6th International Fascia Research Congress

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Montreal, Quebec

ABSTRACT BOOK

Congress Theme: Critical Evaluation: Science — Translation — Practice

FASCIA RESEARCH CONGRESS MONTREAL 2022 SM

FASCIA RESEARCH SOCIETY™

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Half Day Workshop - Integrating Dynamic Neuro-Cognitive Imagery and Fascia for Treating Low Back Pain

Morning Workshops - Oral

Dr. Amit Abraham (Ariel University), Mr. Eric Franklin (Franklin Method Institute)

Introduction/Background

Mental imagery (MI) is a fundamental human skill of creating and using images and metaphors in the mind. Being an active, cognitive process, MI can affect a variety of motor and cognitive functions, including attentional focus, movement biomechanics, and psychological aspects. Traditionally, MI training has focused on muscle tissue and research has investigated its beneficial effects on power, strength, range-of-motion, and flexibility. However, little referral has been devoted to its potential effects on fascia. Building on scientific literature suggesting anatomical, physiological, and functional relationships and similarities between muscular and fascial tissues, we provide a science-based conceptualization for the use of MI for promoting fascial awareness and enhancing its mobility, thus benefiting motor performance and functioning. Fascial Dynamic Neuro-Cognitive Imagery (FDNI) is a codified framework of MI tools and movement applications to motor performance with the goals of gaining better embodiment and exploitation of fascial structure and biomechanics. The evidence-based approach of FDNI is based on findings from the fields of fascial anatomy and physiology, biomechanics, motor learning, and pedagogy. Training in DNI has shown promise in improving motor and non-motor aspects of performance in dancers and people with Parkinson's Disease. FDNI ties together fascia-specific cognitive and motor elements, thus emphasizing the role of fascia in motor and cognitive aspects of motor performance and rehabilitation.

Half Day Workshop - Infraspinatus Fascia System - Dynamic Center for the Shoulder Girdle behavior. Myofascial Induction Therapy (MIT®) Approach

Morning Workshops - Oral

Mr. Andrzej Pilat (School of Myofascial Therapies Tupimek)

Introduction/Background
Evidence suggests that the brain may control the limbs by scaling, offsetting, and temporally dilating fundamental movements encoded in the sensorimotor system. These patterns of motion have been developed into the concept of synergies, which can be defined as a collection of relatively independent degrees of freedom that behave as a single functional unit. Fascia plays an important role in these tasks. Through the intra- and intermuscular links as well as through its extensive network of mechanoreceptors fascia actively participates in the development of movements in search its optimal efficiency.
In the theoretical part (through the slide and videos presentation) will be shown and discussed:

- The anatomical and biomechanical findings related to the fascial system of dissections of non-embalmed cadavers.
- The scapular dyskinesis, as common clinical finding of abnormal movement, positioning, or function of the scapula during shoulder movement.
- The anatomy and biomechanics of the infraspinatus fascia (images and videos of dissections from non-embalmed cadavers).
- Basis of the Myofascia Induction Therapy (MIT) approach.
- Short focus related to the assessment and clinical reasoning process.

In practical part will be performed:

- The basic assessment process.
- The protocol of the application of the MIT approach

Half Day Workshop: Fascial Net Plastination Project: the Unveiling of FR:EIA — Insights and applications from the world‘s first human, whole body, fascial-focused plastinate

Morning Workshops - Oral

Mr. Gary Carter (FR:EIA / Natural Bodies), Ms. Rachelle Clauson (Flourish Bodywork), Ms. Laurice Nemetz (Pace University)

Introduction/Background

The Fascial Net Plastination Project‘s five-year collaboration of the Fascia Research Society, the Plastinarium, and Body Worlds culminates here at FRC6 2022 in Montreal with the unveiling of *FR:EIA*, the world‘s first human, whole body, fascial-focused plastinate. At last, the art and science of plastination preservation is making it possible for a wider audience to see real, human fascia anatomy in 3D! Take a deep dive into fascial connectivity with members of the FNPP dissection and design team as they bring you behind the scenes in this unique, multimedia workshop. Get an in-depth view of the fascial distinctions and continuities highlighted in the FNPP plastinates and find out why they were selected for inclusion in the final design. Improve your spatial understanding and get clarity on fascial tissue relationships. Make the connection between anatomy, research, and clinical application by feeling living fascia through hands-on demonstration and movement participation segments. Learn why plastination is uniquely suited for studying fascial anatomy, and what problems still remain to be solved. Be part of the conversation, talking though the challenges of attempting to truthfully express the human fascial system separately, when its very nature is that of connection. The work of the FNPP will likely challenge, change, and enhance perceptions about the fascial system. Join the collaboration by offering your insights and inspirations gained from the FNPP and join forces with us to continue sharing this ground breaking project worldwide.

Full Day Workshop - Myo-Fascial Sensitization

Full Day Workshops - Oral

Dr. Jay Shah (Department of Rehabilitation Medicine, Clinical Center, National Institutes of Health, Bethesda, MD), Dr. Antonio Stecco (New York University School of Medicine), Prof. John Srbely (Department of Human Health and Nutritional Sciences, University of Guelph,)

Introduction/Background

Neurophysiological Mechanisms of Myofascial pain:

The Role of Central Sensitization and Neurogenic Inflammation in the Pathophysiology of Myofascial Pain Syndrome
by John Srbley

Pathophysiology of Deep Fascia:

Biochemical Alteration of the Extracellular Matrix and its Role in Sensitization
by Antonio Stecco

Spinal Segmental Sensitization in Myofascial Pain Syndrome:

Integrating Pain Mechanisms with Objective Physical Findings and Treatment Strategies
by Jay Shah

WORKSHOP DESCRIPTION:

This comprehensive session presents knowledge emerging from the pain sciences in a clinically accessible way. It will explore the roles that active myofascial trigger points (MTrPs), the three dimensional fascial system and its pathophysiology, the dynamic nature of sensitization, and the presence of quantitative, reproducible physical findings play in the evaluation and management of chronic myofascial pain and dysfunction. Spinal segmental sensitization (SSS) is a hyperactive state of the dorsal horn caused by persistent nociceptive bombardment. Painful MTrPs and stiff deep fascia are common sources of persistent nociception that cause SSS and chronic myofascial pain. Conversely, maladaptive changes in subcortical structures and dysfunctional descending inhibition may cause somatic tissue abnormalities. Common peripheral manifestations include dermatomal allodynia/hyperalgesia, sclerotomal tenderness, MTrPs within the affected myotomes, and dense deep fascia.

Non-pharmacological treatments like dry needling, fascial manipulation, and acupuncture will be discussed. These techniques aim to deactivate MTrPs, decrease fascial stiffness, normalize the threshold of nociceptors, desensitize affected segments, and neuro-modulate subcortical dysfunction, providing long-term pain and symptom relief. The underlying physiology and clinical application and interpretation of the Windup Ratio (WUR) and the Mechanical Pain Threshold (MPT) Quantitative Sensory Testing (QST) outcomes for the assessment of central sensitization and the chronic myofascial pain patient will be discussed. The diagnostic and treatment techniques presented in this seminar apply to the management of various chronic musculoskeletal pain conditions. This underlying rationale and the resultant analytical process guide the clinician to identify the active MTrPs to be treated and reduce nociceptive bombardment from irritated nociceptors.

Full Day Workshop - Myofascial Meridians: Assessment and Treatment Strategies

Full Day Workshops - Oral

Mr. Thomas Myers (Anatomy Trains)

Introduction/Background

Learn to see and resolve body-wide postural patterns through understanding the myofascial force transmission through the body‘s membranes. This workshop reviews the myofascial meridian system, and explores ’meaning‘ in stability, movement, and biopsychology, with emphasis on the role of the ’core‘ structures. Working with established fascial properties, this workshop explores the ’feel‘ of specific fascial and myofascial release work in both manual therapy, stretch, and training contexts.

Full Day Workshop - Inflammation, Hands-On: a Fascial Perspective

Full Day Workshops - Oral

Mr. Til Luchau (Advanced Trainings)

Introduction/Background

Inflammation is involved in nearly all musculoskeletal complaints (including myofascial and joint pain, muscle soreness, neuropathies, neoplastic/chronic pain, and many more). But for fascia-informed manual therapists, working with inflammation can be a
real puzzle. Sometimes our work can clearly help, but at other times, hands-on work can worsen inflammatory reactions. What makes the difference? And, how can our emerging understanding of fascia and the interstitium, as well as pain and the brain, inform our hands-on work with inflammatory conditions? Join author, teacher, manual therapy practitioner, and Certified Advanced Rolfer Til Luchau as he helps clarify inflammation‘s complexity, and offers practical suggestions for practitioners‘ hands-on work. Using recent insights from ongoing fascial, pain, and inflammation research, as well as the clinical experience, input, and tips from a range of expert clinicians, topics will include:

- Understanding inflammation‘s types, signs, symptoms, stages, causes, and resolution
- The role of manual therapy and hands-on work
- A toolbox of hands-on approaches and techniques

This special participatory workshop will include theory, discussion, and hands-on practice. Movement therapists are also welcome and will find relevance to their work.

Full Day Workshop - Microscopic Aspects of Fascia

Full Day Workshops - Oral

Dr. Caterina Fede (University of Padova)

Introduction/Background

The microscopic aspects of the fascia will be deeply explored. After an introduction about cellular and molecular components of the fascial tissue and the basic principles on how to prepare a sample for histology and how to use a microscope, all the fascial structures will be analyzed in subgroups by light microscopy. The practical sessions will be preceded by an introductive lesson, then guided by the principal microscope used by the presenter, while each group will analyze the samples with the help of assistants. All the sections will be provided by our group of Padova University, creating a unique opportunity to view the samples that led to the main publications and studies of our team, such as the identification of the fasciacytes. In particular, the composition of the fibrous and the loose tissue component will be analyzed. The cells that compose the fascial tissue (fibroblasts, fasciacytes, myofibroblasts, telocytes, adipocytes, nerve fibers) will be carefully described. A session will be dedicated to the stainings to visualize the innervating components. Furthermore, the expression of receptors by the cells (hormone receptors, endocannabinoid receptors) will be analyzed. By this way the participants will learn how to distinguish the principal components of the fascial tissue.

Full Day Workshop - Myofascial Meridians and Fascial Therapy Techniques for Dogs

Full Day Workshops - Oral

Ms. Laura Lee (Acres Animal Hospital)

Introduction/Background

Fascia plays a crucial role in supporting and maintaining health. The focus of this workshop will be on maintaining musculoskeletal health of dogs performing in various dog activities, as well as treating common orthopedic injuries or conditions. Information on myofascial meridians in dogs will be presented, and how they are used in the author's practice to treat and maintain optimal mobility in dogs. Photographs and videos taken from the author's practice, as well as hands on demonstrations on ourselves and on dogs will help to further understanding on using fascial releases and balancing to maintain health. Connections with animal chiropractic (veterinary spinal manipulation), and veterinary acupuncture will also be touched upon. This workshop is suitable for veterinarians and those licensed to work with animals. Chiropractic or acupuncture experience is not essential but will be helpful, as will a thorough knowledge of dog anatomy. Some handouts will be provided, and some reference materials will be present at the workshop. Participants are welcome to bring their own references.

Full Day Workshop - Ultrasound-Guided Visualization of Fascia Irritation with Focus on Acupuncture and Biofeedback

Full Day Workshops - Oral

Dr. Johannes Fleckenstein (Goethe-University Frankfurt), Dr. Werner Klingler (Ulm University)

Introduction/Background

Ultrasound (US) is a useful tool for clinicians, manual therapists and other body workers. US offers a non-invasive and real-time imaging method of the musculoskeletal system. Fascial thickening and pathological shear motion are linked to pain syndromes. Apart from diagnostic use, the method can therapeutically be used for neurophysiologic feedback. Most notably, improvement of proprioception has been shown to reduce pain.

The traditional method of defining acupuncture sensation (de qi) through subjective patient reports is widely accepted. Still, there is a broad range of quantifiable neurophysiological changes occurring in direct consequence to the needle stimulus. Ultrasound constitutes an ideal medium for evaluating the biomechanical effects of needle manipulation on tissue, as it yields both images of tissue morphology and biomechanical information. Previous research has shown a strong connection between acupuncture sensation and both tissue depth and needle rotation. The intensity of the needle stimulation seems to correlate with the effect size. In addition, the role of the fascia is understood to promote so called mechanotransduction, i.e. forwarding and transmission of needle stimuli, to other body regions via connective tissue. In terms of myofascial disorders this may explain why needling of the legs alleviates back pain. Consequently, innervation and histologic structure of the derma- fascio- and myotomes where the needle is inserted, can be considered a key in mediating the acupuncture effects. The workshop is mainly hands-on. The participants will learn:

1. the principles of US and basic sonoanatomy
2. how to investigate fascia by US and detect gross fascial pathology
3. the use of US as a quick and effective biofeedback method
4. about the localization of acupuncture points relevant to treat myofascial disorders
5. to distinguish different stimulation techniques by means of tissue response
6. about the sustainability of acupuncture effects on fascia
7. to use ultrasound as a tool to diagnostically assess tissue before, during, and after treatment

Full Day Workshop - Treating Common Myofascial Pain Complaints using Site Specific Fascia Tuning Pegs

Full Day Workshops - Oral

Dr. John Sharkey (University of Dundee)

Introduction/Background

In this practical based "hands-on" fascia focused workshop John Sharkey, will utilize biomechanical, sensory, metabolic and mechanotransducive properties of the body wide fascial network, offered from an evidence-oriented perspective, to provide effective manual and movement therapeutic interventions aimed at treating a wide variety of myofascial pain complaints.

Practical touch therapy applications will be provided supported by evidence-based explanations concerning appropriate manual and movement interventions for effective therapeutic outcomes. This bespoke presentation involves an overview of the living tensegrity- model and its impact on manual and movement therapies. John Sharkey will provide a dynamic practicum translating fascia science into manual and movement applications. The workshop will intersperse fascia science, theories, research-based evidence, and a number of "real time kinesthetic experiences" to support tactile knowledge of the true nature of our fascial net architecture.

Half Day Workshop - Which type of therapeutic touch for which type of dysfunction? Translating Science into Clinical Reasoning for Fascial Treatments

Afternoon Workshops - Oral

Mrs. Julie Ann Day (Fascial Manipulation Association), Mrs. Tiina Lahtinen-Suopanki (Helsingin manuaalinen terapia Oy)

Introduction/Background

This workshop will examine how recent studies of fascial anatomy and histology regarding superficial, deep and visceral fasciae can offer guidelines for therapists when choosing the most appropriate form of therapeutic touch to be applied in each individual dysfunction. The signs and symptoms of a superficial fascia dysfunction differ from those of a deep fascia dysfunction. Likewise, the presentation of a predominately visceral fascia dysfunction has particular characteristics. At the same time, the anatomy, histology and specific relationships of these layers are quite different. For example, superficial fascia, which lies within the hypodermis, is closely related with the autonomic system, lymphatic drainage, superficial nerves and vessels and exteroception, whereas deep fascia consists of aponeurotic and epimysial-type fascia and is more closely related to muscle recruitment and proprioception. The presenters will draw on their extensive experience as physiotherapists and practitioners of the Fascial Manipulation®- Stecco method®, as taught by Luigi Stecco, to explain how science can guide therapists in choosing which type of touch is indicated in different fascial dysfunctions. Following an overview of the anatomical characteristics and clinical presentations of some common superficial, deep and visceral fascia dysfunctions, the clinical rationale applied in several case studies will be discussed.

Half Day Workshop - Communicating the Science of Fascia

Afternoon Workshops - Oral

Ms. Laurice Nemetz (Pace University), Dr. Rebecca Pratt (Oakland University School of Medicine), Mr. David Lesondak (University of Pittsburgh Medical Center)

Introduction/Background

We are fascia enthusiasts who are dedicated to sharing fascia knowledge with other science communities, clients, and the general public. As book authors, article writers, clinicians, educators, and more, our collective background has a common theme of communication. Communicating science with authenticity and clarity is a powerful skill set to possess. Sharing information about fascia to different audiences with the desire to inspire and educate can be successful by learning different communication styles. We will be working with several models, including improvisation, to improve dialog between parties in order to help those involved in fascia science to effectively communicate the latest in fascial research.

Half Day Workshop - Ultrasound and Elastography (with a focus on Hypermobility/Ehlers-Danlos Syndrome): Translation from Science to Practice

Afternoon Workshops - Oral

Dr. Tina Wang (Loma Linda University School of Medicine)

Introduction/Background

The workshop will be divided into 2 parts - a lecture part and a hands-on practical portion using ultrasound. There will be a special focus on hypermobility and Ehlers-Danlos syndrome as well as palpatory techniques using ultrasound. We will start the lecture part with an in-depth review the pathophysiology and imaging findings in the scientific literature regarding trigger points and fascia derived pain with a particular focus on ultrasound and elastography. We will review relevant literature and associated imaging technique, findings, anatomy regarding commonly studied regions: sternocleidomastoid, iliotibial tract, thoracolumbar fascia, and plantar fascia. We will discuss how interventions across disciplines influence these findings (i.e. manual therapy, modality, Fascial Manipulation, massage, electrotherapy laser, stretching, and exercise.

For the practical portion, we will review the basics of imaging techniques (i.e. positioning, anisotropy, high frequency probe, elastography, echogenicity). Konica Minolta will provide 4 Sonimage® HS-1, Konica Minolta Corporation, Japan and L18-4 transducers. We will practice examination of the sternocleidomastoid, iliotibial tract, thoracolumbar fascia, and plantar fascia. For each body region, we will practice the use of ultrasound and strain elastography in the longitudinal plane for ease of visualization for novice ultrasound users. Deep fascia will be examined for thickness and echogenicity. Muscle will be assessed using B-mode ultrasound for echogenicity and elastography for stiffness. Fascial glide will be assessed qualitatively.

Moderator Talk - Johannes Fleckenstein

Assessment Methods - Oral

Dr. Johannes Fleckenstein (Goethe University Frankfurt am Main)

Introduction/Background

Moderators will be speaking on topics that are of interest to the session.

Dr. Johannes Fleckenstein is a specialist anaesthesiologist, acupuncturist and sports physician who graduated at the University of Regensburg, Germany. His research activity ranges from electrophysiology of peripheral nerves and the functioning of neural ion channels to the somatosensory description of different types of pain. He investigated the physiologic effects of different analgesic treatment principles, and experimented in the field of acupuncture techniques, fascia and their mechanism. Dr. Fleckenstein gained profound knowledge in applied and exercise physiology, and is currently trying to link clinical and experimental human pain research, exercise and myofascial pain. He authored more than 100 publications and is the first author of about half of them.

The princess and the pea - Comparison of different stiffness assessment tools on a multi-layered phantom tissue model

Assessment Methods - Oral

Mrs. Katja Bartsch (Department of Sport Science and Sports, Friedrich-Alexander University Erlangen-Nuernberg, 91058 Erlangen, Germany), Mr. Andreas Brandl (DIPLOMA Hochschule, Bad Sooden-Allendorf, Germany), Mr. Philippe Pouletaut (Université de technologie de Compiègne-UTC, CNRS UMR 7338, Biomechanics and Bioengineering, Compiègne, France), Dr. Mashhour CHAKOUCH (Université de technologie de Compiègne-UTC, CNRS UMR 7338, Biomechanics and Bioengineering, Compiègne, France), Mr. Patrick Weber (Department Movement and Health Promotion, German Sport University Cologne, Cologne, Germany), Dr. Sabine Bensamoun (Université de technologie de Compiègne-UTC, CNRS UMR 7338, Biomechanics and Bioengineering, Compiègne, France), Dr. Robert Schleip (Technical University of Munich, Chair of Conservative and Rehabilitative Orthopaedics; DIPLOMA Hochschule, Bad Sooden-Allendorf, Germany)

Introduction/Background

Changes in the mechanical properties (i.e. tissue stiffness) of soft tissues have been linked to musculoskeletal disorders, leading to a rising demand in suitable diagnostic methods. However, little data exists to provide evidence-based recommendations for current stiffness assessment tools (SAT), requiring further research investigating their measurement properties [1]. The study aimed to compare different SAT' reliability and validity on a multi-layered phantom tissue model (MPTM).

Methods

A polyurethane MPTM was used to provide findings on concurrent validity. The MPTM simulated the four layers of the thoracolumbar fascia: cutis (CUT), subcutaneous connective tissue (SCT), fascia profunda (FPR), and erector spinae (ERS). To mimic stiffness alterations, 10 phantoms with varying stiffness parameters (specified in Shore OOO) were produced for each tissue layer. Evaluated assessment technologies included indentometry (Durometer, Tissue Compliance Meter, IndentoPro) [2], myotonometry (Myoton Pro®) [3], ultrasound imaging (ultrasound with attached transducer) [4], ultrasound elastography and magnetic resonance elastography [5]. The artificial relative stiffness changes in the MPTM were measured blindly by two different examiners, and the concurrent validity of the SAT was established using correlation coefficients and linear regression analysis. Between the two examiners, the inter-rater reliability of the assessment tools was determined. It can be noted that both elastography techniques were not able to measure stiffness and the polyurethane MPTM should be further developed.

Results

A total of 1840 measurements was conducted. Except for elastrography, all SAT found significant correlations for stiffness changes in all layers of the MPTM aside from the FPR layer, ranging from 0.70 to 0.98 (all $p < 0.01$). The inter-rater reliability ranged from good to excellent for these methods ($ICC_{(2,2)} = 0.75\sim0.98$). Measurement by elastography was not reliably feasible with MPTM.

Conclusion

Indentometry and myotonometry technologies detected stiffness changes in three of the four MPTM layers (Table 1). With ultrasound imaging, only layers thicker than 3 mm could be measured. No method could detect stiffness changes in the thin (1 mm) layer simulating FPR.

Property / Measurement	Detection of stiffness changes in layers (layer thickness indicated below)				Inter rater reliability
	CUT (3mm)	SCT (6mm)	FPR (1mm)	ERS (10mm)	
Durometer	✓✓✓	✓✓			✓✓
Tissue Compliance Meter	✓	✓✓✓		✓✓✓	✓✓
IndentoPro	✓✓✓	✓✓✓		✓✓✓	✓✓✓
MyotonPro®	✓✓✓	✓✓✓		✓✓✓	✓✓✓
Ultrasound imaging		✓✓✓		✓✓✓	✓✓
Ultrasound and MR elastographies					

Table 1. Correlation of stiffness measurements and inter-rater reliability. Blank denotes “not applicable”. ✓ denotes moderate correlation (> 0.4). ✓✓ denotes strong correlation (> 0.7). ✓✓✓ denotes very strong correlation (> 0.9).

Bartsch table with caption.png

Basal tone: When is posterior myofascial tissue considered "basal"? An experimental study of human physiology

Assessment Methods - Oral

Dr. Loïc Treffel (Institut Toulousain d'Ostéopathie, IRF'O. PNMG Université de Lyon), Dr. Martin Garet (CIDO Saint-Etienne, IRF'O, CHU Saint-Etienne), Ms. Stéphane Renaudo (Institut Toulousain d'Ostéopathie, Toulouse), Ms. Denis Ducommun (Institut Toulousain d'Ostéopathie, IRF'O. Labo AGEIS Grenoble)

Introduction/Background

Myofascial tissue physiology at rest and in asymptomatic young healthy subjects is not well described in literature. In spatial environment and on earth many manual therapies, such as physiotherapy or osteopathy, test myofascial function with subjects at rest. Therefore, the purpose of the current study was to evaluate myofascial tissue properties when loaded and at rest to determine when myofascial tissue can be considered "basal" and if there is a significant correlation between viscoelasticity and volume of posterior myofascial chains.

Methods

CNES financial suport. Investigation in Institut Toulousain d'Ostéopathie, France. Data were collected from 20 asymptomatic young healthy subjects (age: 23±4 years; body mass: 67.2±7.0 kg; height: 170.1±6.2 cm; mean ± SD). Myofascial viscoelastic properties of posterior chains were investigated using the MyotonPRO device while standing and resting in the prone position. Measurements were performed every 10 minutes upon assuming the prone position to determine response kinetics. Ultrasound was used to measure the paravertebral myofascial thickness at the lumbar level (Figure1).

Results

Preliminary results found a significant correlation between Ultrasound parameters and anthropometrics data (Spearman's rho >0.574, $p<0.01$; Figure2). Moreover, we observed a significant decrease in viscoelastic properties of the posterior chain between standing (activated) and resting (prone) positions (ANOVA repeated measures, $p<0.001$). Preliminary results seem to not show a significant correlation between myofascial properties and myofascial thickness in the lumbar region (Figure3). Viscoelastic properties in the lower limb myofascial tissue (*Soleus*) were maintained for the first thirty minutes in the prone position with overall tone variables decreasing rapidly over the first 10 minutes of prone rest (Figure4).

Conclusion

The results from this study confirmed increased myofascial tone and stiffness in a standing position and rapid decrease in myometrics parameters over the first 10 minutes of prone rest. The intersubjects variability of stiffness is higher in standing position. It could traduce the range of postural strategied existing in loading. The tonic asymmetry (left-right) observed in standing position could be maintained after thirty minutes. These changes in myofascial viscoelastic properties could greatly impact passive myofascial tests in standing position and manual tests performed during the first 10 minutes of rest.

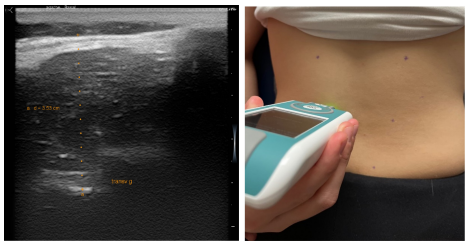


Figure 1. Paravertebral muscles size measured by ultrasound. Example of the Distance between transverse apophysis and thoracolumbar fascia (Multifidus muscle).

Figure 1. ultasound view and myotonpro measurements on paravertebral muscles.jpg

Correlation Matrix

		Frequency	Stifness	Decrement	Relaxation	Erect spin	Transv
Frequency	Spearman's rho	—					
	p-value	—					
Stifness	Spearman's rho	0.879 ***	—				
	p-value	< .001	—				
Decrement	Spearman's rho	0.165	0.491 *	—			
	p-value	0.486	0.028	—			
Relaxation	Spearman's rho	-0.920 ***	-0.912 ***	-0.211	—		
	p-value	< .001	< .001	0.371	—		
Erect spin	Spearman's rho	-0.078	0.079	0.170	0.056	—	
	p-value	0.743	0.740	0.473	0.813	—	
Transv	Spearman's rho	0.206	0.305	0.178	-0.150	0.600 **	—
	p-value	0.383	0.190	0.454	0.529	0.005	—

Note. * p < .05, ** p < .01, *** p < .001

Figure 3. correlation matrix of viscoelastic properties.png

Post Hoc Comparisons - diff side soleus

Comparison							
diff side soleus		diff side soleus	Mean Difference	SE	df	t	P_{tukey}
stand up	-	10'	29.619	12.14	20.0	2.440	0.145
	-	20'	28.048	11.71	20.0	2.395	0.157
	-	30'	33.857	10.20	20.0	3.319	0.025
	-	40'	34.333	10.60	20.0	3.238	0.030
10'	-	20'	-1.571	2.93	20.0	-0.536	0.982
	-	30'	4.238	3.67	20.0	1.154	0.776
	-	40'	4.714	4.07	20.0	1.157	0.775
20'	-	30'	5.810	3.74	20.0	1.553	0.542
	-	40'	6.286	4.24	20.0	1.483	0.585
30'	-	40'	0.476	1.93	20.0	0.247	0.999

Figure 4. cinetic of myofascial stiffnes on soleus difference of sides. post hoc comparisons tests .png

Correlation Matrix

		Height (cm)	Weight (kg)	Erect spin	Transv
Height (cm)	Spearman's rho	—			
	p-value	—			
Weight (kg)	Spearman's rho	0.687 ***	—		
	p-value	< .001	—		
Erect spin	Spearman's rho	0.501 *	0.416	—	
	p-value	0.024	0.068	—	
Transv	Spearman's rho	0.586 **	0.574 **	0.600 **	—
	p-value	0.007	0.008	0.005	—

Note. * p < .05, ** p < .01, *** p < .001

Figure2-correlation us echography vs anthropometrics data.jpg

Fascial alterations in the diabetic foot: an Ultrasound Imaging study.

Assessment Methods - Oral

Dr. Carmelo Pirri (Department of Neurosciences, Institute of Human Anatomy, University of Padova;), Dr. Antonio Stecco (New York University School of Medicine), Dr. Caterina Fede (Department of Neurosciences, Institute of Human Anatomy, University of Padova), Ms. Lucia Petrelli (Department of Neurosciences, Institute of Human Anatomy, University of Padova), Prof. Carla Stecco (Department of Neurosciences, Institute of Human Anatomy, University of Padova)

Introduction/Background

The diabetic foot, in its various forms, represents a growing problem in the general population and an economical burden for our medical systems due to the correlated disability. Charcot foot represents a severe form of diabetes' podiatry complications. Diabetic neuropathy, peripheral vasculopathy, susceptibility to infections and anatomical-histological alterations of soft tissues and bones contribute, most of all, to the development of progressive deformities which alter the biomechanics and functionality of the foot [1]. Increasing attention to this complication of diabetes has already expanded to the study of soft tissues in particular to the plantar fascia [2] but not the crural fascia. The purpose of this study was to measure and compare, by US imaging, the thickness of deep/muscular fasciae in different points of the foot and leg.

Methods

We enrolled 15 diabetic patients and 16 healthy volunteers and we assessed the Ankle-Brachial Index (ABI) and the Neuropathy Disability Score (NDS). Then the patients filled in the surveys SF-12 and Neuropathy Symptoms Score (NSS). We performed a series of ultrasound scans of the foot and leg in both groups. In according to Pirri et al [3], we measured the crural and the plantar fascia at different regions and levels.

Results

The results of the ultrasound imaging measurements of Charcot patients showed a statistically significant positive linear correlation ($p<0.05$) between the thickness of the posterior compartment of the crural fascia and the years of diabetes. In patients with Charcot's foot, compared to healthy group, it was found a statistically significant thickening of: crural fascia, at the different levels ($p=0.03$); plantar fascia, at the different levels ($p <0.0001$).

Conclusion

The study carried out shows that the plantar fascia is not the only fascial structure to be altered in Charcot's foot. The changes in fascial thickness appear to be early findings in the natural history of diabetic disease. Moreover, the thickening appears to be directly related to the development of diabetic complications. Ultrasound Imaging of the fasciae can be considered as a diagnostic assessment in the follow-up of the Charcot foot patient.

Moderator Talk - Kyra De Coninck

Sensory Aspects - Oral

Dr. Kyra De Conninck (University of Kent)

Introduction/Background

Moderators will be speaking on topics that are of interest to the session.

Dr Kyra De Coninck joined the University of Kent as a lecturer in sports therapy in 2005 and completed her PGCHE in 2007. Prior to this, she ran a successful sports massage practice and taught massage to a wide range of students and health practitioners for more than 10 years.

She teaches undergraduate and postgraduate modules in sports massage, sports injuries and soft tissue techniques. Kyra trained in musculoskeletal ultrasound imaging at Centre for Ultrasound Studies, University of Bournemouth in 2009. She is also a member of the Anatomical Society.

Her research interest focuses on understanding the structure, function and dysfunction of specialised connective tissues, such as fascia. Fascia consists of thin layers which wrap around every muscle, bone and organ in the body. These fascial layers transmit forces and allow muscles to slide over each other during movement.

Kyra's PhD thesis investigates how ultrasound imaging can be used to measure the differences in thoracolumbar fascia, in the lower back, in a range of populations with lower back pain. She has presented her research at conferences and scientific meetings in UK, Canada, Italy and Romania.

Kyra continues, together with students, to provide sports massage to athletes at a number of national and international events and championships.

The impact of sensorimotor back exercises DBM on the thickness of the thoracolumbar fascial gliding plane and on chronic idiopathic low back pain and flexibility: a pilot study

Sensory Aspects - Oral

Mr. Paul Sercu (Center for Applied Research and Study in Perceptual Psychoeducation (CERAP), Universidade Fernando Pessoa, Porto (Portugal).)

Introduction/Background

The sensorimotor approach according to the Danis Bois method (hereafter: SA DBM) differs from the classic “motor” approach (hereafter: CMA), which involves warming up and strengthening muscles, followed by stretching. SA DBM consists of consciously experiencing a slow, coordinated movement while in a perceptive state of “full presence”, in order to improve movement quality. The goal is to neutralize the stiffness and inhibition that come with low back pain. The objective of this pilot study is to measure and compare the outcomes of CMA ans SA DBM exercises. We measure pain, flexibility and the thickness of the thoracolumbar fascial sliding plane during a certain movement.

Methods

The control group did CMA exercises, the test group SA DBM exercises. For the inclinometry tests the pretest was used as a reference value. The length variations were calculated in relation to the pretest values. For flexibility the modified Schober test and the fingertip-to-floor test were chosen. Pain was measured on an analog pain scale filled in every morning and evening for three weeks. Ultrasound photos were collected for the thickness of the thoracolumbar fascial sliding plane (hereafter: TFSP thickness) (Mindray, digital ultrasonic diagnostic imaging system, model: DP-50).

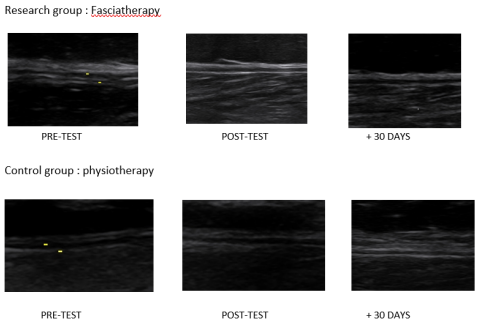
Results

- Flexibility:
  - Modified Schober:
    - § Control group: 0% increase in length, standard deviation 1,5%, standard error 0%;
  - § Test group: 8% increase in length, standard deviation of 7%, standard error 4%;
  - Fingertip-to-floor test:
    - § Control group: 24% decrease in distance, standard deviation 11%, standard error 6%;
  - § Test group: 80% decrease in distance, standard deviation 60%, standard error 30%;
  - Pain:
    - control group: steering coefficient -0.025 per day;
  - test group: -0.058 per day;
  - TFSP thickness: failed to measure.

Conclusion

SA DBM exercises result in greater flexibility and less pain than CMA exercises. Due to COVID: N6. Two points of interest: 1. A stark improvement in the test group. 2. In the post-test and after thirty days of exercises, the

ultrasound showed a reorganized fascial matrix and a realignment of the fibers in both groups, the greater change being observed in the test group. This suggests that SA DBM exercises are more effective than CMA exercises to achieve these outcomes.



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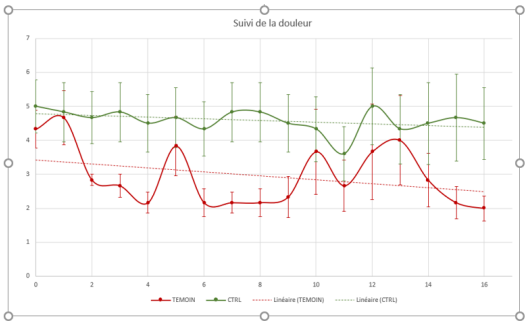


Evolution of the pain.png

The Importance of Combined Research in Fascia and Segmental Anatomy for Acupuncture

Sensory Aspects - Oral

Dr. Thomas Ots (Department of Anesthesiology and Intensive Care Medicine, Medical University Graz, Auenbruggerplatz 2, A-8036 Graz, Austria), Prof. Andreas Sandner-Kiesling (Department of Anesthesiology and Intensive Care Medicine, Medical University Graz, Auenbruggerplatz 2, A-8036 Graz, Austria)

Introduction/Background

BACKGROUND For about 2000 years, Chinese acupuncture theory followed the jingluo system (meridians). All attempts to prove meridians as an organic structure, yielded no evidence. In China, in the 1970s, various explanatory models for acupuncture began to be studied, e.g., the nervous system, fascia and the segmental structure of the body. The large German acupuncture trials (e.g. GERAC) from 2000 to 2006 investigating the three diagnoses of low back pain, knee osteoarthritis and headache in 300,000 subjects showed no significant differences between verum and sham acupuncture.

To support the relevance of segmental anatomy for our understanding of acupuncture we hypothesized, the more verum and sham points were located in the same dermatome, the smaller will be the therapeutic differences. [1]

Methods

All major databases were searched for RCTs that tested acupuncture versus sham acupuncture. Reported clinical outcomes were assessed in relation to the percentage of overlap between the dermatomes stimulated by acupuncture and sham acupuncture.

Results

Our literature search yielded a total of 1738 references. Thirty-four studies met the inclusion criteria. The clinical effects of sham acupuncture varied according to the dermatomes stimulated: high overlap with those stimulated by verum acupuncture resulted in almost identical efficacy, while low overlap resulted in significant differences in efficacy ($p < 0.01$).

Conclusion

Dermatomes are complemented by further aspects of the segment, such as subcutomes, myotomes, sclerotomes and neurotomes. Further research on the interrelation of myofascia and segmental structures can increase our understanding of acupuncture´s physiological pathways. E.g. , why problems of the right shoulder can be treated with acupuncture of the left foot region.

A Case Report: Could Benign Paroxysmal Positional Vertigo (BPPV) Have a Myofascial Mechanism?

Sensory Aspects - Oral

Dr. Cathy Kim (Community Memorial Health System), Dr. Graal Diaz (Community Memorial Health System)

Introduction/Background

Background: Otolith theory for paroxysmal positional vertigo (BPPV) has prevailed for decades, providing the basis for particle repositioning maneuvers such as the Epley. In 1977, based on his animal study, otorhinolaryngology surgeon Dr. Nicholas Torok proposed the existence of a neural mechanism for BPPV and suggested changing the name of BPPV to positioning neurocervical vertigo. In separate work, Dr. Alf Breig, a functional neurosurgeon, explained that tension on nerve tissue, not compression, caused neural dysfunction by impairing conductivity. This paper presents a case report of cessation of acute BPPV with myofascial release of the thigh, supporting the possibility of an alternate mechanism to otolith theory.

Methods

Case Report: A 32-year-old male presented to clinic complaining of two days of intense dizziness associated with change of head position, and had developed nausea, vomiting and loose stools by the end of the first day. Review of systems was negative for viral upper respiratory infection, fever, or allergy symptoms. Past medical history was negative for vertigo. Physical exam revealed no nystagmus. Genu recurvatum and hypertonic thigh fascia were noted. The patient reported the magnitude of dizziness, on a 0 to 10 scale with 10 being the highest intensity, as 10/10. Before treatment, the patient was positioned seated with optimized neutral pelvis and spine, parallel legs and feet, and knees bent at 90 degrees. Patient was instructed to initiate isometric contraction of the pelvic floor (kegel) and thigh muscles (pushing into heels) while the practitioner performed high velocity assisted myofascial glide on the anterior thighs bilaterally. This was accomplished with a smooth-edged tool to glide along the longitudinal axis of the thigh from proximal to distal. The patient reported instant relief of vertigo, 0/10.

Results

(see Methods: new hypothesis, non data-based)

Conclusion

Discussion: Since particle repositioning maneuvers have high recurrence rates, vertigo research is ongoing, usually in tertiary centers for refractory cases, using validated symptom questionnaires. Although this is an incidental outcome without standardized tools, recent science confirming the continuity of the superficial fascia between the neck and the thigh supports the possibility that thigh fascia could play a role in an alternate mechanism for acute BPPV.

Can manual therapy modify fascia?

Clinical - Oral

Dr. Antonio Stecco (New York University School of Medicine)

Introduction/Background

Diagnosis and management of musculoskeletal pain is a major clinical challenge. Following this need, the first aim of our study was to provide an innovative magnetic resonance technique called T1ρ to quantify possible alterations in elbow pain, a common musculoskeletal pain syndrome that has not a clear etiology. Five patients were recruited presenting chronic elbow pain (>3 months), with an age between 30 and 70 years old. Patients underwent two T1ρ mapping evaluations, one before and one after the series of Manual treatments. After the first MRI evaluation, a Disability of the Arm, Shoulder and Hand (DASH) questionnaire was administered to quantify the symptoms and pain intensity. Patients then received three sessions of manual therapy, once a week for 40 min each. A statistically significant difference was found between bound and unbound water concentration before and after treatment. Our preliminary data suggest that the application of the manual method seems to decrease the concentration of unbound water inside the deep fascia in the most chronic patients. This could explain the change in viscosity perceived by many practitioners as well as the decrease of symptoms due to the restoration of the normal property of the loose connective tissue. Being able to identify an altered deep fascial area may better guide therapies, contributing to a more nuanced view of the mechanisms of pain.

Exploring the effects of standardized soft tissue mobilization on viscoelastic properties, pressure pain thresholds and tactile pressure thresholds of the Caesarean section scar

Clinical - Oral

Ms. Isabelle Gilbert (School of rehabilitation and Department of Family Medicine and Emergency Medicine - Faculty of Medicine and Health Sciences - University of Sherbrooke), Prof. Nathaly Gaudreault (School of Rehabilitation, Faculty of Medicine and Health Sciences, University of Sherbrooke, Sherbrooke, Québec, Canada.), Prof. Isabelle Gaboury (Department of Family Medicine and Emergency Medicine, Faculty of Medicine and Health Sciences, University of Sherbrooke)

Introduction/Background

Caesarean section (C-section) remains a major surgery to reduce the risk of fetal and maternal mortality. Between 11 and 15% of new mothers will develop pain and complications at the site of their scar. Some therapeutic solutions exist for the treatment of painful problematic scars; however, these are often modestly supported by the literature. One objective of soft tissue mobilization applied to C-section is to improve the biomechanical properties of the scared skin and reduce pain. The primary objective of this study was to characterize and explore the effects of mobilization of tissue in the C-section scar on viscoelastic properties, pressure pain thresholds, and tactile pain thresholds.

Methods

A descriptive exploratory “proof of concept” study was performed. Women aged 18 to 40 years who had undergone at least one C-section were recruited. An experienced osteopath performed standardized scar tissue mobilization once per week for 2 weeks. Scar quality and pain characteristics, including viscoelastic properties, pressure pain thresholds and tactile pressure thresholds were measured before and after each session. Kendall’s W and Cohen’s d for overall effect sizes, Wilcoxon signed rank test, paired Student’s t test, and Friedman tests with Dunn-Bonferroni adjustment were performed.

Results

Thirty-two participants completed the study. The POSAS showed small to moderate effects for stiffness (p=0.021, d=0.43), relief (p<0.001, d=0.28), area (p=0.040, d=0.36), flexibility (p=0.007, d=0.52), and participant opinion (p=0.001, d=0.62). Mobilizations increased elasticity (p<0.001, W=0.11), decreased stiffness (p<0.001, W=0.30), and improved pressure pain threshold (p<0.001, W=0.10). Friedman tests showed decreased tone and mechanical stress relaxation time and increased tactile pressure thresholds (all p<0.05, W<0.10). There was no significant difference in creep before versus following treatment (p=0.09).

Conclusion

Our results show that two sessions of soft tissue mobilization on C-section scar can produce potentially beneficial effects on certain viscoelastic properties of the C-section scar, and on certain type of pain thresholds. Some variables of interest useful for future empirical studies are highlighted.

The Effects of Pelvic Repositioning Exercise on Pelvic Floor Muscle Contractility in Continent Subjects with Asymmetric Pelvis: A blinded Randomized Control Study

Clinical - Oral

Prof. Mohammad Nourbakhsh (University of North Georgia), Dr. Mahshid Chehrehrazi (University of North Georgia)

Introduction/Background

Backgroun: Function of the PFM is highly coordinated with diaphragm and deep abdominal muscle contractions (Lee et al., 2008). Changes in pelvic alignment, lumbo-pelvic myofascial orientation, or altered synergistic activity of the PFM, diaphragm and abdominal muscles could lead to pelvic floor muscle weakness, incontinence and pain in athletes and general population.
(Handa, 2003). This study assessed the effect repositioning exercises for pelvic symmetry on the contractility of the Pelvic Floor Muscles (PFM).

Methods

Methods: This randomized, double-blinded controlled clinical study was approved by the university Institutional Review Board (IRB), and was registered at Clinicaltrials.gov ID# NCT03975686. Each subject signed an informed consent prior to participating in this research project.
Thirty subjects with unilateral pelvic asymmetry were recruited. Subjects were randomly assigned into pelvic repositioning exercise or control groups. Only subjects in the treatment group received supervised 90-90 Hemibridge with Balloon exercise for pelvic alignment (Boyle, 2011) for 5 days. In this exercise subjects perform deep exhalation along with simultaneous contraction of the hamstrings, hip adductors, transverse and oblique abdominal muscles to reposition the hip-pelvic-trunk alignment.
The primary measurement was assessing the level of PFM contractility, measured by the amount of bladder base elevation, through transabdominal sonography. The secondary measurement was assessing pelvic alignment by Ober's test.

Results

Results: A significant improvement in PFM contractility, bladder base elevation, was noted in the intervention group (pretest: 6.6±2.8 mm; Posttest: 10.1±3.7 mm; p-value=0.00). No significant improvement (pretest: 6.9±4.9 mm; Posttest: 6.3.1±5.1 mm; p-value=0.09) was noted in the control group. The difference in improved PFM contractility was statistically significant between the two groups (p-value = 0.00; 95%CI = 5.69 to 2.69). Only subject in the treatment group obtained pelvic symmetry.

Conclusion

Conclusion: Pelvic repositioning exercise can significantly improve contractility of the pelvic floor muscles.

Myofascial tissue and major depressive disorder

Clinical - Oral

Dr. Robert Schleip (Technical University of Munich, Department of Sport and Health Sciences), Dr. Johannes Michalak (Department of Psychology and Psychotherapy, Witten/ Herdecke University, Witten)

Introduction/Background

Myofascial tissues contribute to the biomechanical functioning of the human body as well as to the etiology of pathological states like chronic pain. In addition, they contain contractile cells and preliminary evidence suggests that their stiffness regulation may be linked to the autonomic nervous system and to psychological factors [1]. The goal of the present research was to explore viscoelastic properties of the myofascial tissue in patients with Major Depressive Disorder (MDD) and to investigate whether the state of the myofascial tissue causally affects pathopsychological processes in MDD.

Methods

In Study 1, the two parameters of stiffness and of elastic recoil capacity (here understood as the inverse of hysteresis) of the myofascial tissue of 40 inpatients suffering from MDD measured with a tissue compliance meter (Fig. 1) were compared with those of 40 matched never-depressed participants. In Study 2, 69 MDD patients were randomly assigned to a single session of a self-myofascial release intervention (SMRI) or to a placebo intervention. Effects of this treatment on memory bias and affect were examined. Ethics approval was obtained from the ethics committee of Witten/Herdecke University.

Results

showed that MDD patients displayed heightened stiffness ($p < 0.05$) and a reduced elastic recoil capacity of the myofascial tissue ($p < 0.05$) in comparison with never-depressed patients. In addition, patients in the SMRI group showed a reduced negative memory bias and more positive affect compared to patients in the placebo condition ($p < 0.05$).

Conclusion

The preliminary results of our studies indicate that myofascial tissues might be part of a dysfunctional dynamic body-mind interaction that maintains MDD.

Img 1377.jpg

Moderator Talk - Peter Freidl

Anatomy - Oral

Dr. Peter Friedl (Radboud University Nijmegen Medical Center)

Introduction/Background
Moderators will be speaking on topics that are of interest to the session.

Peter Friedl holds the chair for Microscopical Imaging of the Cell at the RIMLS since October 2007, which includes the Core Facility for Microscopy at the Radboud University Nijmegen Medical Center.

Research interest is the visualization of cell-matrix interactions and dynamic cell patterning during immune cell interactions and tumor invasion. We, therefore, use 3D extracellular matrix (ECM) based cell culture models and advanced imaging procedures. Recently, the group moved into in vivo-imaging of tumor and immune cell migration by multiphoton microscopy. This complements in vitro culture technology. These approaches have provided insight into the serial dynamics of T cell scanning across antigen-presenting cells and the diversity of tumor invasion mechanisms, as well as novel escape responses in tumor cell migration. New technology allows imaging deep into tumours (video-interview)

In addition, he fulfills the role of the head of the Cell Dynamics Laboratory and, since 11/2011 has a joint-appointment joint-faculty position as head of the imaging section at the David H. Koch Center, Department of Genitoureteal Oncology, MD Anderson Cancer Center, Houston, TX, USA.

THE SUPERFICIAL FASCIA: ANATOMY, INNERVATION AND VASCULARIZATION

Anatomy - Oral

Ms. Lucia Petrelli (University of Padova), Dr. Caterina Fede (University of Padova), Dr. Carmelo Pirri (University of Padova), Prof. Carla Stecco (University of Padova)

Introduction/Background

The superficial fascia has only recently been recognized as a specific anatomical structure in its own right anatomical entity, being first considered as included in the hypodermis. Furthermore, whereas it is actually recognized that the innervation of the deep/muscular fascia plays a key role in proprioception and nociception [1] [2], and there are studies highlighting the cell populations and the extracellular matrix characterization of the deep fascia [3], there are very few studies that have analyzed these characteristics in the superficial fascia.

Methods

Our group analyzed two different anatomical districts (abdomen and thigh), from cadavers, obtained from the 'Body Donation Programme' at the Institute of Anatomy, University of Padova, and from volunteers patients, undergoing elective surgery procedures at the Orthopaedic Clinic of Padova, with a research approved by the Institutional Ethical Committee (n.3722/AO/16). Each sample was processed for histological and morphometric analysis by Hematoxylin&Eosin, Weigert-Van Gieson for elastic fibers, Alcian Blue pH 2.5 for glycosaminoglycans. Furthermore, immuhistochemistry stainings were performed, with antibodies specific for extracellular matrix components (Collagen-I, Collagen-III, HABP-hyaluronic acid binding protein), and for nervous fibers (S100 antibody for the myelin-forming cells, PGP9.5 antibody as neuronal marker, Tyrosine Hydroxylase for autonomic innervation).

Results

The superficial fascia is the second most highly innervated tissue after the skin, with a density of $33.0 \pm 2.5/cm^2$, and a mean nerve sizes of 19.1 ± 7.2 μm [4]. Free nerve endings innervate the tissue, and autonomic nerve fibers are present in the blood vessels, in the areas of vascularization and near adipocytes and in the connective tissue itself. Fibroblasts, myofibroblasts, mast cells are evident in the tissue. Finally, the elastic fibers are more abundant in the superficial fascia than the deep fascia, demonstrating that the superficial fasciae are more adaptable [5].

Conclusion

In the light of these findings is evident that the superficial fasciae have a clear and distinct anatomical entity, and that they should be considered according to their characteristics, innervation and vascularization to better understand their role in thermoregulation, exteroception and pain perception. The knowledge of the superficial fascia may improve grading and developing of different manual approach for treatments of fascial dysfunctions.

Defining The Histological Support Structures of The Digital Web Space: New Anatomy and Clinical Applications

Anatomy - Oral

Dr. Sammy Dowlatshahi (Harvard Medical School, Boston, MA), Ms. Stephanie Francalancia (Harvard Medical School, Boston, MA), Dr. Joseph Upton (Harvard Medical School, Boston, MA), Dr. Frank Willard (University of New England), Dr. Gary Fudem (University of Massachusetts)

Introduction/Background

BACKGROUND/PURPOSE: Deformity of the digital web space is commonly encountered and can be congenital or acquired. An understanding of the normal anatomy is the first step toward correction. It is equally challenging to re-create a web space normal in appearance and function. The purpose of this study is to introduce previously unreported ligamentous structures within the digital web space that determine how it looks, and to a large degree, how it moves.

Methods

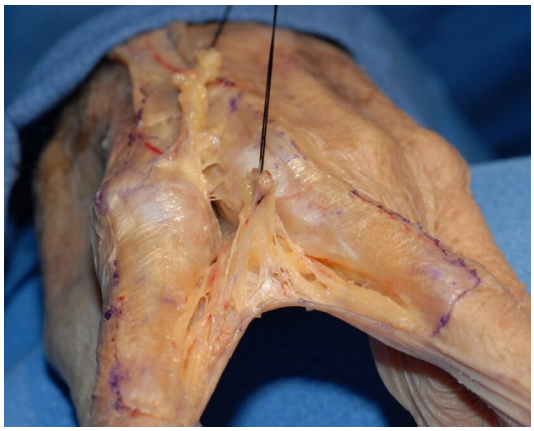
METHODS: Forty web spaces were microsurgically dissected in twenty cadaveric hands. Select H&E, Trichrome and Elastin stains were obtained. Anatomic observations were made and correlated with intraoperative findings as they relate to burn reconstruction and congenital syndactylies.

Results

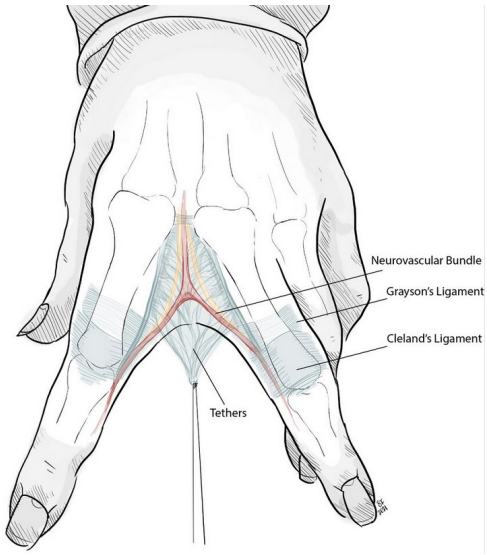
RESULTS: The digital web space is formed by a relatively large, three-dimensional inclined triangle extending from the distal palm to the dorsal metacarpophalangeal joint. The appearance of the web space topographically, its gross and histologic anatomy, and its functional demands are completely interdependent. The dynamically changing planes and contours of the web space are the result of a complex subcutaneous endoskeleton consisting of dense fibrous attachments between the palmar and dorsal skin along its whole length and width. These fascial bands extend into the fingers in continuity with Cleland's and Grayson's ligaments tethering the skin to the phalangeal periostea, tendon sheaths and joint capsules. The tethers are so strong that one can lift the hand by holding onto them, yet they are flexible enough to allow for finger abduction and adduction and return to a resting concave posture.

Conclusion

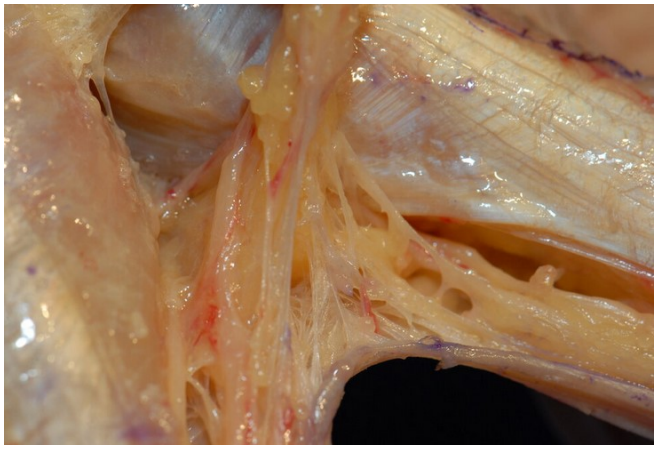
CONCLUSION: As hand surgeons, we frequently perform procedures on the digital web spaces, whether for a congenital anomaly, extensive Dupuytren's disease, or a traumatic injury such as a deep burn. The digital web space is more than skin and fat. A newly described ligamentous framework defines its shape and function. This dynamic anatomical architecture of the web space is very difficult to reproduce or re-create in the injured or congenitally abnormal patient. The first step to improving these clinical outcomes is having a very specific knowledge of the normal anatomy.



Webspace cadaver 1.jpg



Webspace illustration 1.jpg



Webspace cadaver 2.jpg

DEEP FASCIA COMPARTMENTS IN THE LOWER EXTREMITY. CLINICAL AND THERAPEUTIC IMPLICATIONS.

Anatomy - Oral

Ms. Sara Ortiz Miguel (Structure and function human body area. Universitat Internacional de Catalunya. Spain.), Dr. Albert Perez-Bellmunt (Structure and function human body area. Universitat Internacional de Catalunya. Spain.), Dr. Maribel Miguel-Pérez (Unit of Human Anatomy and Embryology. Department of Experimental Pathology and Therapeutic. Faculty of Medicine and Health Sciences (C.Bellvitge). University of Barcelona. Spain. Feixa Llarga s/n 08907. Hospitalet de Llobregat (Barcelona).Spain.), Dr. Ingrid Moller (Unit of Human Anatomy and Embryology. Department of Experimental Pathology and Therapeutic. Faculty of Medicine and Health Sciences (C.Bellvitge). University of Barcelona. Spain. Feixa Llarga s/n 08907. Hospitalet de Llobregat (Barcelona).Spain.), Dr. Juan Carlos Ortiz-Sagristà (Fundació Puigvert. Barcelona. Spain.), Dr. Carlo Martinoli (Radiology Department, DISC, Università di Genova, Genoa, Italy.)

Introduction/Background

Compartment syndrome is a surgical emergency, that can appear in every part of the body where is divided into myofascial compartments that it almost occur in the leg, but it can occur at the thigh and upper limb [1] causing decrease of the tissue perfusion and when is maintain at time, the cell necrosis. The defect of tissue nutrition can cause affection to the nerves, muscle cells, bone tissue and other connective tissue included inside the compartment [2]. The unyielding character of the deep fascia in association with the failure of the drainage system lead to select fasciotomy as a method with a success of 85 to 90% of the patients [3]. At the leg, the anatomical and histological characteristics make it more common to present acute, chronic and exertion compartment syndrome, and can difficulty resolve after surgery, reporting the 13% of the patients complications and the 20% still having pain that incapacitate them from performing physical exercise [4]. Our hypothesis is that an anatomical, ultrasound and histological knowledge of fascia could help to the surgery and resolution of the compartmental syndrome.

Methods

Fifteen cryopreserves lower limbs from male and female cadavers (mean age, 78 years (age range, 60-85) were examined in this study. No specimens showed any evidence of traumatic injuries or surgical scars. Different colours were injected at different levels in the leg under ultrasound guidance to separate the compartments delimited by the deep fascia. Each of them was then individualized on gross dissection or anatomical cuts.

Results

The deep fascia surrounded all the legs but it formed three main compartments, anterior, lateral and posterior. In addition, special compartments for the tibialis anterior and the deep posterior muscles were seen. Moreover, this fascia had important relations with some muscles as the tibial anterior and nerves as the common fibular and tibialis posterioris nervis and their superficial branches to avoid injury in surgical approach in case of compartmental syndromes.

Conclusion

In addition to the classical compartments, others compartment and anatomical structures should be taken into consideration during treatment planning of compartmental syndromes.

Moderator Talk - Thomas Roberts

Biomechanical - Oral

Dr. Thomas Roberts (Brown University)

Introduction/Background

Moderators will be speaking on topics that are of interest to the session.

Thomas Roberts is the Vice Chair of the Department of Ecology and Evolutionary Biology, Professor of Ecology, Evolution, and Organismal Biology

My training is in biomechanics and comparative physiology. I received my B.A. in Biology from the University of Chicago and my Ph.D. from the Organismic and Evolutionary Biology Department at Harvard University. In my graduate work I used a broad comparative approach to examine the link between musculoskeletal morphology and the metabolic energy cost of running. As a postdoctoral fellow at Northeastern I focused on the physiological and mechanical behavior of skeletal muscle. My research program aims to integrate our understanding of muscle physiology with modern approaches in functional morphology and biomechanics.

The Investigation of Physiological Stress Shielding within Lumbar Musculoskeletal Soft Tissues Affected by Unilateral Low Back Pain through Finite Element Analysis

Biomechanical - Oral

Ms. Emily Newell (McGill), Prof. Mark Driscoll (McGill University)

Introduction/Background

Nearly 85% of low back pain (LBP) cases are idiopathic [1]. However, in patients with unilateral LBP, the lumbar soft tissues (including the paraspinals and thoracolumbar fascia (TLF)) often experience morphological and material property changes [2-4]. Such tissue augmentations are indicative of a load allocation bias within the lumbar spine. As such, the purpose of this study is to investigate the potential for stress shielding, which may occur as the result of a load allocation bias within the lumbar musculoskeletal soft tissues of unilateral LBP patients.

Methods

Two finite element models (one healthy, one with unilateral LBP) depicting the lumbar musculoskeletal system undergoing trunk flexion were developed. Models included vertebrae, intervertebral discs (IVDs) and soft tissues (multifidus (MF), longissimus thoracis (LT), TLF, and associated tendons). Material properties were selected from literature. Within the LBP model, tissues located laterally left and right of the vertebral column were denoted as “asymptomatic” and “symptomatic” tissues, respectively. The morphology and material properties of the symptomatic MF, LT, and TLF tissues were modified to reflect tissues affected by unilateral LBP. Models were validated prior to testing.

Results

Validation was achieved as IVD pressure and intervertebral rotation showed good agreement with literature. The unilateral LBP model demonstrated a cumulative increase in soft tissue tension by 10.9kPa relative to the healthy model. The LBP model’s MF, LT, and TLF demonstrated a change in tissue tension by 7.9%, -5.1%, and 9.2%. Individually, the symptomatic MF, ES, and TLF demonstrated changes in tension by 19.0%, -10.4%, and 16.1%.

Conclusion

Results demonstrate a cumulative increase in soft tissue tension by 10.9kPa from the healthy model, with 99.8% of this increase distributed towards the TLF. Thus, unilateral LBP may cause the symptomatic TLF to initiate stress shielding, preventing the adjacent soft tissues from receiving loading. Shielded tissues may undergo further atrophy and become unable to distribute normal loading. To compensate, patients may recruit alternative soft tissues, leading to irregular muscle activation and force balances, entrapping the soft tissues in cyclical stress shielding. Thus, this study suggests stress shielding within lumbar soft tissues may lead to the progression of unilateral LBP.

UNINTENDED BOTULINUM TOXIN TYPE-A EFFECTS ON MUSCLE MECHANICS ARE NOTABLE AND PROGRESSIVE IN TIME

Biomechanical - Oral

Mrs. Cemre Su Kaya-Keles (Institute of Biomedical Engineering, Boğaziçi University, Istanbul), Dr. Agah Karakuzu (NeuroPoly Lab, Polytechnique Montreal), Prof. Can A. Yucesoy (Institute of Biomedical Engineering, Boğaziçi University, Istanbul)

Introduction/Background

Botulinum toxin type-A (BTX-A) is widely used in cerebral palsy patients for spasticity management. BTX-A aims to improve mobility by reducing exaggerated stretch reflexes. This mechanically implies decreased passive resistance and increased length range of active force exertion (l_{range}) of the injected muscle. The aim was to test the effects of BTX-A on (1) passive state forces and (2) l_{range}, of the tibialis anterior (TA) acutely and long-term after-injection.

Methods

Two separate experimental groups of male Wistar rats, each consisting of Control (20µl saline injection) and BTX-A (0.1U/20µl of BTX-A injection) subgroups were studied (approved by Boğaziçi University, Committee on Ethics of Animal Experimentation). The isometric forces of the TA were measured 5-days (acute [1]), and 1-month (long-term [2]) post-injection groups. Measurements were done in the passive state and after maximal activation. TA length was changed exclusively. Two-way ANOVA (factors: TA length and animal group) was used to assess BTX-A effects on muscle forces. Unpaired t or Mann-Whitney U test was used to compare the l_{range} ($P < 0.05$).

Results

Acute effects: In the BTX-A group; active state forces decreased (maximally by 55.9% at short and minimally by 46.6%, at long muscle lengths), passive forces were higher at only higher lengths, and maximally by 43.9% but l_{range} did not change. Long-term effects: In the BTX-A group; active state forces decreased (maximally by 75.2% at short and minimally by 48.3%, at long muscle lengths), passive forces increased for all lengths tested (on average by 12.3%) and l_{range} decreased (by 22.9%).

Conclusion

BTX-A did decrease active muscle forces in both acute and long-term groups as anticipated. However, the effects of (i) elevated passive muscle force and (ii) narrower l_{range} contradict clinical aims. Notably, (i) is the case both acutely and long-term, showing increased passive resistance consistently. (ii) is not consistent nevertheless involves no increased l_{range}. Therefore, such unintended BTX-A-effects on muscle function persist and become more pronounced in the long-term. This was previously predicted by finite element modeling of BTX-A time course of treatment, explained by a stiffening of the muscle's extracellular matrix [3], which requires further testing in patients.

Biomechanical analysis of the thoracolumbar fascia based on biological sex: a finite element study

Biomechanical - Oral

Ms. Brittany Stott (McGill University), Prof. Mark Driscoll (McGill University)

Introduction/Background

Low back pain (LBP) is a prominent affliction, affecting nearly 84% of individuals [1]. However, tissues such as the thoracolumbar fascia (TLF) may play a role in LBP, despite being poorly understood [2]. Females are more at risk of soft tissue injury than their male counterparts, and while variations in anatomy consequential of biological sex are known, the effects of such variation on the fascial tissue stress are not. Hence, the objective of this study was to develop finite element models of the thoracolumbar spine to evaluate changes in fascial tissue stress based on biological sex.

Methods

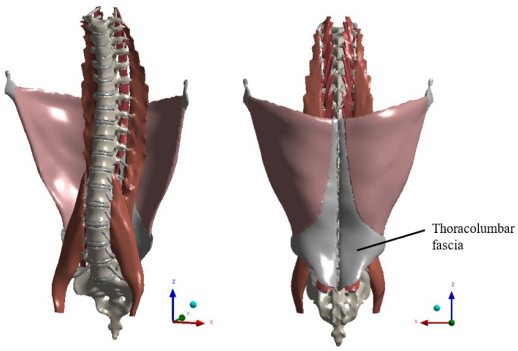
Two models of the spine (one male and one female) were developed, consisting of the vertebrae, intervertebral discs (IVDs), and soft tissues (tendons, paraspinal muscles, and TLF) from T1 to S1. In the first scenario, models included all soft tissues. In a second scenario models included only the vertebrae, IVDs, and TLF. In both scenarios, the spine was subjected to a 14% body weight applied on T1 and 2.6% body weight applied on each subsequent vertebrae [3]. The loads were then amplified to account for paraspinal muscle activity [4]. The body weight for each model was selected to reflect the average body weight of adult male and female subjects. The average fascial tensile stress was subsequently measured for both models. Model validation preceded testing.

Results

Validation was achieved as models demonstrated good agreement with IVD pressure obtained from literature. For the first scenario, the average TLF tension in the male and female models were 645.5kPa and 692.0kPa, respectively. Whereas the average TLF tension was 650.4kPa and 695.4kPa for the male and female models in the second scenario.

Conclusion

The obtained results suggest that the TLF plays a role in supporting the spine, as the removal of the paraspinal muscles did not affect the fascial stress distribution. Additionally, the female model's TLF demonstrated a 7% increase in average tension compared to the male model in both scenarios. Thus, the overall increase in TLF stress based on biological sex demonstrates a potential cause of LBP and soft tissue injuries in female patients.



Fascia figure nocaption.jpg

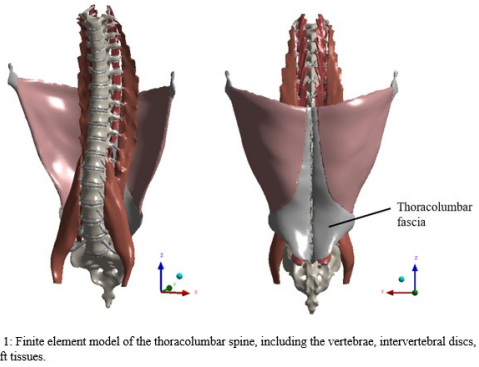


Figure 1: Finite element model of the thoracolumbar spine, including the vertebrae, intervertebral discs, and soft tissues.

Fascia figure withcaption.jpg

Chronic Lower Back Pain and Fascia: Perceptions from Physical Therapists and Fitness Professionals

Biomechanical - Oral

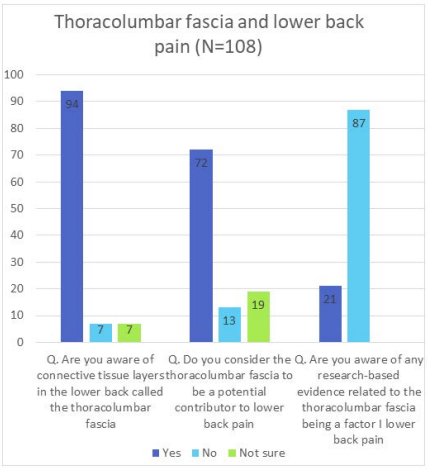
Ms. Claire Boucher (University of Kent), K.De-Coninck (University of Kent)

Introduction/Background:
Lower back pain (LBP) is the leading cause of worldwide disability-adjusted life years with an estimated prevalence of 84%. Adaptations of thoracolumbar fascia, measured using ultrasound imaging (USI), are associated with LBP [1]. Ongoing research continues to examine the role of the thoracolumbar fascia with LBP; the mechanisms behind this and potential interventions to reduce pain, increase functionally capabilities and the quality of life of patients. However, outside of specific research areas little is known about fascia in the wider community, few vocational training or even undergraduate courses cover fascia [2] and information is seemingly found purely from independent literature searches and at scientific conferences.

Method:
This study was approved by the University of Kent's School of Sport and Exercise Sciences Research Ethics Advisory Group. Questionnaire cohort size n=107 participants (Physical therapists n=68, Fitness professionals n=40), n=14 were then randomly selected to take part in a remote semi-structured interview. This study seeks to establish the perceptions of those working with individuals with LBP in both clinical and leisure-based environments using an online questionnaire and semi-structured interviews in order to understand their views on fascia and LBP, where they are finding their information and how well research is being disseminated into this population.

Preliminary findings:
Whilst full analysis has yet to be completed, initial investigation has found that 87% and the majority of all participants are aware of the thoracolumbar fascia and 67% considered fascia to be a potential contributor to LBP. However, only 19% were aware of any research evidence implementing fascia with LBP. The consensus from three of the questions can be seen below.

Conclusion:
The interim findings of this study suggest a divide between research and both vocational and academic courses. Research has shown that fascia acts as a contributor to chronic pain conditions and much more. Dissemination of this research into the curriculums of all those working in or alongside health care is essential.



References:
[1] Langevin, HM, Stevens-Tuttle, D, Fox, JR, Badger, GJ, Bouffard, NA, Krag, MH, Wu, J, Henry, SM. Ultrasound evidence of altered lumbar connective tissue structure in human subjects with chronic low back pain. BMC Musculoskeletal Disorders, 10:151–159, 2009.
[2] Pratt, RL. Educational avenues for promoting dialog on fascia. Clinical Anatomy, 32:871-876, 2019.

KINESIO TAPING EFFECTS ON ALONG MUSCLE FASCICLE LOCAL LENGTH CHANGES: MAGNETIC RESONANCE AND DIFFUSION TENSOR IMAGING BASED ASSESSMENT

Biomechanical - Oral

Ms. Seda YILDIZ (Institute of Biomedical Engineering, Boğaziçi University, Istanbul), Mr. Arda Arpak (Institute of Biomedical Engineering, Boğaziçi University, Istanbul), Dr. Agah Karakuzu (NeuroPoly Lab, Polytechnique Montreal), Prof. Can A. Yucesoy (Institute of Biomedical Engineering, Boğaziçi University, Istanbul)

Introduction/Background

Kinesio taping (KT) is commonly applied for the prevention or treatment of certain musculoskeletal injuries [1]. KT is considered to stretch the underlying superficial fascia in a targeted direction via stretching of the skin beneath the taped area. This in turn is expected to emulate and reinforce the fascial function [2]. However, despite its popular use for muscular therapy, its mechanical effects at the muscle fascicle level lacks an objective assessment. The aim of this study is to quantify such mechanical effects of KT in terms of along muscle fascicle local length changes by combining an MRI-based tissue deformation analysis with diffusion tensor imaging (DTI)-based muscle fascicle tracking.

Methods

5 healthy female subjects without a history of lower extremity injury (mean±SD age=32±3 years, height=163±3 cm, body mass=56±5 kg) volunteered (approved by Acıbadem University, Committee on Ethics of Human Experimentation). Anatomical MRI and DTI were acquired in 3 conditions: (1) at rest without tape, (2) following sham application, and (3) after KT application. Facilitation KT technique was performed on tibialis anterior (TA) muscle with maximal tension. Local length changes and shear strains were calculated using image registration between conditions (1-2) and (2-3). 100 study points (nodes) from images were selected randomly along the tracked fascicles from each condition.

Non-parametric Wilcoxon signed-rank test was performed to compare the two conditions (α=0.05).

Results

Data pooled from all subjects show that KT-imposed along muscle fascicle lengthening (mean±SD 0.026±0.020), shortening (0.032±0.027) and shearing (0.087±0.049) occur and are significantly higher than those caused by sham application (0.012±0.010; 0.013±0.015; 0.029±0.021, respectively) ($p<0,001$). KT induced along muscle fascicle length changes locally show heterogeneity.

Conclusion

We show that KT affects along muscle fascicle length changes and shear strains. This can be explained by KT-imposed myofascial loads over the skin being transmitted via the fascial system [3], non-uniformly manipulating the mechanical equilibrium at different parts along the muscle fascicles. The myofascial continuity of epimuscular structures with the intramuscular connective tissue network facilitates such mechanical interactions [4]. Along muscle fascicle shearing confirms that and local heterogeneity of length changes suggest occurrence of KT effects on sarcomere lengths, hence on muscle function.

The Investigation of Physiological Stress Shielding as a Consequence of Bilateral Low Back Pain on Musculoskeletal Soft Tissues: a Finite Element Study

Biomechanical - Oral

Ms. Emily Newell (McGill University), Prof. Mark Driscoll (McGill University)

Introduction/Background

Low back pain (LBP) is a public health crisis. Up to 85% of people will experience LBP at least once in their lifetime [1]. However, while the cause of LBP still alludes researchers, the lumbar soft tissues of LBP patients often demonstrate augmented morphology and material properties [2-4]. Such augmentations may result in a load allocation bias, causing irregular tissue activation and load sharing. This study aims to analyze the potential presence of stress shielding within soft tissues with augmented tissue properties consequential of LBP.

Methods

Using a finite element platform, two models of the lumbar musculoskeletal system undergoing flexion were developed (one healthy, one LBP). Tissues included the vertebrae, intervertebral discs (IVDs), and soft tissues (the multifidus (MF), longissimus thoracis (LT), thoracolumbar fascia (TLF), and any associated tissues) from L1-S1. Material properties were selected from literature and were assumed to be linear and isotropic. Soft tissues' morphology and material properties for the LBP model were augmented to reflect findings from clinical studies. Models were validated against literature.

Results

Model validation was achieved. Both models demonstrated good agreement in IVD pressure and intervertebral rotation. Relative to the healthy model, the LBP model demonstrated a 15.6% cumulative increase in average lumbar soft tissue tension. The LBP MF, LT, and TLF demonstrated a change in average tension, relative to the healthy tissues, by 13.0%, -4.0%, and 15.6%, respectively.

Conclusion

Results suggest a potential stress allocation bias within the lumbar soft tissues. While the LBP model demonstrated an overall increase in soft tissue tension, 99.8% of this increase was distributed towards the TLF, with the remaining 0.2% distributed towards the MF and LT. As a result of tissue augmentations due to LBP, the TLF may undergo elevated loading, shielding the MF and LT from receiving normal loading. Consequentially, the MF and LT may undergo further atrophy and the inability to distribute loading. Irregular muscle activation may occur to accomplish physiological motion, causing these newly recruited muscles to undergo remodeling, leading to cyclical stress shielding. Thus, this study suggests that stress shielding within the lumbar soft tissues may lead to the progression of LBP.

HFUS Images Illustrate Reduced Dermal and Myofascial Stiffness/Densification and May Be Useful Biomarker

Biomechanical - Oral

Dr. Paul Mettler (Mettler Institute, LLC)

Introduction/Background

BACKGROUND Pain originating from muscles and/or associated soft tissues such, as skin and fascia, are likely an important component of many severe and chronic pain conditions. Patients persistent pain may be due to ineffective treatment of the dermal and myofascial component of their pain. Identifying and developing quantitative biomarkers involving dermal and myofascial tissues are critical for effective pain management. No biomarkers have been available either to study dermal and myofascial tissue pathophysiology or to test the effects of treatments.

Methods

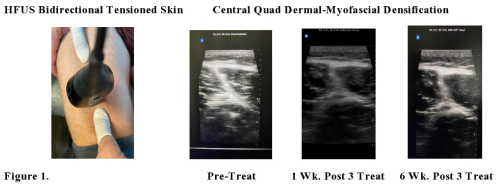
METHOD Structural imaging using high frequency ultrasound (HFUS) to visualize micro-structures of the dermal and myofascial tissue of patient who had 6 months central quadricep aching pain and stiffness/densification. Functional tissue assessments are illustrated using before and after still pictures and real-time passive bidirectional tensioned skin HFUS video to quantify soft tissue mobility and biomechanical properties (e.g., stiffness, viscosity, shear plane mobility) before treatment, after 3 treatments in one week, and no additional treatments at 6 weeks.

Results

RESULTS HFUS images, Fig. 1, illustrate reduced dermal and myofascial stiffness. Rejuvenated myofascial tissue appears replacing the myofascial densification. HFUS video illustrates real time dynamic structural viscoelastic myofascial movement improving from 2 cm. to 2.3 cm. in depth with passive bidirectional tensioned skin.
HFUS Bidirectional Tensioned Skin Central Quad Dermal-Myofascial Densification
Figure 1. Pre-Treat 1 Wk. Post 3 Treat 6 Wk. Post 3 Treat
Video hyperlink. https://dfrtherapy.com/abstract

Conclusion

CONCLUSION HFUS can illustrate dermal and myofascial stiffness and help objectify biomarkers that would appear to be useful in the identification and clinical evaluation of dermal and myofascial stiffness/densification. Precise quantification of tissue stiffness/densification pre and post intervention could not be made without High Frequency ShearWave Elastography.



Hfus bidirectional tensioned skin central quad pic-page0001 1 .jpg

Moderator Talk - Nathaly Gaudreault

New Hypotheses & Veterinary Aspects - Oral

Prof. Nathaly Gaudreault (Faculty of medicine and health sciences, University of Sherbrooke)

Introduction/Background

The study of active and passive stiffness of myofascial tissues and its impact on health has been the focus of my research activities since my PhD training. We have developed a strong expertise in the integration of different data sources recorded with state-of-the-art technologies such as optoelectronic motion analysis systems, force sensors and ultrasound imaging to better understand joint and myofascial tissues mechanical behaviors and to study the effects and the mechanisms of action of interventions that aim to modify these behaviors. My years of clinical practice in sport physiotherapy combined with my research expertise allows me to understand the challenge inherent to the practice of sports medicine and rehabilitation and to transform those into relevant clinical research questions. My laboratory has hosted research projects in the field of pathokinesiology and exercise science in sports such as dance, gymnastics, running and ice hockey.

The Myofascial Facial Massage As An Instrument For Psychological Status Correction

New Hypotheses & Veterinary Aspects - Oral

Mr. Anastasia Dubinskaya (Department of Medical Rehabilitation and Physical Therapy Medical Research Center of Rehabilitation and Balneology Ministry of Health of the Russian Federation 121099, 32 Novy Arbat Str., Moscow, Russian Federation)

Introduction/Background

The problem of stress factor effects on the physical and mental health of a person is one of the most important subjects of modern clinical studies in medicine, psychology and biology [1]. Increased tonic activity in facial muscles can be called an indicator of mental and emotional stress [2]. The purpose of the study was to investigate the relationship between tonic activity of the facial muscles and psycho-emotional states and develop a modern conception method of correction of psychoemotional derivations, based on the use of facial muscle relaxation.

Methods

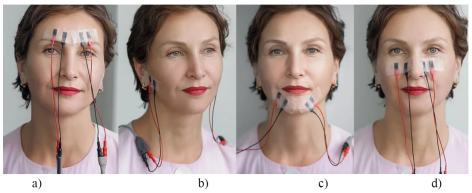
The study consisted of a group of 151 healthy women aged 35 to 50 years. The methods included the frequency and severity of psycho-emotional states and also neurophysiological and clinical-functional tests of facial muscles (m. masseter, m. corrugator supercilii, m. depressor anguli oris, m. nasalis). The group received a course of myofascial massage aimed at identification and inactivation of facial muscle hypertonicity.

Results

The almost 2-fold decrease in depressive symptoms and the absence of women with high levels of anxiety were observed, which was associated with positive changes in major neurophysiological, clinical and functional parameters of facial macules.

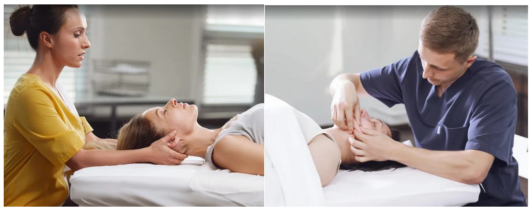
Conclusion

The observed positive psycho-emotional changes together with the neurophysiological parameters allow us to consider the myofascial massage as the most effective tool that breaks the association between muscle tension and negative emotional state.



Location of the electrodes during electromyographic study: a) m. corrugator supercilii; b) m. masseter; c) m. depressor anguli oris; d) m. nasalis

1.png



2.png

Practitioner utilization and perceptions of the clinical utility and value of Danis Bois Method (DBM) Fasciatherapy to pain management: A survey of French physiotherapists.

New Hypotheses & Veterinary Aspects - Oral

Dr. Christian Courraud (Center for Applied Research and Study in Perceptual Psychoeducation (CERAP), Universidade Fernando Pessoa, Porto (Portugal).), Mr. Cyril Dupuis (Center for Applied Research and Study in Perceptual Psychoeducation (CERAP), Universidade Fernando Pessoa, Porto (Portugal).), Dr. Isabelle Bertrand (Center for Applied Research and Study in Perceptual Psychoeducation (CERAP), Universidade Fernando Pessoa, Porto (Portugal).)

Introduction/Background

Fascia is richly endowed with sensory nerve endings, including nociceptors. The study of the fascial system is of increasing interest to researchers and clinicians. The aim of this study is to explore how physiotherapists integrate DBM Fasciatherapy into their daily practice and whether it contributes to pain management.

Methods

This study surveyed 446 physiotherapists trained in DBM Fasciatherapy. An online survey was conducted using a customized, non-validated questionnaire.

The questionnaire had two closed questions to evaluate respondents' opinion of improvements and the therapy's effectiveness in the reduction of physical and mental pain.

The questionnaire also had two open questions about which type(s) of pain were reduced. Respondents were able to give a maximum of six responses and were able to answer "none".

Results

A total of 238 fully completed forms were analyzed.

The DBM Fasciatherapists expressed a strong belief in the effectiveness of the therapy for both physical pain (n = 228, 95.8%) and mental suffering (n = 200, 84%). They mainly reported an important (or significant) improvement (Table 1) in physical pain (n = 144, 60%). However, a significant number of them reported seeing a very important improvement in mental suffering (n = 95, 40%).

All respondents indicated having noticed an improvement in at least one pathology. A total of 51.5% (n = 129) of them reported a lack of improvement in at least one condition. Around 46% (n = 109) of respondents can be estimated to have achieved an improvement in all the pathologies they faced in their daily practice.

The respondents saw the most improvement in headaches (n = 110, 46.2%), neck pain (n = 82, 34.5%), acute low back pain (n= 76, 31.9%), chronic low back pain (n = 47, 19.7%), and migraines (n = 37, 15.5%).

Conclusion

From the perspective of the physiotherapists, this approach fits into and improves their practice through its joint action on physical pain and psychological suffering and through alternative ways of managing musculoskeletal pain. Other studies comparing this approach with other manual therapy techniques or fascia therapies would be necessary to identify its specific benefits.

Replies	Physical Pain		Mental Suffering	
	n	%	n	%
No improvement	0	0	2	0,8%
Little improvement	10	4,2%	36	15,1%
Important improvement	144	60,5%	105	44,1%
Very important improvement	84	35,3%	95	39,9%
Total	238	100%	238	100%

Table1.png

Correlation of fascial continuity between riders and their horses

New Hypotheses & Veterinary Aspects - Oral

Dr. Hang Nguyen (Southern California Univeristy of Health Sciences), Dr. Tina Wang (Loma Linda University School of Medicine), Dr. Toni Ward (Claremont Sunrise Rotary), Dr. Antonio Stecco (New York University School of Medicine)

Introduction/Background

Equestrian riders and their horses develop structural asymmetries(Ginés-Díaz et al., 2020) that are risk factors for injuries.(Cejudo et al., 2020; Ginés-Díaz et al., 2020) Whether these asymmetries develop from riding or prior to riding is unknown. The horse-rider interaction may play an important role in such asymmetries.(Martin et al., 2016) The purpose of this study was to explore the complex interplay of horse-rider asymmetries.

Methods

This study was IRB approved. Four riders and their horses and one trainer independently underwent a specific fascial assessment process—the Fascial Manipulation® method (Stecco and Day, 2010)—involving clinical examination of specific movements and palpatory verifications of specific myofascial points called Centers of Coordination (CCs) and Centers of Fusion (CFs). Dysfunctional segments were identified based on palpation and a hypothesis-driven differential by clinical history. The diagnosed fascial planes were compared between the horse and their riders.

Results

Three out of four riders had dysfunctional fascial planes identical to their horses. Of the three rider-horse couple with the same fascial plane dysfunction, 2 participated in the Hunter and Jumper disciplines and 1 in the Western-style riding disciplines. The 1 rider-horse couple that did not have the same dysfunctional plane participated in carriage driving. The trainer and a randomly selected horse did not have the same identified dysfunctional fascial sequence.

Conclusion

The correlation between riders and their horses' fascial dysfunctions suggest that horse-rider interaction may play an important role in the development of asymmetries(Gunst et al., 2019; Martin et al., 2016) and associated injuries.(Cejudo et al., 2020; Ginés-Díaz et al., 2020) The discipline of riding including additional forces applied to the horse (like carriages) may influence fascial line dysfunctions. This complex interplay of horse-rider fascial dysfunctions suggests that clinical interventions may need to address dysfunctions in both riders and their horses.

Moderator Talk - Werner Klinger

Fascial Pathologies - Oral

Dr. Werner Klingler (Ulm University)

Introduction/Background
Moderators will be speaking on topics that are of interest to the session.

Werner Klingler studied medicine at the University of Ulm and at the Guy's and St. Thomas Medical School in London. He completed his training in Applied Physiology at the University of Ulm under the supervision of Dr. med. Frank Lehmann-Horn, a pioneer in muscle research and one of the world's leading experts in myofascial diseases. There he also completed his specialisation as a clinical anaesthetist with training in complex pain medicine. Klingler is an active clinician, heads the neurophysiological muscle laboratory and is co-founder of the Fascia Research Group in Ulm. He was a founding member of the first Fascia Research Conference at Harvard University in 2007, chairman of the Fascia Research Conference in Berlin 2018 and host of an ongoing series of fascia summer schools and connective tissue conferences. Klingler has received several awards, including the Young Investigator Award of the Federation of European Physiological Societies, the World Congress on Low Back Pain Award and the Vladimir Janda Award for Musculoskeletal Medicine.

Title: Fascial thickness and stiffness in hypermobile Ehlers-Danlos Syndrome and the effect of low dose onabotulinumtoxinA injections based on myofascial continuity

Fascial Pathologies - Oral

Dr. Tina Wang (Loma Linda University School of Medicine), Dr. Kashayar Dashtipour (Loma Linda University School of Medicine), Dr. Antonio Stecco (New York University School of Medicine)

Introduction/Background

Hypermobile Ehlers-Danlos syndrome (hEDS) is a heritable connective tissue disorder characterized by generalized joint hypermobility, joint instability, and skin changes. The hEDS population experiences a high burden of myofascial pain (Bénistan, 2019) with a complex pathophysiology. Myofascial pain may correspond to changes in the extracellular matrix (Menon, 2020). Understanding of how fascial stiffness and densification in the extracellular matrix correlates with the clinical presentation of myofascial pain in hEDS is lacking. The objective of this study was to investigate the structural changes in fascia in hEDS.

Methods

1) A series of 65 patients (26 with hEDS, 39 subjects with neck, knee or back pain without hEDS) were examined prospectively. The deep fascia of the sternocleidomastoid, iliotibial tract, and iliac fascia were examined with sonoelastography. The thicknesses and strain indices (comparing fascia to muscle) were measured. One-way analysis of variance was used to compare differences between groups. 2) Three patients with hEDS underwent low-dose onabotulinumtoxinA injections for cervical dystonia (Simpson, 2016) at myofascial sites selected using Fascial Manipulation® diagnostic sequencing technique. Toronto Western Spasmodic Torticollis Rating Scale (TWSTRS) (Dashtipour, 2019) and thickness of the deep fascia of the sternocleidomastoid were measured pre and post-injection.

Results

hEDS subjects had a higher mean thickness (1.8±0.3mm) in sternocleidomastoid deep fascia compared with non-hEDS subjects. There was no significant difference in thickness of the iliac fascia and iliotibial tract between the groups. hEDS subjects had lower average strain indices (reduced differential in softening of the fascia structures compared with their associated muscles) compared with their non-hEDS counterparts with pain. After onabotulinumtoxinA injection, the patients clinically improved by 16 points on TWSTRS with 0.28mm decrease in thickness of the sternocleidomastoid deep fascia.

Conclusion

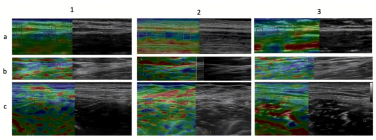
hEDS patients exhibited greater deep fascia thickness compared to non-hEDS counterparts. In myofascial pain, softening of the deep fascia may occur from increase in extracellular matrix content with a relative non-uniform increase in stiffness of the underlying muscle; this change is not as pronounced in hEDS. Low-dose onabotulinumtoxinA injections into sites of a myofascial continuity is a safe and effective treatment in hypermobile EDS patients and may influence pathological changes in the fascial system.

Fascia thickness and strain index of areas of interest

	Fascia Thickness (mm)		*Strain Index* (SI=A/B)*	
	SCM deep fascia		A SCM deep fascia, B SCM	
hEDS with neck pain	1.8±0.3	P<0.05	1.32±0.33	P<0.05
Non-hEDS with neck pain	1.5±0.3		2.35±2.02	
Non-hEDS without neck pain	1.3±0.2		0.88±0.41	
	ITT		A ITT, B TFL	
hEDS with knee pain	2.3±0.7	P=0.15	1.01±0.17	P<0.05
Non-hEDS with knee pain	2.3±0.3		1.34±0.18	
Non-hEDS without knee pain	2.0±0.6		0.53±0.04	
	Iliac fascia		A Iliac fascia, B Iliacus	
hEDS with back pain	2.0±0.7	P=0.17	1.23±0.17	P<0.001
Non-hEDS with back pain	1.9±0.5		2.13±1.7	
Non-hEDS without back pain	1.7±0.6		0.70±0.06	

SCM sternocleidomastoid, ITT iliotibial tract, TFL Tensor fascial lata; *Higher SI indicates softening of fascia to muscle. Lower SI indicates stiffening of fascia in relation to muscle.

Table fascia.png



B-mode ultrasound in black and white and strain elastography in color. Blue represents stiffer areas while red represents softer areas. Ultrasound images of subjects with 1. hEDS, 2. non-hEDS with pain, 3. non-hEDS without pain. Ultrasound image of row a. head of the SCM, row b. ITT, row c.FI. The thickness of deep fascia on the superficial SCM border was measured over 3 areas and the associated stiffness was measured semi-quantitatively using elastography comparing the deep fascia with the underlying muscle. The thickness of the ITT was measured where the superficial, intermediate and deep layers blended into organized fibers approximately 3mm distal to the belly of the TFL (Flato et al., 2017). Stiffness was measured semi-quantitatively using elastography comparing the organized fibers of the ITT with the proximal TFL. The thickness of the FI was measured at 2 areas where it emerged from the conjoint tendon with the transversus abdominis and internal oblique abdominis and associated stiffness was measured semi-quantitatively using elastography comparing the FI with the underlying iliacus muscle. Strain ratios were measured using built-in software and the strain index (SI) was calculated, as the fascia (A) to muscle strain (B), respectively (SI = A/B ratio).

475x171mm (144 x 144 DPI)

Figure.png

TWSTRS, SCM deep fascia thickness, and SCM deep fascia stiffness before and after OnabotulinumtoxinA injection.

	PRE-INJECTION	**POST-INJECTION**	**SITES OF INJECTION**
Average			
TWSTRS	52 ± 4	36 ± 8	
Torticollis Severity	21 ± 5	4 ± 3	
Disability Scale	17 ± 8	1 ± 4	
Pain Scale	16 ± 2	12 ± 5	
SCM Deep Fascia Thickness	1.7 ± 0.5 mm	1.2 ± 0.2 mm	
Stiffness Deep Fascia to SCM Ratio	1.10 ± 0.38	1.33 ± 0.48	

Botox.png

Are fascial strains involved in chronic pelvic pain syndrome etiology? A case-control study

Fascial Pathologies - Oral

Dr. Daniele Origo (SOMA - Istituto Osteopatia Milano), Dr. Maria Federica Bruni (SOMA - Istituto Osteopatia Milano), Dr. Andrea Catalano (SOMA - Istituto Osteopatia Milano), Dr. Lorenzo Marzagalli (SOMA - Istituto Osteopatia Milano), Dr. Irene Bruini (SOMA - Istituto Osteopatia Milano), Dr. Fulvio Dal Farra (SOMA - Istituto Osteopatia Milano)

Introduction/Background

Background

Chronic Pelvic Pain Syndrome (CPPS) is defined as a condition affecting both women and men, frequently impairing quality of life. It represents a medical, social and economic burden, since therapies are often prescribed without reaching consistent effects. Although structural and functional muscular abnormalities have been suggested as key features for CPPS pathogenesis, little is still known regarding its etiology. Aim of this study is to assess whether previous clinical events, leading to a fascial strain, are considerable as risk factors for developing CPPS.

Methods

Methods

This is a case-control study developed following STROBE checklist. 58 CPPS subjects and 127 healthy controls (ratio 1:2) were recruited, matched for age and gender. Inclusion criteria were the following: healthy people or adults affected by CPPS, without any neurological, systemic or cognitive condition. People reporting specific causes of pelvic pain were thus excluded. Subjects were evaluated through a standardized interview aimed to investigate previous clinical events leading to fascia disorders. Then, a series of validated questionnaires (NIH-CPSI, FSFI, FABQ, HADS, TAS-20) were used to assess subjects' functional status. Lastly, 3 experienced practitioners (physiotherapists and osteopaths) made a manual evaluation of the pelvic area.

Results

Results

A positive association between fascial strains and CPPS was found (OR: 2.2, CI 95%: 1.1 - 4.3, p=0.02). Among clinical events, only delivery injuries, previous infections and pelvic surgery showed a significant relation to CPPS [respectively OR: 6.2 (1.5 – 9.8), 3 (1.5 – 6), 3.2 (1.6 – 6.2), $p<0.05$]. A multivariate logistic regression reported only the covariate "job sitting position" as significant in the relationship with CPPS (B: 1.92, Exp B: 6.82, $p<0.003$).

Conclusion

Conclusions

This study represents the first attempt to provide evidence concerning the causal relation between fascial alterations and CPPS. A small positive association between clinical events involving fascia and CPPS was found. Specifically, previous delivery injuries and pelvic surgery seems to be more involved in such association. Further research is needed for confirmation.

“Fascial armoring”: a theoretical model with a cellular pathway for the mechanism of myofascial pain and “functional-psychosomatic” syndromes

Fascial Pathologies - Oral

Dr. Shiloh Plaut (Graduate of School of Medicine, St. George’s University of London, London, United Kingdom)

Introduction/Background

Chronic pain is a major cause of suffering and is extremely prevalent. Myofascial pain syndrome (MPS) is a common, overlooked, and underdiagnosed condition and has significant burden. MPS can evolve into fibromyalgia. The mechanism of MPS and other “functional somatic syndromes” is yet to be fully understood. Many theories exist for “fibromyalgia”, the most accepted and studied is central sensitization, but no single theory seems to explain a wide range of empirical evidence, and the pathophysiology and etiology are still not clear. Treatments are insufficient, meanwhile patients suffer. This work suggests an organic mechanical mechanism to help explain MPS and “functional psycho/somatic syndromes” like fibromyalgia, based on cross-disciplinary empirical studies.

Methods

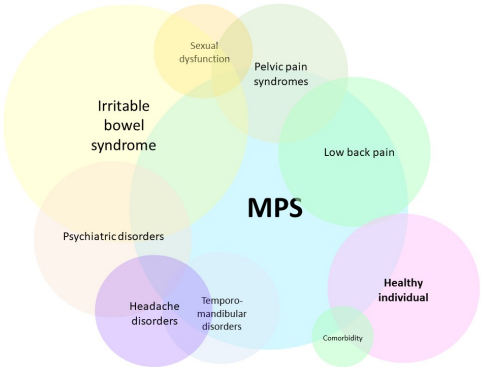
Systematic and scoping literature review. Systematically searched multiple phrases in MEDLINE, EMBASE, COCHRANE, PEDro, and medRxiv, majority with no time limit. Inclusion/exclusion based on title and abstract, then full text inspection. Additional literature added on relevant side topics. Review follows PRISMA-ScR guidelines. 831 records included.

Results

Fascia can adapt to various states by reversibly changing biomechanical and physical properties. Trigger points, tension, and pain are a hallmark of MPS. Myofibroblasts form a collaborating network of contracting cells and play a role in sustained myofascial tension. Fascia has properties of tensegrity (or biotensegrity).

Conclusion

MPS is a pathological state of imbalance in a natural process; manifesting from the inherent properties of the fascia, triggered by a disrupted biomechanical and cellular interplay. “MPS” might “evolve” into “fibromyalgia” via deranged myofibroblasts in connective tissue, or “fascial armoring”, which may explain pain, distribution of pain, decreased pressure/pain threshold, trigger/tender points, chronic fatigue, cardiovascular and metabolic abnormalities, autonomic abnormalities, absence of clear inflammation, silent imaging investigations, various somatic symptoms, overlap with other psycho/functional disorders, and other phenomena (e.g., occasional complete resolution soon after surgery). Alpha smooth muscle actin and transforming-growth-factor beta1 pathways are at the core of fascial armoring. “Psychosomatics” involve a myo/fibroblast network in connective tissue. “Functional”/“non-specific”/“psychosomatic” conditions share a common rheuma-psycho-neurological mechanism (i.e., myofibroblast-generated-tensegrity-tension). “Fibromyalgia” is a mild-moderate chronic compartment-like syndrome of the whole body. Tensegrity-based-needling/Acupuncture (a global percutaneous needle fasciotomy that respects tensegrity principles) is expected to treat “functional-somatic” conditions more effectively.



Overlaps.jpg

Educational Avenues to Promote Fascia Dialog in Professional Curricula

Anatomy - Oral

Dr. Rebecca Pratt (Oakland University School of Medicine)

Introduction/Background

Integration is critical in whole body health care. Whether you teach students in schools of medical, veterinary, dental, physical therapy, physician assistant, massage or occupational therapy, fascia matters. Whether you teach in an integrated curriculum or a curriculum that is designed for problem-based learning or a classical discipline-based curriculum, connective tissue has a place in academia. So, in our cramped curricula how do we make sure that our current students understand the complexity of fascia without adding additional time to coursework? To answer this question, we will need buy-in to embrace integration and facilitate the destruction of compartmentalized disciplines so we can finally work together for the greater health good.

Physical and Simulated Tensegrity Models of the Skull Bones and Fascia using CT Bone-Shape Data

Anatomy - Oral

Ms. Jeanine Looman (McGill University), Prof. Gabriel Venne (McGill University), Dr. Dorothea Blostein (Queen's University), Mr. Graham Scarr (NA)

Introduction/Background

Assessing the mechanical response of the skull to physical trauma has long presented a challenge because of the difficulties inherent within current methodologies. Finite-element modelling places an emphasis on the bones and has poorly captured the flexibility provided by the intervening sutures and their fascial connections [1,2].

We describe a recent approach to modelling the mechanics of the skull using CT bone-shape data, CAD and simulation software [1,3] that directly follows from a previous description of the cranial vault as a tensegrity structure [4]. Such modelling has potential applications in concussion research, investigations of fascial force transmission patterns, and research into the mechanisms of cranial osteopathy/cranio-sacral therapy.

Methods

A high-resolution CT scan dataset of a disarticulated human skull was obtained (slice thickness 0.625 mm) with the acquired data used to reconstruct the individual bones in silico.

***Physical model*:** 3D printed replicas (layer thickness 20 μ) were then assembled into a model of the skull using elastic membranes to represent the dural membranes.

Digital simulation: The data was also imported into Artisynth – a biomechanical modelling software - where the bones were connected across their respective sutures through the manual placement of tensional links [3,4]. The position and stiffness of each link was found by simulating how the links and bones reach force equilibrium, followed by iterated adjustments to refine the tensegrity configuration [4,5].

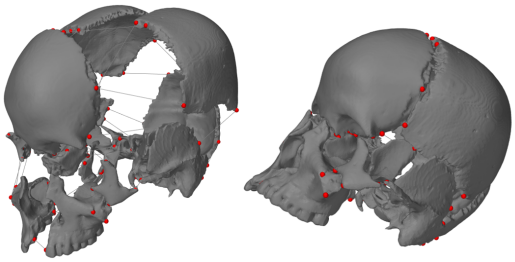
Video of simulation: https://youtu.be/J5anwCcFmGs

Results

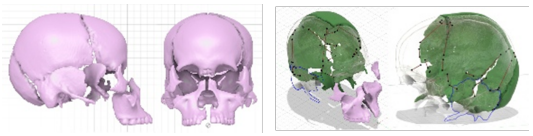
Surprisingly, the elastic membranes of the physical model are sufficient to maintain overall integrity with the bony bevels stabilizing the sutures in a way similar to a jigsaw puzzle. In addition, the versatility of the simulated tensegrity model demonstrates that single parameter changes mechanically affected the entire structure, a characteristic similar to living tissues.

Conclusion

The Artisynth model demonstrates the capability of the software to model complex biomechanics through tensegrity. This adds to a research field that is increasingly recognized for its more thorough descriptions of functional anatomy [5] by working towards a better understanding of the role of fascia during skull development.



Simulation.png



Ct scan dataset.png

Physical model.jpg

Anatomical variations of the liver and its suspensory system: a cadaver-based study

Anatomy - Oral

Ms. Beryl Arnould (McGill University), Ms. Pascale Décarie (Université de Montréal), Prof. Gabriel Venne (McGill University)

Introduction/Background

Non-traumatic musculoskeletal (MSK) pain is a socio-economic burden, being the leading cause of absenteeism and prolonged disability [1]. The origin of this pain is unclear, yet studies have reported theories on the role of fascia, nociceptive stimulation, and visceral (im)mobility, and provided evidence for the success of visceral manipulation therapy [2,3,4]. The influence of viscera on the MSK system is understudied, even though the human body functions best when its components, including the viscera, are free to move in full range [5]. Thus, to understand the influence of visceral mobility on the MSK system, this study investigated the anatomical variation of the liver's suspensory system via physical measurements and 3D surface scanning.

Methods

With ethics clearance, fourteen of twenty-two formaldehyde-fixed donors were selected; eight donors were excluded due to alteration of the region of interest. Using dissection, livers and diaphragms were isolated. Using a string and a digital micrometer, the length and thickness of the triangular ligaments, falciform ligament, and the circumference of the bare area were measured for each selected donor. Each isolated liver was weighed. Using a structured light scanner, each liver and its suspensory system were digitalized for future analysis.

Results

The mean lengths (mm) of the left triangular ligament edges were 55.70 ± 27.1, 88.38 ± 31.69, and 63.62 ± 28.76. The mean lengths of the right triangular ligament edges were 35.32 ± 21.15, 46.98 ± 51.83, and 33.28 ± 21.83. The mean lengths of the falciform edges were 102.75 ± 30.40, 172.32 ± 35.70, and 105.51 ± 49.25. The mean thicknesses of the left and right triangular ligaments, and the falciform, were 0.32 ± 0.16, 0.32 ± 0.20, and 0.34 ± 0.31, respectively. The bare area circumference was 443.12 ± 98.38mm, and the mean liver weight was 1439.09 ± 752.39g.

Conclusion

This dissection-based study provides evidence of a broad range of anatomical variations that exists between livers and the suspensory system, which suggests that the liver's suspensory system has adapted to each body's needs and demands. Recognizing these variations is important to understand the impact of viscera on the MSK system, which could lead to improved treatments.

Fascia anatomy of the female pelvic floor: a systematic search and review

Anatomy - Oral

Dr. Melanie Roch (Université de Sherbrooke), Prof. Nathaly Gaudreault (Faculty of medicine and health sciences, University of Sherbrooke), Dr. Marie-Pierre Cyr (The University of Queensland), Prof. Gabriel Venne (McGill University), Prof. Nathalie Bureau (Centre de recherche du Centre hospitalier universitaire de Montréal (CRCHUM); Département de radiologie, radio-oncologie et médecine nucléaire, Université de Montréal), Prof. Mélanie Morin (Centre de recherche du Centre hospitalier universitaire de Sherbrooke (CRCHUS); Faculté de médecine et des sciences de la santé, Université de Sherbrooke)

Introduction/Background

Few studies have investigated the female pelvic floor's fascia and its anatomical descriptions are inconsistent. Hence, our understanding of its contribution to pelvic floor disorders such as chronic pelvic pain, urinary incontinence, and pelvic organ prolapse is limited. The goal of this systematic search and review was to summarize the current state of knowledge on the micro- and macro-anatomy of this structure.

Methods

A systematic search was performed in Medline, Scopus and ProQuest databases to identify relevant primary studies according to preselected search terms/inclusion criteria. The anatomical region of interest was delimited by the pubic symphysis, anteriorly, and the sacrum, posteriorly, and from the membranous layer of the perineal subcutaneous tissue, inferiorly, and endopelvic fascia, superiorly. The data were collected independently by two reviewers using standardized scoring sheets. The risk of bias (ROB) assessment was also conducted by the same two reviewers using the Anatomical Quality Assurance tool.

Results

A total of 39 articles were included in the review. The ROB was scored low in 41% of the studies. Most of the studies were dissection studies (67%) and very few utilized imaging (ultrasound and MRI) technologies (21%). Twelve distinct anatomical structures were identified, the most frequently described were: the tendinous arch of pelvic fascia (n=10), the perineal body (n=9), the pubourethral ligaments (n=9),the rectovaginal fascia (n=9), and the perineal membrane (n=7). Based mainly on low ROB studies, this review shed light on the macro-anatomy of the perineal body and rectovaginal fascia. Some of the macro-anatomy of the tendinous arch of the pelvic fascia and endopelvic fascia was clarified, but the studies had high ROB and uncertainties still persist regarding their histological composition. For the remaining 8 anatomical structures described in this review, there is still a lack of consensus about their anatomy and most selected studies describing these showed a high ROB.

Conclusion

This review critically appraises the current knowledge and description of the fascia anatomy of the female pelvic floor. High quality studies should be conducted to address the discrepancies in the pelvic floor fascia anatomy highlighted in this review to improve our understanding of its role in common pelvic disorders.

The implication of Deep Fascia in chronic pain and common MSK-related pathological conditions

Anatomy - Oral

Mr. Flemming Kondrup (McGill University), Prof. Gabriel Venne (McGill University), Prof. Nathaly Gaudreault (Université de Sherbrooke)

Introduction/Background
Musculoskeletal disorders are the leading causes of disability worldwide. Research in this regard has aimed to study the muscles and bones composing this system, often disregarding the complex connective tissues maintaining its structural integrity. Nonetheless, the deep fascia, a three-dimensional continuum of connective tissue, has recently been brought to light due to its implication in various common pathological conditions. This literature review investigates alterations of the deep fascia in common pathologies to gain a more comprehensive understanding of its clinical implication and the underlying mechanisms.

Methods
A state-of-the-art review was conducted in PubMed and Google Scholar to identify relevant studies according to predetermined criteria: 1) full-text publications in English; 2) the paper studies one of multiple outlined deep fasciae, common pathologies of this deep fascia and the associated tissue alterations. Risks of bias were identified to emphasize the strengths and weaknesses of each selected study.

Results
37 studies were included. The thoracolumbar fascia, deep cervical fascia, palmar fascia, plantar fascia and iliotibial band were investigated in terms of tissue alterations in the following corresponding conditions: chronic low back and neck pain, Dupuytren's disease, plantar fasciitis and iliotibial band syndrome. Overall, pathological fascia in these conditions appears to be characterized by increased tissue stiffness and contracture. Myofibroblast are more present and activated, and the extra-cellular matrix is characterized by changes in collagen and matrix metalloproteases (MMP) levels. Inflammation appears to play a central role in tissue alteration and in pain, as various pro-inflammatory cytokines and immune cells are documented in these conditions. Pain originating from the deep fascia likely results from a combination of increased nerve density, sensitization and chronic nociceptive stimulation, whether physical or chemical.

Conclusion
This review highlights evidence that pathological fascia is characterized by changes in innervation, immunology and tissue contracture. Despite the increased recognition of the clinical relevance of fascia, its understanding is still incomplete. We believe that further investigation of the pathological transition of fasciae will highly benefit both research opportunities and patient care.

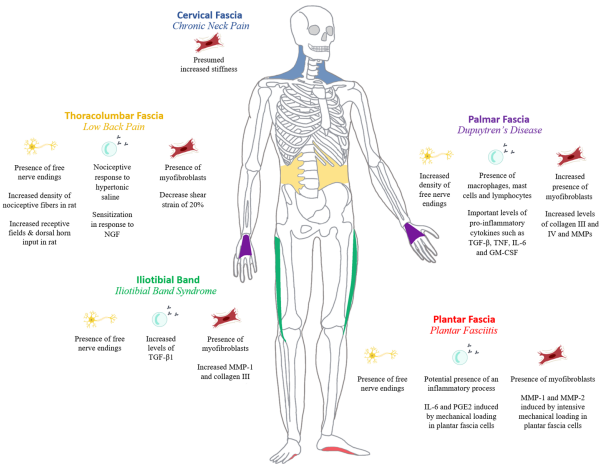


Figure 1. Summary of changes in innervation, immune response and tissue composition in cervical fascia, thoracolumbar fascia, palmar fascia, iliotibial band and plantar fascia

Fascia abstract image.png

Moderator Talk - Jean□Claude Guimberteau

Biomechanical & Surgical Aspects - Oral

Mr. JEAN CLAUDE GUIMBERTEAU (Institut Aquitain de chirurgie plastique)

Introduction/Background

Moderators will be speaking on topics that are of interest to the session.

Dr Jean-Claude Guimberteau is co-founder of the Institut Aquitain de la Main, and past-President 2011-2012 of the French Society for Plastic and Reconstructive Surgery (SOFCPRE). He has been an established member of the French Hand Society (GEM) . He was trained in the Hand and Plastic department of the Bordeaux University by Chiefs-surgeons Dr AJM. Goumain and Professor J. Baudet. He extended this training (1976) in a fellowship with world-renowned surgeon‘s Professor J.M. Converse in New York (USA) and Professor R. Millard in Miami (USA). Over the following years he compiled his book ’New Ideas in Hand Surgery, which introduced innovative concepts in hand anatomy, physiology and secondary flexor tendon repair.

He has become a pioneer in hand surgery innovating a novel technique for reconstruction of flexor tendons, using vascularized island transfers and he was the first to perform vascularized allotransplants of flexor tendon in 1991. He is the first person to film living human tissue through an endoscope in an attempt to understand the organisation of living matter. He has developed his own concept of the multifibrillar structural organisation of the body, of which the microvacuole is the basic functional unit. He has also developed a concept of global dynamics and continuous matter.

Viscoelastic Properties of a 3D Printed Analogue of Thoracolumbar Fascia

Biomechanical & Surgical Aspects - Oral

Mr. Siril Teja Dukkipati (McGill University), Prof. Mark Driscoll (McGill University)

Introduction/Background

Analogue biomechanical models are powerful tools to further the understanding of human spine. As opposed to cadaveric studies and finite element models these models are time and cost effective. An effort is made to develop an analogue biomechanical model of human thoracolumbar fascia (TLF) and characterize its mechanical properties.

Methods

For such a model to be reliable, high repeatability in model force response and less manufacturing variability is desired. Stereolithography 3D printing is adopted due to these reasons. A 3D model of TLF based on 3D MRI patent data is trimmed from L1 to S1 and is printed on Form 3L (Formlabs Inc, USA) with an elastomer of shore hardness 80A with 10 minutes of post curing. It is then subjected to tensile loading with 10mm longitudinal displacement at 0.5mm/sec while the model is anchored throughout the iliac arch by a custom jig. Resisting force and displacement data above 50% deformation is curve fitted to linear regression and the slope is adopted as model stiffness. Mechanical hysteresis for the soft tissue is estimated according to [1]. Force-time graph is also plotted to characterize stress relaxation in the model.

Results

The model displayed viscoelastic properties much like the fascial tissue. Model stiffness is estimated to be 22.2±0.41N/mm. This agrees with 24.1±8.3N/mm range reported for posterior thoracolumbar fascia in [2]. Hysteresis of the model is estimated to be 34.3±0.68% owing its viscoelastic nature. This falls in the range of 24.3±10.1% for posterior fascia lata in longitudinal direction as reported in [3]. This comparison assumes tissue similarities between fascia lata and TLF. Force-time curve at 10mm initial deformation revealed a 40.1±3.0% drop in resisting force after 500sec. This agrees with 43.9% drop during the first stretch of TLF reported by [4]. Excellent model repeatability is observed owing to low standard deviations in results.

Conclusion

This model of TLF behaves mechanically much like its human counterpart in tension. Further testing is warranted involving loading scenarios such as shear and tear. When coupled with existing lumbar analogue models, it can increase overall model accuracy and can be used as a spinal biomechanics research tool.

Developed tlf analogue mounted on custom tensile jig.jpeg

Getting to Know the Orbicularis Oris: Anatomical Intersections as a Determinant of Clinical Care

Biomechanical & Surgical Aspects - Oral

Ms. Charlotte Bloom (University of New England, Bitteford, ME), Ms. Stephanie Francalancia (Harvard Medical School, Boston, MA), Dr. Sammy Dowlatshahi (Harvard Medical School, Boston, MA), Dr. Frank Willard (University of New England, Bitteford, ME), Mrs. Susan McCormack (Children's Hospital of Philadelphia, Philadelphia, PA), Ms. Caitlyn Bailey (University of Washington), Dr. Gary Fudem (University of Massachusetts Medical School, Worcester, MA)

Introduction/Background

The orbicularis oris muscle encircles the orifice of the mouth and is often described as the first independent sphincter of the alimentary tract [1, 2]. However, this definition downplays the pivotal role that the orbicularis oris and surrounding fascia play in facial expression, forming speech, and grasping or directing food [3, 4]. Recent studies have verified the orbicularis oris' complexity beyond a simple sphincter muscle due to its interweaving multidirectional muscle fibers and dual sphincteric and retractor functions in the deep and superficial fibers, respectively [2, 5]. The simplified and misunderstood version of the muscle, though, is still prevalent among head and neck clinicians and therapists. The purpose of this work is to highlight the orbicularis oris' important structural and functional relationships to surrounding muscles, fascia, and overlying skin and to explore therapeutic and patient education applications of this knowledge.

Methods

Our team consisted of two plastic surgeons who frequent the head and neck, a senior anatomist, a speech and swallow therapist, an occupational burn therapist, an osteopathic medical student, and a medical illustrator. The study includes a literature review, radiographic analysis, medical illustrations, and our anatomical dissections looking specifically at the structural and functional intersection of the perioral muscles and fascia.

Results

The orbicularis oris is made of fibers from more than 15 different surrounding muscles that merge and diverge to facilitate animated expression and food-gathering. This composite function is transferred via subcutaneous fascial and, in some cases, muscular connections directly to the skin. Our study focuses on not just the structural, but also the clinical intersection of these anatomical layers.

Conclusion

The orbicularis oris is not a simple sphincter muscle, though one of its many functions is as a dynamic obturator. This work offers a comprehensive review of the present understanding of the orbicularis oris as defined by surrounding musculofascial units and zooms in, specifically on the anatomical intersections that contribute to the complex functions of facial expression, speech, and swallowing. We hope that by demonstrating the interdependence of structure and function, treatment plans will become more clear for physicians, therapists, bodyworkers, and patients.

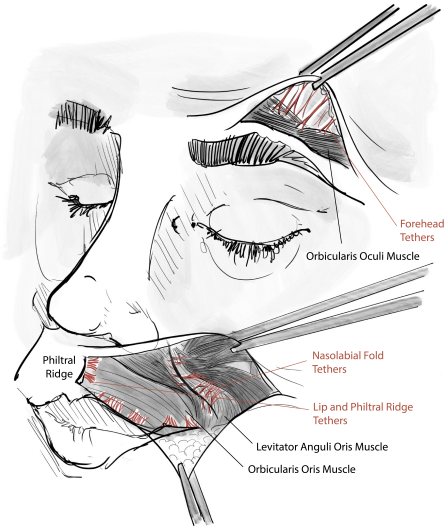


Figure 1 illustrating the interconnected muscles around the orbicularis oris.jpg

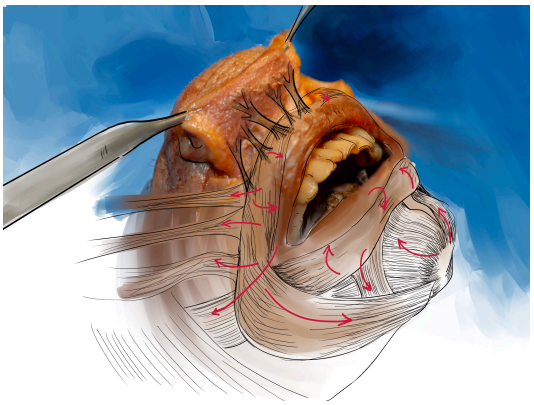


Figure 2 collage illustrating the direction of movement of perioral muscles.jpg

Role and biomechanics of the thoracolumbar fascia in achieving static spine stability: A numerical approach using a validated spine model

Biomechanical & Surgical Aspects - Oral

Mr. Ibrahim El Bojairami (McGill University)

Introduction/Background

Muscle activation and tissue coordination models are often devised to assess spinal stability via estimating individual forces. Upon activation, muscles have shown to transmit lateral forces through their enclosed intramuscular pressure (IMP) field to surrounding tissues, mainly the thoracolumbar fascia (TLF) 1. The purpose of this study is, thus, to leverage a validated finite elements (FE) spine model to assess the role of TLF, as engaged by muscles activation and IMP, in the objective of maintaining equilibrium spinal stability.

Methods

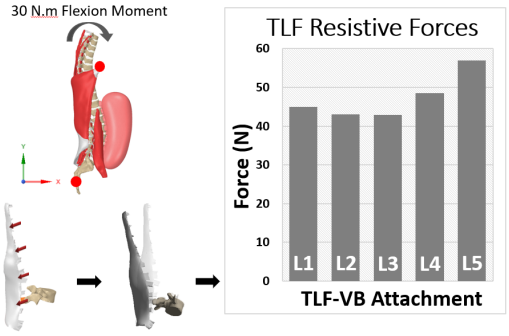
Using a validated FE spine model, two case-studies have been investigated to assess the relative contribution of the TLF towards spinal stability. In the first, the spine was flexed with a 350N force whereby different spinal tissues, inclusive of the TLF, were activated. In the second, the spine was loaded with a 30 N.m moment 2, to which, conventional and two novel muscle activation strategies, spanning minimizing and maximizing IMP, were investigated. The contribution of the TLF to maintain spinal stability was then assessed by means of spinal displacement (U). Lastly, physiological muscle and spinal constraints were applied 3,4.

Results

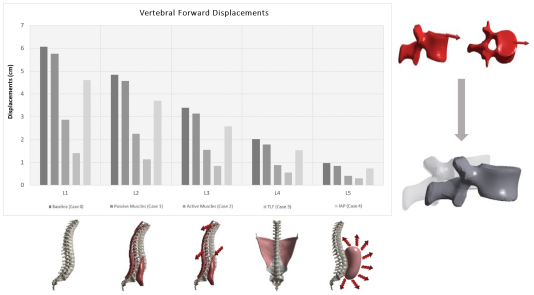
For the first case-study, TLF activation contributed to 77% of spine's stability on its own, whereby up to a total of 93% stability was observed when combined with other tissues. Furthermore, a drop of about 46% in IMP was found when muscles were paired with the TLF. In the second study, TLF supportive forces were shown to range between 6.9-56.9N. Accompanied spinal displacements, indicative of equilibrium stability, ranged between 0.18cm and 0.25cm.

Conclusion

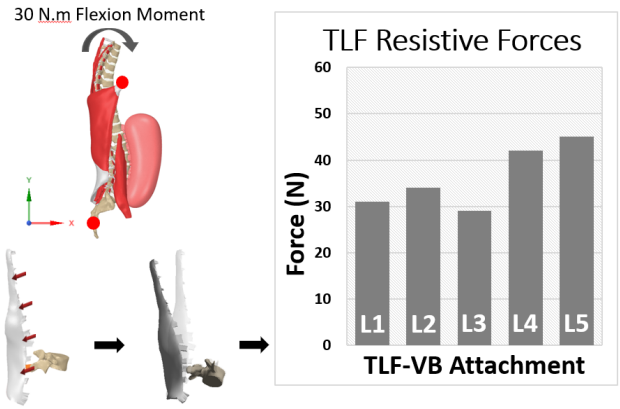
The enclosed research suggests a significant role of the TLF in support of spine's stability. Even though the TLF is a passive tissue, its material properties and strong attachments to the vertebra give it a strong potential to store excessive loads as a protective measure. Muscle activations further show that IMP has a significant impact on neuromuscular activity; namely, exerting less muscular force by means of engaging the TLF, perhaps in the interest of providing more efficient equilibrium spinal stability (U = 0.18 and 0.25 cm) from the perspective of muscle contribution



Elbojairami image3.png



Elbojairami image1.png



Elbojairami image2.png

Moderator Talk - Gabriel Venne

Fascial Pathologies - Oral

Prof. Gabriel Venne (McGill University)

Introduction/Background
Moderators will be speaking on topics that are of interest to the session.

Dr. Gabriel Venne is a Professor of Anatomy at the Faculty of Medicine and Health Sciences of the internationally renowned McGill University and the director of the International Clinical Dissection Program and chair of the Subdivision of Anatomy committee. Dr. Venne is also a practicing osteopath since 2009, and is an expert in classical dissection. Through his clinical practice and dissections, he had developed a profound understanding of the clinical implications of the interrelationship between neurovascular structures, visceral organs within the fascial network. Dr. Venne is known for his passion and enthusiasm during workshops and dissection; you will feel engaged during your exploration of the intricacies of the human body.

Dynamic Thoracolumbar Fascial Integrity in Chronic Low Back Pain – an Ultrasonographic Study

Fascial Pathologies - Oral

Dr. Bradley Fullerton (Adjunct Assistant Professor, Texas A&M University College of Medicine), Dr. Emily Molina (2. Resident (PGY3), Department of Medicine, Johns Hopkins Hospital), Dr. David Rabago (Professor, Penn State, Department of Family and Community Medicine), Dr. K. Dean Reeves (Private Practice)

Introduction/Background

Segmental dysfunction at the thoracolumbar junction is a cause of chronic low back pain (cLBP) [1]. The thoracolumbar fascia (TLF) can be pathologically altered in patients with cLBP [2]. While reliable quantitative ultrasound techniques exist using static images at low lumbar levels [3], little is known about the relationship between chronic pain and dynamic ultrasound images [4]. We therefore compared dynamic US imaging of the thoracolumbar junction fascia in patients with and without cLBP.

Methods

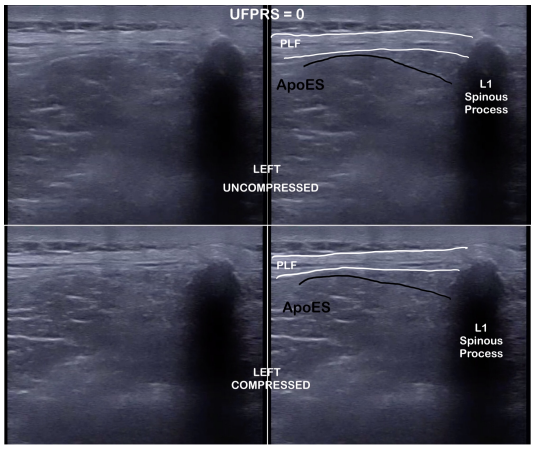
This two-arm cross-sectional cohort study assessed participants with and without cLBP. Assessment included demographics, back pain (0-10), and lower extremity strength during prone straight leg raise (SLR; 0-10). Fascial organization and resting tensional integrity (fascial pathology) of the posterior layer of the TLF and aponeurosis of the erector spinae were assessed using an adapted published 4-point scale (0-1 points “mild fascial pathology”; ≥ 2 points “moderate fascial pathology”). [5] Participants were assessed while prone with B mode sonographic palpation bilaterally at the T11, T12, and L1 spinous processes. T-tests compared strength and UFPRS (Ultrasound Fascial Pathology Rating Scale) scores between participants with and without cLBP.

Results

We assessed 50 cLBP participants (male, 48%; 52.5±14.1 years, median pain duration 4.3 years, at-rest pain severity 3.8±2.3 points, with exercise 6.0±2.4 points); and 50 Control participants without cLBP (male, 46%; age 51.3±14.1 years). There were no between-group baseline differences in age, sex, height and weight. Compared with Controls, cLBP participants had significantly weaker SLR (Left 7.0±1.3 vs 7.58±1.1, p=0.018; Right 6.8±1.3 vs 7.66±1.2). p=0.002). Those with moderate fascial pathology were significantly weaker on SLR regardless of the presence or absence of back pain (Left 7.2±1.2 vs 7.8±1.4, p = .042; Right 7.1±1.3 vs 8.0±1.3, p =.010). Moderate fascial pathology was common in both groups, but more common in those with low back pain (44/50 vs 36/50, p = .009).

Conclusion

cLBP patients had a weaker prone SLR and more thoracolumbar fascial pathology on dynamic ultrasound, suggesting further evaluation of this technique toward potential inclusion in cLBP examination is warranted. Altered fascial integrity was common with or without cLBP.



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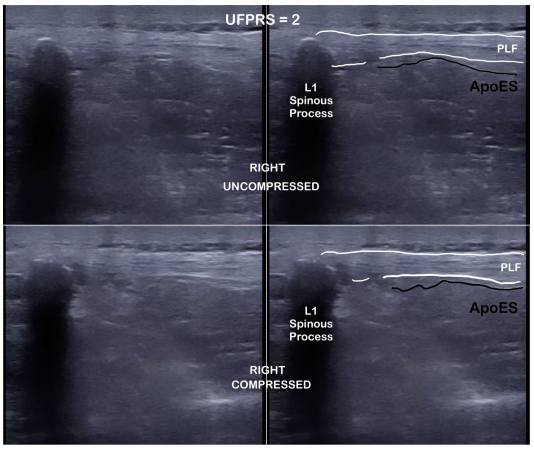

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Myofascial Injections and the Delineation of Multifactorial Myofascial Pain

Fascial Pathologies - Oral

Dr. Tina Wang (Loma Linda University School of Medicine), Dr. Roya Vahdatinia (Loma Linda University School of Medicine), Dr. Sarah Humbert (Loma Linda University School of Medicine), Dr. Antonio Stecco (New York University School of Medicine)

Introduction/Background

Myofascial pain is a common clinical entity with a high prevalence (Skootsky, 1989). However, understanding of pain contributions from specific fascial layers of the myofascial unit (superficial fascia, deep fascia, and muscle) needs further elucidation (Gebhart, 1994). The objectives of this study were to delineate the contribution of specific fascial layers of the myofascial unit to myofascial pain using fascial layer-specific hydromanipulation (FLuSH), an ultrasound guided injection technique that can be used in the diagnosis and treatment of the specific fascial layers contributing to myofascial pain.

Methods

The clinical data of 20 adult patients who underwent myofascial injections using FLuSH technique for the treatment of myofascial pain were reviewed. The pain pressure threshold was measured using an analog algometer initially and after each ultrasound guided injection of normal saline (Kongsagul, 2019) into the specific layers of the myofascial unit (superficial fascia, deep fascia, or muscle) in myofascial points corresponding with Centers of Coordination/Fusion (Fascial Manipulation®). Any change in the pressure algometer greater than 5.8 N/cm^2 of pressure in pressure tolerance was categorized as an improvement in pain response (De Meulemeester, 2017).

Results

Treatment of the deep fascia resulted in clinical improvement of pain pressure threshold in 73%, superficial fascia in 55%, and muscle in 43% of injected points. A non-response to injection of all three layers occurred in 10% of all injected points. The most common combinations of fascial layers contributing to pain in a given point were deep fascia alone in 23%, deep fascia and superficial fascia in 22%, and deep fascia and muscle in 18% of injected points. Each individual had on average of 3.0 ± 1.2 different combinations of fascial layers contributing to myofascial pain.

Conclusion

Multiple fascial layers likely contribute to myofascial pain. For a given patient, pain may develop from discrete combinations of fascial layers unique to each myofascial point, and each individual point may require treatment as a distinct pathologic entity rather than as a uniform process in a given patient or across patients.

Anatomical regions treated.

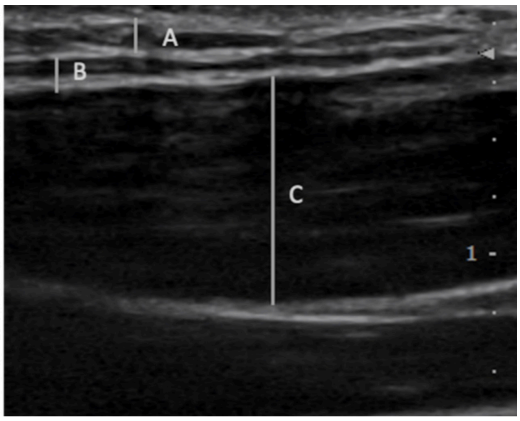
	Number of Treated Myofascial Points (% of All Treated Myofascial Points)
Trapezius	16 (18%)
Torso	14 (16%)
Arm	22 (25%)
Leg	35 (40%)

Anatomical areas.png

Number of discrete combinations of fascial layers contributing to pain in treated myofascial points across patients.

	Number of Treated Myofascial Points (% of All Treated Myofascial Points)
Muscle only	5 (6%)
Deep fascia only	18 (23%)
Superficial fascia only	11 (14%)
Muscle + Superficial Fascia	7 (9%)
Muscle + Deep Fascia	14 (18%)
Deep Fascia + Superficial Fascia	17 (22%)
Muscle + Deep Fascia + Superficial Fascia	7 (9%)
None	8 (10%)

Fascial layers.png



Fascial layer-specific hydromanipulation into specific fascial layers A: Superficial fascia B: Deep fascia C: Muscle.

Figure.png

Utilization and perception of the clinical relevance of Danis Bois Method (DBM) Fasciatherapy for endometriosis: A questionnaire submitted to French physiotherapists

Fascial Pathologies - Oral

Mr. Cyril Dupuis (Center for Applied Research and Study in Perceptual Psychoeducation (CERAP), Universidade Fernando Pessoa, Porto (Portugal).), Dr. Isabelle Bertrand (Center for Applied Research and Study in Perceptual Psychoeducation (CERAP), Universidade Fernando Pessoa, Porto (Portugal).), Dr. Christian Courraud (Center for Applied Research and Study in Perceptual Psychoeducation (CERAP), Universidade Fernando Pessoa, Porto (Portugal).)

Introduction/Background

Endometriosis is a painful chronic condition affecting quality of life. Fascia may be involved due to its nociceptive innervation and sensitivity to hormones and fibrosis, characteristics of endometriosis [1]. These patients value the efficacy of manual therapies [2], but fascia-oriented therapies have not been evaluated.

This practice survey, which was submitted to 367 physiotherapists trained in DBM Fasciatherapy [3,4], aimed to identify the physiotherapists' clinical opinion on this technique, its modalities of use, and the characteristics of the patients consulting them about this condition.

Methods

An online, customized questionnaire with 20 questions was submitted. Practitioners without clinical experience were excluded. There were two themes: first, how patients are consulting and how DBM Fasciatherapy is deployed (number of sessions, efficacy perception, and modalities of application); and second, the reason for the consultation and expectations of DBM Fasciatherapy.

Results

A total of 99 practitioners were included. Most of them were female (74%), with a mean age of 43 years, and practiced DBM Fasciatherapy for a mean of three years. They felt satisfied with DBM Fasciatherapy's efficacy in reducing pain (42%) and improving quality of life (25%).

A total of 57% used DBM Fasciatherapy exclusively, 20% combined it with other techniques, and 23% used it either exclusively or with other techniques. A mean of nine sessions were delivered at a frequency of one (28%) or two (57%) sessions per month. Musculoskeletal (50%), visceral (43%), and cranial (20%) techniques were used, as well as those oriented towards liquid fascia – i.e., blood and lymph (12%).

55% of the respondents said patients specifically asked for DBM Fasciatherapy. The main reason behind the demand was pain relief – lumbar (62%), visceral (67%), and/or perineal (64%) pain. 91% of the patients expected DBM Fasciatherapy to reduce their pain.

Conclusion

The physiotherapists using DBM Fasciatherapy were satisfied with its effects on pain and quality of life, which are the two main complaints of patients suffering from endometriosis. They combined various techniques (musculoskeletal, visceral, and cranial approaches) and conducted relatively few sessions. Clinical studies comparing DBM Fasciatherapy to other physical and/or psychological interventions are necessary to confirm these results.

Of muscles, cats and hangovers: a tale of fascia and its role in recovery

Fascia in Sport & Movement - Oral

Dr. Jan Wilke (University of Klagenfurt)

Introduction/Background

A myriad of methods have been developed and used to improve regeneration after sporting activities.
Most of the available approaches focus on the skeletal muscle, which, for instance, is reflected by the term delayed-onset muscle soreness (DOMS). Initial experiments, however, suggest that the collagenous connective tissue (i.e. the deep fascia) may represent the unsung hero of recovery from mechanical loading. This lecture will (1) bust common myths and misconceptions about the muscle's role in DOMS and
(2) present latest research findings explaining how fascia reacts to strenuous loading.

The role of physical activity and sitting time as potential determinants of thoracolumbar fascia in people with lower back pain

Fascia in Sport & Movement - Oral

Dr. Kyra De Conninck (University of Kent), Ms. Claire Boucher (University of Kent), Dr. Lex Mauger (University of Kent)

Introduction/Background
The role of movement on the structure of lower back muscles is well established. However, the impact of physical activity and sitting time on the structure of the thoracolumbar fascia is less well understood. The main aim of this study was to explore the relationship of physical activity and sitting time measured by a wearable activity tracker, with the structure of the thoracolumbar fascia.

Methods
This study was approved by the University of Kent's School of Sport and Exercise Sciences Research Ethics Advisory Group. Cohort size: n:38, mean age 38 (10 SD) with lower back pain. All participants wore an activity tracker, Fibion (Jyvaskyla, Finland) for 48 hours. Ultrasound of the posterior layer thoracolumbar fascia (longitudinal view, 2 cm lateral of L2-L3 spinal level) were taken at a frequency of 18 MHz, depth of 3 cm. A multiple linear regression analysis of thickness and echogenicity was performed. Thickness and echogencity were the dependent variables. The independent variables as potential determinants were: age, lower back pain duration, physical activity and sitting time.

Results
The overall model predicted thoracolumbar thickness by 18.8% and normalised echogenicity by 32.1 %, a small Cohen's effect size. A multiple regression was run to predict thoracolumbar thickness and echogenicity from age, lower back pain duration, physical activity and sitting time. An increase of 10 years in age is associated with a decrease of 0.4 millimetres of thoracolumbar and subcutaneous thickness. The predicted thickness of the thoracolumbar fascia and subcutaneous layer for people with lower back pain with a pain duration up to 3 years is 0.4 millimetres thicker than in people with less than 6 months of lower back pain. An increase of 10 minutes of sitting time was associated with a decrease of 5.5 millimetres in thoracolumbar thickness. An increase of 10 minutes of moderate activity was associated with an increase of 4.2 millimetres of thoracolumbar thickness. None of the independent variables could predict changes in echogencity.

Conclusion
These preliminary results suggest that determinants such as physical activity and sitting time may affect the structure of specialised connective tissue structures and associated subcutaneous layer.

The association between human fascia lata thickness and underlying muscles' morphology and function

Fascia in Sport & Movement - Oral

Dr. Shun Otsuka (Aichi Medical University), Dr. Xiyao Shan (Aichi Medical University), Prof. Munekazu Naito (Aichi Medical University), Prof. Yasuo Kawakami (Waseda University)

Introduction/Background

The fascia lata envelopes and connects with all thigh muscles through loose and dense connective tissues. The fascia lata morphology shows site-dependent differences [1], and its mechanical property changes associated with the underlying muscle contraction [2]. It is presumable that the property of the fascia lata is locally influenced by the morphology and strength of underlying thigh muscles. We hypothesized that the thickness of the fascia lata reflect neighboring muscles' size and strength.

Methods

Twenty healthy individuals were recruited (25 ± 3 years,167.1 ± 8.5 cm, 62.5 ± 13.2 kg). The thicknesses of the skeletal muscles (rectus femoris (RF), vastus lateralis (VL), biceps femoris (BF), and semitendinosus (ST)), and those of the overlying parts of fascia lata were measured by B-mode ultrasonography. Maximal voluntary isometric knee extension and flexion torques were also measured. The relationships between the fascia thickness and underlying muscle thickness and joint torque were tested by the Pearson product-moment correlation. The significance level was set at $p<0.05$.

Results

The local fascia lata thickness was positively correlated with the underlying muscle thickness at RF ($r = 0.39$) and ST ($r = 0.74$). Positive correlations were also confirmed between fascia lata thicknesses over RF ($r = 0.52$), VL ($r = 0.40$), and ST ($r = 0.40$), and corresponding joint torques (Figure).

Conclusion

The present study revealed that the fascia lata thickness individuality is accounted for the underlying muscle thickness and strength. Results suggest plasticity of the fascia lata thickness driven by the neighboring muscles.

The impact of exercise and an increase in movement on the thoracolumbar fascia in people with lower back pain – Interim findings.

Fascia in Sport & Movement - Oral

Ms. Claire Boucher (University of Kent), Dr. Lex Mauger (University of Kent), Dr. Kyra De Conninck (University of Kent)

Introduction/Background

Lower back pain (LBP) is the leading cause of worldwide disability-adjusted life years with an estimated prevalence of 84%. Adaptations of thoracolumbar fascia, measured using ultrasound imaging (USI), are associated with LBP [1]. USI has found to be a reliable method to analyse thoracolumbar fascia morphology [2]. Increasing physical activity can reduce LBP by 52.5% [3], likewise reducing sedentary behaviour can reduce LBP by 31.8% [4]. The aim of the current study is to measure the impact of a 6-month exercise and movement prompt intervention on the thoracolumbar fascia. This abstract presents interim findings.

Methods

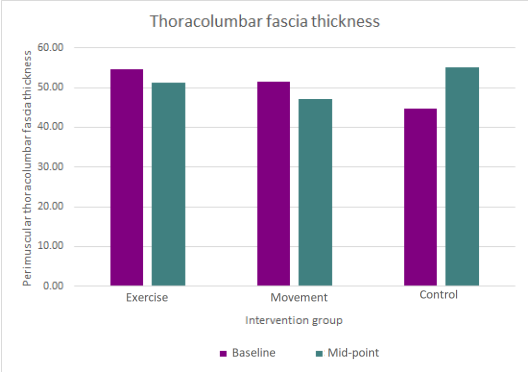
This study was approved by the University of Kent's School of Sport and Exercise Sciences Research Ethics Advisory Group. Cohort size n:45 (13 male, 32 female), aged 19-57 years (37.71±10.90) with LBP. Participants were randomised into one of three groups: control, exercise, and movement. Exercise group included 2 x weekly remote supervised-exercise classes; movement group included daily prompting to break up sitting time. USI of thoracolumbar fascia (longitudinal view, 2cm lateral of L2-L3 spinal level) were taken at a frequency of 18 MHz, depth of 3cm at baseline and mid-point (3-months). Analysis of thickness and echogenicity was performed using a customised MATLAB grey-scale script and IBM SPSS statistics.

Results

ANCOVA mid-point analysis adjusted mean thickness of thoracolumbar fascia was lower in exercise intervention (48.47±5.68 mm) and movement groups (46.47±5.80 mm) compared to control (58.45±5.71 mm). Although not significant, a 6% reduction in thickness in the exercise group and 8% reduction in the movement group was apparent. The adjusted mean echogenicity (grey-scale range 0-255) of thoracolumbar fascia was lower in the exercise intervention (31.61±2.97) compared to movement group (33.58±3.13) and control (32.87±2.97). Although not significant, a 7% reduction in echogenicity in the exercise group and a 4% reduction in the movement group was present. See tables below.

Conclusion

The interim findings of this study suggest promising adaptations of thoracolumbar fascia at 3-months of an exercise and movement intervention. At the mid-point of the intervention the observed differences in thickness and echogenicity are not statistically significant but could prove clinically meaningful. Further analysis at 6-month stage will investigate this trend.



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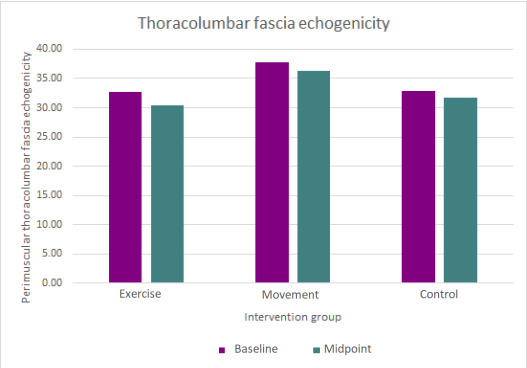

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Age-related changes in transversus abdominis activation and myofascial structure in healthy adults using ultrasound imaging

Fascia in Sport & Movement - Oral

Ms. Justine Benoit-Piau (Université de Sherbrooke, Faculté de médecine et des sciences de la santé), Ms. Frédérique Daigle (Université de Sherbrooke), Mr. Guillaume Léonard (Université de Sherbrooke), Dr. Jan Paul van Wingerden (Spine and Joint Center Rotterdam), Prof. Carla Stecco (University of Padova), Prof. Nathaly Gaudreault (Université de Sherbrooke)

Introduction/Background

The internal oblique, external oblique and transversus abdominis (TrA) are deep abdominal muscles involved in many basic human functional activities such as postural adjustments and gait. There are knowledge gaps on age-related structural changes of these muscles and their associated fascias (i.e. myofascial units) as well as on TrA activation. The aim of this study was to investigate, in healthy adults, (1) the association between TrA myofascial structures and activation with age, and (2) the association between internal oblique and external oblique myofascial structures with age.

Methods

Eighty-six healthy adults were recruited for this cross-sectional study. All participants were assessed using ultrasound (US) imaging in supine position. Images were captured at rest and during contraction using standardized hollow-in instructions. Myofascial structure was represented by the thickness of the three muscles and their related epimysial fascia measured on the US images. TrA activation was characterized by the activation ratio obtained by dividing TrA thickness during contraction with TrA thickness at rest. Bivariate correlation analyses and hierarchical analyses were performed (significance level: $p < 0.05$).

Results

TrA activation declined with age ($r = -0.44$). The thickness of all three muscles also decreased with age ($\rho = -0.66$ for external oblique, -0.51 for internal oblique and -0.58 for TrA), whereas the thickness of their fasciae increased ($\rho = 0.39$ for the fascia of external oblique, 0.54 for the fascia between internal oblique and external oblique, and 0.74 for the fascia between internal oblique and TrA). Age accounts for 19.5% of the variance in TrA activation.

Conclusion

These results demonstrate that normal aging is associated with changes in deep abdominal myofascial structures and transversus abdominis activation. Assessment of these outcomes can provide valuable baseline information for professionals involved in rehabilitation and strengthening programs targeting older individuals. Age-related factors other than structural modifications could probably explain the decline in TrA activation.

Muscle Shear Effects of Various Cupping Devices on the Lumbar Spine Myofascia Using MR Imaging

Fascia in Sport & Movement - Oral

Dr. Christopher DaPrato (christopher.daprato@ucsf.edu), Dr. Roland Krug (UCSF)

Introduction/Background

Cupping therapy applications have expanded in the treatment of myofascial pain in the last five years. However, its mechanism and depth of tissue effects are not well understood. Low back pain is currently the second most common reason for seeking medical advice [1]. Current research supports hypotheses suggesting muscle stiffness, atrophy, and fatty infiltration occur specifically at the spinal level where most degenerative changes are found as a factor [2,3,4]. Reduced shear forces in these tissues have also been found [4]. The purpose of this study is to quantify the effects of cupping on the muscle shear of lumbar myofascia with various cupping devices. We hypothesize that higher cupping pressures and harder material cups will have a greater impact on the shear forces between these deeper layers.

Methods

We evaluated the effects of three different cupping therapy devices, all with the same diameter, on lumbar spine myofascia assessing L2-L4. A 3 Tesla MRI was used to visualize pressurized cups on each participant. Two asymptomatic participants were screened for previous lumbar injury or structural deformities, one 31 y/o male with BMI=23 and one 32 y/o female with BMI=24, and evaluated with the intervention. Images were analyzed using OsiriXTM software, tracking the magnitude of effects from the base of the cup to the most posterior pull of muscle, using plastic cups at 500mmHg and 200mmHg, silicone cup at 300mmHg and rockpod at 175mmHg [5].

Results

T1 weighted magnitudes can be seen in Table 1. The quantity of muscle tissue pulled above the base of the cup was significant; see example Fig 1. Under higher pressures, an average of 28.01% more muscle tissue was pulled into the cup volume. Surprisingly, 300mmHg silicone cups had a decreased magnitude of muscle shear relative to plastic cups of lower pressures.

Conclusion

The results support our hypothesis that higher pressures and harder material cups have a significant effect on muscle shear in the lumbar spine. Improved myofascial shear should allow tissues to glide more easily with movement therapies. Future studies should focus on applying protocols to those with lumbar pathology to further understand the effects of cupping on myofascial structures.

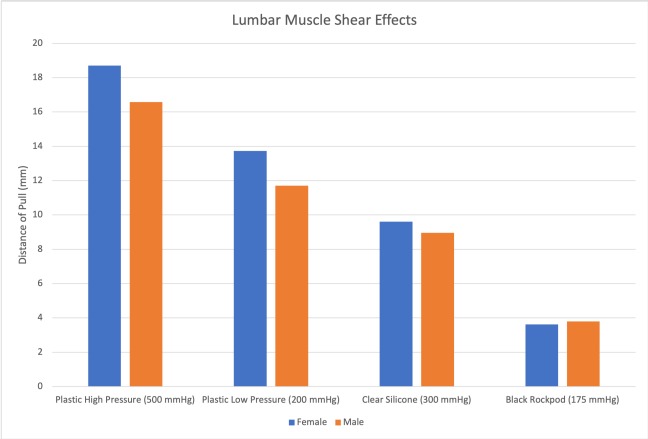


Table 1- magnitudes of muscle shear.png

Poster Submissions

Critical assessment of the state of the art of spine supportive corsets – can we do better?

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Mr. Emeric Bernier (McGill University), Prof. Mark Driscoll (McGill University)

Introduction/Background

Spinal support corsets have long been used to treat a wide variety of spine disorders and assist in stabilizing the spine during everyday activities. Although corsets on the market have similar functions, their shape and labels can vary considerably, which can often be confusing to the consumer. The purpose of this study was to investigate the current state of spinal corset technology, assess the effectiveness and derive suggestions for improvement.

Methods

Following a systematic protocol using multiple search criteria to capture relevant and available articles and patents, PubMed, Scopus, Web of Science and the United States Patent and Trademark Office databases were consulted. The function, claims, shape, and actuation method for providing spinal support for each identified spinal corset were then evaluated.

Results

The vast majority of corsets claim to treat numerous spinal disorders and to relieve pressure on the spine through a belt portion which increases intra-abdominal pressure. Most corsets of interest also provide insufficient torso support. Further, there is a lack of spinal support corsets that provide support to trunk movement without restricting it.

Conclusion

Wearing a corset that restricts movement rather than supporting it often prevents the wearer from increasing muscle strength and improving their condition. Additionally, taller corsets that extend from the pelvis to the ribcage should be explored as they provide better torso support. In most corsets, function is related to pain which is difficult to define and measure. A better measure of effectiveness may be to assess spinal stability.

Fascia assessment by ultrasound and its relation with body composition

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Prof. Rute Santos (✉ Polytechnic of Polytechnic of Coimbra, Coimbra Health School, Coimbra, Portugal; Laboratory for Applied Health Research (LabinSaúde), Portugal)

Introduction/Background

The fascia is a not much studied structure, consisting of connective tissue, adipose tissue and elastic fibers. Its function in the skeletal muscle system has gained importance knowing that it contributes to locomotion, regulation of posture, biomechanics of muscles and peripheral motor coordination (1).

The aims of this study are to determine a correlation between fascial characteristics and body composition, and o evaluate the stiffness, echo-intensity and thickness of the fascia by B-mode ultrasound and elastography and body composition, by DEXA, in two different groups of volunteers (sedentary group and athletes group).

Methods

Participants aged between 13 and 35 years old. Divided according to their weekly physical activity and their body constitution, considering inclusion and exclusion criteria.

Participants were fully informed of the purpose and procedures of the study and provided written informed consent. The study conformed to the guidelines of the Declaration of Helsinki and was approved by the ethics committee of the Polytechnic Institute of Coimbra.

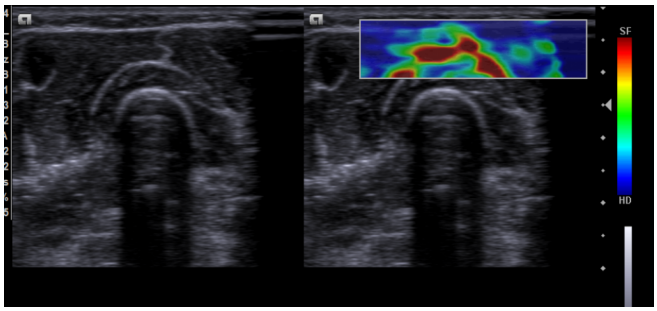
Bilateral evaluation of the point of intersection of the fascia in the anterior myofascial vector of the knee (an-ge) and in the lateral myofascial vector of the elbow (la-ca). Echogenicity of the fascia with B- mode ultrasound. Stiffness/elasticity of the fascia with elastography.

Results

46 people with an average age of 21, 24 participants practice physical activity regularly. The fascia shown to be a structure with intermediate elasticity. There were no significant differences between the study groups. There is a correlation between fat mass and elasticity of the fascia.

Conclusion

In conclusion, the fascia is a structure in constant development. Ultrasound and elastography proved to be the appropriate techniques for your research and evaluation. The present study serves as a pilot study and it is suggested to deepen the study of the relationship between physical activity, body composition and fascia.



Elbow ultrasound images.png

Sonographic Study of Thoracolumbar Fascia Morphology at Multiple Transition Zones Over Multiple Decades of Life in Subjects With and Without Low Back Pain

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Dr. Alicia Roldan (Montefiore Medical Center), Mr. Connor Barrand (Edward Via College of Osteopathic Medicine), Ms. Valerie Daniels (Edward Via College of Osteopathic Medicine), Mr. Kevin White (Edward Via College of Osteopathic Medicine), Dr. David Redden (Edward Via College of Osteopathic Medicine), Dr. Albert Kozar (Edward Via College of Osteopathic Medicine)

Introduction/Background

Sonographic study of the thoracolumbar fascia (TLF) in the published literature is largely limited to the L2-L3 interspace and demonstrates that subjects with low back pain (LBP) have increased thickness and decreased TLF tissue displacement with movement compared to subjects without LBP.

A pilot study was conducted to test the hypothesis that in the setting of LBP increased thickness and decreased stiffness are sonographically identifiable in key transition zones of the TLF.

Methods

Using b-mode, doppler and shearwave elastography (SWE) six anatomically significant locations of the TLF were imaged bilaterally in both transverse and parallel orientation to the fibers of the fascia. The main outcome measures examined were thickness and stiffness (elasticity modulus). The 58 subjects (24 female, 34 male), ages 22 to 86 years old, were imaged in an outpatient sports medicine office. Of the total subjects, 15 had back pain.

Results

TLF thickness was increased in subjects with LBP at the right L3 transverse process (TP) ($p = 0.0275$), left L3 TP ($p = 0.0384$), and left L4 TP ($p = 0.0396$). Stiffness of the TLF in subjects with LBP was increased in the posterior layer ($p = 0.0275$) and combined layers of the TLF ($p = 0.0494$) at the right L3 TP ($p = 0.0275$), and in the combined layers at the right inferior lateral raphe ($p = 0.0417$).

Conclusion

Our imaging protocol using b-mode and SWE detected statistically significant changes within the TLF of subjects with LBP at the L3 and L4 TP and the transition zone of the lateral raphe. Orientation of the probe and layer of the fascia examined additionally influenced findings with statistical significance. These preliminary results suggest that further research into sonographic assessment of the TLF at its transition points using a more robust sample size of participants with LBP and aged matched controls is warranted.

The role of adenosine A1 receptor in the analgesia induced by myofascial reorganization technique in mice with peripheral inflammation

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Prof. Maria Eugênia Ortiz (Experimental Neuroscience Laboratory, Post-Graduate Program of Health Science, Southern University of Santa Catarina), Prof. Larissa Sinhorim (Experimental Neuroscience Laboratory, Post-Graduate Program of Health Science, Southern University of Santa Catarina), Ms. Bruna Hoffmann de Oliveira (Experimental Neuroscience Laboratory, Post-Graduate Program of Health Science, Southern University of Santa Catarina), Mr. Gabriel Melo de Souza (Experimental Neuroscience Laboratory, Post-Graduate Program of Health Science, Southern University of Santa Catarina), Ms. Rafaela Hardt da Silva (Experimental Neuroscience Laboratory, Post-Graduate Program of Health Science, Southern University of Santa Catarina), Dr. Robert Schleip (Technical University of Munich, Chair of Conservative and Rehabilitative Orthopaedics), Prof. Edsel B. Bittencourt (Experimental Neuroscience Laboratory, Post-Graduate Program of Health Science, Southern University of Santa Catarina and Coastal Health Institute, Central Parkway Suite 201), Prof. Gianluca Bianco (Research Laboratory of Posturology and Neuromodulation RELPON, Department of Human Neuroscience, Sapienza University and Istituto di Formazione in Agopuntura e Neuromodulazione IFAN), Prof. John Srbely (Department of Human Health and Nutritional Sciences, University of Guelph,), Dr. Jay Shah (Department of Rehabilitation Medicine, Clinical Center, National Institutes of Health, Bethesda, MD), Dr. Daniel Martins (Experimental Neuroscience Laboratory, Post-Graduate Program of Health Science, Southern University of Santa Catarina)

Introduction/Background

Physical therapists frequently use miofascial release techniques to treat people with musculoskeletal dysfunction and pain [1]. Several studies suggest that endogenous adenosine may act in an analgesic fashion in various pain states [2]. The main focus for the development of adenosine targets as analgesics to date has been the A1Rs and A3Rs [3]. The purpose of this study was to evaluate the involvement of the peripheral and spinal adenosinergic receptor on the antihyperalgesic effect of myofascial reorganization technique, applied to the paw in mice with acute peripheral inflammation. This MFR technique was used in a previous investigation, targets the fascial system [4].

Methods

This was an experimental study. To test the hypothesis that the adenosinergic receptors is involved in the antihyperalgesic effect of myofascial reorganization technique, the mice (25–35 g) were submitted to the animal model of induction of peripheral inflammation, through i.pl. containing 20 µl of 50% (Complete Freund's Adjuvant) CFA solution. The mice were subjected to myofascial reorganization technique for 3, 9 or 15 minutes. Withdrawal frequency to mechanical stimuli was assessed 24 hours before and after CFA model (24h and 96h). The adenosinergic system was assessed by systemic (intraperitoneal), central (intrathecal), and peripheral (intraplantar) administration of caffeine in 24h and 96h after CFA injection. The participation of the A1 receptor was investigated using a selective adenosine A1 receptor subtype antagonist (DPCPX - 1,3-dipropyl-8-cyclopentylxanthine) also in 24h and 96h after CFA injection.

Results

Myofascial reorganization technique decreased mechanical hyperalgesia, and this effect was reversed by pretreatment of the animals with caffeine given by intraperitoneal, intraplantar, and intrathecal routes. In addition, intraplantar and intrathecal administrations of 1,3-dipropyl-8-cyclopentylxanthine (DPCPX), prevented the antihyper-

algesia induced by myofascial reorganization technique. The results are limited to animal models and cannot be generalized to acute pain in humans.

Conclusion

This study demonstrated the involvement of the adenosinergic system in the antihyperalgesic effect of myofascial reorganization technique in a rodent model of pain and provides a possible mechanism basis for myofascial reorganization technique induced relief of pain.

Effects of Myofascial Manipulative Therapies in Chronic Pelvic Pain Syndromes: A Systematic Review and Meta-Analysis

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Dr. Fulvio Dal Farra (SOMA - Istituto Osteopatia Milano), Dr. Alessandro Aquino (SOMA - Istituto Osteopatia Milano), Dr. Andrea Tarantino (SOMA - Istituto Osteopatia Milano), Dr. Daniele Origo (SOMA - Istituto Osteopatia Milano)

Introduction/Background

Background. Chronic pelvic pain syndromes (CPPS) is defined as the persistence of chronic pelvic pain without any specific cause. People typically refer to pain associated with urological, gynecological, and sexual dysfunction, affecting their quality of life. In this context, we assessed the effects of myofascial manipulative therapies (MMT) for pain levels and symptoms impact.

Methods

Methods. A systematic review and meta-analysis were conducted relying on the 2020 PRISMA statement. Five databases (Pubmed, Embase, Scopus, Central and PEDro) were searched for randomized controlled trials. Studies were independently assessed through a standardized form and their methodological quality was judged using the Cochrane risk of bias (RoB) tool. Effect sizes (ES) were calculated at post-treatment and the quality of evidence was formulated through GRADE framework.

Results

Results. Seven articles were included in this review, five of these in the quantitative synthesis (meta-analysis). None of these studies were completely judged at low risk of bias. MMT revealed to be not significantly superior for pain reduction [ES: -0.54 (-1.16; 0.08); p=0.09], for symptoms impact [ES: -0.37 (-0.87; 0.13); p= 0.15], and for quality of life [ES: -0.44 (-1.22, 0.33), p= 0.26] when compared to usual care. The quality of evidence varies from “very low” to “low.”

Conclusion

Conclusions. In patients with CPP/CPPS, MMT is not to be considered superior to other interventions for pain levels and symptoms impact modification. However, some positive cues were detected and we should find confirmation in the future. Further high-quality, double-blinded, sham-controlled RCTs are firstly necessary to confirm these positive trend and to improve the quality of evidence.

Effect of Myofascial Reorganization and Classical Massage on Lower Trapezius Muscle Electromiographic Activity in Subjects with Non-Specific in Neck Pain: Randomized Clinical Trial

Opening of FRC Poster Sessions (+ Abstracts) - Poster

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Introduction/Background

Nonspecific neck pain is a common idiopathic disorder that can alter the function of the scapular, compromising myofascial structures including the trapezius muscle [1]. Changes in these structures can generate pain [2], fatigue, muscle tension and bring deficit in the performance of functional activities [3]. We hypothesize that myofascial reorganization (MR) and/or classical massage (CM) may help to improve tissue restriction found in this condition [4]. The study proposal was to analyze the amplitude of the electrical activity of the lower trapezium muscle (LTM) bilaterally, after MR and CM

Methods

Clinical parallel randomized, double-blind controlled study. Exclusion: neurological diseases; history of trauma or cervical spine surgeries; Specific neck pain (clinical diagnosis of hernias or nerve compression) and; previous physiotherapeutic treatment (three months); Inclusion: individuals aged between 18 and 30 years of both sexes, with non-specific neck pain. Thirty individuals participated were randomly allocated into two groups (15 MR and 15 MC). Were submitted to evaluation of muscle electrical activity (Telemyo Dts Desk Receiver, USA - NoraxonTM). Electrodes were positioned in the lower trapezium muscle LTM according to the recommendations of SENIAM (Surface ElectroMyoGraphy for the Non- Invasive Assessment of Muscles) bilaterally. The amplitude of electrical activity (EMG) of the LTM was determined before and after treatment by MR or CM. Signal normalization was applied at the maximum value of the EMG activity during a maximum voluntary contraction. For the electromyographic data, a band pass filter (10-500 Hz) was used and the root mean square (RMS) with 100ms interval. To verify if there was a difference between pre and post-evaluation within the groups, a paired t-test was used. The significance level used was $p<0.05$. Clinical Trials (ID: NCT03882515) - Ethical committee Santa Catarina State University (number: 2.630.855)

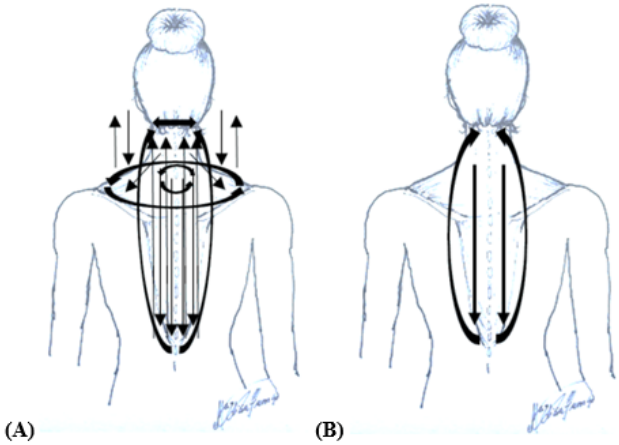
Results

The MR group presented significantly lower EMG activity in the LTM after six weeks of intervention ($p=0.02$). The

CM did not generate a significant change in the muscle activity of the LTM after a protocol of equal periodization

Conclusion

The results suggest that the MR is able to decrease the EMG activity during isometric contraction of the LTM immediately after the application of the proposed method



Figurex.png

THE RELATIONSHIP BETWEEN TENSION-LOW BACK PAIN AND RENAL PATHOLOGY

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Mr. Alin Voaides (Physiotherapy and Medical Recovery Department, Clinical Hospital of Nephrology "Dr. Carol Davila" Address: Calea Grivitei Nr 4, Sector 1, Bucharest, 010731, Phone: 021.318.9184, Fax: 021.318.9184 E-mail: contact@spcaroldavila.ro)

Introduction/Background

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Although every person, at least once in their life, has a pain in the lumbar area, it happens that we do not really know the origin. We identify the real cause only when the pain persists or is more aggressive, and we have to do an objective investigation. !

Methods

We took a group of patients with kidney disease who had low back pain. We performed objective examinations to see if the patients had structural changes in the lumbar level, in order to determine the cause of the pain in the lumbar area. After evaluating the subjects, pain and stiffness in the lumbar fascia as well as in the lumbar square muscles were highlighted. Following the medical analyzes, changes in the dynamics of homeostasis were highlighted, which we consider to have influenced changes in the local metabolism in terms of the tissues involved.

Half of the selected group, following fascial manipulation techniques at the level of the lumbar area as well as above and below.

Results

Despite the administration of the same drug treatment for renal pathology, we found a considerable reduction in lumbar pain in the group to which the fascial techniques were applied, compared to the group in which no fascial technique was applied, where the pain remained close. at the same level.

Conclusion

We conclude that, lumbar pain can also be caused by kidney disease, even if there are no structural changes in the lumbar area!

Auto-measurement of thickness of ultrasound imaging of psoas major in asymptomatic participants by speckle tracking in comparison with manual method

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Prof. Shwufen Wang (Graduate Institute and School of Physical Therapy, National Taiwan University, Taipei, Taiwan), Ms. Yean Chu (Graduate Institute and School of Physical Therapy, National Taiwan University, Taipei, Taiwan), Dr. Yi Chi Wang (Graduate Institute and School of Physical Therapy, National Taiwan University, Taipei, Taiwan), Mr. Yu-Wen Huang (Graduate Institute of Biomedical Electronics and Bioinformatics, National Taiwan University, Taipei, Taiwan), Prof. Pai-Chi Li (Graduate Institute of Biomedical Electronics and Bioinformatics, National Taiwan University, Taipei, Taiwan)

Introduction/Background

Psoas major (PM) is an important muscle synergistic with other deep muscle and fascia, providing trunk stability and hip motion (Penning, 2002). Ultrasound imaging could provide non-invasive and real-time dynamic imaging of the PM to reveal the muscle function, which is significantly related to motor performance (Chu, 2020). Using speckle tracking principle, auto-measurement of the thickness of ultrasound imaging (USI) is possible, however, the reliability in measuring PM is unknown.

Methods

Asymptomatic participants (n=19) aged from 21-65 years old were recruited. USI of PM was recoded in side-lying position. The ultrasound transducer was placed horizontally at L3 level and moving anterior-laterally until the border of PM could be observed. The task of pulling the knee approximating to the hip (PKAH) was performed to induce PM muscle contraction. PKAH was repeated for 3 times. The USI was recoded to measure the resting and contraction thickness. A software using speckle tracking principle was used to tracking the dynamic imaging by manually mark the thickness of one image and auto-tracking the imaging during contraction. The value of 10 frame of resting and 10 frame of contraction imaging were averaged. Intraclass classification (ICC) was analysis using SPSS. ICC between 0.40 and 0.59 is fair; between 0.60 and 0.74 is good; between 0.75 and 1.00 is excellent.

Results

91% (52/3*19) of resting and 91% (52/3*19) of the dynamic USI during contraction could be analyzed by auto-measurement using speckle tracking. During resting condition, the measurement by manual (24.0±4.9mm) and auto-measurement (23.4±4.7mm) is not significantly different. ICC for resting condition is 0.85(0.62-0.94), which is excellent reliability. For the contraction condition, the measurement by manual (29.2±6.2mm) and auto-measurement (27.5±5.6mm) is not significantly different. The ICC during contraction is 0.67 (0.17-0.87) which is good reliability.

Conclusion

Automatic measurement of the dynamic USI of PM during contraction yield good reliability. This auto-measurement method will enhance the application of dynamic ultrasound in clinical assessment of deep muscles.

Induction of Hyperemia of the Neck as a Consequence of Thigh Fascia Manipulation Suggests Direct Connection

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Dr. Cathy Kim (Community Memorial Health System), Dr. Graal Diaz (Community Memorial Health System)

Introduction/Background

Genu Recurvatum (GR) is clinically neglected despite the degree of biomechanical dysfunction. This perspective may be a result of teleological bias, according to Thomas Kuhn, author of The Structure of Scientific Revolutions. The superficial fascia and retinacula cutis form a network, which absorbs multi-directional stresses to and from the deep fascia. Vital to bipedal movement, the thigh has high retinacula cutis content, buffering the network from deep fascia stresses. However, in GR patients, the network becomes less elastic, functionally fusing the superficial fascia and deep fascia. The superficial lamina of the neck is already adherent to the superficial fascia. Dissections have discovered that the superficial fascia between the thigh and neck is continuous. This paper presents findings that suggest a physiologic link exists between thigh and neck fascia in GR patients.

Methods

The described method was utilized in a chronic pain patient with genu recurvatum and hypertonic thigh fascia. Myofascial release on the thigh resulted in hyperemia in the cervical areas (Images 1-3). The procedure places the patient in a seated position with optimized neutral pelvis and spine; legs and feet parallel, and knees bent at 90 degrees. The patient then performs isometric contraction of the pelvic floor (kegel) and thigh muscles (by pushing into heels). Simultaneously, high-velocity myofascial glide is executed with a smooth-edged tool along the longitudinal axis of the thigh, moving from proximal to distal. Two key elements are required for this technique, fascial potentiation and high velocity, to maximize disruption of adhesions before the buffering capacity of the retinacula cutis can mitigate the applied force.

Results

(see Methods: new hypothesis, non data-based)

Conclusion

A functional neurosurgeon, Dr. Breig, described that it was tension, not compression, on nerve tissue that caused symptoms and proposed creating a field called histodynamics to study the impact of tension on tissue at the cellular level. Results obtained from this intervention suggest that the thigh may translate biomechanical forces into physiological changes via fascial histodynamics, especially in GR patients. With mortality linked to gait and fall risk, these findings support the clinical value of more research into the functional relationship between the thigh and neck.

Fig1neckbeforerelease.jpeg

Fig2rightneckafter.jpeg

Fig3leftneckafter.jpeg

Structural Integration Effects on Postural Alignment of Young Recreational Athletes: A Pilot Study

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Mr. M.T. Antush (University of Idaho), Ms. S.A. Viera (St. Joseph), Mr. R.E. Stolzoff (Stolzoff Sportsworks), Prof. L.R. Brilla (Western Washington University), Prof. D.N. Suprak (Western Washington University), Prof. J.G. San Juan (Western Washington University)

Introduction/Background

BACKGROUND Structural integration (SI) is a manual therapy that focuses on whole body functionality. The purpose of this study was to determine if SI could affect postural alignment in recreational soccer players.

Methods

METHODS Participants received 10 SI sessions, one per week, by a certified advanced Rolfer practitioner. No participants were already involved in another form of proprioceptive training or had received SI before. All participants (n=10) were in good health and overall fitness. Participant characteristics were height 1.72±0.10 m; weight 67.6±3.99 kg; age 30.5±4.72 years. This study was approved by the university Human Participants Review Committee.
Pre- and post- SI treatment images of each participant were obtained using the Body Align Pro app (Motion Unlimited, Inc., Santa Barbara, CA). The camera was in the same fixed position, held by a tripod for each photograph. Participants were instructed to align their feet with markings on the floor and to "stand naturally;" no coaching of posture or position was given. Photos were taken of the anterior and sagittal aspects of each subject. Images were analyzed as JPG files using MaxTRAQ (Innovision Systems, Inc., Columbiaville, MI). Anatomical landmarks were selected for identification based on the consistent presence of these landmarks within and between subjects. Acromion tilt, lateral tilt, and anteroposterior tilt as related to spine angle were selected for statistical analysis of posture (Drerup and Hierholzer, 1992; Kuo et al., 2009). Data analysis was performed in Microsoft Excel (Microsoft Corporation, Redmond, WA).

Results

RESULTS There was no statistical difference in acromion tilt (pre: 0.000267°; post: -0.152369°; $p = 0.187$; d = 0.166) but significant improvements in both lateral tilt (pre: 177.306°; post: 176.673°; $p = 0.022$; d = 0.439) and anteroposterior spine angle (pre: 191.9237°; post: 189.552°; $p = 0.024$; d = 0.298). Posture significantly improved as measured by lateral and anteroposterior spine angle.

Conclusion

CONCLUSIONS This study was able to quantitatively measure changes in postural alignment as indicated in changes in spine angle photographed before and after a 10-series treatment in young recreational athletes. Posture significantly improved as measured by lateral and anteroposterior spine angle.

The Cinderella Layer – Defining the Anatomy of Appearance and Movement

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Dr. Sammy Dowlatshahi (Harvard Medical School, Boston, MA), Ms. Stephanie Francalancia (Harvard Medical School, Boston, MA), Dr. Frank Willard (University of New England), Dr. Gary Fudem (University of Massachusetts)

Introduction/Background

Introduction/Purpose: We have characterized a layer of anatomy containing a variety of attachments between the skin and fascia that help us understand why we look the way we do and how we move. This layer not only determines our appearance, but also helps regulate our movement, particularly in returning to a resting posture. More commonly and disparagingly referred to as the fatty layer, it orchestrates an intimate relationship between the dermis above and the fascia below. We named it the Cinderella Layer for its overlooked beauty and intelligence.

Methods

Methods: Through cadaver dissections, clinical observation and radiologic imaging, we divided the Cinderella Layer tethers into structural and functional categories.

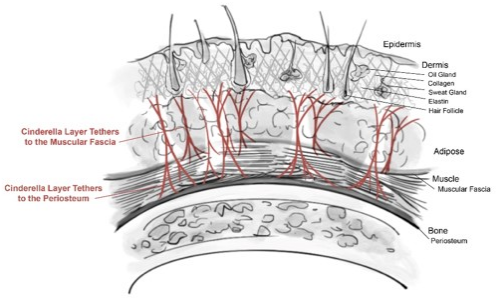
Results

Results: These descriptive categories depend on whether the attachments serve more as a boundary, anchor, animator, accordion-like, or elastic-band framework. The tethers typically serve more than one of these purposes. Short and long, dense and filmy, elastic and rigid, and vertical and transverse tethers are found corresponding to appearance and function. For example, our facial expressions are determined by tethers between the underlying muscular fascia and skin. Flexing our fingers or knees is facilitated by deep tethers, which store redundant skin in extension that can be used during flexion.

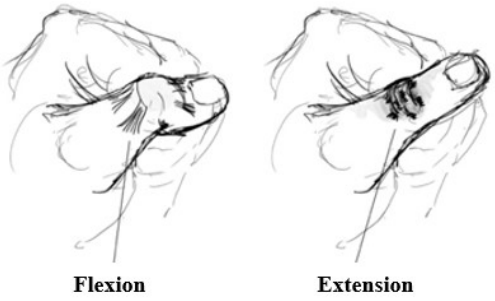
Conclusion

Conclusion: Try looking at your skin like a sheath surrounding a tree with the bark being the epidermis. The knotty contours just beneath the bark would be your dermis, and in some cases, scar. The roots of a tree extend deep into the ground, often surrounding large stones, lending support to stand and withstand the forces of gravity and nature. Likewise, your skin is tethered to the fascia and sometimes periosteum around the bone. The Cinderella Layer additionally contains vascular and lymphatic connections to the dermis, which nourish your skin like the roots of a tree.

This anatomic study clearly demonstrates the interdependence of form and function when analyzing the human body. Whether you are an artist, physician, bodyworker or student of anatomy, once you understand the concept of dermal tethers that define our body as a collage of spaces, contours, and creases, you will begin to notice these attachments everywhere.



Graphictethers.jpg



Accordionjoint.jpg

Cartoontethers.jpg

Can Myofascial Treatment with Pulsating Vibrations Improve Mobility for Patients with Frozen Shoulder? A Case Study

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Mr. Hans Bohlin (Fascia Innovation Sweden AB), Ms. Camilla Ranje Nordin (Private Practicing Human & Equine Therapist,), Dr. Hakan Borg (Physician Private Practicing)

Introduction/Background

Thousands of patients are annually diagnosed with Frozen Shoulder (FS) or adhesive capsulitis, where the joint capsule contracts and becomes less flexible. The condition is painful, with reduced range of motion (ROM) in the shoulder and arm and causes great suffering, often with difficulty sleeping and greatly reduced work ability. The treatment given today is partly conventional treatment with cortisone or NSAID preparations as well as physiotherapy and other therapeutic treatment which usually have limited effect.

Methods

The study investigates whether myofascial treatment, using a device generating deep pulsating vibrations, can provide increased ROM and facilitate for these patients. 23 patients diagnosed with FS were included in the study. Three treatments were performed, within set time intervals. The ROM was measured before and after each treatment, pictures were taken with a thermography camera and angles were measured.

Results

The result showed that 87 percent got an increased ROM by 30 degrees or more, that 52 percent of the patients improved ROM by 60 degrees or more, and that 30 percent regained full ROM. 61 percent of the patients also reported improved quality of sleep.

Conclusion

The study indicates that this treatment could possibly improve ROM and wellbeing for patients with FS. Further studies are recommended to evaluate and validate these findings. A validated treatment of FS could mean great socioeconomic benefits and an increased quality of life for patients diagnosed with FS

Patient ID	Age	Gender	FS duration in months	°ROM Day 1 before	°ROM Day 1 after	°ROM Day 7 before	°ROM Day 7 after	°ROM Day 37 before	°ROM Day 37 after	Δ °ROM	Full ROM	Improved sleep
FS01	52	W	7-9	65	95	105	110	115	120	55		X
FS02	57	W	5-7	80	180	180	180	180	180	100	X	
FS03	42	W	14-16	50	90					40		X
FS04	41	W	7-9	100	180					80	X	
FS05	51	W	4-6	30	90					60		
FS06	56	M	6-8	80	120	125	140	140	150	70		X
FS07	50	W	6-8	65	130	75	115			50		X
FS08	42	W	5-7	65	90	95	110	95	110	45		X
FS09	46	W	5-7	135	180	180	180	180	180	45	X	X
FS10	48	W	4-6	50	80	70	80			30		
FS11	69	M	10-11	75	90	80	90	80	100	25		X
FS12	62	M	1-2	100	180	115	170	140	140	40		
FS13	89	W	11-13	65	115	100	150	150	160	95		
FS14	47	W	9-11	70	140	150	160	180	180	110	X	X
FS15	49	W	10-12	90	135	140	160	120	135	45		X
FS16	47	M	5-7	160	170	170	170			10	X	
FS17	47	W	3-5	135	150	160	160	160	160	25		X
FS18	45	M	22-24	100	170	140	180	180	180	80	X	X
FS19	58	M	12-14	135	160	130	170	130	170	35	X	
FS20	68	W	6-8	50	130	100	125	80	85	35		
FS21	27	M	3-5	70	160	135	180	180	180	110	X	X
FS22	42	W	8-10	60	110	70	100	90	150	90		X
FS23	45	M	3-5	70	140	155	180	180	180	110	X	X

Table 1.png

	No	>30°	>45°	>60°	>90°	Full	Imp sleep
Total	17	15	13	10	9	7	12
Percent	100%	88%	76%	59%	53%	41%	71%

Table 3.png

	No	>30°	>45°	>60°	>90°	Full	Imp sleep
Total	23	20	16	12	9	9	14
Percent	100%	87%	70%	52%	39%	39%	61%

Table 2.png

Structural and shear strain behaviors of the thoracolumbar fascia during breathing: a proof-of-concept study

Opening of FRC Poster Sessions (+ Abstracts) - Poster

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Introduction/Background

Structural and mechanical alterations of the thoracolumbar fascia (TLF) have been recognized as potential pain generators in people with chronic low back pain. Ultrasonography (US) is a non-invasive imaging technology allowing to quantify TLF strain biomechanics. Most US studies have investigated people with low back pain. However, the TLF has anatomical connections with the respiratory muscles and therefore potential implications with respiratory physiology and dysregulation. The objectives of this study were to use an US elastography technique to 1) quantify the TLF structural and shear strain behaviors during a standardized resisted inspiration task, and 2) explore the association between thoracic expansion and TLF structural change and shear strains.

Methods

Fifteen asymptomatic adults (8 men and 7 women) participated in this proof-of-concept study. Their height, weight and thoracic expansion were measured. Images (Terason 3200 system in research mode, B-mode/radiofrequency, 13 MHz linear transducer) were acquired with the participants standing, the transducer was positioned on the erector spinae, 2 cm lateral from the midline at the level of the L2-L3 interspace. A US cine-loop was recorded at rest and during a resisted inspiration task that was standardized with specific instructions and using a spirometer. Cross correlation methods were applied to calculate axial and shear strains. The difference between TLF thickness measured at the end of inspiration and at rest (structural change), and the shear strain measured during inspiration were used in the statistical analyses. Descriptive statistics (**obj. 1**) and Spearman correlation coefficients (**obj. 2**) analyses were used.

Results

The median and interquartile range [IQR] of the participants' age, body mass index and thoracic expansion were: 29 years [13]; 24.6 [4.6] and 6.3 cm [2.2]. Thinning of TLF (median = 0.96 mm [0.01]) and TLF shear strain (median = 4.96% [0.06]) were observed during the resisted inspiration task in all participants. Thoracic expansion and shear strain were moderately correlated (Spearman rho coefficient = 0.61, p = 0.03).

Conclusion

These preliminary results suggest that resisted inspiration induces thinning and shear strain behaviors of the TLF due to the anatomical connections between the respiratory muscles and the TLF.

Myofascial Release of the Pectoral Fascia: Relationship Between Forward Shoulder Posture Severity and Magnitude of Change in Posture, Pectoral Length, and Muscle Excitation

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Ms. Sarah Bohunicky (University of Manitoba), Ms. Lindsey Rutherford (Univeristy of Manitoba), Ms. Sophie Menet-Espina (University of Manitoba), Mr. Quinn Malone (University of British Columbia), Dr. Cheryl Glazebrook (University of Manitoba), Dr. Trisha Scribbans (University of Manitoba)

Introduction/Background

Restriction of pectoral soft-tissues, including the pectoral fascia, are associated with forward shoulder posture (FSP) and hypothesized to increase muscle excitation of the scapular protractors and decrease excitation of the retractors. Musculoskeletal therapists use manual techniques such as myofascial release (MFR) to lengthen pectoral soft-tissues, reducing FSP and correcting muscular excitation. While FSP is reduced following MFR to the pectoral region, it is not known if the magnitude of change observed depends on FSP severity. The objective of this study was to explore the relationship between FSP severity and the magnitude of change in FSP, pectoral length (PL), and muscle excitation following a 4-minute MFR to the pectoral fascia.

Methods

Thirty-six participants (26 ± 8 years; 20 female) with asymptomatic FSP had FSP, PL, and muscle excitation measured PRE and POST a 4-minute MFR to the pectoral fascia. Photographs of participants' right shoulders were taken to measure FSP, where the distance from C7 to the acromion was divided by the distance from C7 to sternal notch. Passive horizontal abduction range of motion measured PL, and surface electromyography measured muscle excitation of the protractors (pectoralis major; PM) and retractors (upper, middle, lower trapezius; UT, MT, LT) during a reaching task. A Pearson correlation was conducted comparing PRE-FSP to changes in (Δ) FSP, PL, and excitation from PRE to POST MFR.

Results

There was a strong significant positive correlation between PRE-FSP and ΔFSP (p= .002; r= .502). A non-significant weak positive correlation was observed between PRE-FSP and ΔPL (p= .837; r= .036), ΔUT (p= .703; r= .066), and ΔMT (p= .648; r= .079). A non-significant negative weak correlation was observed between PRE-FSP and ΔLT (p= .575; r= -.097) and ΔPM (p= .817; r= -.040).

Conclusion

Individuals with more severe FSP experience greater reductions in FSP in response to a 4-minute MFR to the pectoral fascia than those with less severe FSP. Interestingly, FSP severity was not associated with changes in PL and muscle excitation. Future investigations should explore changes in the extensibility of the pectoral fascia in response to MFR to determine if they contribute to improving FSP.

THE EXPERIENCES AND BENEFITS OF APPLYING FASCIAL MANIPULATION® STECCO METHOD IN NEUROLOGICAL PHYSIOTHERAPY FOR CHILDREN AND ADULTS.

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Mrs. Nita Tolvanen (4fysio), Mrs. Tiina Lahtinen-Suopanki (Helsingin manuaalinen terapia Oy, Orton Oy)

Introduction/Background

Paralysis, immobility and spasticity lead to increased proportion of muscular extracellular matrix (ECM) of which hyaluronan is the main component providing lubrication to facilitate sliding and myofascial force transmission within and between muscles. Alterations of fascial structures are an important nonneural factor contributing to increased resistance in active and passive motion, increased muscle spindle activation, limited range of motion (ROM) and impaired body awareness.

Methods

The aim of this qualitative study was to collect and identify data of the additional effects of applying Fascial Manipulation® (FM) to neurological physiotherapy. The study was carried out by group interviewing 12 physiotherapists with extensive experience of neurological physiotherapy about the different effects gained by applying FM® on 135 patients.

Evaluation included analysis of changes in movement patterns and function, ROM and quality of movement before and after FM® treatment. The changes were evaluated by observation, taking photos or videos and noting the difference in the need of assistance. When possible, patients own experiences were collected.

Results

Neurological patients benefit from FM® combined with other rehabilitation approaches. The additional benefits were improved proprioception, body awareness and balance and significant increase of ROM. Improved agonist antagonist coordination made the active and selective movements easier. The impact of incorrect movement patterns became less severe, which was evident also in breathing and oral function. Clonus and spasms decreased or disappeared. FM® on scars affected muscle recruitment and improved sensory feedback. FM® was effective and used as the only method for treating pain caused by hypertonia.

Conclusion

FM® approach revealed the importance of fascial system´s function and adaptability for movement control and proprioception. Pain caused by abnormal muscle tone can be understood and treated effectively. FM® was used repetitively since muscle hypertonia continuously affects the ECM and adaptability of fascial structures. Application of FM® led to better benefits from active training when the fascial system is taken care of. Treatment interval correlated with the degree of muscle tone and the person´s ability to make use of the changes gained by FM.

Pupillometry to show stress release during equine sports massage therapy

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Prof. Claus-Peter Richter (Northwestern University), Dr. Karen Wild (Hands for Horses Sweden), Mr. Stephan Skiba (Skimagine)

Introduction/Background

Anecdotal reports state that wellness treatment for horses, such as massage therapy, relaxes the treated animal. Massage therapists and horse owners typically report an ”improvement” without quantifying the treatment results. This paper provides evidence that the effect of wellness treatment and stress release can be measured.

Methods

One of the horse’s pupils was photographed at the beginning and the end of the experiment. Horses were randomly assigned to two experimental groups, animals receiving a massage (N=10) and horses standing for the time of a massage in the stable lane (N=5). We opened the images of the pupil with Fiji (ImageJ) and used the elliptical selection tool to measure the pupils’ and iris’ areas, and the line tool to measure the long axis of the pupil. The ratio between the iris’ area and the pupils’ aperture, and the ratio of the pupils’ long axis and the eyes’ diameter served as normalized measures for the pupil width. At the end of the experiment, we compared the ratios obtained between each experimental group with a paired t-test. The research was carried out in accord with national or international standards.

Results

The treatment significantly decreased the area ratio on average by a factor of 1.39 (paired t-test; n=10; df=10; t=4.6; P=0.0009). The effect size is 0.37; the power is 92.5%. Since the ambient light was constant, an explanation for the change in the pupil area is a relative increase of the parasympathetic over the sympathetic activity.

Conclusion

Massage therapy decreases the pupil area in horses. The observed changes likely result from an enhanced parasympathetic and diminished sympathetic activity. The method provides a measure for the treatment effect. Observed changes in pupil size agree with the anecdotal horse owner reports and the therapist’s treatment notes.

Persistent Dizziness Utilizing a Novel Manual Therapy Assessment and Treatment Approach: A Pragmatic Case Series

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Mr. Larry Steinbeck (Advance Rehabilitation), Prof. Brent Harper (Chapman University, Crean College)

Introduction/Background

Sixty-nine percent of U.S. adults over 40 years of age have unknown etiology vestibular disorders with persistent dizziness and balance deficits. The purpose of this case series was to investigate short-term outcomes of Fascial Manipulation® (FM®), a systematic regional interdependence movement-based approach, in patients with persistent postural-perceptual dizziness (PPPD).

Methods

Case series of those with PPPD after vertigo resolution post-canalith repositioning and -vestibular rehabilitation treated with FM®, addressing dizziness proprioception using fascial mobility to improve capsular and free-nerve ending mechanoreceptors interactions. There were 12 participants (mean age = 68.3 ± 19.3) in this case series with an equal number male (76.8 ± 10.7) and female (59.7 ± 23.1). Independent t-tests performed for gender differences. Pre- and posttest nonparametric paired sample t-tests (Wilcoxon signed-rank) performed on four outcome measures: Dizziness Handicap Inventory, Timed Up and Go, bilateral tandem balance, and bilateral single-limb stance

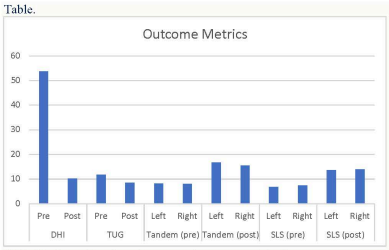
Results

There were no significant differences between outcome metrics and gender, except tandem pre-right, $t(10) = -3.1$, $p = .01$, tandem post-right, $t(10) = -2.4$, $p = .04$, and tandem pre-left, $t(10) = -3.4$, $p = .007$, with females having longer stance times. Treatment visits ranged from 2 to 8, with a mean and standard deviation of 4.5 ± .5. Pre-post Dizziness Handicap Inventory decreased 43.6 points. Pre-post Timed Up and Go decreased 3.2 seconds. Pre-post tandem left increased 8.7 seconds, while right increased 7.5 seconds. Pre-post left single limb stance increased 6.8 seconds and right increased 6.6 seconds. Significant gains included Dizziness Handicap Inventory ($z = -3.1$, $p = .002$), Timed Up and Go ($z = -2.8$, $p = .005$), bilateral tandem stance ($z = 2.8$, $p = .005$), and single-limb stance (left: $z = 2.9$, $p = .003$; right: $z = 2.9$, $p = .004$).

Conclusion

Two to eight FM® treatment visits resulted in significant changes in all four outcomes. FM® may be a reliable treatment intervention for PPPD. As a case series the findings are not generalizable, nor can observed changes be directly related to the intervention. Further research, inclusive of a control group, is warranted.

Table.



DHI: Dizziness Handicap Inventory, lower score is better;
TUG: Timed Up and Go, lower score is better, measured in seconds;
Tandem: balance higher score is better, measured in seconds;
SLS: Single-Limb Stance, higher score is better, measured in seconds.

Fascia-congress-2022-tabe-v4.jpg

Ultrasound evaluation of deep fascia thickness: reliability and association with clinically evaluated changes

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Mrs. Shir Schadmy (Ben-Gurion University of the Negev), Mr. yacov weiss (Ben-Gurion University of the Negev), Prof. Leonid Klaichman (Ben Gurion University of the Negev)

Introduction/Background

There is growing evidence of fascial involvement in musculoskeletal pathologies; thus, measuring the fascia's properties is clinically important.

Objectives: 1) to evaluate intra- and inter-tester reliability of sonographic measurements of deep fascia thickness in healthy individuals; 2) to compare fascial thickness between the right and left sides of the body; 3) to assess whether fascial thickness in areas of fascial movement restriction (fascial densification in Stecco's Fascial Manipulation method), differs from contralateral areas with normal fascia.

Methods

Part 1 (reliability study): fascial thickness was sonographically measured in 10 sites (5 on each side), twice by a single examiner to assess intra-rater reliability and once by a second examiner to assess inter-rater reliability.

Part 2 (cross-sectional study): Unilateral fascial movement restrictions were detected in 5 bilateral sites by palpation. Fascial thickness was measured at the site of restriction and its normal contralateral side by a blinded assessor.

Results

21 healthy individuals were evaluated in part 1; 15 healthy individuals in part 2. Intra-tester reliability (Interclass correlation – ICC) values ranged from 0.677 to 0.975; inter-tester ICC values ranged from 0.473 to 0.966. No significant differences in fascia thickness between the right and left body sides were observed in most sites. Significant differences were found between fascial thickness of the site of fascial movement restrictions vs. normal counterpart.

Conclusion

Intra- and inter-rater reliability of sonographic measuring fascial thickness was high, and fascial thickness of the site of fascial movement restrictions was greater than in the normal counterpart. Ultrasonography may be used as a reliable method to evaluate fascial alterations.

Intra- and inter-evaluator reliability of the MyotonPRO for the assessment of the viscoelastic properties of caesarean section scar and unscarred skin

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Ms. Isabelle Gilbert (School of rehabilitation and Department of Family Medicine and Emergency Medicine - Faculty of Medicine and Health Sciences - University of Sherbrooke), Prof. Nathaly Gaudreault (School of rehabilitation - Faculty of Medicine and Health Sciences - University of Sherbrooke), Prof. Isabelle Gaboury (Department of Family Medicine and Emergency Medicine, Faculty of Medicine and Health Sciences, University of Sherbrooke)

Introduction/Background

The MyotonPRO is a tool that usually provides information on the biomechanical and viscoelastic properties of skeletal muscles, tendons, and other soft tissues. The clinical evaluation of viscoelastic properties of the Caesarean section (C-section) scar, such as stiffness and elasticity, is usually carried out using subjective scales and palpation techniques. There is currently no reliable and valid tools that objectively quantify concurrently biomechanical and viscoelastic properties of a C-section scar. The MyotonPRO could fill this gap.

Methods

A reliability study was performed. Women aged 18 to 40 years who had undergone at least one C-section were recruited. Two points, one on the scar and one on unscarred skin, were measured four times successively with the MyotonPRO by three independent evaluators on the same day. The intra-class correlation (ICC) coefficients were estimated using a two-factor ANOVA to determine the inter- and intra-rater reliability. The capacity of the MyotonPRO to discriminate the viscoelastic properties of the C-section scar against unscarred skin was assessed using the Wilcoxon signed rank test.

Results

Nineteen healthy participants completed the study. Intra- and inter evaluator reliability of the MyotonPRO was good to excellent (ICC 0.99-1.00 and 0.87-0.98, respectively). There was no significant difference between C-section scar and unscarred skin in terms of elasticity ($p = .737$). Significant differences between C-section scars and unscarred skin tissue were observed for tone ($p < .001$), stiffness ($p < .001$), creep ($p < .001$), and mechanical stress relaxation time ($p < .001$).

Conclusion

The MyotonPRO is a reliable tool for an objective measurement of the viscoelastic properties of the C-section scar and unscarred skin. The MyotonPRO can discriminate the viscoelastic properties of the C-section scar against the unscarred skin, for tone, stiffness, creep and mechanical stress relaxation times, but not for elasticity.

Early scar remodeling therapy improves outcome in mastectomy patients compared with sham laser therapy? - A comparative study in 34 patients

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Dr. Stephanie Otto (University Hospital Ulm, Comprehensive Cancer Center (CCCU)), Dr. Robert Schleip (Technical University of Munich, Chair of Conservative and Rehabilitative Orthopaedics), Dr. Visnja Fink (University Hospital Ulm, Department of Gynaecology and Obstetrics), Prof. Ardeshir Bayat (Plastic & Reconstructive Surgery Research, University of Manchester, Manchester)

Introduction/Background

A staggering, 25-60% of patients suffer from chronic pain, due to physical, psychological and functional morbidity of post-mastectomy scars [1]. These symptoms often go untreated, leading to a deterioration in quality of life. Nonetheless, the timing (early v. late) plus therapeutic modality of scar management remains ill-understood and further limited by protective attitudes towards fear of adopting early scar manipulation resulting in a falsely presumed deteriorating outcome. In light of this, a novel scar therapy approach will be evaluated for its effect on early intervention resulting in improving scar tissue quality.

Methods

This is a phase II, interventional, prospective, randomized-controlled, two-arm study to be conducted over a 12-week period in 34 patients undergoing bilateral mastectomy. All participants will receive two interventions, with one breast side randomly assigned to the experimental or the controlled intervention. The experimental intervention includes a multimodal manual therapy program (mobilization movement therapy). The control intervention includes 'high-tech' laser therapy (Sham) with green light and gentle touch. Important endpoints such as improvement in scar tissue quality, stiffness and mechanical mobility/elasticity, laboratory validation of scar healing, as well as ROM (Range Of Motion) and quality of life will be evaluated.

Results

Early use of multimodal manual therapy program on the developing scar tissue quality (e.g. stiffness) in women after bilateral mastectomy gives a significantly better result than sham laser therapy.

Conclusion

This approach provides an improvement in early scar management over sham laser therapy by maximizing functional movement, tissue repair, pain-free range of motion, and quality of life.

A Hypothesized Biotensegral Model for Scar Tissue, as Observed in Anterior Cruciate Ligament Reconstruction and Concomitant Knee Surgeries.

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Ms. Brandi Higbee (Sports Medicine Northwest)

Introduction/Background

The knee is a complex joint that relies on strength and flexibility. Over 60,000 Anterior Cruciate Ligament (ACL) surgeries are conducted annually [2]. Research demonstrates scar tissue is a contributing factor to a patient's successful post-surgical rehabilitation [1,2,4,5]. The fascia system is best explained through biotensegrity as a three-dimensional, omni-dependent, Closed Kinematic Circuit (CKC), [3,4,5]. The articulation of the femur and tibia, demonstrate biotensegrity principles [3,4]. How can an ACL scar impact the entire knee's range of motion (ROM)? Is scar tissue three-dimensional and perhaps a localized CKC? The hypothesis suggests a scar's tissue engagement extends beyond the scar's location. That predictable lines of restriction can be palpated in the circumference of the scar. This case study seeks to identify possible implications of how an ACL scar can inhibit a patient's knee mobility, even years after surgery.

Methods

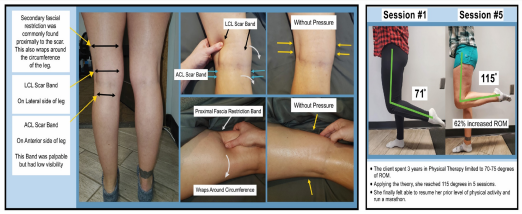
10 Knees were assessed for ROM, ACL scar mobility, and fascia restriction. Concomitant scars were observed if present. Modalities were applied with light to medium pressure with stretching of local tissue along specific directions according to the hypothesis. Sessions were 50 minutes for 5 sessions.

Results

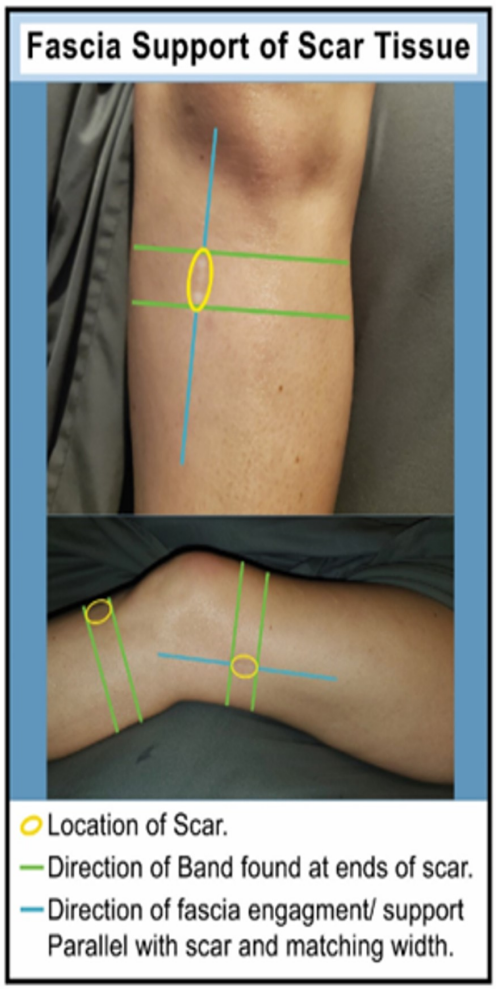
Palpable indentations in the dermis were found along the circumference of the knees. They were in line with the scar's location, even posteriorly, indicating continuity. The width of each line varied from $1/4^{th}$ to an inch. Adhesions were found along these lines. Patients noted decreased pain, increased ROM (40-60%), as well as improved balance, circulation, and ADLs (Even months later)

Conclusion

These channels of tension are deeper than the dermis and superficial to the musculoskeletal tissue. They appear to pin down and moderately restrict all biological structures and tissue in the circumference of the scar, possibly decreasing lymphatic and circulatory flow. This degree of fascia engagement could explain a limb's restriction of ROM and indicate why manual therapy is helpful for rehabilitation. The restriction indicates a biomechanical compensation that creates a retinacula-type structure for the scar. Potentially creating a localized CKC for biofeedback, assistance in wound healing, and localized protection. Enabling new channels for omni-directional force transfer, or to re-tension the area and reestablish a pre-tensioned fascia system.



Final image 1.jpg



Final image 2.jpg

Final image 3.jpg

Fascial quality properties over visual images

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Mrs. Heike Oellerich (FASZIO®), Mrs. Miriam Wessels (FASZIO®), Mrs. Juliane Galke (FASZIO®)

Introduction/Background

Finding complex illustrations about fascia is very rare. To expand knowledge and give better insights in fascia, those are needed. Above all, connections between body structures need to be shown more clearly in graphics. Images are more realistic, but you can't see or detect small details as fibers or cells.

Methods

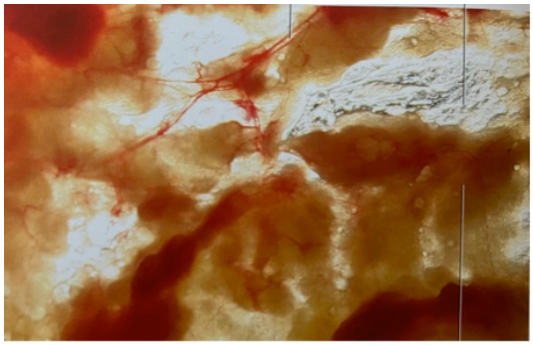
To visualize the fascia in a picturesque way, our graphic designer, Juliane Galke draws up images conceptualized by Heike Oellerich and Miriam Wessels. With the program Adobe Illustrator® she can create small details from actual pictures which makes it look very real. As a template we are using the images from Carla Stecco and Jean-Claude Guimberteau [1, 2]. The final illustrations have been approved by several experts and will be offered by fascialnet.com [3].

Results

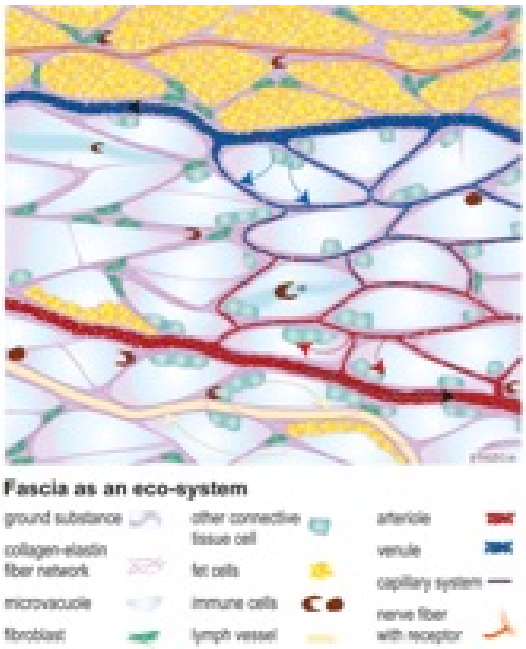
The graphics can illustrate processes in the body better and more detailed. In addition, enzymes, blood vessels or fibers can be displayed. While pictures only demonstrate a rough overview, the graphics are very detailed and present the complexity of fascia.

Conclusion

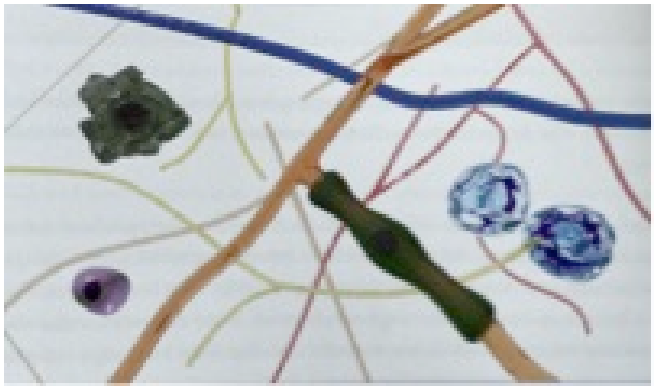
The graphics can illustrate processes in the body better and more detailed. In addition, enzymes, blood vessels or fibers can be displayed. While pictures only demonstrate a rough overview, the graphics are very detailed and present the complexity of fascia.



Carlastecco.jpg



Faszio fascia ecosystem.jpg



Guimberteau.jpg

Relevance of Danis Bois Method (DBM) Fasciatherapy for physiotherapists treating chronic nonspecific low back pain: Design and research methodology.

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Dr. Isabelle Bertrand (Center for Applied Research and Study in Perceptual Psychoeducation (CERAP), Universidade Fernando Pessoa, Porto (Portugal).), Mr. Cyril Dupuis (Center for Applied Research and Study in Perceptual Psychoeducation (CERAP), Universidade Fernando Pessoa, Porto (Portugal).), Dr. Christian Courraud (Center for Applied Research and Study in Perceptual Psychoeducation (CERAP), Universidade Fernando Pessoa, Porto (Portugal).)

Introduction/Background

The implication of fascia in low back pain (LBP) is probable [1-2]; however, the efficacy and specificities of fascial techniques remain to be shown and compared with other physical therapies [3-4]. This clinical study aims to evaluate the efficacy of DBM Fasciatherapy on chronic LBP [5], alone or in combination with physiotherapy, compared to physiotherapy. Approval of the ethics board was delivered in December 2020. Inclusions started on May 2021 and should end in September 2022. Data analyses are expected to take place in January 2023 (Figure 1).

Methods

The primary outcome measurement is pain intensity measured with the visual analogic scale (VAS). Secondary outcomes are functional impairment (Dallas Pain Questionnaire), quality of life (SF-12), anxiety (STAI YA+B), and medication consumption.

Practitioners must be physiotherapists trained in DBM Fasciatherapy (105 hours minimum). Patients must suffer from chronic nonspecific LBP and consult the practitioner for LBP for the first time.

The study has three arms: DBM Fasciatherapy, physiotherapy, and physiotherapy combined with DBM Fasciatherapy. Practitioners are randomized (design in cluster) by the statistical team. The expectations are 20 practitioners per arm, with each practitioner following three to five patients, for a total of 60 patients per arm.

The patients benefit from five sessions of 30 to 45 minutes over a three-month period. The questionnaires are submitted as shown in Figure 2.

Results

Using questionnaires assessing several dimensions of LBP should provide better insight on the clinical relevance of DBM Fasciatherapy and how it can be combined with physiotherapy.

The limits of this study are related to methodological constraints required by the study design such as the need to equate the groups, positive expectations of DBM Fasciatherapy, the need for randomization, practitioners being out of their usual practice, and difficulties to blind the patients.

Conclusion

This study should offer information that will be useful for reflecting on complementary therapies and their association with conventional approaches for LBP. The three arms should provide insights on the efficacy of DBM Fasciatherapy compared to physiotherapy and the relevance of combining the two approaches. The broad range of LBP dimensions evaluated should offer details on this comparison.

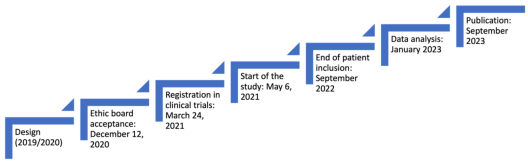


Figure 1: Timeline

Figure1.png

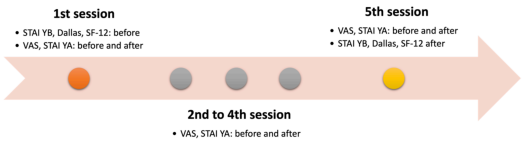


Figure 2: Timeline for administrating the questionnaires

Figure2.png

EMG myofascial continuity activation in active and sedentary

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Dr. Artur Bonezi (Biomechanics and Movement Analyses Laboratory (LIBiAM), CENUR Litoral Norte - Paysandú, Universidad de la República, URUGUAY), Dr. Renata Bona (Biomechanics and Movement Analyses Laboratory (LIBiAM), CENUR Litoral Norte - Paysandú, Universidad de la República, URUGUAY)

Introduction/Background

The fascia is presented in a continuous form. This characteristic gives it the ability to absorb mechanical energies as well, as to propagate these energies between different body parts[1]. Understand the role of fascia musculoskeletal system in dynamics situations is essential. Purpose: analyses the activation of anterior myofascial continuity (AMC) and back (BMC) in TRX exercises at active and sedentary young people.

Methods

Participated 10 active adults (22.6±1.3 years, 168±18cm, 64.3±5.1kg), 10 sedentary adults (23.1± 1.1 years, 176±0.2cm, 65±4.8kg). Surface EMG and accelerometry with Delsys Trigno (2000Hz), at 12 different regions: gastrocnemiuslateralis (GL), bicepsfemoris (BF), posterosuperior iliac spine (EIPS), longissimum (LG), T6, splenius head (EC), tibialisanterior (TA), rectusfemoris (RF), rectus abdominis inferior (RAI), superioris (RAS), pectoralismajor (PM), sternocleidomastoideus (SCM)[2]. Synchronized accelerometry cut off 10 cycles of movement. Electromiography (EMG) data recording while Seniam. Peak of cicle were used to normalized data. RMS values are calculated in Matlab routines to pull-up and push-up TRX exercises [3] (exercises figure 1 and 2). A two-way ANOVA and Tukey's post hoc was performed. In accordance with the Declaration of Helsinki and ethics committee approval the protocol.

Results

High values for AMC: Active adults for TA(28± 7 mV) and ECM (39± 8 mV); sedentary adults in RF (49± 9 mV) and PM (78± 11 mV).

In BMC, high values were found for EIPS (36± 11 mV) for active adults and sedentary adults at T6 (78m± 19 mV). Figure show graphic of sedentary data.

Conclusion

Training increases the efficiency of force transmission[4] in both AMC and BMC during the dynamic situation in this study. The sedentary group showed low values in the central regions for the myofascial continuity system.

It seems that the sedentary group needs higher activations of movement agonists. Differently, the activation patterns of active adults suggest postural and central regions activation and/or connectivity of the musculoskeletal fascia system.

The interactions between agonist, synergist, antagonist, and other adjacent muscles to generate the movement summed to fascia are active components of the system [1,4].

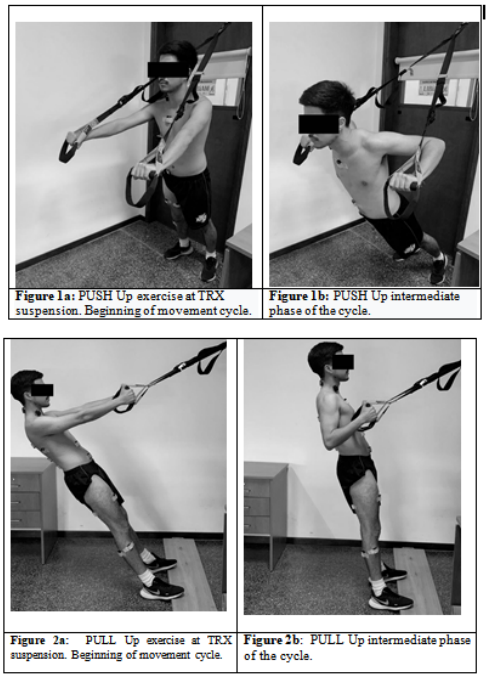


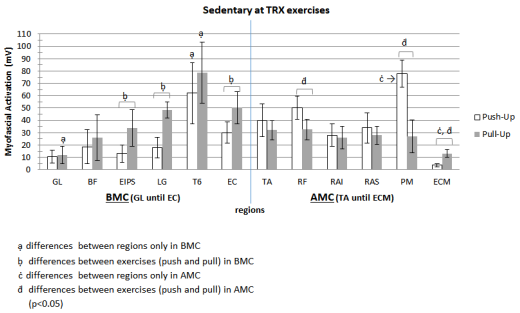
Figure 1a: PUSH Up exercise at TRX suspension. Beginning of movement cycle.

Figure 1b: PUSH Up intermediate phase of the cycle.

Figure 2a: PULL Up exercise at TRX suspension. Beginning of movement cycle.

Figure 2b: PULL Up intermediate phase of the cycle.

Bonezi figure.png



Bonezi graphic.png

Case Study of an Interprofessional Approach to Restore Function for a Rare Left Knee Contracture Post Left Hip Arthroscopy

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Mrs. Amy Whitelaw-VanLeuven (Barnes West County Hospital Physical Therapy), Dr. Devyani Hunt, MD (Washington University School of Medicine, Department of Orthopedic Surgery, Division of Physical Medicine and Rehabilitation), Ms. Alyssa Skala, PT, DPT (Washington University Physical Therapy), Mrs. Lynette Stanko (Barnes West County Hospital Physical Therapy)

Introduction/Background

Immobilization or paresis decreases the normal turnover of the extracellular matrix, increasing its concentration within and between muscular compartments [1]. The increased viscosity of the loose connective tissue may cause decreased gliding between layers of collagen fibers, which may be perceived as stiffness by patients [2]. We describe a case study of a 66 year old man with the inability to flex his left knee past 38 degrees at 7 days post a left total hip arthroplasty treated successfully with an interprofessional approach.

Methods

Physical Therapy initiated 4 weeks post-surgery with 7 degrees improvement in left knee flexion range of motion (ROM) after 2 months. PT services included dynamic splinting, joint mobilization, active/passive stretching, soft tissue mobilization, movement pattern retraining.

Physiatry delivered a high volume steroid injection into the left knee joint followed by a series of trigger point injections to the left lower extremity.

Medical massage therapy was performed for Stecco Fascial Manipulation in the frontal plane.

Lymphatic physical therapy was initiated to resolve chronic post-operative edema with interarticular joint restriction at the left knee and hip.

Results

Functional Outcomes Measure: Lower Extremity Functional Scale: 40% improvement with 9 months of interprofessional treatment. Supine passive knee flexion ROM improved by 89 degrees.

Conclusion

This rare case of a post left total hip arthroplasty left knee contracture required an interprofessional approach to address the joint, muscle, fascial restrictions and lymphatic influence on the knee joint range of motion.

Picture 2.png

Picture 1.jpg

Comparation of fascia chains during dynamic exercises in elderly

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Dr. Renata Bona (Biomechanics and Movement Analyses Laboratory (LIBiAM), CENUR Litoral Norte - Paysandú, Universidad de la República - UdelaR), Dr. Artur Bonezi (Biomechanics and Movement Analyses Laboratory (LIBiAM), CENUR Litoral Norte - Paysandú, Universidad de la República - Ud)

Introduction/Background

The fascia provides connections between different body structures, transmits tension between different body segments, allows structural continuity as well as body balance[1]. Purpose: to evaluate and compare the propagation of electrical activation along the superficial front line (SFL) and back (SBL) in elderly and young during push up and pull up exercises.

Methods

Participated 10 elderly (65±0.5 years, 165±14cm, 80.5± 17.1kg) five female and five male, 10 young (22.6±1.3 years, 168±18cm, 64.3±8.1kg) five female and five male, both groups were physically active. The subjects were instructed in the execution of the movement and familiarized (3-5 repetitions) with the suspension training apparatus (figure 1).

Delsys was used (2000Hz), at fascia chains: gastrocnemiuslateralis (GL), bicepsfemoris (BF), iliac spine (EIPS), longissimum (LG), T6, splenius head (EC); tibialisanterior (TA), rectusfemoris (RF), rectus abdominis inferior (RAI), superioris (RAS), pectoralis (PM), sternocleidomastoideus (SCM)[2,3]. Superficial electromiography followed SENIAM processing, RMS values presented and exercises describers previous [3]. Two-way ANOVA and Tukey's were used. Ethics Committee approved the protocol, in accordance to Helsinki Declaration.

Results

Elderly: great values at TA (70 ± 10 mV) and ECM (50 ±11.5 mV) in SFL, EC (40 ± 8.9 mV) in SBL ($p=0.0002$) in the pull up exercise (figure 2). Young: great values for core regions (RF, RAI, RAS, PM) in SFL ($p<0.0001$) during the push up exercise. All regions of SFL of younger are different between push up and pull up ($p=0.002$) (figure 3).

Conclusion

The propagation of electrical activation was different in the elderly compared to the young. In both chains, SFL and SBL, there were different behaviors both between groups and between exercises. Aging decrease fascia hydration, reduces of body balance and stability [4]. Younger present strongest core as better propagation of force transmission for SFL and SB. The position of the body can generate changes in the transmission function of the fascial tissues.

-*Agencia Nacional de Investigación e Innovación*, UY and *Universidad de la Republica de Uruguay* support this research.

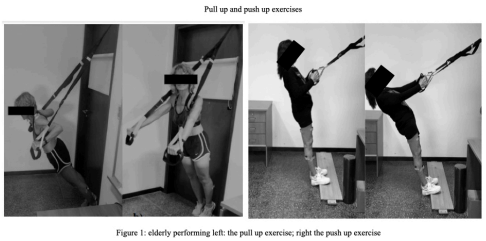


Figure 1: elderly performing left: the pull up exercise; right the push up exercise

Figure 1.jpeg

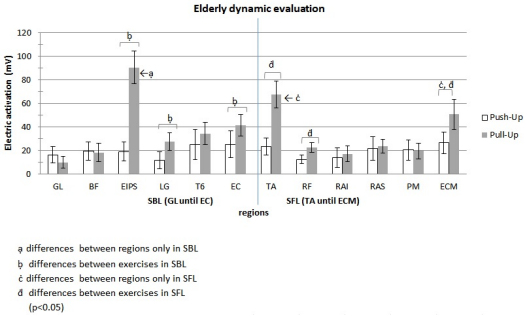


Figure 2 bona graphic.png

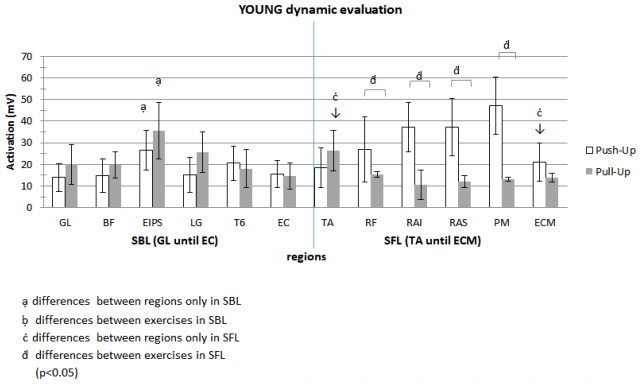


Figure 3 bona graphic2-young.png

The Clinical Anatomy of the Deep and Visceral Fascia of the Neck and the Implications for Manual Therapy: A Narrative Review.

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Dr. Mette Coleman (Fellowship student, North American Institute of Orthopedic Manual Therapy.), Mrs. Julie Ann Day (Fascial Manipulation Association), Dr. Elizabeth Oakley (Andrews University)

Introduction/Background

BACKGROUND While manual therapists predominately treat dysfunctions affecting the musculoskeletal system, a clear vision of how the fascial continuum links those disorders to a global system and, in particular, to visceral structures is crucial for effective treatment.

PURPOSE Our goal was to provide a narrative review investigating the neck's deep and visceral cervical fascial layers, describing their embryology, anatomical organization, and innervation to enhance the understanding of possible clinical implications and regional interdependence of the cervical fascia from a manual therapy perspective.

Methods

APPROACH A comprehensive and multimodal search of available literature was conducted through PubMed, CINAHL, Google Scholar, and Science Direct.

Results

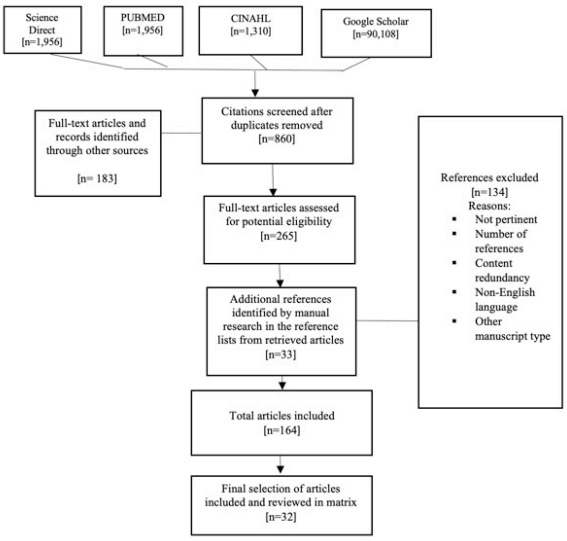
RESULTS After reading 265 full-text articles and 33 additional studies, 32 articles were included for final review.

Conclusion

DISCUSSION The integration of the cervical viscera and the musculoskeletal system may represent a new paradigm for many clinicians. The mesenchymal mesoderm origin of fascia and its spatial organization is significant when considering potential clinical implications linked to the architecture of neck fascia. The deep and visceral fasciae of the neck represent the anatomical continuity of fascia as well as its regional interdependence and explain how treatments aimed at these tissues may affect the autonomic and peripheral nervous systems. Alterations in the tension and thickness of the trilaminar deep cervical fascia are involved in chronic neck pain, tension-type headaches, sequela of head and neck surgeries, temporomandibular dysfunctions, frequent dysphonia, peripheral nerve compression and can potentially alter thyroid and parathyroid activity. All three laminae connect firmly to the underlying muscles, but each lamina has specific functional roles. This knowledge may contribute to manual therapists' vision of the fascial system in their clinical reasoning of pain patterns, related symptoms, and segments.

CONCLUSION This review examines recent peer-reviewed articles to highlight data on the innervation of the deep and visceral fascia of the neck in relation to myofascial pain, nerve entrapment, and the connection between the cervical fascia and the dura mater, all applicable to manual therapy. Understanding the function, innervation, and embryological origin of the cervical fascial anatomy is vital for effective and safe manual therapy.

Figure 1. Flow chart of the literature process.



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Development of a multi-layered polyurethane phantom model to mimic the thoracolumbar layers

Opening of FRC Poster Sessions (+ Abstracts) - Poster

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Introduction/Background

Lumbopelvic pain is one of the most prevalent musculoskeletal disorders. Tissue stiffness measurement techniques can help in evaluation [1]. In order to compare the precision of these tools, there is a need of building a phantom mimicking the different layers of the thoracolumbar tissue. In the literature, phantoms made in polyvinyl alcohol, gelatin, agar, etc. have been made to imitate the stiffness of healthy and fibrotic tissue. However, there is a lack of phantoms that can represent layers of differing tissue. Thus, the purpose of this study was to develop and to define the characteristics of a phantom mimicking layered thoracolumbar tissues.

Methods

A phantom made of four individual layers has been developed to reproduce the four layers of the thoracolumbar tissue which are the cutis (epidermis and dermis), the subcutaneous connective[RS1] tissue, the fascia profunda and the muscle (erector spinae). These layers (300 x 210 mm) were manufactured with polyurethane-based gel from Technogel^{Ò}. The gel is homogeneous and shows memory form behaviour, demonstrating viscoelastic properties. Each layer has a specific thickness [1-3] and stiffness [4-5], to mimic the real morphological and mechanical properties of the tissue. The choices of these characteristics were taken from a literature review. Mechanical, ultrasound, and elastography techniques were used to evaluate the stiffness of each layer.

Results

A thickness of 3 mm, 6 mm, 1 mm and 10 mm was chosen for the cutis, the subcutaneous connective tissue, the fascia profunda and the muscle, respectively (Figure 1A). Gel pads with several stiffness values were manufactured in the range from 38 to 118 kPa to take potential alterations of the tissue into account. Among the different tools ultrasound elastography shows no propagation of the wave due to the homogeneity of the gel while MR elastography was able to measure surface waves (Figure 1B).

Conclusion

The multi-layered phantom could possibly be improved by adding diffusers inside the gel or by using other gel such as gelatin. This tissue-mimicking phantom for the thoracolumbar layers is a first step allowing the comparison of the performances of stiffness measurement apparatus in the context of evaluation of low back pain

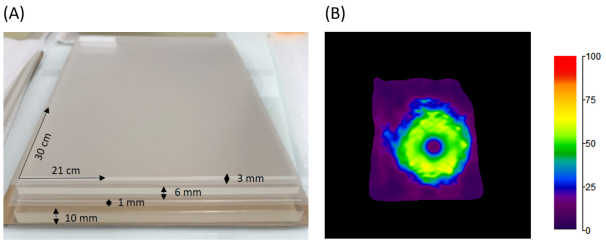

Figure1.png

A novel approach to the management of chronic pain using an emotional-somatic release technique in a yoga context

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Dr. Anne Jensen (Central Queensland University), Ms. Judith Hotek (Private Practice)

Introduction/Background

The link between chronic pain, stress and the fascial system is compelling (Linton, 2000). To effectively help those in chronic pain, physical and mental/emotional aspects must be addressed. Less evident is how, since mindbody approaches (e.g. mindfulness and yoga), show small effect sizes and inconsistent outcomes, compared to pharmaceutical approaches (Hilton, 2017; Johnson & Greenwood-Van Meerveld, 2014; Posadzki, 2011). Consideration of new approaches is warranted. The purpose of this study is to investigate if a new mindbody intervention should be considered for management of chronic pain.

Methods

Participants were recruited from a bimonthly 1-hour gentle yoga class. Along with the gentle movements, participants were invited to participate in a new mindbody intervention that involved feeling specific feelings. The instructor guided participants through feeling several emotions, whose goal was to release pain, muscle tension and fascial adhesions. Volunteers completed a 0-10 numerical pain rating scale (NPRS; 0=No pain, 10=Worst pain ever), before and after class. Using a paired sample t-test the differences in NPRS scores were analysed.

Results

A total of 96 participants provided NPRS feedback, including 16 males and 80. Over the 12 classes, the mean pre-class NPRS was 5.5 (SD=2.3), and the mean post-class NPRS was 2.9 (SD=2.7), which difference reached statistical significance (p<0.01). In all 12 classes, the mean NPRS scores were lower after class (post-class) compared to before class (pre-class), which reached significance (p<0.05) in 10 of the 12 classes. For a summary of NPRS scores by class, see Table 1.

Conclusion

These preliminary results may suggest that this novel emotional-somatic release technique may be useful in lowering subjective pain in those with chronic pain. Limitations of this study include the lack of control group and the inability to blind participants and the instructor. Further research is warranted and should incorporate more comprehensive blinding and a control group. As an example, a control group could participate in only the yoga aspect of the class, while the experimental group would receive the intervention as well as the yoga class. Until such a trial is completed, no causation of effect can be established, and caution is urged when interpreting the results.

				NPRS Scores				
	Participants			Before Class		After Class		
Class #	n	Female	Male	Mean	SD	Mean	SD	*p* -value
1	12	10	2	6.2	2.1	4.1	2.9	**0.021**
2	8	5	3	4.6	2.6	1.9	2.6	**0.004**
3	5	4	1	4.8	1.3	2.2	1.5	**0.003**
4	6	5	1	4.5	1.8	1.8	1.8	**0.034**
5	10	8	2	5.4	2.9	2.8	3.7	**0.013**
6	6	5	1	5.2	2.5	2.3	1.4	0.060
7	10	8	2	5.6	1.6	4.0	2.5	**0.016**
8	7	6	1	5.3	2.1	3.1	2.9	0.078
9	11	10	1	5.9	2.3	4.1	3.0	**0.016**
10	8	7	1	6.6	2.7	2.4	3.3	**0.004**
11	7	6	1	5.4	2.4	1.7	1.8	**0.014**
12	6	6	0	5.5	3.4	1.7	1.4	**0.043**
Totals	**96**	**80**	**16**					

SD, Standard Deviation; NPRS, Numerical Pain Rating Scale

Table 1 - nprs scores by class.png

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DISCLOSURES

The first author was employed by PainWISE as a yoga instructor to teach these movement classes, and as executive director of HeartSpeak International, teaches the emotional-somatic release technique under investigation. The remaining author has no conflicts of interest to declare.

Abstract references disclosures.png

Development and validation of a novel suction device for internal pressure and modulus of elasticity measurements at a constant strain rate.

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Mr. ALVARO TORRES (McGill University)

Introduction/Background

The increasing number of low back pain cases in adults is a common problem of interest. One possible explanation for this issue is spine instability, caused by inadequate intra-abdominal pressure and abdominal wall elasticity. Several direct and indirect intra-abdominal pressure and modulus of elasticity measurement techniques are currently available. However, the most accepted and popularized methods are invasive, inconsistent, or not accepted by the clinical community. The objective of this research is to develop a novel suction device that is reliable, easy to use, and provides accurate readings as a biomedical supportive tool.

Methods

A novel 3D printed suction device was developed, comprised of a piston, pressure sensors, and distance sensors, and relied on application of the extended Henky solution and hoop stress for thick wall cylinders. During testing, three sets of five suction pulses at a fixed suction rate were applied to a testing benchtop model, representative of a human abdominal compartment, for different internal pressures to mimic the abdominal mechanical properties.

Results

The results of internal pressure and modulus of elasticity were calculated and validated with a pressure sensor inside the benchtop model and the use of the tensile test machine. Results indicated consistent measurements for internal pressure and calculated a modulus of elasticity of 85.65 MPa with 87% accuracy.

Conclusion

With these results, the present device stands as a promising tool for clinical support and rehabilitation purposes, as it was able to accurately estimate values close to or within accepted biological ranges

Auto-measurement of thickness of ultrasound imaging of psoas major in asymptomatic participants by speckle tracking in comparison with manual method

Opening of FRC Poster Sessions (+ Abstracts) - Poster

Prof. shwufen Wang (National Taiwan University), Ms. Yean Chu (National Taiwan University), Dr. Yi Chi Wang (National Taiwan University), Prof. Pai-Chi Li (National Taiwan University)

Introduction/Background

Psoas major (PM) is an important muscle synergistic with other deep muscle and fascia, providing trunk stability and hip motion [1]. Ultrasound imaging could provide non-invasive and real-time dynamic imaging of the PM to reveal the muscle function, which is significantly related to motor performance [2]. Using speckle tracking principle, auto-measurement of the thickness of ultrasound imaging (USI) is possible, however, the reliability in measuring PM is unknown.

Methods

Asymptomatic participants (n=19) aged from 21-65 years old were recruited. USI of PM was recoded in supine position. The ultrasound transducer was placed horizontally at L3 level and moving anterior-laterally until the border of PM could be observed. The task of pulling the knee approximating to the hip (PKAH) was performed to induce PM muscle contraction. PKAH was repeated for 3 times. The USI was recoded to measure the resting and contraction thickness. A software using speckle tracking principle was used to tracking the dynamic imaging by manually mark the thickness of one image and auto-tracking the imaging during contraction. The value of 10 frame of resting and 10 frame of contraction imaging were averaged. Intraclass classification (ICC) was analysis using SPSS. ICC between 0.40 and 0.59 is fair; between 0.60 and 0.74 is good; between 0.75 and 1.00 is excellent.

Results

91% (52/3*19) of resting and 91% (52/3*19) of the dynamic USI during contraction could be analyzed by auto-measurement using speckle tracking. During resting condition, the measurement by manual (24.0±4.9mm) and auto-measurement (23.4±4.7mm) is not significantly different. ICC for resting condition is 0.85(0.62-0.94), which is excellent reliability. For the contraction condition, the measurement by manual (29.2±6.2mm) and auto-measurement (27.5±5.6mm) is not significantly different. The ICC during contraction is 0.67 (0.17-0.87) which is good reliability.

Conclusion

Automatic measurement of the dynamic USI of PM during contraction yield good reliability. This auto-measurement method will enhance the application of dynamic ultrasound in clinical assessment of deep muscles.

Effects of a myofascial technique on tissue state and pain intensity of adults presenting chronic nonspecific low back pain

Biomechanical & Surgical Aspects - Poster

Mrs. Karine Devantéry (Centre de recherche du Centre hospitalier universitaire de Sherbrooke (CRCHUS); Faculté de médecine et des sciences de la santé, Université de Sherbrooke), Prof. Mélanie Morin (Centre de recherche du Centre hospitalier universitaire de Sherbrooke (CRCHUS); Faculté de médecine et des sciences de la santé, Université de Sherbrooke), Mr. Julien Grimard (Faculté de médecine et des sciences de la santé, Université de Sherbrooke), Prof. Nathaly Gaudreault (Centre de recherche du Centre hospitalier universitaire de Sherbrooke (CRCHUS); Faculté de médecine et des sciences de la santé, Université de Sherbrooke)

Introduction/Background

The thoracolumbar fascia could be a pain generator, given its rich innervation and the structural/biomechanical changes documented in chronic nonspecific low back pain (cNSLBP) adults[1,2]. Myofascial techniques are commonly used in manual therapy. Their presumed effects include a reduction in tissue stiffness (fascia/muscle) and pain. However, evidence of their effects on tissue and pain are limited[3,4,5]. The objective of this study was to evaluate the immediate effect of a standardized myofascial technique (MFT) compared with a simulated MFT (SMFT) on: 1) the structure and biomechanical properties of the myofascia (ie. adipose tissue, thoracolumbar fascia, erector spinae muscle) and 2) pain intensity.

Methods

A before-and-after experimental study was conducted in 48 participants presenting cNSLBP. Participants were randomized to receive either a standardized MFT or SMFT on thoracolumbar fascia. Main outcomes were collected before (T0) and immediately after (T1) intervention (T1) by a physiotherapist blinded to group assignation, with validated instruments and following a standardized procedure. They included stiffness (*shear-wave sonoelastography*) and thickness (*B-mode ultrasound*) of the myofascia. Pain intensity (*numerical rating scale*) was assessed at T0, T1, T2 and T7 (day 2 and 7 post intervention). Mixed linear model for repeated measures and post-hoc tests with Bonferroni correction were used to assess the effects between groups and measurement times.

Results

The MFT group presented a significant reduction in left erector spinae muscle stiffness from T0 to T1 (mean difference 12.45 kPa; p=0.029). No differences between groups were observed at T1, however SMFT group had significantly less stiffness than MFT group at T0 (p= 0.043). Both groups showed an increase in left adipose tissue thickness from T0 to T1 ($p<0.05$), MFT group showing more changes than SMFT group (p=0.046). MFT group showed a significant decrease in pain intensity from T0 to T1 ($p<0.001$) and T0 to T2 (p=0.008) whereas no difference was observed in the SMFT group. At T1, MFT group had less pain than SMFT group (p=0.024). No differences between groups were found at T2 and T7.

Conclusion

Changes in the structure and biomechanical properties of the lumbar myofascia, as well as transient pain reduction were observed following a standardized MFT in cNSLBP patients.

Authors Index