

Neurolymphatic Stimulation and Low Load Exercise Prescription as Treatment for Diastasis Recti: A Case Study

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Abstract

Diastasis recti is an increased distance between the rectus abdominis muscles at the midline caused by weakness in the anterior abdominal wall. Diastasis recti's signs and symptoms caused by diastasis recti are common patient complaints to healthcare providers in many different clinical settings, including emergency medicine, plastic surgery, general surgery, family medicine, and obstetrics and gynecology. Diastasis recti treatment is somewhat controversial and ranges from recommendations for conservative management with lifestyle modifications and exercises to recommendations for surgical repair with mesh [1]. This case study looks at manual therapeutic options including resistance exercise and fascial/neural innervation for effective treatment on the condition with particular interest in postpartum recovery.

Keywords: *Neurolymphatic Stimulation; Diastasis Recti*

Objectives of the Study:

- Identify the typical physical exam findings associated with diastasis recti.
- Review the risk factors for developing diastasis recti.
- Describe the treatment considerations for case study patient with diastasis recti.
- Summarize the outcomes for the treatment protocol for the case study participant.

Introduction and Case Study

Diastasis recti is an increased distance between the rectus abdominis muscles at the midline caused by weakness in the anterior abdominal wall [2], it is defined as a gap of about 2.7 cm or greater between the two sides of the rectus abdominis muscle. There is an impairment characterized by a midline separation of the rectus abdominis muscles along the linea alba. This linea alba is a connective collagen sheath created by the aponeurosis insertions of the transverse abdominis, internal oblique, and external oblique. It has its onset during pregnancy and the first weeks following childbirth. There is scant knowledge on both prevalence and risk factors for development of the condition [3].

The treatment of diastasis recti is somewhat controversial and ranges from conservative management with lifestyle modifications and exercises to surgical repair with mesh recommendations [4]. This article looks at manual therapy using a variety of musculoskeletal techniques including neurolymphatic stimulation [5] and low load muscle recruitment (LLMR) activation or low-load motor control

(LMC) exercise. An article written by Björn Aasa, RPT, MaSci, Lars Berglund, RPT, MaSci, Peter Michaelson, RPT, PhD and Ulrika Aasa, RPT, PhD on the Individualized LMC exercises versus high load lifting exercises, it was found that LMC group showed significantly greater improvement on the Patient-Specific Functional Scale (4.2 points) compared with the HLL group (2.5 points) ($P < .001$). The conclusion was that there were superior outcomes in activity, movement control and muscle endurance compared to the HLL, but not in pain intensity. This is relevant to weakness of the abdominal strength where pain is not part of the symptom picture [5].

Clinical features

A healthy female Remedial Massage Practitioner in her early 30's enrolled into one of my courses on the testing and treatment of musculoskeletal conditions using neurolymphatic point stimulation often referred to "Chapmans Reflexes" in Calgary, Canada - July 2018. During the two-day course it became apparent that the participant had severe weakness of her core musculature due to a 5 centimeter diastasis recti presenting post the birth of her first born which was 5 years ago and exacerbated after the birth of her second child 3 years ago.

This article is presented as a way for therapists to achieve strength and stability of a chronic post-natal condition that can be debilitating to a large portion of women.

Treatment choices for diastasis recti

The abdominal wall has important functions in posture, trunk and pelvic stability, respiration, trunk movement and support of the abdominal viscera. An increase in the inter-recti distance puts these functions in jeopardy [6]. Strength training of all the core muscles, including the abdominis recti muscle, may or may not reduce the size of the gap in pregnant or postpartum women. Crunches may increase the diastasis recti separation. All corrective exercises should be in the form of pulling in the abdominal muscles rather than pushing them outwards. In this article we apply activation of the neurolymphatic points to increase the neural tone to the muscles effected with the condition and also to the neurolymphatic points housed in the same area that provide strength, neural support to the lower limbs.

Clinically relevant anatomy

Abdominal muscles

The anterior abdominal wall is supported by symmetrically aligned muscles on either side of the midline called the rectus abdominis muscles, which are composed of parallel muscle fibres. The external abdominal oblique, internal abdominal oblique, and transverse abdominis (TrA) obliques are flat muscles that can be found on the anterolateral aspect of the abdominal wall arranged from superficial to deep, with muscle fibres running obliquely and perpendicular, respectively. White, fibrous tissue called aponeuroses run from the lateral abdominal wall to the midline, where it fuses to form the rectus sheaths encompassing the rectus abdominis muscles. The two rectus abdominis muscle bellies run parallel to each other and are separated by connective tissue from the rectus sheaths that are composed of highly organized collagen fibres and make up the linea alba which runs horizontally from the xiphoid process to the pubic symphysis. The distance between the two rectus abdominis muscles is commonly referred to as the inter-rectus distance (IRD).

The abdominal wall plays an important role in posture, trunk and pelvic stability and movement, respiration, and provides support to abdominal viscera. An increase in IRD, such as that seen in diastasis recti, can jeopardize the function of the abdominal wall and the rectus abdominis muscles, resulting in weakness and decreased stability and control. When the abdominal wall musculature, the rectus sheath, or the linea alba is distorted, functional limitations may arise [7].

A study by da Mota and colleagues (2015) [8] during pregnancy, 33% of women present with an increased inter-rectus distance by the second trimester, and 100% of these women present with an increased IRD by the end of the third trimester [8].

A variety of interventions were performed by her physiotherapist post-partum but to date nothing had improved her ability to sit up or the sensations of heavy legs and “disconnection of the core”. No references for the cause of the heavy legs was hypothesized by the practicing physiotherapist, though, heaviness is often linked to poor venous return though this paper is not researching this area of her symptom picture. In a paper by Nisha Acharry and Rahul Krishnan Kutty, exercises for diastasis recti include a set of abdominal exercise to correct their diastasis recti. These include: Static abdominal exercise; subject in supine lying with her arms crossed over the diastasis for support, and subject has to draw or pull the abdomen inwards so that there elicits an isometric contraction of abdominal muscles and repeated this for 5 - 7 times. Head lift with bracing: Subject placed in hook lying with her hands crossed over midline at the level of the diastasis for support, subject were asked to exhale and lift only her head off the floor or until the point just before a bulge appears. At that time, subjects hands were gently approximate the rectus muscles toward midline and lower her head slowly and relax or use of a sheet or a towel wrapped around the trunk at the level of the separation can also been another alternative to provide support and approximation [9].

When presenting a weekend course on neurolymphatic stimulation and progressive exercise prescription, we tested, treated and re-assessed the various reflex regions. We found that one student who presented with a significant diastasis recti, general weakness and instability of the lower limbs was to gain significant positive changes during the course.

Chapmans reflexes - neurolymphatic points

Neuro-lymphatic reflexes, or “neurolymphatics” as referred to in Applied Kinesiology, are reflexes located in the lymphoid tissue in the fascia and are manifested in the acute stage by soreness or tenderness at the distal ends of the spinal nerves. The tenderness is due to hyper-congestion of “gangliform” contractions in areas of lymphatic congestion and myofascial changes and is known as a Chapman’s reflex point [10]. These hyper-congestions vary in size according to their location, and to the proportion of pathology present which can be specific to a muscle or an organ. These neurolymphatic points are used in Applied Kinesiology for diagnosing the relationship between a weak muscle and dysfunction with that muscle or its corresponding organ or gland/tissue.

According to Osteopath Fred Mitchell D.O., “Chapman’s Reflexes is just a term given to the receptor organs because of the osteopath who discovered their diagnostic and therapeutic value in the location and treatment of disease” [11]. Since Chapman’s Reflexes were located all over the body the impression given was that a reflex is a lesion under the skin.

Dr. Charles Owens, determined that there is a strong link with the autonomic phase of the nervous system, called these areas ‘reflex center’s’. “So far, we know that a Chapman reflex point is the result of a lymph stasis in the viscus or glands. This lymph stasis is responsible for the dysfunction of that organ or gland. Both the lymph stasis and the resultant dysfunction are flexibly responsible for the Chapman lesion due in part to nerve impulse and to a chemical reaction of the lymphatic tissue in which the reflex lesion is found” [12].

Founder of applied kinesiology, George Goodheart [13] is pivotal to this case history.

Historically the approach to muscle weakness has been to strengthen muscles using conventional strength and conditioning methods as well as resistance training (Reiman and Lorenz, 2011; Kraemer and Ratamess, 2004). However, if the problem lies not in the muscle contractile unit being weak, but in the inability of the nervous system to fire efficiently to produce a sufficient contraction, perhaps another treatment approach is required [14]. Goodheart showed through testing that the problem may be more about the inability of the nervous system to fire efficiently to produce a sufficient contraction. The process of strength testing and facilitation of the neurolymphatic reflex arcs is the progression of Chapman and Goodheart’s works. It is the basis of the treatment options that are now available for patients suffering from weakness, instability and pain.

Goodheart proposed that the inhibition of the motor neurons can be located in the anterior horn motor neuron pool of the spinal cord (McCord, 2029). This inhibition is determined by its central integrative state CIS, comprised of both the excitatory and inhibitory inputs at

the neuron. This in turn affects functional skeletal muscle strength. Schmitt and Yanuck (1999) [15] suggest that changes in the nervous system can include the sensory receptors in skin, joints, organs and fascia. This is due to the interconnectedness of the nervous systems CIS. This collaborates with the changes in strength testing before and after the jostling at the superficial fascial layers.

Author Gibwa Cole, application of neurolymphatic reflex stimulation to sports: A gap in the Literature refers to therapist Douglas Heel who has adapted and charted some of the major points.

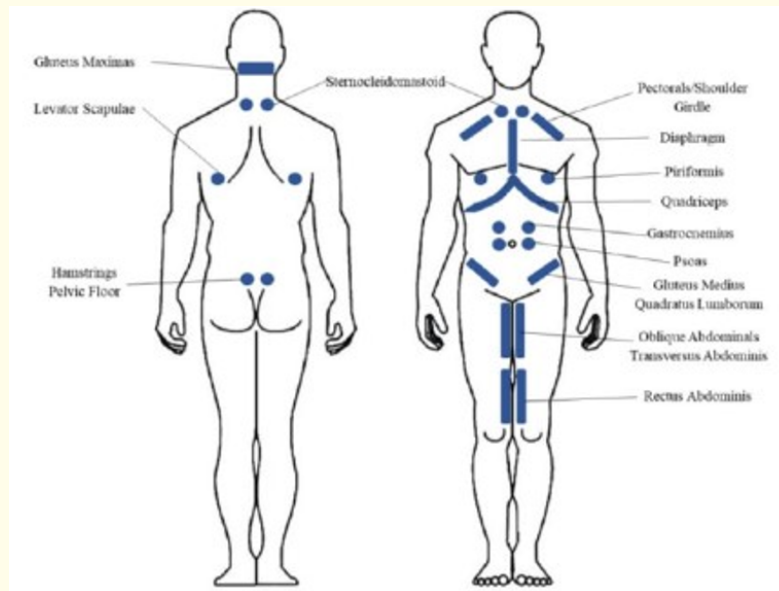


Figure 1: Neurolymphatic reflex points for muscles. Adapted from Heel (2018).and NHPC (2013) [20].

Low load muscle activation - low load activation (muscle control)

Once the neural efficiency to the reflex arc has been stimulated, the activation of the motor units at low levels are used to action the target muscle and reduce the synergists from initiating the specific action of the joint.

Many studies are available on the function of muscles, the firing around Golgi tendon organs, behavior of muscle spindles and what changes are apparent of neighboring muscles. One study done on changes in muscle spindle firing in response to length changes of neighboring muscles [16] supports the theory that length changes are evident and that muscle spindles not only signal length changes of the muscle in which they are located but can also sense length changes that occur as a result of changing the length of synergistic muscles. When a muscle contracts, force can be transmitted to the skeleton, not only via its tendons of origin and insertion but also through connective tissues linking the muscle belly to surrounding structures.

The assessment and facilitation of the specific muscles we chose for our patient included the hips flexors and extensors, rectus abdominus, internal and external obliques, transversus abdominus, gluteus minimus and medius muscles, the latter being involved in function of lateral hip/pelvis stability.

Noting that the brain-muscle function is not a simple system but rather one of more complexity to assist in the protective and functional status of the body. Roy Sugarman describes a more realistic movement pattern behavior, whereby manual muscle MMT testing is not about testing muscles; it is about testing the nervous systems ability to respond in specific position/s. The brain doesn't know how to isolate muscles. The brain does know how to create a strategy to accomplish a movement task" [17].

Methods

Manual muscle testing (MMT) or Oxford Scale is the most popular way to test muscle strength. For this test, the PT will push on your body in specific directions while you resist the pressure. A score or grade is then assigned, depending on how much you were able to resist the pressure.

An assessment of muscle strength is typically performed as part of a patient's objective assessment and is an important component of the physical exam that can reveal information about neurologic deficits. It is used to evaluate weakness and can be effective in differentiating true weakness from imbalance or poor endurance. It may be referred to as motor testing, muscle strength grading, manual muscle testing, or any other synonyms. Muscle strength can be assessed by a number of methods-manually, functionally, or mechanically [18].

Muscle strength is measured with an MMT on a five-point scale:

- 0/5: A 0/5 grade means that you are unable to create any noticeable contraction in a specific muscle. This can occur when a muscle is paralysed, such as after a stroke, spinal cord injury, or cervical or lumbar radiculopathy. Sometimes, pain can prevent a muscle from contracting at all.
- 1/5: A grade of 1/5 occurs when muscle contraction is noted but no movement occurs. In this case, the muscle is not strong enough to lift the particular body part against gravity or move it when in a gravity-reduced position. A small contraction may be detected with palpation (physical touch) but not enough to effect movement.
- 2/5: A 2/5 grade is assigned when a muscle can contract but cannot move the body part fully against gravity. However, when gravity is reduced or eliminated with a change in body position, the body part will be able to move through its full range of motion.
- 3/5: With a 3/5 grade, you are able to fully contract a muscle and body part through its full range of motion against the force of gravity. But when resistance is applied, the muscle is unable to maintain the contraction.
- 4/5: A 4/5 grade indicates that the muscle yields to maximum resistance. The muscle is able to contract and provide resistance, but, when maximum resistance is exerted, the muscle is unable to maintain the contraction.
- 5/5: A 5/5 grade means that the muscle is functioning normally and is able to maintain its position even when maximum resistance is applied [19].

Initial presentation and assessment

During the first day of the course, we discovered that the participant had a physical separation of her linea alba of 5 cm, this indicated an extreme distance and confirmed diagnosis of diastasis recti. Her strength testing of her core musculature was tested before and after the neurolymphatic point stimulation. Strength tests were performed on muscles involved in core stability and hip function. Our participant tested weak in hip flexors, extensors, lateral stabilizers, lower limb and abdominals. She showed a positive testing for Trendelenburg sign bilaterally and displayed general ankle instability moving up into standing plantar flexion. Passive tests showed limited ROM through ankle dorsi and plantar flexion ranges.

Interventions using Chapmans reflexes and LLMR

For the interventions using Chapmans reflexes, day one strength testing and facilitation treatment was applied to the pelvic region including stimulation of the hip flexors (psoas, iliacus and rectus femoris), the gluteus maximus, minimus and medius and the abdominal muscles. Before and after strength tests were applied (Table 1). The second day we strength tested and stimulated the relevant muscles of the lower limb’s quadriceps, gastrocnemius, soleus and tibialis muscles. Before and after strength tests were recorded. The strength gains in isometric rectus and oblique holds and stability during single leg stance were significantly improved, with strength to all muscles tested pre and post neurolymphatic point stimulation recorded from 3/5 to 5/5 in isometric holds. The ability to perform supine-to-sit unaided was still 2/5 on the Oxford scale.

Oxford strength Scale	Quadriceps (day 2)	Gluteus medius and minimus	Gluteus maximus	Psoas, iliacus, rectus femoris	Internal and external obliques	Rectus abdominus
0/5						
1/5						
2/5					1/5	2/5
3/5	3/5	3/5	3/5	3/5	2/5	2/5
4/5		4/5		4/5		
5/5	5/5		5/5			

Table 1: Daily strength tests before stimulation (red) and after stimulation (green).

To note: The strength of the obliques was slightly lower than the rectus abdominus which surprised the testing students, as the presumption was the rectus abdominus would have had a greater deficit. One hypothesis was that the lateral trunk stabilizers were fatigued due to the more excessive loads required to hold the anterior trunk/core stable during the 60% single leg phase of gait. In a publication by Nirav Maniar, Anthony G. Schache, Claudio Pizzolato, David A. Opar, “Muscle Function during Single leg Landing [21]. It was found that the vasti, soleus, gluteus maximus and gluteus medius produced the greatest muscle forces and negative (eccentric) mechanical work. Downward momentum of the centre-of-mass was resisted primarily by the soleus, vasti, gastrocnemius, rectus femoris, and gluteus maximus, whilst forward momentum was primarily resisted by the quadriceps (vasti and rectus femoris). Flexion of the lower limb joints was primarily resisted by the uni-articular gluteus maximus (hip), vasti (knee) and soleus (ankle).

This study added to the veracity and assessment protocol of including these muscles into the strength testing and facilitating using the neurolymphatic system. In this treatment protocol, we endeavor to improve the fascial links associated with Thomas Myers Anatomy Trains [22]. We assess the Functional back and front line and relevance to the gluteus maximus, psoas and abdominal muscles, the Superficial front line rectus abdominus, quadriceps, tibialis and the Lateral line lateral gluteals and obliques.

The in-efficiency of the muscle recruitment and timing sequence within each of the myofascial lines is managed with relevant light contractions of the primary muscle weaker within the line.

Palpation of tendon attachments of the muscles listed above assisted in the qualification of which of these to recruit for improved quality of contractions. We are not reviewing the fascial trains in this article.

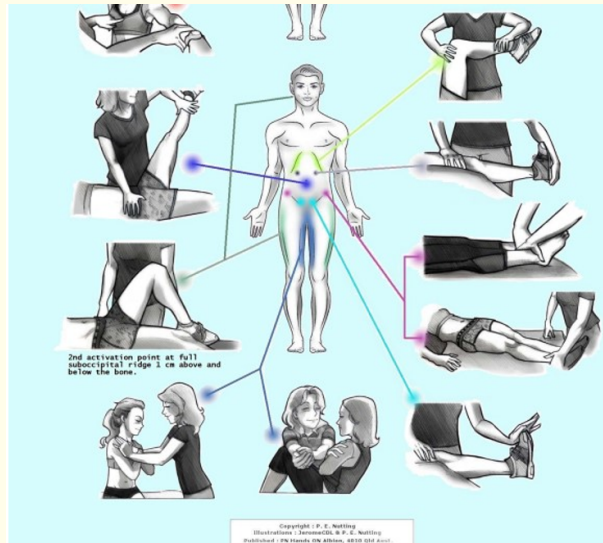


Figure 2: Assessment of the relevant muscle strength and application of the neurolymphatic point/s.

Treatment protocol

Treatments for the patient included the following:

1. **Chapmans reflexes:** Commenced by stimulation of the neurolymphatic points feeding the hip flexors and extensors, followed by stimulation of the region to support the lateral sling. Lastly, we stimulated the region for the abdominals in the anterior and posterior regions of the body. In chronic conditions the Chapmans Reflexes treatment indicates stimulation of both the neurolymphatic points housed anteriorly but to include the points nested in and about the erector spinae. We followed the protocol of vigorous rubbing at a superficial level for 30 seconds in each region. Once these areas were stimulated the strength tests were repeated.
2. **Low load muscle recruitment:** She then performed a low load muscle recruitment of the gluteus minimus and medius to improve the initiation of abduction and increase the stability of the pelvis. Low load muscle recruitment is where the muscle initiates the action potential from a neutral position, it is imperative that the muscle is completely inert prior to the contraction phase to allow the neural pathway of contraction and firing patterns to provide stability and strength. This allows the target muscle to contract independently from the synergistic muscles where possible, the small gentle contractions assist when the muscle is weak, it reduces the need for these synergistic muscles from over-performing.
3. **Homecare:** Once before retiring and on waking the participant was instructed to activate the neurolymphatic points of the hip flexors, hip extensors, lateral sling and abdominals. She was also instructed to perform a lateral gluteal exercise commonly referred to as a small clam exercise. In a systematic review of rehabilitation exercises to progressively load gluteus medius, the use of the clam exercise was investigated and indicated a very high maximal volitional isometric contraction [23]. This is the usual protocol within our rehabilitation so she was instructed to perform 20 side lying clams the following day of the course.

2nd treatment day two

Our participant was homework compliant completing both the side lying clam that morning and the neurolymphatic stimulation overnight and in the morning.

Pre-treatment assessment

There were still some weaknesses with the abdominal strength in rectus abdominus but much better quality of strength in the oblique testing 4/5 but unable to sustain with overpressure over time.

Assessment for day 2 included lower limbs, the patient testing 3/5 in hip flexion and knee flexion when testing the quadriceps isometric strength. Reduced range of ankle dorsi-flexion was also evident indicating either joint mobility stiffness or shortness of the gastrocnemius and/or soleus muscles.

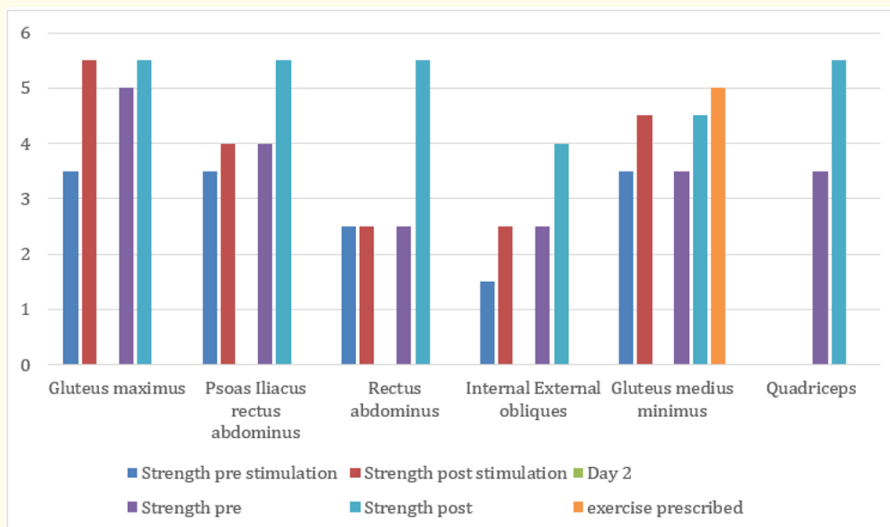
The neurolymphatic points for the lower limbs are housed in and around the torso. The hypothesis of weakness and the inability of the rectus abdominus to maintain a functional anterior core leading to stress on the neural chains. With the dysfunction of these points to their relevant muscles, we see relevant weakness of the muscles of the quadriceps and associated lower limb imbalance of calves and tibialis muscles.

Treatments

1. **Chapmans reflexes:** These were applied to the quadriceps, tibialis anterior, gastrocnemius and soleus. We reapplied the Chapmans Reflex stimulation to the rectus abdominus and obliques due to their weakness. Re-assessment of strength was astounding as the patient managed her first sit up from supine in over 3 years.
2. **Homecare:** A 30-second stimulation of the neurolymphatic points of the hip flexors, hip extensors, lateral sling, rectus abdominus, obliques and including the neurolymphatic locations for the quadriceps, gastrocnemius/soleus and tibialis. She is also encouraged to do low load muscle recruitment to the lateral gluteal muscles side lying and to start to do progressive functional movements for the gluteal groups progressing to the full lower limb as recommended by her acting exercise physiologist.

Results

The strength changes of the muscles tested had a notable improvement post facilitation of the neurolymphatic regions associated with each area.



Graph 1

Discussion

Diastasis Recti is a common phenomenon during pregnancy and in many women post-partum. Patients present into the remedial therapists' clinic with a variety of musculoskeletal complaints post-partum and also exhibit the non-closure of the linea alba sheath between the rectus abdominus muscles. Surgical intervention is either seen as cosmetic surgery, which then becomes a financial restraint, or as cited in Management of diastasis recti, Recommendations for Swedish National Guidelines "the surgery only considered in patients with functional impairment" [25]. The primary rehabilitation being exercise-based by a qualified physiotherapist.

Massage, remedial massage and Myotherapists see these patients regularly enough to deem we have treatment options available to us. Using a way to stimulate the nervous system to the weakened muscles gives both allopathic and complementary practitioners the ability to both stabilize the area and address musculoskeletal complaints associated with the condition.

It was evident through the weekend workshop that our participant had significant changes to her core strength, hip flexor/extensor stability, her functional gait and lower limb strength with the neurolymphatic work we were applying.

We hypothesize that by increasing the neural tone it is shown that the muscle power is also improved. We weakness that the condition created had changed with the stimulation of the abdominals, the hip flexors and extensors, the lateral trunk stabilizers/flexors and the lower limb.

It is difficult to quantify the relevance of applying the low load muscle exercises to the lateral gluteal muscles, we did not have equipment to confirm that the lateral gluteals were actually the prime muscles. We did, use palpation of the lateral hip tissue to feel for tension changes on each elevation by the participant. We could see the correlation of the abdominal capacity to go from supine to sit which was not evident in prior testing. The subjective comments from the participant included the sense of greater stability in standing and she returned a negative Trendelenburg tests post the exercise.

Noted also was the emotional change and confidence that our patient alluded to on day two. The BPS relevance, albeit very relevant, is not included in this case study due to the lack of capacity to offer educational referencing.

If therapists have strategies around muscle strength testing and exercise prescription in their patients, then we are better capable of helping our patients with their pain management.

Conclusion

Currently there is no neural facilitation papers that I could find to assist in this citing for this condition. There are research papers on the neurolymphatic stimulation but none that look at specific post-partum conditions. Further investigation to weakness and pain to distal muscles whose origin of the neurolymphatics are housed in the anterior trunk region should be documented. Hoping that by offering a multitude of case studies we can start a catalogue that can be both usable and relevant for manual therapists in the future.

More research should be undertaken into the involvement and effectiveness of the neurolymphatic points aka Chapmans Reflexes to the musculoskeletal system.

Feedback from the participant in question can be heard here [24].

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