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Research Paper Review

A Theoretical Framework for the Role of Fascia in Manual Therapy

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ABSTRACT

A theoretical framework for the role that fascia may play in apparently diverse passive manual therapies is presented. The relevant anatomy of fascia is briefly reviewed. Therapies are divided into myofascial ('soft tissue') and manipulative ('joint-based') and comparisons are made between them on a qualitative basis using measures of pain, function and 'autonomic activation'. When these three outcomes are evaluated between therapies it is observed that they are usually comparable in the quality, if not the quantity of the measures. Viewed from a patients' perspective alone the therapeutic benefits are hard to distinguish. It is proposed that a biologically plausible mechanism which may generate a significant component of the observed effects of manual therapies of all descriptions, is the therapeutic stimulation of fascia in its various forms within the body. Such considerations may help explain why diverse therapies apparently give comparable results.

ANALYSIS

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Background Information
A large number of manual therapy techniques exist. Fundamentally (albeit simplistically), techniques can be separated into two broad camps: those that are joint-based (manipulative techniques – used by chiropractors, osteopaths and physiotherapists) and those that focus on myofascial structures (muscle energy techniques [MET], rolfing, osteopathic soft-tissue techniques…the list goes on and on).

This paper endeavours to discuss the common elements between these apparently diverse techniques by describing how fascia may be involved in how these therapies impart their therapeutic effects. The authors of this paper did not attempt to be entirely comprehensive, but rather strived to provide a testable framework that will allow clinicians and other researchers to compare therapies and promote future discussion.

ANATOMY OF FASCIA

Fascia is the connective tissue that covers and provides shape for the human form. Its connections are expansive, as it envelops almost every tissue in the body. Most manual medicine providers think of fascia in terms of its relation to muscle tissue. From this perspective, it is almost impossible to structurally separate the two tissues – fascia surrounds muscle, helps to give it shape and structure, as well as contributing to its function. Fascial fibers are densely intertwined with muscle tissue. Further, fascia is highly intertwined with the autonomic nervous system (ANS), as both myelinated and unmyelinated nerve fibers have been found and documented in the literature. Other research groups have found a rich vascular and nerve supply, and Ruffini and Pacinian corpuscles interwoven through the limb and lumbodorsal fascia, respectively. Additionally, it has been shown that small nerve fibers attach to the collagen fibers in fascia – these are assumed to be stretch receptors. The take home point here is that fascia is intimately connected to both the CNS and ANS.

The fascial network is maintained by fascia's chief cell: the fibrocyte. These cells respond to mechanical stretch through a process called mechanotransduction. This theory posits that mechanical stresses applied to any cell induce changes in cell morphology. Actual mechanical changes in the length of fibroblasts have been observed to occur after 2 hours of applied tension (1). However, changes in tissue quality, experienced by patients and practitioners alike, are said to occur with 90-120 seconds of manual therapy (2). It has thus been theorized that changes in tissue quality experienced with manual therapy are not biomechanical. Rather, they may be neurophysiological in nature.

Fascia, epimyseum and perimyseum also contain contractile filaments called myofibroblasts. These filaments give fascia the ability to alter tissue tension, as well as contract and relax within short time scales – phenomenon commonly observed in practice and in past research.

CLINICAL APPLICATION & CONCLUSIONS

Therapeutic Interventions: Manipulative Therapies

Therapies such as high velocity, low amplitude (HVLA) manipulation and joint mobilizations are considered here. Various research groups have proposed an association between myofascial trigger points and articular dysfunction. They propose that joint hypomobility is mainly due to soft tissue restriction, because of a positive feedback loop via the CNS. This association is thought to explain why techniques such as post-isometric relaxation (PIR) and reciprocal inhibition (RI) work well to improve joint dysfunction (in conjunction with HVLA and mobilization techniques). This is something you have likely observed in your practice.

Mobilizations and manipulations affect not only the targeted joints, but also the surrounding musculature and its fascial coverings, the deep fascial interconnections and ligaments. Due to this intimately connected anatomy, the joint, which is considered to be the primary source of afferent stimulation, may in fact not be. More receptors are found in the collection of fascia surrounding the joint that in the joint itself (in most, if not all, cases). Because of this, absolute joint motion may not be the largest component in the positive responses attained from manipulation or mobilization. Clinicians should consider the possibility that part of the benefit may be gleaned from changes to the fascia and connective tissue – whether mechanical, contractile, nociceptive (or, some other factor, or a combination of these).

Therapeutic Interventions: Myofascial Therapies

Mechanically based techniques, such as Graston Technique and deep tissue work, rely on the mechanics of fascia, aiming to 'break up' adhesions leading to a speedy return to normal function and tissue quality. These therapies intend to create a permanent alteration of tissue structure. This is achieved, at least partially, by fibers of collagen slowly sliding past one another in a response to stretch (know as creep), creating a loosening of cross-links between collagen fibers. This changes the character

of the tissue (making it softer) and may, in the case of Graston Technique (or other instrument assisted techniques), cause the release of inflammatory mediators to apparently speed healing.

As stated previously, a mechanical change in tissue is likely not what is causing the therapeutic effect; these positive effects are likely neurophysiological in nature (3, 4). To illustrate, some studies (5) have shown that PIR does not alter tissue length, while others have purported not only a neurophysiological response, but a small mechanical and plastic deformation of the local fascia. Various research groups have demonstrated that myofibroblasts respond to cytokines, other components of the ECM, and to mechanical tension. Tension and stretching causing stimulation of C-fibers in the epimysium layer may cause a reflex via the CNS, reducing the excitability of the gamma-muscle spindles (6), thereby reducing 'muscle tone'.

Additionally, manual therapy can alter the tissue tonus and change the consistency of ground substance. Because of this, manual therapies may affect the mechanical properties of fascia by altering viscoelastic, shock-absorbing and energy-absorbing properties.

Many authors have said that the common ground between manipulative and myofascial therapies lie in the dorsal periaqueductal grey (dPAG), which is known to be implicated in autonomic regulation and descending inhibition. However, very little is known about the afferent signals emanating from fascia to the dPAG. More research is required in this area.

Afferent signals from fascia originate from a number of mechanoreceptors, including Pacini corpuscles, which respond to fast stimulation (rather than slow, steady pressure), and Ruffini fibres, which respond to slow and steady stretch. Schleip (3, 4) speculates that SMT and vibration have an effect on the former, while myofascial techniques take their effect on the latter. However, the presence of type III and type IV nociceptors, both of which have high and low levels of stimulation, are also found in fascia, complicating this theory. It could be that low level pressure on the skin (ex. massage) stimulates the low level type III and IV mechanoreceptors, while HVLA stimulate the high level mechanoreceptors. At this time, the data is simply much too sparse to draw a complete conclusion.

The authors of this paper suggest, and it could be convincingly argued that, taken as a whole, the evidence favors the idea that fascia is a primary mechanism behind how these two broad types therapy create their therapeutic effect. More research is required to help clinicians integrate emerging knowledge of this expansive tissue network into our daily practices and patient care.

STUDY METHODS

Databases such as AMED, CINAHL, DC Consult, ICL, ISL, MANTIS and PubMed were accessed to find research articles. Google Scholar and other journal websites were utilized to search for articles. The literature found reflected the mass of information on the anatomy and property of fascia, and how this tissue is affected by manual therapy techniques.

STUDY STRENGTHS/WEAKNESSES

This commentary is not comprehensive from a research perspective. Rather, it is simply a taste of the growing body of literature on how manual therapy can affect fascial tissues and the potential health of our patients. Its strength lies in its referencing – the references in this study are certainly recommended reading!

Additional References:

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