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Practical issues in musculoskeletal function, treatment and rehabilitation

EDITORIAL

Somatic dysfunction and fascia's gliding-potential

Most practitioners who employ manual means of treatment will have experienced the phenomenon of palpating soft-tissues that appear to be more densely indurated, less pliable, than would be anticipated, relative to the age and physical status of the individual.

In osteopathic medicine this experience is clustered, together with several other indicators, to suggest an area of what has been termed 'somatic dysfunction' (Rumney, 1979). Somatic dysfunction is defined as "*impaired or altered function of related components of the somatic (body framework) system: skeletal, arthrodial, and myofascial structures, and related vascular, lymphatic, and neural elements.*" (Ward, 2003).

The osteopathic model of somatic dysfunction, that attempts to make sense of such a finding, has been summarized by the acronym STAR (Dowling, 1998).

This includes:

"S" = sensitivity (abnormal tenderness)
"T" = tissue texture change such as altered tone, laxity etc.
"A" = asymmetry (malalignment)
"R" = range of motion and pliability reduction (e.g. contracture)

The STAR designation offers no diagnosis – only an observation that all may not be well in the tissues being evaluated, demanding further investigation as to causal, aggravating and maintaining features – whether local, global or distant.

Other descriptors in the literature for this phenomenon of tissues that have a perceptibly different (from 'normal') feel, include terms such as fibrotic (Purslow, 2010), densification (Borgini et al., 2010), indurated (Mosby, 2012), – and others.

The STAR palpation model, and it's constituent elements, have been partially validated by Fryer et al. (2006), and it is widely employed in osteopathic manual medical assessment.

Investigation of the possible etiological and maintaining features of somatic dysfunction might include any of a wide range of observational and functional tests. These might involve evaluation of painful features, altered motor control, and/or modified 'end feel' qualities, as tissues are taken towards restriction barriers.

More recently, the degree of normal gliding potential between fascial, visceral and muscular tissue layers has been recognized as a potentially important form of somatic dysfunction.

Sliding, gliding functions as part of the "R" feature of somatic function and dysfunction

An as yet relatively under-explored function of many soft-tissues, involves their ability to slide, glide and generally to be able to accommodate to the movements of adjacent structures.

Loose connective tissue (also known as areolar or superficial fascia) is relatively less structurally organized, as compared with dense connective tissue layers. The processes involved in thickening, and densification of the loose connective tissues, and its' extra-cellular matrix, appears to correspond to the loss (or reduction) of sliding potential between dense fascial layers and adjacent structures (Pilat, 2011).

For example, Langevin et al. (2011) has shown that the density of superficial thoracolumbar fascia is markedly increased in individuals with low back pain, as compared with those without low back pain. In this particular study the process of thickening, densification appeared – in ultrasound video images – to correspond with a marked reduction in the sliding potential of the deeper layers of the thoracolumbar fascia, in individuals with low back pain.

More recently Luomala et al. (in press) have demonstrated the presence of thicker ('denser') layers of loose-connective tissue in both the sternocleidomastoid, and scalene muscles, in individuals with chronic neck pain, compared with those without neck pain.

Stecco et al. (2013) have noted: "*Ultrasound indicates that the main alteration in the deep fasciae is increased*

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loose connective tissue between the fibrous sub-layers. It is for this reason that, in indicating fascial alteration, we do not use the term "fibrosis", which indicates an increase in collagen fiber bundles. We prefer the term "densification", which suggests a variation in the viscosity of the fascia."

Assessment of loss of glide potential?

Assessment of changes in the gliding potential of tissues remains a work-in-progress. Clues are apparently deducible by means of a matching of manually assessed tissue changes, noted during palpation, with symptoms reported – such as pain and/or restriction on movement.

Observation of posture, and functional motion, may offer additional opportunities for identification of restrictions existing between fascial layers (Myers, 2013).

Imaging and tissue change

In addition to palpation and functional assessment, imaging, utilizing a range of technologies, is being employed to identify objective tissue changes – including use of real-time ultrasound, and its' color-coded variant, sonoelastography Such approaches are particularly useful where visualization of scar tissues, or altered density, are concerned – pre- and post-treatment.

For example Martínez Rodríguez and Galán del Río (2013) have observed – substantiated by imaging – that poor myofascial repair processes, following tissue trauma, may result in excessive degrees of connective tissue change, although in their observation such changes involve fibrosis rather than densification: *"Fibrosis can be defined as the replacement of the normal structural elements of the tissue by distorted, non-functional and excessive accumulation of fibrotic tissue."*

Imaging caution

Boon et al. (2012) have observed that the *"monographer has the ability to combine sonopalpation (direct pressure over structures of interest) and receive real-time feedback from the patient. The ability to palpate and visualise simultaneously – for example during muscle activation – is a unique feature of sonography."*

While the non-invasive visualization of soft tissue behavior and structure is a compelling clinical and research advance, providing as it does objective evidence of many mechanical attributes and characteristics of both normal and pathological tissues, a caution is required, as the element of operator bias needs to be considered (Konofagou et al., 2003).

Since the operator manually controls the transducer, variations in the compressive pressure, orientation or direction of the ultrasound transducer can all potentially modify the resulting echo-signal images (Drakonaki et al., 2009). However, as new more automated imaging methods evolve, the subjective nature of currently utilised approaches, should reduce the risk of inadvertent bias (Gennisson et al., 2013).

Restoring glide function and reducing fibrosis

Roman et al. (2013) have offered evidence that manual (or instrument assisted) therapies that incorporate tangential oscillation, and perpendicular vibration, produce greater increase in levels of hyaluronic acid which forms a fluid layer separating deep fascia from muscle – than does application of manual shear force alone. This leads to greater lubrication produced in the extracellular matrix between fascial planes and viscera or muscle, or between dense fascial layers, improving the sliding system, and encouraging more efficient function.

In practice Martínez Rodríguez and Galán del Río (2013) have demonstrated (via sonoelastography imaging and clinical changes) that sustained, non-invasive manual engagement with associated restriction barriers can result in relative normalisation of restriction, following trauma. *"Combined use of torsion, shear, traction, axial and compressive vectors on scar tissue…in order to generate a maintained tension, against a barrier"* can lead to relative normalization of both structural and functional changes.

In a prospective, randomized, double-blinded study Parmar et al. (2011) compared isotonic eccentric stretching in post-operative settings (following femur fracture) with passive stretching methods. The objective was to: *"promote orientation of collagen fibers along the lines of stress and direction of movement, limit infiltration of cross bridges between collagen fibers, and prevent excessive collagen."*

Both methods proved successful during post-operative rehabilitation, however the isotonic eccentric stretching method produced a greater degree of pain reduction, and an enhanced tendency towards a greater range of motion – as compared with static stretching methods.

To summarise:

- The ability of fascial planes and muscles to glide on each other, or against other tissues, is a function that can be reduced or lost, for a variety of reasons.
- Identification may be possible of such dysfunctional changes via sensitive palpation and observation methods
- Novel imaging methods can offer real-time evidence of dysfunction – but is potentially subject to operator bias
- The potential also exists for restoration of normal function via a variety of manual methods

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