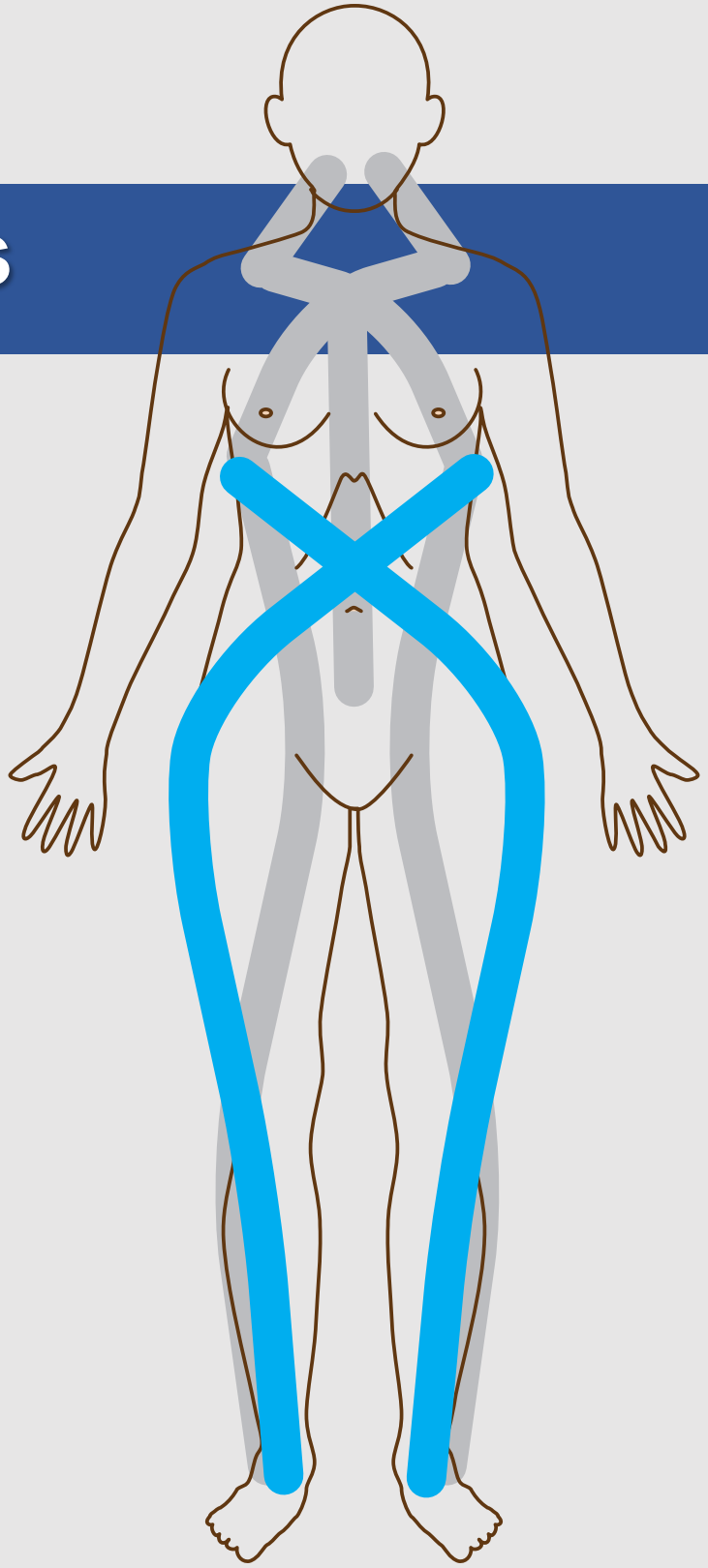
Fascial Chains



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- Cranial Nerve Disorders and the Scientific Osteopathic Approach
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- Scientific Osteopathic Approach to Patients with Abdominal Complaints
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Fascial Chains

1. General

Fascia is connective tissue composed of partly irregular arranged collagen fibers.

Irregular arranged means different from arranged collagen fibers as in ligaments, tendons or aponeurotic sheets where all fibers are in the same direction.

Figure 1 - Fascia

The advantage of the ‘irregular’ arranged collagen is that it can act as packing tissue of different structures; it can connect tissues and it can resist tensional forces in several directions.

Although ‘irregular’, the different fascial layers have often a well-defined orientation, each time different from each other.

Definition in Gray’s Anatomy (quote):

‘Fascia is a term applied to masses of connective tissue, large enough to be visible to the unaided eye. Its structure is highly variable but, in general, collagen fibres in fascia tend to be interwoven and seldom show the compact, parallel orientation seen in tendons and aponeuroses.’

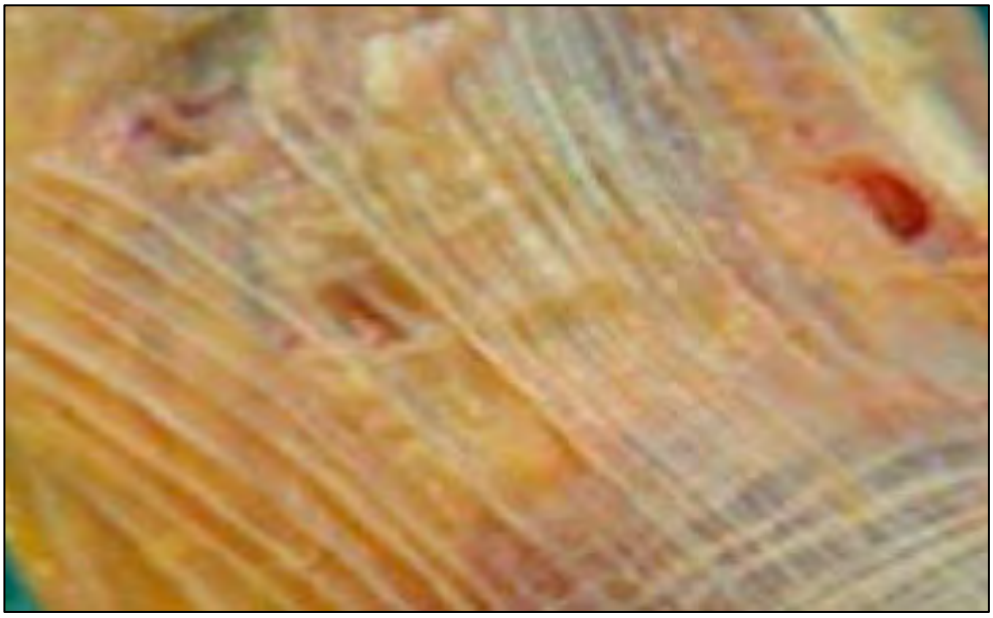

Figure 2 - different layers with well-defined orientation

Definition of fascia according to Adstrum et Al (quote):

'The fascial system includes adipose tissue, adventitia, neurovascular sheaths, aponeuroses, deep and superficial fasciae, dermis, epineurium, joint capsules, ligaments, membranes, meninges, myofascial expansions, periostea, retinacula, septa, tendons (including endotendon/peritendon/epitendon/paratendon), visceral fasciae, and all the intramuscular and intermuscular connective tissues, including endomysium/perimysium/epimysium.'

Quote from Thomas W. Findley (2011):

'All organs, muscles, and body structures must be viewed in the context of the surrounding connective tissues and distant blood and lymphatic fluid flow; specific pathology cannot be fully understood or treated without taking those tissues into account. '

Quote from A.T. Still:

'The fascia is the place to look for the cause of disease and the place to consult and begin the action of remedies in all diseases.'

- Hormonal deregulations such as estrogen depravity. (oral contraceptives have an overall depressing effect on collagen synthesis).
- Nearby chronic inflammation.

Fascial dysfunction can lead to inflammation, inadequate remodeling and the development of fibrosis.

Densification can occur and this reduces sliding facilities, changes proprioception as well as muscle balance. Again, this results in inflammation, fibrosis and adhesions.

This reduced sliding and thickening (fibrosis) of the fascia is seen for example in patients with chronic low back pain.

Add some disturbance in the oxygen supply and the degenerative picture is clear.

Local pain and sensitization follow (free nerve endings become hyperactivated).

Aging can also be a cause of densification.

Fibrosis is an increase of collagen fiber bundles. Densification suggest a variation in the viscosity of the fascia.

4.2. Fascia and Aging

The aging process leads to marked changes in the fascial structures of the body.

Because of age we see wrinkles and creases in the surface. These phenomena are fortified by decrease in estrogen production (menopause), poor nutrition, harmful environmental factors, sunbathing, alcohol, smoking.

Very important to know is that inadequate hydration aggravates these phenomena.

Glycosaminoglycans, collagen and elastin are essential for hydration because they can bind large amounts of water. When these glycosaminoglycans levels decrease, the elastic fibers reduce. The remaining collagen fibers become disorganized; they lose their shape which contributes to ptosis.

Fat cells atrophy so they also distort in shape. We see this as cellulitis.

Diseases as diabetes accelerate these degenerative processes.

We also see cross linking in muscular fascia, and this reduces soft tissue mobility.

Video 1 - Trigger point general approach local treatment (example procedure)

4.4. Scar Tissue

Scar tissue follows wound healing. Usually the wound healing process goes well-organized but when this goes wrong and becomes excessive, it turns into three-dimensional tissue deformities. We then see hypertrophic scarring, fibromatoses and fibro-contractive diseases.

4.5. Inflammation

Excessive or prolonged loading or direct trauma to fascial tissues initiates micro and macro changes necessary for tissue repair. These effects can also contribute to pathological changes that modify tissue function and mechanics, leading to compromised function of the healthy tissue.

When fascia suffer from injury, overload or anoxia, the immune response wants to phagocytose damaged cells. An acute inflammatory response is relatively short and reversible.

This acute inflammatory reaction involves the release of a range of proinflammatory cytokines from injured cells and macrophages, along with other substances (bradykinin, substance P and proteases) that sensitize nociceptive afferents and promote immune cell infiltration.

- In babies: lifting of the eyes which leads progressively to lifting the body to standing position.
- In standing:
    - Keeps the body standing.

5.2.2. The Lateral Line (LL) and the Spiral Line (SL)

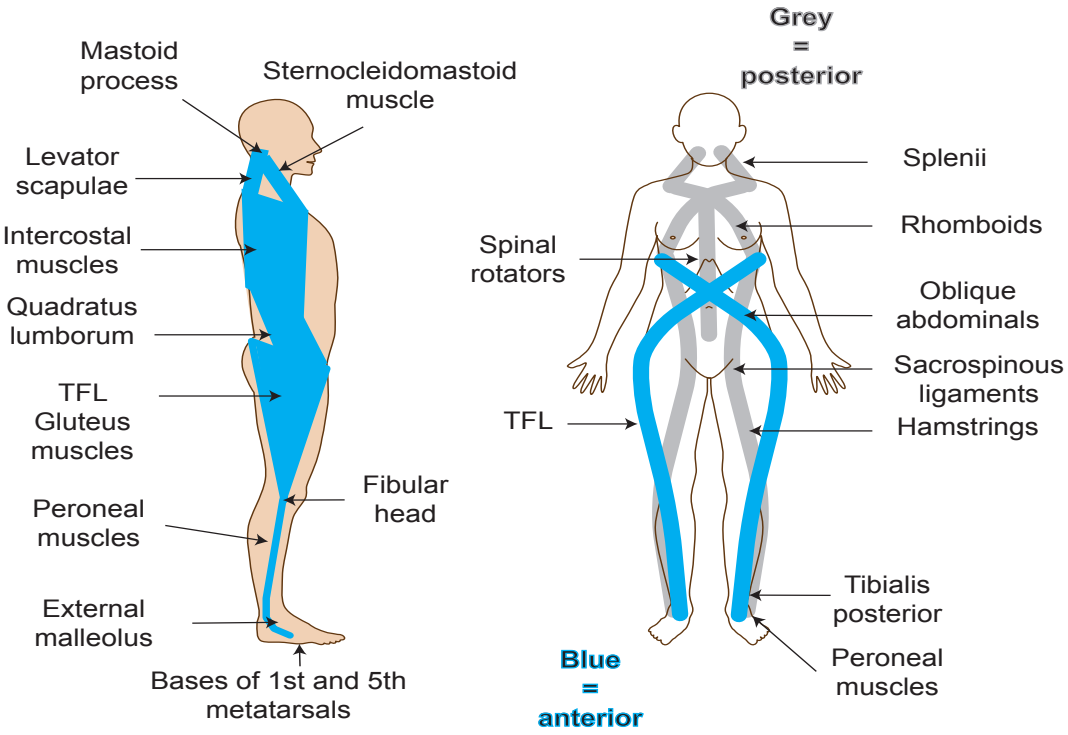

Figure 7 - LL & SL

The LL traverses from each side of the body, from the medial and lateral midpoints of the foot around the lateral malleolus up the lateral aspect of leg and thigh, passing along the quadratus lumborum and intercostal muscles to the skull (mastoid process).

LL function:

- Balances left and right side of the body. This creates a stable basis for the flexion and extension of the body.

The SL winds through the 3 cardinal lines, looping around the trunk like a helix.

SL function:

- Mediates rotation and oblique movements of the body.
- In posture the line balances in all planes.

5.2.3.3. Superficial Back Arm Line

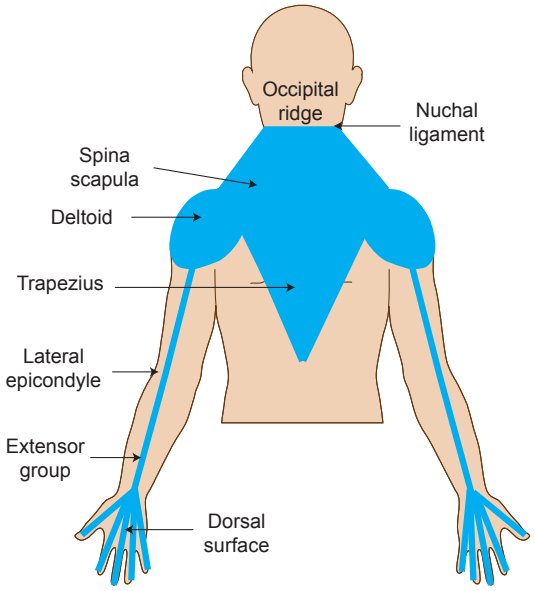

Figure 10 - Superficial back arm line

5.2.3.4. Deep Back Arm Line

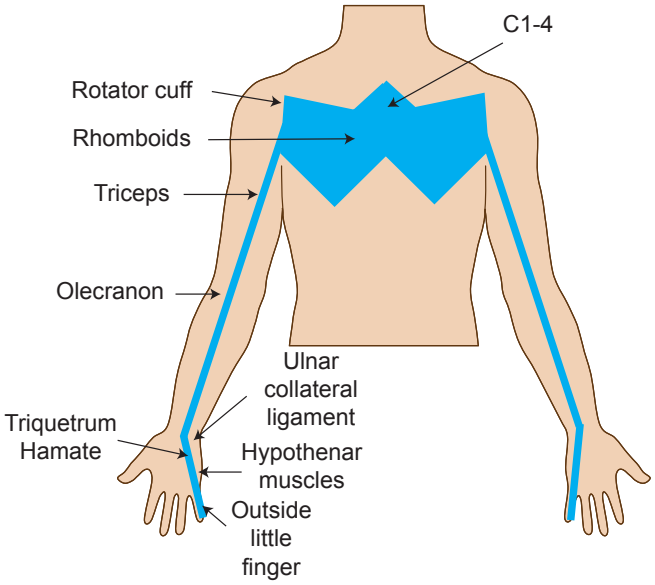

Figure 11 - Deep back arm line

The thoracolumbar fascia is also the origin of different muscles in the lower back. Gluteus maximus, latissimus dorsi, abdominal muscles, perineum,…

The thoracolumbar fascia is in continuity with the deep fascia of the upper and lower limbs, with the abdominals and with the pelvic floor. This means that every trauma, surgery, strain, retraction or overuse far away from the thoracolumbar fascia can alter the sliding system within the thoracolumbar fascia because of the anatomical continuity and force transmission. This can explain why for example foot dysfunction can cause low back pain.

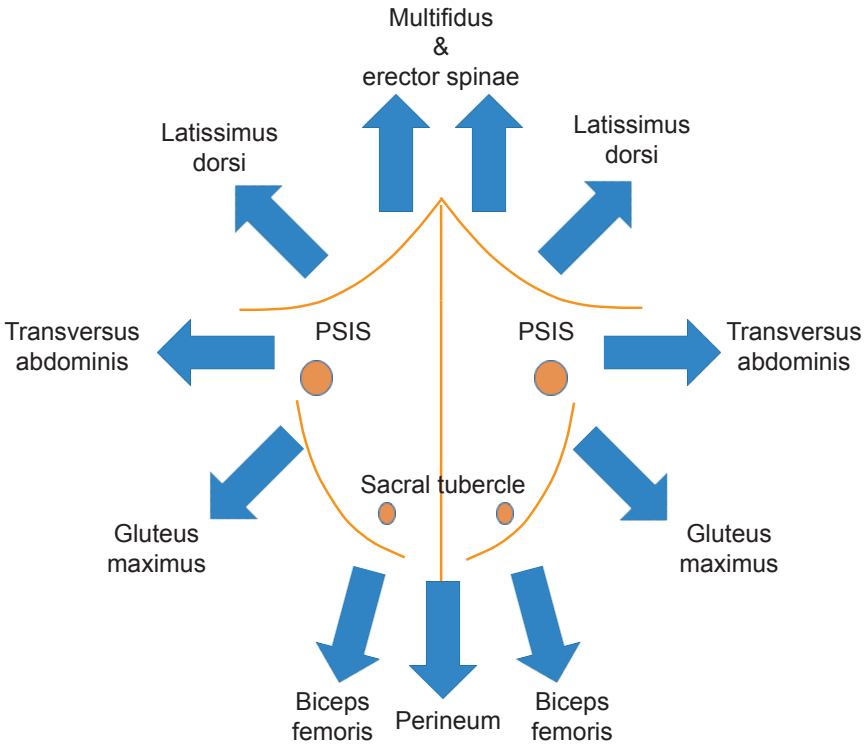

Figure 13 - The thoracolumbar fascia

Nociceptive Capacity of the Thoracolumbar Fascia

The fascia of the low back could be an important structure in the genesis of low back pain because of:

- Its high-density innervation (nociceptive nerve endings).
- Its high pain sensitivity to different stimuli.
- Substantial pain amplification after its stimulation.

The thoracolumbar fascia is also richly innervated in proprioception (here mainly mechanoreceptors such as Ruffini and Pacini corpuscles).

Zink saw 4 zones, 4 junctions and 4 diaphragms:

Zones	Junctions	Transverse Diaphragms
Occipito-atlantal	Craniocervical	Tentorium cerebelli
Cervico-thoracic	Cervicothoracic	Thoracic outlet
Thoraco-lumbar	Thoracolumbar	Respiratory diaphragm
Lumbo-sacral	Lumbosacral	Pelvic diaphragm

In these anatomical junctions, the function of the spine changes in a horizontal plane. Zink considered these junctions as weak points.

He also associated these junctions with a functional horizontal (transverse) diaphragm.

The occipito-atlantal junction is very mobile. The heavy head balances on the mobile cervical spine. Here we see the tonic neck reflexes and they can influence the postural muscular tone throughout the trunk. Rotational dysfunctions are the most common and don't forget that the dura here is connected with the rectus capitis posterior minor. Also, the cranial nerves IX, X and XI pass here.

The cervico-thoracic junction connects the mobile cervical spine with the more rigid thoracic spine. Here the muscles of the shoulders and upper extremities connect to the trunk. The junction is related to the thoracic outlet where we see the lymphatic ducts, the brachial plexuses, phrenic and vagus nerves pass.

In the thoraco-lumbar junction, spinal function changes from the rigid thorax (spine with ribs) to the lumbar spine. Somatic dysfunctions here are mostly associated with dysfunctions (hypertone) of the psoas muscles, quadratus lumborum, thoracolumbar erector spinae and with weakness of the abdominals. In this junction, the most important diaphragm is found. Different structures have to pass such as oesophagus, thoracic duct, aorta, caval vein, vagus and phrenic nerves. This diaphragm also concerns breathing and the regulation of the intra-abdominal pressure (important for the core stability).

The lumbo-sacral junction forms the basis of the spinal column and is therefore very important for body statics. It contains the pelvic organs and the muscular and osseous connection with the lower extremities.

Restrictions (losses of mobility, non-physiological axes) in these transitional areas can cause alterations in the functioning of all surrounding structures.

In this common compensatory pattern, observation plays an important role as well as the knowledge on how we normally compensate to maintain efficiency.

In the following schedule you can see normal adaptation phenomena:

Postural Asymmetry	Sacral Base Declination	Pelvic Rotation	Pelvic Side Shift	Lordosis
Short Leg	Ipsilateral Low Base	Contralateral Rotation	Contralateral Side Shift	Increases
Unilateral Pronation	Ipsilaterally Lowers Base	Contralateral Rotation	Little or no effect	Little or no effect
Unilateral Supination	Ipsilaterally Raises Base	Ipsilateral Rotation	Little or no effect	Little or no effect
Bilateral Pronation	No Effect	No Effect	No Effect	Increases
Bilateral Supination	No Effect	No Effect	No Effect	Decreases
Supination and Pronation	Towards Level	Decreases	Decreases	Decreases

Palpatory assessment protocol of the 4 junctions:

1. Patient supine: palpate the atlanto-occipital junction in unstressed flexion. Palpate the rotational preference. Is the rotation freer left, or right?
2. Patient supine: palpate the cervicothoracic transition area. Lift the upper ribs and shoulders from the table and evaluate the rotational preference.
3. Patient supine: palpate the thoracolumbar area (hands over the lower ribs). The lower thoracic cylinder is tested in rotation to feel the preference. Is the freedom of rotation better to the left or to the right?
4. Patient supine: palpate the lumbosacral area with the hands on the anterior pelvic structures. Is the rotation easier to the left or to the right?

In the treatment of a patient it is advised to first correct general uncompensated patterns before treating local structures. If not, the local treatment could make patients worse because of poor adaptation potential to the corrections.

Another important element in the evaluation of the upper thoracic region and the thoracic outlet is that when there is an abnormal breathing pattern (hyperventilation or paradoxal breathing), this will lead to an altered pH in the blood. This reduced level of CO_2 can lead to respiratory alkalosis (elevated pH).

Alkalosis leads to smooth muscle cell constriction, resulting in vasoconstriction, colon spasm and pseudo angina. Also, an increased fascial tone is often seen.

7. Janda and Lewit's Postural Patterns

7.1. Upper Cross Syndrome

The upper cross syndrome overlaps the forward head posture.

The upper cross syndrome is an agonist-antagonist-synergy loss in a characteristic, predictable pattern. Some muscles become tight other muscles become weak.

The pattern forms an X or a cross when viewed laterally.

The head translates ventrally versus the thorax.

The cervical spine is in an increased lordosis.

The thoracic spine is in increased kyphosis.

There are elevated, protracted, or rounded shoulders, where the muscles are in a continuous state of being pulled or stretched forward.

The scapulae are winging.

The pattern is seen with or without complaints.

The eventual complaints can be various:

- Headache.
- TMJ (temporomandibular) complaints.
- Neck and shoulder pain.
- TOS (Thoracic Outlet Syndrome).
- Rotator cuff syndrome.
- Loss of cervical range of motion, especially flexion and rotation.
- Difficult breathing.

- Rotator cuff syndrome.
- Loss of lumbar range of motion.
- Thoracolumbar pain.

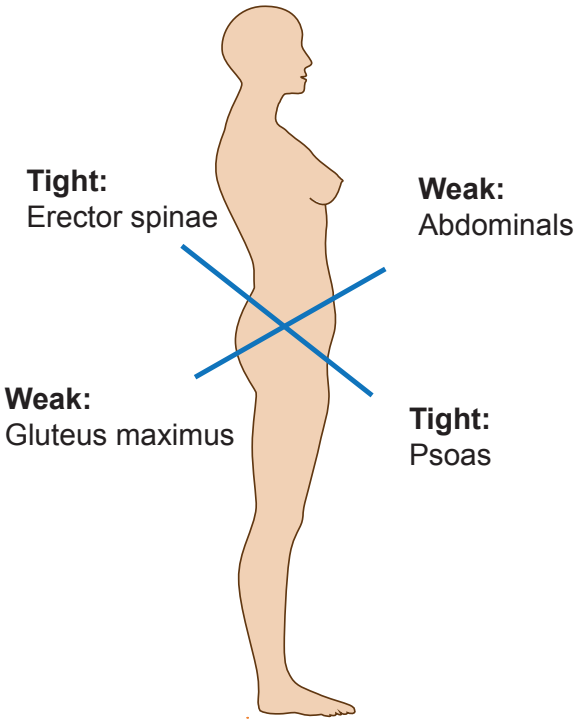

Figure 16 - Lower cross syndrome

What we learn from both patterns is that we have to observe a patient carefully on:

- Where are the short structures?
- Where are muscles tight, where are they weak?
- What is out of balance?

Osteopathic treatment must aim for a normal postural balance and the correcting of the tone-length balance of the involved muscles and segments.

Local dysfunctions can be found. Possibly with the findings of somatic dysfunctions but when we treat these somatic dysfunctions, we must be aware that the fascial compensatory system must be able to accept the mobility changes that we make.

If the fascial system still stays under the influence of misuse, disuse, overuse, habits, the local lesions will re-occur.

8. Skin Assessment Method by Lewit

When skin mobility is reduced, this means that there is underlying reflexogenic activity. Lewit called this ‘hyperallergic skin zones’.

Light stroking of the skin, looking for a drag sensation, may give an indication on underlying dysfunction. The method can be uses all over the body. The skin is mobilized over the underlying fascia.

Video 4 - Skin assessment method by Lewit, patient sitting

Skin lifting and pulling, as we do when we look for somatic dysfunctions is part of this assessment method.

In the low back, the technique can be used to find the direction of the problem causing lesion.

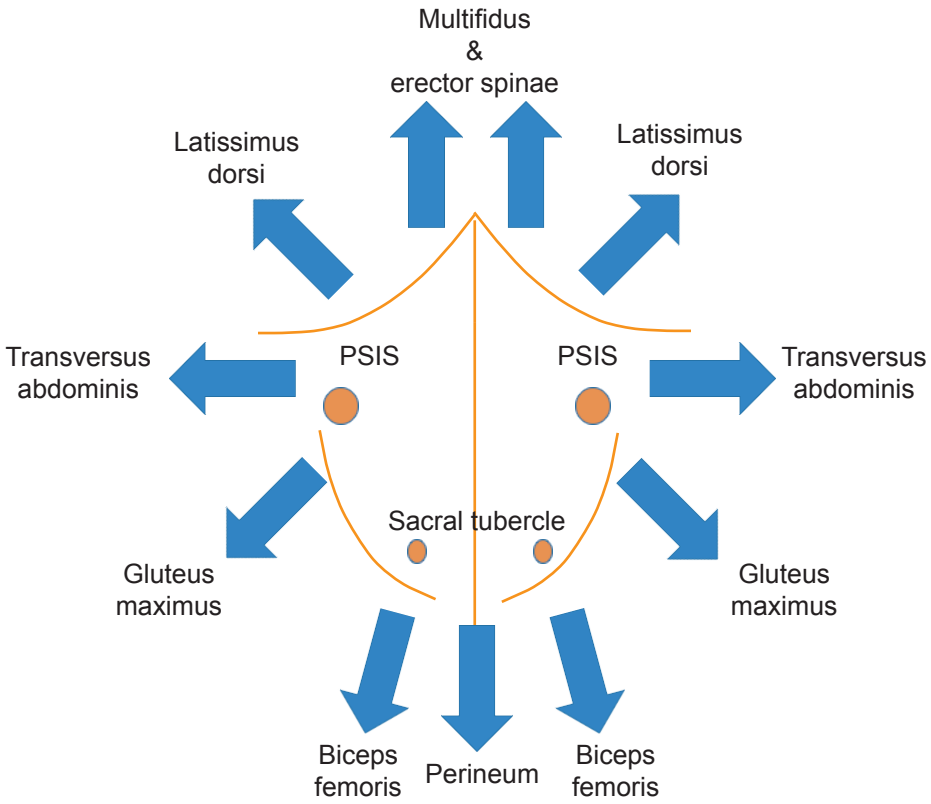

Figure 17 - Thoracolumbar fascia – testing directions

Video 5 - Skin assessment method by Lewin, patient prone

11. Osteopathic Treatment

In osteopathy, we consider local treatment, especially when it concerns an acute patient. The nociceptive pain is generated locally coming from damage, near damage, inflammation, infection or ischemia.

However even in acute patients and much more in chronic patients where the complaint seems to be more neuropathic in nature, we also consider lesions distant from the complaint area but mechanically, vascular, neurological or metabolically related.

In this latter approach we must also consider the health of the fascia and their mechanical chains.

We therefore must always consider in a patient:

- Local lesions (mobility loss).
- Related dysfunctions (mechanical, neurological, vascular and metabolic).
- The integrity of the fascial system (viscosity, elasticity, lubrication).
- The general acid-base (pH) balance in the body (concerns lung and heart function – breathing and nutrition).
- The autonomic balance.

To reach these therapeutic goals, we have tools (that we adapt to each patient individually):

- High velocity low amplitude manipulations with long and short lever.
- Mobilizations.
- Muscle Energy Techniques (isometric, stretching, isolytic or isotonic).
- Spontaneous Release Techniques.
- Chapman reflexes.
- Trigger point therapy – local frictions and stretch techniques.
- Tissue stretching and fascial shearing (sliding) techniques.
- Fascial stretching (sustained).
- Exercise.
- Nutrition (reducing weight/fat, change acid-base balance, hydration).

In this chapter we want to promote, beside the mentioned osteopathic approach, the use of local ‘massage’, ‘trigger point’ or fascial chain stretching techniques.

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Luc Peeters is an osteopath since 1985. He was the Joint-Principal of the largest Academy of Osteopathy in Europe from 1987 till 2020.

This book gives a practical overview of the fascial chains and how they can be used in an osteopathic examination and treatment.

The theory and procedures in this book are checked on their scientific background and esotericism is avoided.

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