FASCIA
AS A SENSORY ORGAN:
Clinical Applications

by Robert Schleip

It is now recognized that fascial network is one of our richest sensory organs, the fascial element of the muscle is innervated by approximately 6 times as many sensory nerves than its red muscular counterpart. Fascia contains four types of sensory nerve endings, which are responsive to mechanical stimulation: Golgi organs, Ruffini receptors, Pacini corpuscles, and Interstitial receptors. These sensory nerve endings can be called fascial mechanoreceptors, meaning that they respond to mechanical tension and/or pressure. These mechanoreceptors have been found in intramuscular, as well as extramuscular, and fascial tissues. Therapists working with fascial tissue now understand that these mechanoreceptors respond to various kinds of touch (Table 1). This article provides examples of how specific techniques can be utilized in order to optimize an intended stimulation of specific mechanoreceptors in fascial tissues.

Stimulation of muscle spindles

The 'petrissage' from Swedish massage – a form of deep, rhythmical kneading – that can be best applied for this purpose. In order to use the myotatic reflex arc in a muscular relaxation direction, the therapist uses both hands to grab hold of two larger muscular tissue portions and moves them towards each other in a compression manner. Using a more rhythmical style, the therapist attempts to quickly decrease the length of the muscle spindles in the zone between the two hands. A different version of this basic technique is sometimes used in sports massage for the purpose of increasing muscle tone before an athletic performance. In this case the two hands move away from each other in a rhythmic fashion, thereby inducing a stretching effect – rather than compression – in order to ignite the well-known myotatic reflex in a way that stretches muscle spindles and thereby exerts a stimulatory effect on the active muscular tonus regulation. In contrast, in the style described here, the two hands attempt to create a rapid tonus decrease within the spindle fibres, which is expected to induce a tonus-decreasing effect on alpha motor tonus activity.

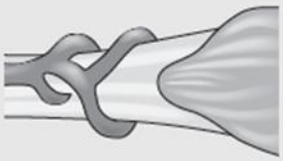
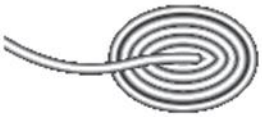
Stimulation of Golgi receptors

In myofascial mobilization it is typical that slower tissue deformations are created, with a focus on relaxation rather than on tonus augmentation. The Golgi receptors are a good target for such an approach, since stimulation of these neural receptors tends to induce muscular relaxation in those muscle fibres that are mechanically linked with the area of stimulation. However, when applying stretch in tissue areas that are serially arranged with soft and compliant muscle fibres, all stretch can be 'swallowed' by the softer myofibres (rather than the more rigid collagen fibres) and the Golgi receptors within the collagenous fibres may not sufficiently lengthened.

One way to prevent this seems to be a cross-fibre mobilization across the muscle belly area (rather than the muscular attachments) in order to minimise the spreading effect towards the compliant muscle fibres. A common technique, often taught as part of the Bowen method, involves cross-friction across the muscle bellies, which might induce at least a temporary regional muscular relaxation via stimulation of related Golgi receptors. If one wants to work within the more tendinous areas, another approach is advocated. Here the client is asked to activate the related myofibres against external resistance, while the therapist applies a moderate to strong stimulation (usually 10–50 N/cm2) to the tendinous collagenous tissues that are tensed by the respective muscular contraction. One way of achieving this seems to be by using the post-isometric relaxation technique, as frequently used in the proprioceptive neuromuscular facilitation or (PNF) concept. Here the client is usually instructed to contract a joint musculature against the handheld resistance of the therapist for a period of between 60 and 90 seconds and a 'tissue release' is often observed during the subsequent relaxation. Sometimes there is also a brief antagonistic contraction included immediately before the final relaxation.

A more advanced and proprioceptively stimulating approach was taught as 'pandiculations' by Thomas Hanna (1998). Here the therapist also provides an

Table 1. Overview of the different sensory receptors in myofascial tissue, the responses triggered by their stimulation, and the manual techniques that can evoke those responses. From Schleip (2017), Reproduced with permission.

Receptor	Triggered response	Potential usage in manual therapy
 Muscle spindle	• Tonus decrease in related myofibers	• Petrissage element of Swedish massage: compressional moves toward muscle belly
 Golgi receptor	• Tonus decrease in related myofibers	• Cross-fiber techniques at muscle belly • Postisometric relaxation techniques • Hanna's pandiculation
 Pacini corpuscle	• Enhancement of local proprioception, plus – hopefully – improvement in local neuromuscular self-regulation	• High-velocity manipulations • Recoil technique • Harmonic technique • Trager work
 Ruffini endings	• Inhibition of sympathetic activity	• Classical myofascial 'melting' work (e.g., Rolfing)
 Interstitial free nerve endings	• Tactile C-afferents: affiliation, well-being, pain-inhibition • Threatening pain: withdrawal response and pain sensitization • 'Relieving pain': orienting response, pain desensitization	• Slow skin-stroking techniques • Periosteum stimulation: induction of novel nociceptive stimulation within same fasciatome

external resistance to the actively moving body part of the client, however, client and therapist cooperate in such a way that the client is instructed to move against the resisting hand of the therapist in a super-slow continuous fashion. Subsequently the respective limb is pulled back towards the body, again against a moderated resistance of the therapist; and this movement is also performed in a smooth and super-slow fashion. Client and therapist direct most of their mindful attention toward achieving a non-erratic movement quality (i.e., without any perceived 'stop and go' interruptions). As soon as such an erratic moment is detected, the client is instructed to return to the position immediately before it happened, and then try to repeat the movement at an even slower speed and, hopefully, with less bumpy movement orchestration. This active resistance phase – with the client participating in both concentric as well as eccentric activation – is usually practiced for between 60 and 90 seconds and – as in the PNF technique – is followed by a brief moment of isometric contraction of the antagonistic muscles. In addition, the therapist provides a strong myofascial stimulation (but not beyond the comfort zone of the pressure–pain tolerance of the client) to the fascial tissue area within

the tendinous portions of the related musculature.

For example, when sitting, a client may be instructed to slowly raise her right shoulder against the external resistance of the therapist. Then she is asked to gradually lower her muscular activation in order to allow the downward pushing force of the therapist to gradually lower the shoulder to the starting position. Each of these two movements should occur in a smooth, uninterrupted, continuous manner, lasting at least five seconds each. Whenever a tiny 'jerk' is detected by either the client or therapist, the movement is repeated with increased mindfulness from the position shortly before it occurred. During all of this the therapist works with a deep stretching myofascial release approach on the aponeurotic insertions of the upper trapezius on the superior nuchal line of the cranium. After approximately 60 to 90 seconds the myofascial hands-on work is finished and the client is asked to perform a downward active shoulder movement for one or two seconds only, with her elbow pressing isometrically against the resisting hand of the therapist. Finally, the client is asked to relax and to subjectively compare the perceived height and sensation of the treated shoulder with the other shoulder.

Stimulation of Pacini corpuscles

The following example is for the stimulation of spinal joint receptors in the cervico-thoracic region. The client is asked to lie comfortably on her right side with the therapist sitting behind the client's back. The therapist starts with a prominent spinal process, for example, from C6, C7, or T1, and lifts this process a few millimetres away from the table toward the ceiling. It is then wiggled two to four times in a random manner before it is lowered again to the starting position. This is repeated in slightly different lifting directions, varying between slightly more cranial and more caudal lateral directions. The lifting amplitude is calibrated so that the maximal delay occurs between the movement of the manipulated vertebrae and its two adjacent neighbours. The intention of the therapist is to show the central nervous system of the client that the spine in this region is not a rigid column but rather a series of mobile elements that are arranged like a string of pearls. If successful, this may support a related reformation of the respective cortical mapping of what is called 'body schema' representation in the brain.

One or two minutes are spent in this way on each vertebra before the neighbouring vertebra is approached in a similar manner. The natural breathing movements of the client are carefully observed. Sometimes during a slow lifting movement of a thoracic spinous process a normal inhalation movement is slightly increased in time and amplitude (maybe 10% more than usual). If this happens, the therapist may play with the concept of 'taking a ride' on this extended inhalation and lifting the vertebra a tiny bit more (and for a second longer) at the apex of the inhalation movement. If successful this may result in a release-like response around the costo-vertebral joints of the respective vertebrae on the side on which the lifting movement causes a temporary decompression.

Note that it may take 10 minutes to apply this technique to the spinous processes of, for example, C6 to T5. In most cases the technique does not need to be repeated for the opposite side-lying position – at least not in those cases for which the main intention is to produce a more refined representation of this spinal area in the client's body schema in terms of a mobile rather than rigid body portion.

Stimulation of Ruffini corpuscles

Here a slow but firm touch is provided that exerts a lateral tangential shearing motion to the skin, as well as to fascial membranes below the subcutaneous loose connective tissue. Once the pressure achieves a slow gliding of the therapist's hand in relation to the skin of the client, the speed of this gliding motion is calibrated toward the slowest possible continuous speed. For a beginner this may be a speed around 5 cm per second, while for a more experienced therapist much slower gliding motions of around 1 cm per second or less are possible. If possible the client can be instructed to assist this technique by conducting a slow active movement participation that provides an expansional stretch to

Figure 1. Example of the use of AMPs (active movement participation) with the client during a Ruffini-oriented release technique. While deeply melting with one hand into the tissue and specific joints of the upper thorax, the therapist guides the client to support his myofascial work with subtle and random slow-motion participations. Here the client performs a lateral bending movement of the thorax combined with a cranially directed extension (following the elbow) in order to increase an opening of the thoracic vertebral joints. Photo (c) Schleip.

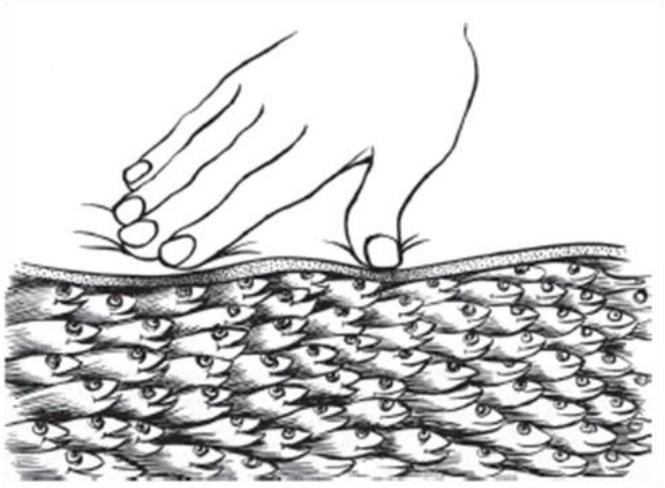


Figure 2. Myofascial tissue illustrated as a school of fish. A therapist working with myofascial tissue may feel several of the motor units responding to the touch. If the therapist then responds supportively to their new behaviour, the working hand will feel other fish joining this release, and so on. Photo (c) Schleip.

the working area (Fig. 1).

During the gliding motion, the therapist feels for the optimal vectorial direction of his/her hands – whether slightly more vertical/horizontal, more distal/proximal, or more medial/lateral, etc. – at which the local tissue relaxation response spreads out most readily toward a larger, more spacious tissue response. The analogy of a school of fish can be employed to foster the related empathic palpatory sensitivity of the therapist (Fig. 2).

Stimulation of free nerve endings

The recent discovery of the tactile C-afferents in the dermis of the hairy skin of humans (and other mammals) has led to an increase in research on 'affective touch'. Based on this, therapeutic methods – usually involving gentle and slow stroking – are explored, and these provide the cortical insula with a sensation of nurturing touch, also called 'social touch', which can induce a general sense of well-being and relaxation in the client. The depth of responses can involve profound shifts in immunological, psychosocial, and neurophysiological parameters (McGlone et al., 2014). For related instruction on this intriguing aspect of therapeutic touch the reader is referred to the new literature on this subject, for example, Lloyd et al. (2015) and McGlone et al. (2014).

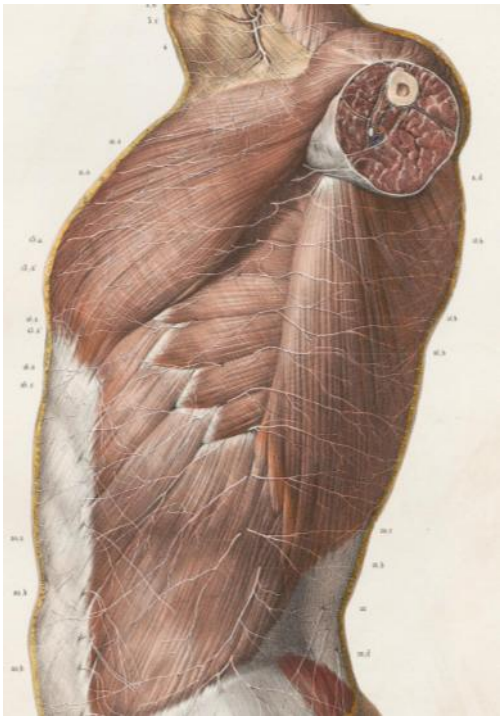
Another method for stimulation of C-fibres or A-delta fibres (both terminating in free nerve endings) targets the high density of their related nerve endings in the periosteum (i.e., the fascial envelope around bones). This approach is inspired by the ancient Chua K'a method, as taught by Oscar Ichazo (Hertling & Kessler, 2006). Here strong pressure is applied to bony surfaces until a slight sympathetic activation is observed in the client. This response may involve a slight dilation of the pupil, an increased and elongated inhalation, an increased circulation in the face, and/or a turning of head and eyes toward the respective body part. It should be an expression of the so-called 'orienting response' in behavioural biology, during which an animal responds to a new challenging stimulus by straightening its neck upwards toward the perceived place of

stimulation in a general state of alertness. Care should be taken that an avoidance-and-withdrawal response is avoided, which expresses itself in very different behaviour involving a flexion movement of the trunk and limbs, a turning away from the perceived stimulus location, a shortening of the neck, and either a halt in breathing or an augmented breathing speed. The client may be instructed to participate with an active movement that intensifies the perceived pressure with an assertive gesture, such as arm abduction and pushing the elbow into the working stimulus of the therapist. The use of tools – such as in instrument-assisted manual therapies – could help with more precision.

Once a slight sympathetic orienting response is achieved, a moment of rest – without any touch – is added, during which the therapist waits for at least three to five of the client's breathing cycles until a parasympathetic shift (or general relaxation) is observed. Subsequently a spot on the periosteum in very close proximity to the first spot is treated in a similar manner. If there is a hyperalgesic zone, the treatment starts first in the nearest area with a normal pressure sensitivity. Once a relaxation response is achieved there, gradually periosteum zones nearer to the hyperalgesic spot are treated. The goal is a gradual desensitization process leading to increased resilience to pain. Most likely this process will involve an activation of cortical descending modulatory pathways (Bingel & Tracey, 2008).

Summary

- Stimulation of spindle receptors can be facilitated by quick compressional impulses to the muscle bellies.
- Golgi receptors can be stimulated by techniques that require temporary resistance by the client.
- Ruffini techniques attempt to apply slow shear sensations while finding the respective optimal vectorial direction.
- Pacini corpuscles require constantly changing novel sensations.



Picture CCo. Public Domain

- Free nerve endings can be stimulated by work on the periosteum.

This article is an extract Chapter from the book "Fascia in the Osteopathic Field" (Liem, Tozzi, Chila Eds), Handspring Publishing, 2017. Reprinted with permission from Handspring Publishing.

References

Bingel, U., Tracey, I. 2008. Imaging CNS modulation of pain in humans. Physiology. 23:371-380.

Hanna, T., 1998. Somatics: Reawakening the Mind's Control of Movement, Flexibility, and Health. Da Capo Press, Cambridge MA, USA.

Hertling, D, Kessler, R. M 2006. Management of Common Musculoskeletal Disorders. Lippincott Williams & Wilkins, Philadelphia, p. 170.

Lloyd, D. M., McGlone, F. P., Yosipovitch, G.2015. Somatosensory pleasure circuit: from skin to brain and back. Experimental Dermatology.24(5):321–324.

McGlone, F., Wessberg, J., Olausson, H. 2014. Discriminative and affective touch: sensing and feeling. Neuron. 82(4):737–755.

Excerpt from: Terra Rosa E-mag No. 20
https://issuu.com/terrarosa