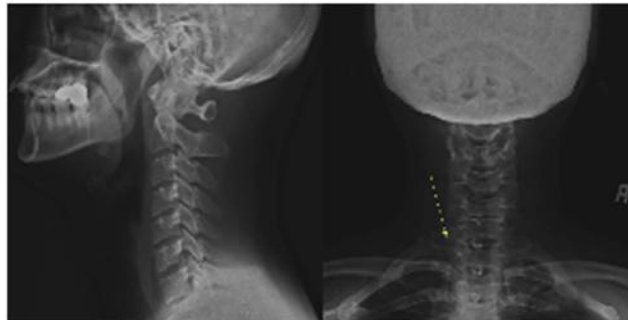


Fig. 5 C-spine x-ray (lateral): straightening in c-spine.

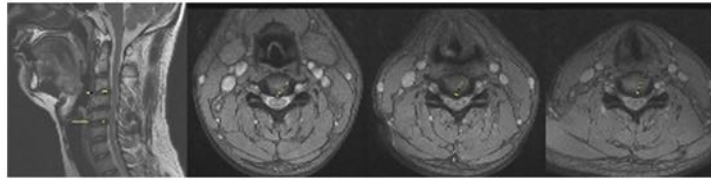


Fig. 6 C-spine MRI: C2/3, C3/4, C4/5 and C5/6 mild central disc protrusion.

required.<sup>18</sup> In the two cases, the physical examination included Spurling's test, Adson's test, and Roos test. All tests were positive in both patients at admission<sup>19</sup> and negative responses at discharge. Spurling's test involves a combination of cervical rotation and flexion with compression and a positive response is generally suggestive of CDH.<sup>2,20</sup> Positive responses with both Adson's test and Roos test are suggestive of TOS.<sup>15,21</sup> Adson's test<sup>2</sup> requires the rotation and extension of the cervical spine towards dysfunctional side while the assessor laterally rotates, abducts and extends the patient's shoulder monitoring the patient's radial pulse. Positive indication was observed with the changes in the pulse. Roos test required the patient to open and close both hands repeatedly with the arms positioned in abduction and extension for 30 s–3 min. Aggravation of the existing symptoms was observed in both cases presented here therefore both tests were considered positive.<sup>2</sup>

#### Outcome measurements

The Visual Analogue Scale (VAS)<sup>22,23</sup> and Neck Disability Index (NDI)<sup>24</sup> were administered both at admission and discharge to measure the degree of pain and evaluate functional changes. The VAS is the most commonly used self-report subjective scale for measuring the degree of pain experienced by a patient.<sup>22–24</sup> VAS scores range from 0 to 10, with 0 being no pain and 10 being the severest.<sup>22</sup> The NDI assesses the impact of cervical spine pain on a number of activities of daily living.<sup>25,26</sup>

#### Treatments

##### Manual therapy

The two cases that are the subject of the current report presented at the Jaseng Hospital in Korea. The hospital provides both western and Korean medical services. Patients are offered a standardised treatment package that consists of manual

therapy, and additional Korean medicine treatments on a regular basis. Upon the diagnosis of a patient's condition, the treatment approach is specifically tailored for the patient.

Both patients received manual therapy sessions every two or three days a week for approximately 20 minutes per session. MET and LAS were performed as the main techniques with additional treatments including herbal medicine, acupuncture and pharmacopuncture. MET and LAS were applied specifically targeting the scalene muscles, ascended first rib and the cervical vertebrae. The following techniques were repeated throughout the entirety of the patient's hospital stay.

##### Muscle energy technique (MET)

MET is a manual therapy technique<sup>16</sup> that has been practiced by many physicians in different clinical fields, and is often used for treating muscle weakness and shortening, restricted joint range of motion, and other related problems.<sup>28</sup> MET requires accuracy and precision in the diagnostic process, and is based on a biomechanical system that assesses restriction of functional movement.<sup>28</sup>

MET for the treatment of neck related symptoms was performed targeting the scalene muscles and it was repeated for 3–5 times at each session until no further increase in range of motion (ROM) were observed.<sup>29</sup>

##### Ligamentous articular strain (LAS)

Ligamentous Articular Strain (LAS) is an osteopathic manipulative technique intended to restore normal functional and physiological movement of the tissues.<sup>17</sup> LAS targets the somatic dysfunction utilising compression or decompression of the joints and fascia to achieve this balance.<sup>24</sup>

To assess and treat the ascended first rib, the outer surface of the patient's cervical vertebrae and the costal surface of the first rib were palpated using the tips of both thumbs. Constant pressure was applied to the first rib until a sense of 'giving way' was achieved.<sup>30</sup>

For the cervical spine, the practitioners hands were placed under the both sides of the patient's base of the skull for support. The middle fingers were removed by approximately 0.5 inches and were placed on the patient's cervical dysfunctional site so that the tips of the fingers remained in contact with the area while moving the operator's fingers to the anterior and superior direction. Finally, the hands were bent slightly to pull the fingers towards the thumbs. Constant pressure was applied on the contact areas of the fingers until full relaxation was achieved.<sup>30</sup>

To address the anterior cervical fascia and the scalene muscle, the tips of both thumbs were placed on the patient's lateral side of supraclavicular fossa and pressed downwards towards the patient's legs. Constant pressure was applied and once the tissue had released, the thumbs were pulled outwards, towards acromioclavicular joint. Due to the sensitivity of this area, only minimal pressure is required to release the muscle. The release of the anterior cervical fascia also contributes to the release of the scalene muscle.<sup>30</sup>

#### Other treatments

##### Herbal medicine

120 ml of Chungpa-jeon (named GCSB-5) in decoction form was prescribed and taken three times daily. Chungpa-jeon is traditionally indicated for spinal disorders for the effects of anti-inflammatory<sup>31</sup> and nerve protection.<sup>32</sup>

##### Acupuncture

Acupuncture treatment was conducted daily on the local area to relieve tension in the muscles, and ligaments in the anterior and posterior neck and shoulder area. The selected acupoints were LI18, LI17, SI17, SI16, TE16, GB20, GB21, LI16, ST12, TE15. LI18 is between the anterior and posterior parts of the sternocleidomastoid muscle (SCM), at the level of the superior border of the thyroid cartilage, and LI17 is directly inferior to LI18, just posterior to the SCM. SI17 is posterior to the mandibular angle, in the depression directly anterior to the SCM, and SI16 is posterior to the SCM, at the level of the superior border of the thyroid cartilage. TE16 is posterior to the mandibular angle, in the depression directly posterior to the SCM. GB20 and GB21 are in the posterior neck and shoulder region; GB20 is inferior to the occiput, and between the origins of the SCM and trapezius, and GB21 is at the midpoint between the C7 spinous process and the lateral end

of the acromion. LI16 is located in the depression between the acromial end of the clavicle and scapular spine, lateral to the suprascapular fossa. ST12 is situated in the depression superior to the clavicle, and TE15. TE15 is in the posterior scapular region, directly superior to the superior scapular angle.<sup>33</sup>

##### Pharmacopuncture

2 cc of Hwangryunhaedok-tang (HRHD-T) pharmacopuncture<sup>34</sup> was injected on the same selected acupuncture points three times daily. HRHD-T pharmacopuncture is used as an anti-inflammatory.<sup>35</sup>

#### Discussion

In both cases that are the subject of the current paper, CDH was confirmed by MRI scans. The common symptom across these two cases was interrupted sleep due to pain and numbness in the arm and hand. Neurological symptoms in CDH are frequently related to the neurological dysfunction around the central spinal structures, whereas in TOS, the symptoms are typically produced by compression of neurovascular structures in the periphery. Furthermore, TOS often causes the pain and numbness to continue throughout the night and day<sup>38</sup> and 'relaxation symptoms' are manifested when the compressed soft tissues are released.<sup>39</sup> Differentiating between CDH and TOS is difficult using the clinical history alone, and there are cases where CDH and TOS have concurrently occurred. Thus, careful consideration of the incidence of both CDH and TOS is required when the clinical symptoms are present in the upper extremities.

The two cases were diagnosed with CDH prior to their admission to Jaseng hospital of Korean Medicine. They both received standard medical treatments for CDH (nerve block therapy, medications, injections etc.) but no improvement was observed. We were able to speculate that TOS could be the cause of the presenting complaints due to the lack of response to the standard medical interventions, rather than identifying TOS according to the patients' clinical signs and symptoms. Orthopaedic examination suggested a diagnosis of TOS, and significant improvement was achieved through application of MET and LAS for the treatment of this condition.

MET and LAS were considered to be effective treatments for these two cases. MET was used to release the shortened scalene muscle to obtain

balance and relieve pain. The LAS<sup>30</sup> was specifically used to release the ascended first rib back and to release anterior cervical fascia. In the first case, a total of 11 sessions of MET and LAS were conducted once every two days for 21 days. In case 2, a total of 12 sessions of MET and LAS were conducted once every 2 days for 24 days. The interventions resulted in significant improvements in the VAS, NDI and in the three orthopaedic tests for TOS.

This report investigates only two successful treatment cases of CDH with TOS. Given this, as well as the use of other interventions, it is difficult to draw conclusions as to the effectiveness of MET and LAS. However the successful outcome presented here suggests that non-surgical approaches for CDH with TOS are worthwhile pursuing, because patients often respond to conservative treatments well enough to achieve significant improvement.<sup>40</sup>

### Conclusion

Surgical approaches in the treatment of spinal disorders, particularly with symptoms in the upper extremities, are frequently observed in many practices. As a result, there are a number of published reports available discussing the surgical indications and approaches for cervical disc herniations, persistent cervical spine pain and persistent neurological changes in the upper extremity. There are however, few reports on the outcomes achieved through manual therapy approaches for the treatment of CDH with TOS. Further research is required into this area and the current case reports suggest that manual therapy may be a useful treatment approach when these conditions occur concurrently.

### Conflict of interest

None declared.

### Ethical approval

None declared.

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