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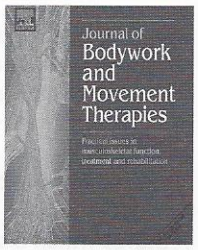

FASCIA SCIENCE AND CLINICAL APPLICATIONS: HYPOTHESIS

A theoretical framework for the role of fascia in manual therapy

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Summary 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.

Introduction

Aims and objectives

There are many manual therapies available for patients to choose from with considerable variation between techniques. This paper considers these techniques as being divided into 2 basic groups, with joint-based referred to as 'manipulative techniques' on one hand and on the other localised working of skin and connective tissues referred to as 'myofascial techniques'. Manipulative techniques may be characterised by the application of a high velocity low amplitude (HVLA) thrust or repetitive joint motion (mobilisations) characteristic of chiropractors, osteopaths and some physiotherapists, whereas myofascial therapies are considered to affect the 'static' tissue in between the joints and include a number of therapies such as osteopathic soft-tissue techniques, muscle energy techniques (MET) and Rolfing.

At this point we make a distinction in the hierarchy of respectively, techniques, systems and professions. Taking techniques first, whilst definitions vary between authors

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(for example, see Farrell and Jensen, 1992 on manipulations and mobilisations) techniques form the core repertoire of treatment options available to the manual therapist. Systems (for example, chiropractic or structural integration) may be considered to be philosophical or methodological approaches to diagnosis and treatment with manual therapy and generally claim to have unique features which distinguish them (for a review, see Coughlin, 2002). Finally, manual therapy is not exclusive to any profession (Farrell and Jensen, 1992) and each profession may have associated with it a variety of approaches and techniques. In this paper we restrict ourselves to consideration of techniques as it is through the technique that the therapeutic intervention is delivered to the patient. The perspective of the patient is important, because they are the recipients of the techniques irrespective of the system or profession from which they have originated, and practitioners of all therapies regard the welfare of patients as the highest priority.

This paper considers that there may be common elements between apparently diverse techniques, by linking the anatomy of fascia with the mechanisms thought to lie behind therapies. It is not intended to be a comprehensive review of the available literature, and the research referred to is used to illustrate the ideas in the paper. Its aims are to provide a testable framework within which therapies may be compared and to promote discussion amongst clinicians and researchers about apparent distinctions and similarities between therapies.

Method

The literature on the anatomy and properties of fascia was reviewed together with the literature on selected manual therapeutic techniques and their outcomes. Databases (AMED, CINAHL, DC Consult, ICL, ISI, MANTIS, Pubmed), Google Scholar and journal websites (Elsevier ScienceDirect and Wiley SpringerLink) were searched using keywords and for authors known to actively publish in the field.

Anatomy of fascia

This section briefly describes some features of fascia of relevance for this paper. An excellent general summary of the anatomy of fascia is given by Cantu and Grodin (2001).

Fascia is intimately involved with the autonomic nervous sytem (Barnes, 1997; Schleip, 2003a). Staubesand in 1997 reported by Schleip (2003b) found both myelinated and unmyelinated fibres in fascia, probably of autonomic origin. Stecco et al. (2008) found that the outer layers of the limb deep fascia contained a rich vascular and nerve supply with intrafascial nerve fibres seen throughout the deep fascia. They also observed Ruffini and Pacini corpuscles, confirming the earlier findings of Yahia et al. (1992) in relation to the lumbodorsal fascia. There were also small nerves oriented perpendicularly and attached to the collagen fibres which they presumed to be stretch receptors, but they also found some small nerves which displayed the morphological characteristics of autonomic nerves, agreeing with the earlier work of Staubesand. Table 1 summarises the fascial mechanoreceptors (after Baldry et al., 2001; Cantu and Grodin, 2001; Graven-Nielsen et al., 2004) and Figure 1 illustrates these receptors and their responses.

The fascial network of collagen and ground substance is maintained by fibrocytes. It is known that fibrocytes regulate interstitial fluid volume and pressure (McAnulty, 2007) as well as the extracellular molecular components and thus the composition of ground substance. It is also known that fibrocytes respond to mechanical stretch through mechanotransduction as described by Ingber (2003) and others (Chiquet et al., 2007; Eagan et al., 2007). Langevin et al. (2005) verified the mechanism of mechanotransduction (in relation to mouse tissue) *in vivo* i.e. that applied mechanical stress induces a change in cell morphology but found that the timescale in which the fibrocytes responded was in the order of 2 h. Barnes (1997) however notes that when performing myofascial release the response is felt in 90–120 s, and therefore any matrix adaptations initiated by a change in mechanical stress apparently take too long to occur to explain the observed immediate benefits of mechanical therapies. Fibrocytes may further transform themselves into myofibroblasts (Hinz and Gabbiani, 2003) through this mechanical tension, as observed in wound healing. However, myofibroblasts also appear to be a *normal* component of fascia (Schleip, 2003b reporting Staubesand in 1996) and importantly they are also observed additionally in epimysium and perimysium (Schleip et al., 2006). The contractile nature of these cells appears to give them ability to alter tissue tension, through

Table 1 Fascial mechanoreceptors affected by pressure.

Fibre Type	Location	Characteristics
Aβ (Type II)	Many types of endings in skin. Pacini and Ruffini corpuscles in superficial and deep fascia.	Large diameter myelinated fibres including Pacini corpuscle (vibration) and Ruffini corpuscle (steady stretch).
Aδ (Type III)	Skin, muscle and superficial and deep fascia.	Small diameter myelinated fibres with a high threshold, some of which may respond to heat. Conduction speed is slower than Aβ fibres. There are 2 subgroups of fibres, one having a high threshold to mechanical stimuli but others responding to light pressure.
C (Type IV)	Skin, superficial and deep fascia.	Unmyelinated fibres with multimodal receptors affected by chemical, mechanical and thermal stimuli. As with type III fibres there are 2 subgroups having high and low mechanical thresholds.