The Iliosacral Joint

OSTEOPATHIC MEDICINE

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1. Introduction

Due to our sedentary lifestyle most joints are no longer used to their maximum capacity. How often do we sit in postures such as cross-legged or slumped sitting positions? We maintain “middle range” postures with the consequence that soft tissues around many joints then lose their normal elasticity and become fibrotic.

Classic pathology describes conditions of the lumbar spine in great detail but has neglected the pelvic complex (sacrum and both iliac bones). Attention is only given to the motions of nutation and contra-nutation during pregnancy and labour.

In case of pathology of the lower back it seems that lower back pain is nearly always blamed on the disc. While the importance of a disc hernia is not disputed, it should not be over-exaggerated. Pre-operative anaesthe-
sia is often sufficient to render the patient pain free! There must be other factors at play.

When mobility testing a joint it should be remembered that between immobility and normal mobility there is a plethora of possibilities. A joint could have lost just 20% of normal mobility and is therefore, directly or indirectly, needing treatment.

In osteopathy it is thought that the sacroiliac joint (SI) consists of both iliosacral (the lower extremity is the lever) and sacroiliac motion (the spine is the lever). In case of iliosacral motion, the iliac bone moves relative to the sacrum while sacroiliac motion involves the sacrum moving between the two iliac bones.

In the sacroiliac joint two long levers (spine and leg) meet, creating significant mechanical stress.

Although there is some overlap, this e-book concerns examination and treatment of the iliosacral motion with the lower extremity as the lever.

The sacroiliac motion is described in the e-book “The Sacroiliac Joint”.

For those who are not familiar with the typical osteopathic terminology, we refer to chapter 8 at the end of this e-book.
2. Biomechanics

2.1. General

The sacroiliac joint is the largest axial joint in the body, with an average surface area of 17.5 cm². There is wide variability in the adult SI joint, encompassing size, shape, and surface contour. Large disparities may even exist within the same individual.

The SI joint is most often characterized as a large, auricular-shaped, diarthrodial synovial joint. In reality, only the anterior 1/3 and the inferior part of the interface between the sacrum and iliac bones are true synovial joints, the rest of the junction is comprised of an intricate set of ligamentous connections.

As we age the characteristics of the sacroiliac joint change. The joint’s surfaces are flat or planar in early life and as we start walking the sacroiliac joint surfaces develop distinct angular orientations. Structure follows function.

They also develop an elevated ridge along the ilial surface and a depression along the sacral surface ridge and corresponding depression, along with the very strong ligaments, increase the sacroiliac joints' stability and makes real dislocations very rare (Walker 1986).

The major function of the SI joints is providing stability of the pelvis. More about this function is described in the e-book “The Sacroiliac Joint”.

There have been different attempts to discern the biomechanics of the SI joints.

**There is consensus about:**

- The SI joint rotates in the 3 planes.
- The movements are small and difficult to measure. Vleeming et al found that the total range of motion during flexion and extension at the SI joint rarely exceeded 2 degrees, with 4 degrees being the upper limit during sagittal rotation. During walking this amplitude is larger.
• There are differences whether there is load on one or two legs and this supports the differentiation between iliosacral (lever is lower extremity) and sacroiliac (lever is spine – both legs fixed to the ground in standing) movements. Researchers found that with 1 leg immobile, movements in all planes ranged from between 2 to 7.8 times more than that measured with both legs fixed. This means that the iliosacral movements are more ample than the sacroiliac movements.

**Note concerning mobility in the SI joints:**

• No differences in mobility were found between symptomatic and asymptomatic joints, leading the authors to conclude that 3-dimensional motion analysis was not useful for identifying painful SI joints in most patients.

• Low back pain however is often caused by mechanical strain of soft tissues and the SI joints play an important role in the pelvic and low lumbar mechanics. Therefore testing mobility and treating mobility of the SI joints is important to reduce mechanical strain in the complex pelvic and low lumbar region.

In this e-book the focus is on the mobility of the iliac bone versus the sacrum. In this context the lever of mobility is the lower extremity.
2.2. Normal Biomechanics

2.2.1. Axis of Mobility

The lever is the lower extremity and the axis of mobility is the inferior transverse axis (ITA).

The iliac bone rotates anteriorly and posteriorly relative to the sacrum around this axis.

The posterior and anterior ilial lesions can occur around this axis.

Since the joint surface is orientated three dimensionally, the different movements in the three planes can be described separately. This is done further in this chapter.

Figure 1 - Anterior and posterior rotation of the iliac bone around the ITA
2.2.2. Mobility around the inferior transverse Axis

The lever is the lower extremity.

*Figure 2 - Iliac bone in external rotation*

*Figure 3 - Iliac bone in internal rotation*
Figure 4 - Iliac bone in external rotation

Figure 5 - Iliac bone in internal rotation
Figure 6 - Iliac bone in in-flare

Figure 7 - Iliac bone in out-flare
Figure 8 - Iliac bone in out-flare

Figure 9 - Iliac bone in in-flare
Figure 10 - Iliac bone in anterior rotation

Figure 11 - Iliac bone in posterior rotation
Because of the obliqueness of the orientation of the SI joint surface, there mostly occurs a movement, which is a combination in the three planes.

**Figure 12 - Orientation of the SI joint**

**Figure 13 (left) - The iliac bone rotates anterior, in out-flare, in internal rotation**

**Figure 14 (right) - The iliac bone rotates posterior, in in-flare, in external rotation**

When the iliac bone rotates anterior – in out-flare and internal rotation, the pubic branch on the same side will descend and rotate anteriorly.

When the iliac bone rotates posterior – in in-flare and external rotation, the pubic branch on the same side will ascend and rotate posteriorly.
2.3. The Iliac Bone in Weight Bearing

In a standing position, the sacrum is loaded with the superincumbent weight. Primary vertebral load on the sacral promontory causes the sacrum to rotate anterior. This is called primary load on S1.

This primary load on the sacral promontory and anterior rotation of the sacrum causes the iliac bone to rotate relatively posteriorly.

The tensile stress caused by the primary load is transferred to the posterior sacroiliac capsule. This causes the caudal part of the sacrum to move posteriorly causing a counter-balancing tensile stress on the sacrospinous and sacrotuberous ligaments. Relatively, the iliac bones rotate posteriorly.

The weight bearing forces join at the inferior transverse axis. Under load, the sacrum tilts anterior. The more load, the more anterior tilt of the sacrum. This induces the lumbar spine in more lordosis and the iliac bones in more posterior rotation.

This caudal gravity load on the sacrum with tensile stretch on the posterior capsule and the sacrospinous- and sacrotuberous ligaments happens around the ITA (some claim the MTA), thus compressing the inferior part of the SI joints along a medio-lateral axis on this S3 level.
On the cephalic side of S3 (on the iliac bone) there is an ilial ridge. This prevents S3 to move cranially.
After load bearing, the gravity line is anterior to the sacral axis. The gravity line stays posterior to the acetabula causing a general posterior pelvic tilt and creating a dynamic, balanced tension on the pelvic ligaments. The posterior pelvic tilt decreases the lumbar lordosis.

**Figure 17 - Gravity line and weight balance**

As long as the gravity line falls between the ITA and the acetabula, there is a balance in the pelvic in the sagittal plane: the sacrum tilts anteriorly and the iliac bones counteract in posterior rotation.

Some authors state that this posterior rotation is around the IFA, other authors state that this occurs around the acetabula.
The ligamentous stability of the pelvis in the sagittal plane is maintained by a good condition of the posterior sacroiliac capsule and the sacrospinous- and sacrotuberous ligaments.

The basic muscular balance of the pelvis is achieved by contracture of the lower paravertebral muscles and the coccygeal muscles. Secondarily, the piriformis muscle and the sacral part of the gluteus maximus muscle provide a counter force for the anterior sacral rotation.

Specifically for the balance of the unilateral iliac bone in the sagittal plane, a good muscular balance between iliacus muscle on the anterior side
and coccygeus – gluteus maximus (iliaic part) – Hamstrings on the posteri-
or side is necessary.

The iliacus and coccygeus muscles rotate the iliac bone anteriorly, the
gluteus maximus (iliaic part) and the hamstrings rotate the iliac bone posteri-
orly.

Figure 19 - Ligamentous stability and muscular balance of the pelvis in the sagittal plane
To have an optimal functioning pelvic girdle that spreads tension equally over the joints and capsular-ligamentous structures, the correct locking mechanism (self-bracing) must be in place. Therefore the condition of the posterior SI capsule and sacrospinous- and tuberous ligaments must be optimal.

There is also a need for an effective functioning of the muscular system that maintains the self-bracing mechanism.

**Three muscle slings (chains) are supposed to contribute to force closure of the SI joints:**

- A longitudinal muscle sling.
- A posterior oblique muscle sling.
- An anterior oblique muscle sling.
The longitudinal muscle sling consists of the combination of the deep paravertebral muscles attaching to the sacrum, the deep layer of the thora-columbar fascia and the sacrotuberous ligament, which is connected to the long head of the biceps femoris muscle.

**Tension in this muscle sling will stabilize the SI joint in 3 ways:**

- Contraction of the deep paravertebral muscles will anteriorize the sacrum. This increased the tension on the posterior SI capsule thus leading to more force closure of the SI joints.

- Contraction of these muscles will also inflate the thoracolumbar fascia leading to more force closure.

- Due to the anatomical relation with the sacrotuberous ligament, the contraction of these muscles will increase tension on the ligament thus increasing the closure of the SI joint.
The posterior oblique sling is the coupled function of the latissimus dorsi muscle and the gluteus maximus muscle. Both muscles function as synergists. Contraction will directly optimize stabilization of the SI joints.
Figure 22 - Posterior oblique sling

The anterior oblique sling consists of the external and internal oblique muscles as well as of the transverse abdominis muscle (connection via rectus sheet).

Muscle contraction of this sling also increases the SI stabilization (self-bracing mechanism).
For example sitting with the legs crossed reduces strongly the tone of the anterior oblique sling. This is because sitting with crossed legs increases mechanically the SI compression and friction. Reducing this muscle tone diminishes this compression and friction.

**The iliolumbar ligaments**

- The iliolumbar ligaments also play an important role in the stability of the SI joint.
- Their action compresses the SI joint.
- Goudzwaard et al (2003) found that following severing of the iliolumbar ligaments the range of motion of the iliosacral joint was significantly higher. According to that study the anterior part of the ligament provides the strongest influence upon this mobility. They suggested that it is highly likely that surgical severing of this ligament during lumbosacral surgery could explain post-operative symptoms and instability.
Figure 24 - The iliolumbar ligaments compress the SI joints

- This means that when L5 goes in flexion, stretch comes upon the iliolumbar ligaments thus compressing the SI joints even more. Loss of mobility in the SI joints can depend on the tension in these ligaments.

- In a case of anterolysthesis, of L5, the vertebra glides anteriorly thus stretching the iliolumbar ligaments and compressing the SI joints.

Figure 25 - The iliolumbar ligaments
More details on the biomechanics of the iliolumbar ligaments can be found in the e-book “The Lumbar Spine”.

**The pubic symphysis**

- The pubic symphysis is a secondary cartilaginous joint with very limited mobility. At later stages of pregnancy and during labour the increased fluid retention and the action of the hormone oxytocin allow more mobility and the pubic rami are able to glide to a greater degree. If the articular disc is intact the joint can resist significant torsional forces. However, if the disc is not fully intact pathological motions (translations) and pelvic instability can result.

- The pubic symphysis is a very stable complex that is not easily dislocated. In traumatic circumstances dislocation can occur and this condition is generally very difficult to treat, not surprising considering that the complex is normally not very mobile. During an anterior rotation of the ilium the symphysis will be subject to an antero-inferior torsion. Ilium posterior rotation will place the symphysis under postero-superior torsion. If not intact, superior and inferior translations will occur.

*Figure 26 - Pubic symphysis*
2.4. Sacral and Ilial Mechanics in Walking

At heel strike (weight bearing), there is a posterior rotation of the iliac bone and an anterior sacral rotation “gripped” by the posterior capsule on the weight bearing side.

Because of the body weight the sacrum descends (the iliac bone slides cranially – called upslip). This closes the SI joint at S1 level and opens it at S3 level.

There is essentially no motion in the pelvis on the non-weight bearing side as the iliac bone remains anterior rotated. The sacrum slips relatively cranially, thus closing the SI joint at S3 level and opening it at S1 level.

The closing of the SI joints creates the oblique axis: weight bearing on right leg: right oblique axis, weight bearing on the left leg: left oblique axis.

At the mid-point of the walking cycle, the iliac bone on the weight bearing side begins to move anteriorly with the sacral torsion on that side at maximum.

When the opposite foot strikes the ground, the original weight bearing side changes from posterior to anterior ilial rotation and sacral torsion is eliminated.

The mechanical process repeats itself on the other side.
Figure 27 - Sacrum and ilial mechanics in walking
Figure 28 - Sacrum mechanics in walking – left and right oblique axis
Lesion means that there is a loss of mobility.

Dysfunction of the SI joints can cause complaints. Dysfunctions can be due to hypermobility or hypomobility.
3.1. Lesional Mechanics

3.1.1. Ilium Lesions

3.1.1.1. General

Iliosacral lesion (loss of mobility of the iliac bone versus the sacrum) are mostly fixed in three dimensions. This is due to the three-dimensional position of the joint surfaces.

However in many cases we can see that there is dominance in the direction of the mobility loss. The different lesions are named after the dominance in mobility loss although also the other dimensions play a secondary role.

The importance of this differentiation of dominance lies in the correction techniques.

Osteopaths treat the shortened capsuloligamentous structures by stretching them with short or long lever techniques. They also treat the muscular balance in the plane of the dominance.

**Planes of dominance:**

- Ilium anterior and posterior lesions: sagittal plane.
- Ilium out-flare and in-flare lesions: frontal plane.
- Ilium lesions in external and internal rotations: horizontal plane.

When the tendency of the lesion is more posterior, in-flare, external rotation mostly there is an upslip involved (superior translation of the iliac bone).
3.1.1.2. Ilium Anterior Lesion

The iliac bone is fixed in anterior rotation versus the sacrum around the inferior transverse axis (ITA).

Posterior rotation of the iliac bone versus the sacrum is not possible any more.

An ilium anterior lesion is accompanied with the following findings:

• Anterior SI capsule shortened.
• Posterior SI capsule stretched.
• Sacrotuberous and sacrospinal ligaments shortened.
• Leg apparently longer.
• Iliacus and/or quadratus lumborum muscles shorten.
• Gluteus maximus muscle (iliac part) is stretched.

Figure 29 - Ilium anterior lesion
• Pubic branch low.
• PSIP high.
• ASIS low.
• Tuber high.
• SI joint space shallow.

3.1.1.3. Ilium Posterior Lesion
The iliac bone is fixed in posterior rotation versus the sacrum around the inferior transverse axis (ITA).

Anterior rotation of the iliac bone relative to the sacrum is not possible any more.

*Figure 30 - Ilium posterior lesion*

An ilium posterior lesion is accompanied with the following findings:

• Anterior SI capsule stretched.
• Posterior SI capsule shortened.
• Sacrotuberous and sacrospinal ligaments stretched.
• Leg apparently shorter.
• Iliacus and/or quadratus lumborum muscles are stretched.
• Gluteus maximus muscle (iliac part) is shortened.
• Pubic branch high.
• PSIP low.
• ASIS high.
• Tuber low.
• SI joint space deepens.

3.1.1.4. Out-flare Lesion
The iliac bone is fixed in out-flare versus the sacrum around the antero-posterior axis.

In-flare of the iliac bone versus the sacrum is not possible any more.

An out-flare lesion is accompanied with the following findings:
• Superior SI capsule stretched.
• Inferior SI capsule shortened.
• Sacrotuberous and sacrospinal ligaments shortened.
• Quadratus lumborum muscle stretched.
• Perineum shortened.
• Pubic branch medial.
• PSIP lateral.
• ASIS lateral.
• Tuber medial.

3.1.1.5. In-flare Lesion
The iliac bone is fixed in in-flare versus the sacrum around the antero-posterior axis.

Out-flare of the iliac bone versus the sacrum is not possible any more.

Figure 32 - In-flare lesion

An in-flare lesion is accompanied with the following findings:
• Superior SI capsule shortened.
• Inferior SI capsule stretched.
• Sacrotuberous and sacrospinal ligaments stretched.
• Quadratus lumborum muscle shortened.
• Perineum stretched.
• Pubic branch lateral.
• PSIP medial.
• ASIS medial.
• Tuber lateral.

3.1.1.6. Lesion in Internal Rotation

The iliac bone is fixed in internal rotation versus the sacrum around the craniocaudal axis.

External rotation of the iliac bone versus the sacrum is not possible any more.

An internal rotation lesion is accompanied with the following findings:

• Posterior SI capsule stretched.
• Anterior SI capsule shortened.
• Internal oblique abdominal muscle shortened.
• External oblique abdominal muscle stretched.
• Pubic branch medial.
• PSIP lateral.
• ASIS medial.

3.1.1.7. Lesion in External Rotation
The iliac bone is fixed in external rotation versus the sacrum around the craniocaudal axis.

Internal rotation of the iliac bone versus the sacrum is not possible any more.

Figure 34 - Lesion in external rotation

An external rotation lesion is accompanied with the following findings:

• Posterior SI capsule shortened.
• Anterior SI capsule stretched.
• Internal oblique abdominal muscle stretched.
• External oblique abdominal muscle shortened.
• Pubic branch lateral.
• PSIP medial.
• ASIS lateral.
3.1.2. Primary Iliosacral Lesion

With primary iliosacral lesions we mean lesions (loss of mobility) of the iliac bone versus the sacrum of traumatic origin.

3.1.2.1. Traumatic Ilium Anterior Lesion

Stepping in a hole while running or coming down the stairs and missing the last step, can cause a traumatic ilium anterior lesion. The iliac bone blocks in anterior rotation versus the sacrum.

The reason therefore is that the patients’ proprioception doesn’t expect the floor to be that deep and the iliac muscle overstretches and brings the iliac bone into anterior rotation too far.

A caudal translation mostly accompanies the ilium anterior lesion and in a prone position, the leg is apparently longer.

*Figure 35 - Traumatic ilium anterior lesion*
3.1.2.2. Traumatic Ilium Anterior Lesion in Forward Bending

In normal standing, the body weight (gravity line) falls anterior of the SI joint and posterior of the acetabula.

The body load on the sacral promontory tilts the sacrum in an anterior rotation.

The body load on the acetabula tilts the pelvis posteriorly, thus bringing the iliac bones in posterior rotation versus the sacrum.
When we lean forward, the line of gravity moves anterior to the hips and the iliac bones will rotate anteriorly on an acetabular axis. This will loosen the sacrospinous- and sacrotuberous ligaments. The force dependant axis of rotation is lost and the iliac bones will subluxate in a cephalic and lateral direction relative to the sacrum (anterior rotation of the Iliac bone). The lesion ilium anterior is created.

Figure 38 - Lesional mechanics in bending forward

3.1.2.3. Traumatic Ilium Posterior Lesion
When a person stands, the body weight already brings the iliac bones into posterior rotation.

If a sudden body rotation is added, the iliac bone can block in posterior rotation.
In a patient with an ilium posterior lesion, mostly a cranial translation of the iliac bone is included. Some authors refer to this as an ‘upslip lesion’.

With the patient supine, this gives an apparent shortening of the leg.

**Figure 39 - Traumatic ilium posterior lesion**

**Figure 40 - Apparent short leg**
3.1.3. Secondary iliosacral Lesion

With secondary iliosacral lesions we mean that the iliosacral joint goes into lesion due to other mechanical lesions in the surrounding joints.

3.1.3.1. Iliosacral Compression Lesion Due to iliolumbar Ligaments

When L5 is in a flexion lesion, both iliolumbar ligaments are under stretch. This stretch will compress the iliosacral joints thus limiting all possible movements.

Correction of iliosacral lesions (if still necessary) can only be done after correction of the more primary lesion, often L5.

*Figure 41 - Overstretch of the iliolumbar ligaments compresses the SI joints*

When L5 is in an extension lesion over a longer period, the iliolumbar ligaments lose their elasticity. The will retract. This ligamentous retraction will also cause compression in the SI joints.

Correction of iliosacral lesions (if still necessary) can only be done after correction of the more primary lesion, often L5.
In a patient with a spondylolysis of L5 and a spondylolisthesis of L5, the anterior gliding of L5 will overstretch the iliolumbar ligaments. This overstretching will also compress the SI joints.

Correction of iliosacral lesions (if still necessary) can only be done after correction of the more primary lesion, often L5.
3.1.3.2. Ilium Anterior Lesion due to a L5 Rotation Lesion

In a classical rotational posture pattern, L5 rotates right. This rotates the whole body below L5 anteriorly and the major body weight comes on the left leg. From L5 downwards we see a descending chain with an anterior rotated iliac bone.

When this situation exists for some time it can create an anterior ilium lesion.

Correction of iliosacral lesions (if still necessary) can only be done after correction of the more primary lesion, often L5.

Figure 44 - Rotation pattern
3.1.3.3. Ilium Lesions Due to sacral Lesions

Sacral lesions as discussed in the e-book “The Sacroiliac Joint” are lesions versus both iliac bones and versus L5. These lesions occur around different axis.

Although the sacroiliac part of the lesion is dominant, also the iliosacral part will show lesions.

![Axes of mobility in the frontal plane](image)

*Figure 45 - Axes of mobility in the frontal plane*

These secondary iliosacral lesions normally disappear when the sacroiliac lesions are corrected.
3.1.3.4. Ilium Posterior Lesion Due to Foot Lesions

These type of lesions are called “ascending chains”. This means that the primary lesion is in the foot and the consequence in the pelvic region.

Ascending chains, starting in the foot and causing a posterior rotated iliac bone can find their origin in three types of lesions, both mostly caused by an inversion trauma.

*Figure 46 - Inversion trauma*
Type I:

• The patient makes an inversion trauma through which the subtalar joint (between calcaneus and talus bone) blocks in a postero-external lesion. The talus blocks in a postero-external direction versus the calcaneus.

Figure 47 - Postero-external lesion in the subtalar joint

• The lateral ligaments are overstretched and keep the fibula in a caudal position.

• This caudal traction on the fibula also keeps the head of the fibula in a caudal position and the attachment of the biceps femoris muscle can cause a stretch on the biceps femoris muscle which keeps the iliac bone in a posterior rotated position by pulling on the ischial tuberosity.
Figure 48 - Ascending chain
Type II:

- The patient jumps in the air with the foot in inversion.
- He comes down to the floor with the foot still in inversion.
- This trauma causes an impaction lesion of the tibiotalar joint with external rotation of the talus within the fork tibia-fibula.
- The impaction lesion with external rotation of the talus keeps the fibula mechanically in an inferior position.
- The malleoli are spread by the impaction of the talus as it ascends.

![Figure 49 - Coaptation lesion tibiotalar joint](image)

- The same ascending chain appears with an ilium posterior lesion.
Type III:

- The patient does an inversion trauma and blocks the cuboid bone in external rotation. This type of lesion is rather seldom.
  - The rotated cuboid bone overstretches the peronei muscles.
  - The overstretched peronei muscles keep the fibula in a caudal position.
  - The same type of ascending chain occurs with an ilium posterior lesion.

*Figure 50 - Cuboid in external rotation – ascending chain*
3.2. Sacroiliac Pain


3.2.1. General
The sacroiliac joint is a source of pain in the lower back and buttocks in approximately 15% of the population (Dreyfuss 2004). Rarely pain above L5 is reported.

The innervation of the sacroiliac joint is not clear.

Different experts claim different segments:

Dorsal joint:
- Dorsal rami L4-S3.
- L3 and S4.

Ventral joint:
- L2-S2.
- L4-S2.
- L5-S2.
- Each time ventral rami.

Pain sensitivity of the SI joints is much lower than the lumbar facet joints but higher than the anterior portion of the lumbar discs.

Although it is widely acknowledged that dysfunctional SI joints may cause low back pain, the prevalence of this condition has not been well studied.

The causes of sacroiliac pain can be divided into intra-articular and extraarticular sources. Arthritis and infection are two examples of intra-articu-
lar causes of SI joint pain. Extra-articular sources are the more common of the two and include enthesopathy, fractures, ligamentous injury, and myo-fascial pain. Clinical studies have demonstrated significant pain relief after both intraarticular and periarticular SI joint injections.

The osteopath starts his or her investigation with an anamnesis or case history.

**In the case history, the osteopath tries to identify the nature of the pain:**

- Aching pain can be ligamentous, especially when occurring in the morning and associated with stiffness. Also when it occurs after a longer period of immobilisation (sitting or standing).
- Sharp pain on specific movements can be caused by muscle strain or inflammation.
  - Fatigue can be caused by bad posture and poor muscular balance.
  - Sharp pain when coughing often directs towards inflammation.
- Irradiating pain indicates a neurogenic factor, can be radicular or pseudo radicular.
  - Numbness or muscle weakness indicates severe radicular inflammation, often with hernia compression on the nerve root.
  - Vague, sometimes irradiating pain in the legs during exercise can indicate an ischemic neuralgia.
- Are there visceral signs associated with the pelvic pain?
- Nocturnal pain often indicates cancer.

The type of patient (child, adult, elderly, pregnant, peri-menopausal woman) can give information to the osteopath.

The onset of pelvic pain is important. Was there a trauma? Was the onset sudden or progressively worsening?

Where there recent infections?
Is there symptom magnification and psychological distress? (superficial or non-anatomical pain distribution, non-anatomic sensory or motor disturbance, inconsistent neurological signs, inappropriate or excessive verbalisation of the pain).

3.2.2. Possible Cause for Pain in the pelvic Region

3.2.2.1. Joint Capsule Disruption

When there is increased severity of SI dysfunction, the joint capsule may be disrupted.

This can be as well in the anterior as in the posterior capsule of the SI joint.

When there is a disruption of the joint capsule, in arthrography contrast product has been found in the surroundings of the L5 nerve root and even in the psoas muscle.

There are three potential pathways of communication between the SI joint and neural elements in the surroundings:

- Posterior sub-ligamentous extensions into the dorsal sacral foramina.
- Superior recess extravasation at the alar level into the L5 epidural sheet.
- Leakage from a ventral tear to the lumbosacral plexus.
The difficulty in an osteopathic examination of the pelvic region is that disruption of the joint capsule can only be diagnosed by thorough case history, provocation and mobility tests.

Arthrography gives the final diagnosis but this is seldom done.

If the osteopath suspects disruption of the joint capsule, care must be taken not to mobilize too much locally. Rest is an important advice here.

An anterior rotated iliac bone also causes an inhibition of the gluteus medius muscle.
3.2.2.2. Muscular Separation in the Gluteus Maximus Muscle

As a consequence of an anterior rotated iliac lesion, the gluteus maximus muscle may be disrupted between the ilial and sacral part at the level of the muscle origin.

The muscular fibres separate on a line from the conjoint origin towards the great trochanter.

This may even produce a trochanteric bursitis and pain down the iliotibial tract towards the lateral aspect of the knee.

This should not be confused with pain originating from the piriformis muscle. Differentiation is done by palpation (the piriformis muscle lies more caudal).

The ilial and sacral portion of the gluteus maximus muscle have different functions. In standing on one leg during walking, the gluteus maximus muscle pulls the iliac bone towards posterior. The sacral portion however is stretched because of the anterior rotation of S1 on the same side. This sacral portion then contracts isolytically while the ilial portion contracts isometrically.

With muscular separation of the gluteus maximus muscle, the line between the ilial and sacral portion of the muscle is painful.

After osteopathic treatment, where the aim is to restore normal function of the whole pelvis, rest is absolutely necessary to let the separation heal.
3.2.2.3. Muscular Separation in the Iliacus Muscle

Caused by an anterior rotated iliac lesion, on the anterior side separation of the small sacral part of the origin of the ilacus muscle may occur. This is called enthesopathy.

Pain on hip flexion is then noticed.

Anterior synovial leakage may also cause this hip flexion pain.

**Note on enthesopathy:**

- Enthesopathy is a condition that affects the entheses (e.g. inflammation of the entheses). The entheses are sites of tendinous or ligamentous attachment to the bone. Enthesopathy may be due to an inflammatory condition or to a constant or abrupt pull on muscle or ligamentous attachment.

- Most obvious in the case history is a sudden sharp and local pain after an extreme movement.
• Enthesopathy can however also occur after chronic pull of a muscle or ligament. A local sharp pain is found that even increases with muscular contraction.

• In the case of entheropathy, inflammation of the local region is common.

3.2.2.4. Piriformis Syndrome


The piriformis syndrome is a neuromuscular condition characterized by hip and buttock pain. This syndrome is often overlooked in clinical settings because its presentation may be similar to that of lumbar radiculopathy, primary sacral dysfunction, or ilial dysfunction.

Piriformis syndrome occurs most frequently during the fourth and fifth decades of life and affects individuals of all occupations and activity levels. Reported incidence rates for piriformis syndrome among patients with low back pain vary widely, from 5% to 36%.

There are different possible relations between the piriformis muscle and the sciatic nerve. In most people (96%) the sciatic nerve leaves the pelvis below the piriformis muscle. In 22% of the population however, the sciatic nerve runs through the muscle.

Some of the symptoms in a piriformis syndrome occur at the result of local inflammation and congestion caused by muscular compression. Also the pudendal nerve can be compressed.

In all cases there is a mechanical component (overstretch or spasm of the piriformis muscle due to SI lesions) and a vascular component (compression of small vessels).

In a sacrum anterior lesion, the piriformis muscle is mostly overstretched, in an sacrum posterior lesion the muscle is mostly shortened. In both cases there is a hip in external rotation on the same side.
The clinical symptoms in a piriformis syndrome are:

- Pain with sitting or standing longer than 15 minutes.
- Pain irradiating along the gluteus maximus muscle, the buttock and the posterior thigh, not going down the knee.
- Pain improves with walking.
- Paresthesia posterior leg, above the knee.
- Walking is painful at start.
- Palpation piriformis muscle very painful.
- Complaint possible in the area of gluteus medius and minimus and TFL region.
- A hip in external rotation with painful internal rotation.
• Positive SLR test with hip in internal rotation.

**Osteopathic treatment:**

• **Aim:** taking away the stress on the piriformis muscle. This stress can be due to:
  
  • Overstretch (with sacrum anterior lesion).
  
  • Shortened with spasm (segment L5).
  
  • Shortened with trophic alterations.
  
  • Bad circulation in the muscle.
  
  • Adhesion with rectum.
  
  • Pelvic congestion.

*Figure 54 - External rotation of right hip in piriformis syndrome*
3.2.2.5. Stress on the Biceps Femoris Muscle

An anterior rotated iliac bone can cause stretch of the biceps femoris muscle since the extension of the muscle is the sacrotuberous ligament that stretches cranially.

Tendonitis of the muscle may occur at the level of the tuber or at the level of the fibular head.

It may also subluxate the fibular head in a cranial and posterior direction. This stress may continue caudally and cause symptoms in the peroneal muscles.

![Figure 55 - Stress on the biceps femoris muscle](image)

This pull on the peronei muscles will rotate the cuboid bone internally thus creating a collapse downwards of the joint between cuboid and navicular, thus creating a flatfoot.
3.2.2.6. Visceral Component
Iliosacral dysfunctions change the position of the ischial tuberosity and can therefore change the tension in the perineum.

Spasm of the pelvic floor may occur.

Possible symptoms are coccygodynia, levator ani syndrome, proctalgia fugax, tension myalgia and dyspareunia. Even groin pain and testicular pain may occur.

More details on this visceral relationship can be found in the visceral e-books of the same authors.

![Figure 56 - Visceral component](image)

3.2.2.7. Leg Length Difference
When there is a change in the relationship between the SI joint and the acetabula, an apparent leg length difference can occur. Heel lifts are no solution here.
3.2.2.8. Influence on the Iliolumbar Ligaments
The iliolumbar ligaments have a compression effect on the SI joints.

Figure 57 - Iliolumbar ligaments

3.2.2.9. Pain in the Long Dorsal Sacroiliac Ligament

The long dorsal sacroiliac ligament lies between the PSIS (posterior superior iliac spine) and sacrum (lateral S3, S4) and the ischial tuberosity.

It has strong anatomical connections with the erector spinae, the thoracolumbar fascia, the gluteus maximus muscle, the sacrotuberous ligament and the SI capsule.

Pain can be found just below the PSIS.

Functionally the ligament works opposite to the sacrotuberous ligament.

Anterior rotation of the sacrum decreases the tension on the long dorsal sacroiliac ligament. This is in contrast to the tension that increases on the sacrotuberous ligament.

Posterior rotation of the sacrum leads to the opposite, more tension in the long dorsal sacroiliac ligament.

Traction on the biceps femoris muscle hardly provokes tension in the long dorsal sacroiliac ligament but strong tension in the sacrotuberous ligament.
3.2.2.10. Anterior Opening of the SI Joints After Delivery

After vaginal delivery it regularly happens that not only the pubic symphysis opens too far but also that the anterior part of the SI joint opens and overstretches (or tears) the anterior capsule.

Extreme abduction with the hip in sports injuries can also cause this SI joint opening on one side.
3.2.2.11. Synovial Cyst
(Hughes 2006)

This condition can be seen in elderly people and presents with severe difficulty in walking and groin pain.

The condition is seldom seen but is always associated with severe osteoarthritis.

This condition is a contraindication for manipulation. Only surgery will help.

\[\text{Figure 60 - Synovial cyst}\]
3.2.2.12. SI joint Dislocation

Traumatically a joint dislocation can occur.

Osteopathic treatment is not possible and surgery unavoidable.

Figure 61 - SI joint dislocation

3.2.2.13. Osteoarthritis

Osteoarthritis is a degenerative joint disease.

Osteoarthritis occurs more frequently as we age. Before age 45, osteoarthritis occurs more frequently in males. After 55 years of age, it occurs more frequently in females.

Primary osteoarthritis is mostly related to aging. With aging, the water content of the cartilage decreases, and the protein makeup of cartilage degenerates.

The cartilage begins to degenerate by forming tiny crevasses.

In advanced cases, there is a total loss of cartilage cushion between the bones of the joints.

Repetitive use of the worn joints over the years can irritate and inflame the cartilage, causing joint pain and swelling.

Loss of the cartilage cushion causes friction between the bones, leading to pain and limitation of joint mobility.
Inflammation of the cartilage can also stimulate new bone outgrowths (osteophytes) to form around the joints.

Osteoarthritis occasionally can develop in multiple members of the same family, implying a hereditary (genetic) basis for this condition.

**Figure 62 - Sclerosis and osteophytes in osteoarthritis**

It is recognized that the pain relieving effects of osteotomy is likely due to the pressure relieving effect of the bony cut rather than any type of “mechanical concept”.

It is theorized that the beneficial effects of these procedures is probably due to the opening and simultaneous decompression of the “venous hypertension” of the vascular sinusoids in the medullary bone cavities. Moreover, it is found that micro fractures of subchondral bone along with their associated pressure effects have an initiating and propagating effect in the development of osteoarthritis and pain.

Thus, we are left with the inevitable realisation that inflammation and its effects appear to be a fundamentally patho-physiological component of back or pelvic pain.

Local inflammation is the cause of low back pain. This local inflammation can have multiple causes such as:

• Mechanical dysfunctions.
Wrong use of the spine and pelvis.

Immune system dysfunctions.

Dysfunctions in the local and general vascularisation and local metabolism.

Osteoarthritis can even lead to ankylosis of the joint by creating bridging osteophytes. In this case local treatment is forbidden.

The osteopathic treatment in the case of degenerative disease has purposes:

- Improve the local and general vascularisation by treating:
  - The heart - lung segments (oxygen supply, oxygen/CO2 balance in the whole body).
  - Treating the segment T12-L2 (arterial tone).
  - Treating locally with long lever.
  - Correct the local instability by:
Manipulation, mobilization, MET.
Mechanical manual decompression of the joint space.
Correcting posture in the three planes.

- Improve the immune system to reinforce the body’s actions against inflammation. Here the adrenal segment can play an important role.

Advices:
- Induce more movement.
- Stress reduction.
- Eventually loss of body weight.
- Healthy nutrition.
- Sufficient rest.

This affection is a very good indication for osteopathic treatment.

3.2.2.14. Sacroiliitis
(O’Shea et al 2010)

Sacroiliitis describes inflammation in the sacroiliac joint.

Sacroiliitis is often found as a part of inflammatory conditions of the spine. As a group, these conditions are called spondyloarthropathy and they include conditions such as ankylosing spondylitis, psoriatic arthritis and reactive arthritis amongst others.

Sacroiliitis may also be a component of other types of arthritis, such as ulcerative colitis, Crohn’s disease or osteoarthritis.

Sacroiliitis may also be caused by sacroiliac dysfunction.

The most common symptoms of sacroiliitis are fever, low back pain, hip pain, buttock pain, stiffness in hips and back, especially after prolonged sitting or in the morning.
3.2.2.15. Bechterew Disease

Bechterew's disease is also called Marie Strumpell disease, rheumatoid spondylitis, and ankylosing spondylitis.

Ankylosing spondylitis is a serious illness that affects males almost exclusively, with the first appearance of the signs or symptoms usually occurring between the ages of 15 and 45.

There is stiffening of the spinal joints and ligaments, so that movement becomes increasingly painful and difficult. When it runs its full course, it results in bony ankylosis of the sacroiliac joints and the vertebral joints. The stiffening may extend to the ribs and limit the flexibility of the rib cage, so that breathing is impaired.

A familial tendency has been strongly suggested by recent evidence. Immunologic activity is suggested by the presence of histocompatibility antigen HLA-B27 (in more than 90 percent of patients with this disease) and circulating immune complexes.
**Symptoms:**

- Intermittent low back pain, usually most severe in the morning or after a period of inactivity.
- Stiffness and limited motion of the sacroiliac joints and the lumbar spine.
- Pain and limited expansion of the chest due to involvement of the costovertebral joints.
- Peripheral arthritis involving shoulders, hips and knees.
- Mild fatigue, fever, anorexia, or weight loss.
- Occasional iritis.
- Aortic regurgitation and cardiomegaly are possible.

Bechterew’s disease often starts with a complaint related to the SI joints (most bilaterally). These joints will progressively ankylose (fuse) after a longer period of arthritis.

The further evolution is the calcification of the intervertebral capsules, resulting in a bamboo spine.

*Figure 65 - Bilateral partial fusion*
Figure 66 - SI ankylosis

Figure 67 - Bamboo spine
4. Examination

4.1. Provocation Tests

4.1.1. Intra-articular Compression

The test is positive if local SI pain results, that continues after release of the compression.

A positive test indicates sacroiliitis.

A negative test does not provide absolute certainty that no inflammation is present.

If radicular or other pain symptoms occur, a leakage of the synovial fluid must be suspected.

4.1.1.1. Compression of the Posterior Part of the Sacroiliac Joint

The osteopath puts both hands on the medial side of the ASIS and provokes in a lateral direction. This way the posterior side of the SI joint is under compression.

The test is first done with light pressure and continued by provocative pressure.

*Video 1 - Compression of the posterior part of the sacroiliac joint*
4.1.1.2. Compression of the Anterior Part of the Sacroiliac Joint

The osteopath puts both hands on the lateral side of the ASIS and provokes in a medial direction. This way the anterior side of the SI joint is under compression.

The test is first done with light pressure and continued by provocative pressure.

Video 2 - Compression of the anterior part of the sacroiliac joint
4.1.1.3. *Compression via the Hip*

The osteopath sits next to the patient on the side to be tested.

The leg of the patient is bent, the foot against the medial side of the knee and the leg supported against the thigh of the osteopath. This way the femur is put in the direction of the SI joint.

The osteopath fixes the opposite Iliac bone and compresses along the femur in the direction of the SI joint.

The test is first done with light pressure and continued by provocative pressure.

Some body weight must be used in this compression test.

*Video 3 - Compression via the hip*
4.1.1.4. Direct Compression of the ‘Foot’ of the Joint
The “foot” of the SI joint is the caudal part of the joint where the most compressive forces occur.

The patient is in sidelying with the superior leg bended, the knee on the table and the pelvis oblique on the table to bring the articular surface of the SI joint parallel to the table.

The osteopath stands on the backside of the patient and contacts with his pisiform the PIIS without compressing the muscles excessively.

The other hand supports this position.

The osteopath gives compression in the foot of the SI joint, perpendicular to the table.

The test is first done with light pressure and continued by provocative pressure.

Some body weight must be used in this compression test.

This test is very reliable but care must be taken as the local soft tissue can also cause pain.

Video 4 - Direct compression of the ‘foot’ of the joint
4.1.2. Mennel Test

This test is a differentiation between pain originating from the hip, the SI joint or the lumbar spine.

The patient is prone.

The osteopath takes the patients' leg.

He first fixes the iliac bone on the level of the tuber and provokes with the leg in extension. Hereby he provokes the hip joint.

He then fixes the sacrum and provokes the SI joint by lifting the leg some more in extension.

At last he fixes the lumbar spine and lifts the leg even more to compress between L5 and the sacrum.

Video 5 - Mennel test
4.1.3. Fabere Test

This test is a differentiation between pain coming from the hip and pain coming from the SI joint.

The patient lies supine with the leg on the affected side in abduction and bent., foot against the inner side of the knee.

The osteopath brings the leg into abduction. Inguinal pain indicates a hip problem.

The osteopath then compresses between the opposite iliac bone and the patients’ leg. Pain in the posterior region of the pelvis indicates a SI problem.

*Video 6 - Fabere test*
4.2. Mobility Tests

4.2.1. Standing Flexion Test (SFT)

The osteopath sits behind the patient, his eyes on PSIS height.

The thumbs palpate underneath the PSIS. Take up the skin slack.

This test is positive on the side where the PSIS moves more during flexion: the PSIS ascends (cranial displacement). This test can give a false positive when the patient flexes the opposite knee faster to the side of PSIS movement during flexion.

The test indicates the side of lesion.

Video 7 - Dorsal view of the SFT
4.2.2. Sitting Flexion Test (SitFT)

The osteopath sits behind the patient, his eyes on PSIS height.

The thumbs palpate underneath the PSIS. Take up the skin slack.

This test is positive on the side where the PSIS moves more during flexion: the PSIS ascends (cranial displacement).

**When the standing test is clearly more positive than the sitting test a iliosacral problem is suspected.**

**When the sitting test is clearly more positive than the standing test a sacroiliac problem is suspected.**

The sitting test eliminates eventual tension from the hamstrings.
Video 9 - Dorsal view of the SitFT

Video 10 - Lateral view of the SitFT
4.2.3. “Rucklauf” Test

This test provides information about the direction and quality of the dysfunction: fixation or restriction.

For example: if the PSIS does not descend during hip flexion, this means that the ilium cannot rotate posteriorly. This indicates an ilium anterior lesion.

Remark: the ilium only rotates posteriorly with hip flexion above 90°.

*Video 11 - “Rucklauf” test – dorsal view*
Video 12 - “Rucklauf” test – lateral view
4.2.4. In-flare Test

The patient is sitting.

He performs internal rotation of both hips, knees stay together. The lumbar spine stays in lordosis.

The ischial tuberosity moves laterally.

If the ischial tuberosity does not move laterally then an out-flare lesion is present.

*Video 13 - In-flare test – ventral view*
Video 14 - In-flare test – lateral view
4.2.5. Out-flare Test

The patient is sitting, knees together.

He performs an external rotation of both hips. The lumbar spine stays in kyphosis.

The ischial tuberosity moves medially.

If the ischial tuberosity does not move medially then an in-flare lesion is present.

*Video 15 - Out-flare test – ventral view*
Video 16 - Out-flare test – lateral view
4.2.6. Downing Test - Ligamentous

**Lengthening test (LT):** hip motion: flexion - adduction - external rotation: the external rotation is maintained.

The iliac bone rotates anteriorly causing the leg to apparently lengthen.

This test is used to identify a posterior ilial fixation.

**Video 17 - Lengthening test – LT**

**Shortening test (ST):** hip motion: extension - abduction - internal rotation: the internal rotation is maintained.

The ilium rotates posteriorly causing the leg to apparently shorten.

This test is used to identify an anterior fixation.
Video 18 - Shortening test – ST
4.2.7. Sidebending Test

The patient is sitting in kyphosis.
The patient does a lateral flexion to the right.
The right iliac bone should rotate posteriorly.

Video 19 - Patient in kyphosis
4.2.8. Sidebending Test

The patient is sitting in lordosis.

The patient does a lateral flexion to the right.

The right iliac bone should rotate anteriorly.

Video 20 - Patient in lordosis
4.2.9. Elasticity Test for Sacrospinous and Sacrotuberous Ligaments

Evaluation of the elasticity of the sacrospinous ligament: between the ILA and the ischial spine.

Evaluation of the elasticity of the sacrotuberous ligament: between the ILA and the ischial tuberosity.

In the case of an ilium anterior lesion, it is the sacrospinous ligament that maintains the iliac bone in its lesioned state.

Video 21 - Elasticity test for sacrospinous and sacrotuberous ligaments
4.2.10. Test (Palpation) of the Iliolumbar Ligaments

The test is done on pain and elasticity.

The palpation is done in the junction between the iliac crest and the lateral border of the paravertebral muscles.

The palpation is done in a caudal direction and can be done with the patient sitting (in relaxed lordosis) or with the patient prone.

*Figure 68 - Palpation of the patient sitting and prone*

The pain from the provocation should not be confused with pain that is due to entrapment of the dorsal ramus L1 or L2 nerve roots (Figure 69). These nerves cross the iliac crest approximately 7 cm from the middle line and run through a osteofibrous opening where entrapment is possible. Maigne et al (1991) first discovered these entrapment locations.
Figure 69 - Palpation in case of nerve entrapment
5. Techniques

Disclaimer

The techniques in this e-book are exclusively meant for academically trained osteopaths who know their capacities and limits and who know when a patient should be referred to another qualified health professional.

The authors are not responsible for the wrong use of the techniques described and explained in this e-book.
5.1. Mobilisations

(Kutchera 1996, 2001, Maitland 2001)

5.1.1. General

The aim of a mobilisation is:

• Correction of the false axis in the joint by stretching retractions in the capsule and surrounding ligaments. This is done with enough specificity so that it is appropriate even in a joint that is hypermobile in other directions. In this way the biomechanical quality of the joint can be repaired and the overstretched soft tissues can relax.

• Via rhythmical mobilisations and use of long lever techniques a drainage of all soft tissues around the joint will occur. Local to the false axis (shortened structures) a congestion of all tissue will still occur.

• The mobilisation is done in a pain free and rhythmical manner. The aim is to normalise any hyperactivity of the sympathetic system in the surrounding tissues. Pain will increase this sympathetic activity further.

• Via rhythmical compression/traction the synovial production is stimulated which is a desirable reaction when treating arthrotic joints. This is also the reason why mobilisations of an arthritic joint are not suggested.

• Range of motion increase is not necessarily the primary aim of mobilisation. It can even be relatively contraindicated so as not to cause instability (especially of concern in arthrotic joints).

The mobilisation must be pain free so as to avoid further increasing sympathetic activity further which is contradictory to the aim.

The mobilisation must occur on the end of range so that a light tension is maintained in the tissues being treated.
The mobilisation is rhythmical and with circumduction where possible.

If the aim is to stimulate synovial production, a light push or pull (compression/traction) technique is indicated.

The mobilisation is always done in the direction of the false axis (shortened structures) and according to the normal biomechanics of the joint. The hypermobile directions are avoided.

**Contraindications**

- Inflammation or infection.
- A joint with intra-articular swelling.
  - Mobilisation will only increase and worsen the swelling.
- Painful end of range.
- In the direction of a structurally damaged capsule.
- Directly following recent trauma.
5.1.2. Mobilisation in the “General Treatment”

5.1.2.1. Posterior Mobilisation

The patient is supine with the legs straight on the table. The osteopath sits facing the patient on the side to be mobilised.

The knee and hip are flexed and the knee is held with the hand.

While adducting the hip, the osteopath places the fingers of the other hand posterior to the sacroiliac joint with the fingertips in the sacroiliac joint space against the sacrum, the palmar surface of the fingers contact the PSIS.

While the osteopath fixes the sacrum ventrally with the fingertips, the leg is mobilised in a combined flexion-external rotation-abduction circumduction. The osteopath mobilises using his bodyweight.

The palmar surface of the fingers palpates the ilium (PSIS), to ensure that it is being mobilised in a posterior/medial direction.

Video 22 - Posterior mobilisation
5.1.2.2. Anterior Mobilisation

The osteopath hooks onto the PSIS with the fingertips and mobilises the hip in a combined extension-internal rotation-adduction circumduction while simultaneously pulling the ilium laterally via the PSIS.

The osteopath mobilises with his bodyweight.

**Remark**: after this mobilisation the leg is put back to rest on the table:

- In the case of a posterior ilial mobilisation in abduction/external rotation.
- In the case of an anterior mobilisation in adduction/internal rotation.

*Video 23 - Anterior mobilisation*
5.1.2.3. Posterior Mobilisation
The patient is prone with arms hanging next to the table.

The osteopath stands next to the pelvis on the side to be mobilised.

The caudal hand takes the ankle and flexes the knee to 90°.

While the other hand fixes the sacrum towards anterior rotation, the leg is mobilised into external rotation / circumduction.
5.1.2.4. Anterior Mobilisation

The patient is prone with arms hanging next to the table.

The osteopath stands next to the pelvis on the side to be mobilised and uses his knee to fix the lateral side of the knee so that the hip remains in adduction during the mobilisation.

The caudal hand takes the ankle and flexes the knee to 90°.

While the other hand fixes the sacrum in posterior rotation, the leg is mobilised into internal rotation / circumduction.

*Video 25 - Anterior mobilisation*
5.1.3. Anterior and Posterior Mobilisation

The patient is lying on the side with the upper hip and knee flexed and the lower leg straight.

The osteopath stands in front of the patient.

With one knee on the table the osteopath supports the weight of the upper leg.

The osteopath contacts the ilium with one hand on the ischial tuberosity and the other hand on the ASIS.

The ilium is mobilised in an oblique plane (in line with the joint) from anterior to posterior and vice versa.

*Video 26 - Sidelying mobilisation*
5.1.4. Reflexogenic Correction / Leg Tug

The patient is supine.

The osteopath stands at the foot end of the table and takes the ankle of the side to be treated.

A plane between the sacroiliac joint and both acetabuli is visualised.

To bring the ilium anteriorly: the straight leg is placed in internal rotation/adduction \textit{under} the plane being visualised.

To bring the ilium posteriorly: the straight leg is placed in internal rotation/adduction \textit{above} the plane being visualised.

The osteopath holds the leg in position and adds traction in the length of the leg.

An additional traction/thrust is done so as to give a reflexogenic correction to the ilium.

After this correction the leg is put back to rest on the table for a few minutes:

• In the case of a posterior correction of the ilium in abduction/external rotation.
• In the case of an anterior correction of the ilium in adduction/internal rotation.
Video 27 - Anterior mobilisation

Video 28 - Posterior mobilisation
5.1.5. Ilium Out-flare Lesion

Flare dysfunctions can limit the effectiveness of an otherwise sufficient treatment of iliac rotations. Therefore, if identified, they are best treated before the rotation component of the iliosacral dysfunctions.

This lesion is the result of a hypertonic coccygeus muscle and/or retraction of the sacrospinous and/or sacrotuberous ligament.

Therefore a complete correction of this dysfunction also requires relaxation/stretching of these structures.

5.1.6. Ilium In-flare Lesion

This dysfunction is the result of a shortening or retraction of the iliolumbar ligament and/or hypertonic quadratus lumborum, latissimus dorsi or paravertebral musculature.

The correction of this dysfunction includes consideration for these soft tissue structures.

5.1.7. The Iliolumbar Ligament

The patient is supine and relaxed.

The osteopath stands on the side to be treated and takes the leg between his arm and thorax while the other hand hooks onto the PSIS. The leg is placed in internal rotation and this is maintained during the entire technique. A gentle and rhythmic traction is given in the length of the leg. This technique stretches the vertical fibres of the ligament.

If this technique is done in exactly the same manner but with the leg in adduction, the stretch will be more specific for the horizontal fibres of the ligament.

If during the technique the lower lumbar spine becomes lordotic, the patient’s other leg should be bent so that the stretch is specific to the ligament and the lumbar spine is protected.
The osteopath must feel the low lumbar spine flatten, if not the technique is not stretching the iliolumbar ligament.

*Video 29 - Iliolumbar ligament*
5.1.8. The Sacrotuberous and Sacrospinous Ligament

The patient is prone.

The osteopath stands on the side to be corrected and abducts the leg until the ligament to be treated is at maximum length. From this position the leg is mobilised into internal rotation by rhythmic circumduction so that the ischial tuberosity and ischial spine move away from the inferior angle of the sacrum.

This motion stretches the sacrotuberous and sacrospinous ligament.

Video 30 - Sacrotuberous and sacrospinous ligament
5.2. Osteopathic Manipulative Techniques (OMT)

(Hartmann 1997, Gibbons et al 2000)

5.2.1. General

A manipulation or HVLAT (High Velocity Low Amplitude Thrust) is a short, specific and rapid thrust applied to an articulation.

The aim of a manipulation is variable depending upon the lesion and joint being treated.

The aim of a manipulation is:

• Repositioning of a joint subluxation.
• Alleviation of muscular spasm in short musculature.
• Stretching of a capsulo-ligamentous retraction (correction of false axis – shortened structures).

Manipulations are in some situations a necessity, most notably in cases of an articular blockade or subluxation. This is often difficult to differentiate from a restriction (mobility loss with elastic end feel).

Manipulations are, in some cases, a more efficient treatment for restriction. Where elastic end feel is present mobilisations can be used but, if no contra indications exist, then manipulation is also an option.

Before the age of 20 years, “real” articular blockades seldom occur.

The OAA region is an exception because no discs are present but articular blockades occur. Even in small children subluxations can be found here.
Contraindications

Before an osteopath decides to use a manipulative technique it must be sure that no contraindications are present.

Contraindications fall into several categories:

• Medication
  - The osteopath will not manipulate if the patient takes anticoagulants or corticosteroids.

• Trauma
  - The osteopath will not manipulate directly after trauma, without radiological testing showing no osseous lesions.
  - The osteopath will not manipulate too soon after an operation.

• Lever use
  - If the patient has pain or neurological symptoms during the positioning of the body and levers for the technique, the osteopath will not manipulate.

• Osteoporosis
  - The osteopath will not manipulate in cases of obvious osteoporosis such as Sudeck atrophy.

• Children
  - Real articular blockades do not occur in children, so manipulation is not necessary. A real blockade is not only a facet fixation but implicates certain damage to the disc, which allows displacement of the nucleus pulposus. It is very rare that the disc is damaged in children.

The OAA is an exception. Because no discs are present, subluxations can occur. Cervical manipulations on children are to be avoided. The reason for this is that the vulnerable structures can’t be blocked in that way that this can’t be solved with other, softer techniques such as gentle mobilisations and “side of ease – side of barrier” techniques.
• **Pregnancy**

  • Manipulation of lesions during pregnancy is not an absolute contra indication but does deserve extra vigilance. Hypermobility is not infrequent so any manipulative technique must be carried out very specifically.

• **Elderly**

  • In older patients, arthrosis is a frequent reality and changes the joint surface congruency. Manipulation is not absolutely contraindicated but extra care must be taken. Manipulation is needed only in cases of subluxation.

  • When treating arthrotic joints it is not the aim to drastically improve the range of motion. This will only lead to joint instability. In cases of arthrotic joints it is necessary to leave the general mobility loss alone because this is seen as a normal protective mechanism of the body. The aim is to not allow false axis to develop and to maximise circulatory factors.

• **Cardiac patients**

  • Manipulations that can create a potential neurovegetative influence upon the heart are contraindicated. These patients are not the ideal patients for a total osteopathic treatment because osteopathy works so effectively on the circulatory system. Cardiac patients have a faulty "motor" in their circulatory system and an improvement in this circulation may well create overload for the heart.

  • Other authors propose that it is indicated to optimise the neurovegetative influences to the heart via manipulations, MET and mobilisations of the thoracic and cervical region, but the author has no such specific experience and so can only suggest that any such treatment is done in a clinically controlled environment.
• **Cancer patients**
  - It is also strongly suggested to avoid manipulation of cancer patients. Osseous metastasis is always possible.
  - These patients are not the ideal patients for a total osteopathic treatment because osteopathy works so effectively on the circulatory system, which can allow rapid spread of any metastasis. Post-operative treatment of complaint is possible if allowed by the consulting specialist. This must be considered case by case.

• **Psychiatric patients**
  - Much care must be taken with these patients as manipulation can release unexpected emotional reactions and with this patient group this is not desired as the appropriate reaction for the osteopath is not always evident.

• **Prosthesis**
  - Prosthetic articulations are not manipulated.

### 5.2.2. Anterior Manipulation

The patient is lying on the opposite side to that being treated in the middle of the table.

The spine is as straight as possible and parallel to the edge of the table.

The patient is supporting himself on his shoulder, has a cushion under the head and both hips and knees are in maximum flexion.

Both the shoulder and pelvic girdles are vertical.

The osteopath stands in front of the patient.

The underlying arm is taken with one hand while the other hand supports the patient’s thorax.
The spine and thorax are placed in light flexion and rotation by gently pulling on the underlying arm until rotation and, most importantly, flexion is palpated at the sacroiliac joint.

The spine should remain in the same position on the table. The spine is then very lightly flexed further so that additional rotation can be added.

The superior leverage is complete up to the sacroiliac joint.

The patient then straightens the underlying leg so that the hip and knee are no longer flexed.

The osteopath holds the upper leg in flexion.

The osteopath’s superior hand and forearm fix the patient’s thorax while the thumb of this same hand fixes the lateral surfaces of the spinous processes S1, L5, L4.

The osteopath uses his thorax to support the fixation of the superior leverage with a light pressure towards the sacrum.

The osteopath contacts the upper ilium with his elbow, just under the dorsal surface of the iliac crest.

The patient’s pelvis is then rolled towards the osteopath and after several mobilisations of the sacroiliac joint to anterior rotation and without creating any tension; the ilium is corrected anteriorly by way of a thrust towards the table/anterior rotation from the osteopath’s bodyweight, via the elbow.

The joint plane should be respected and visualised so that the corrective thrust is given in the correct direction.

The thrust is only employed once the patient is relaxed and while the patient exhales.
Video 31 - Anterior manipulation
5.2.3. Posterior Manipulation – So Called “Chicago Technique”

The patient is supine on the table, with the fingers interlocked behind the neck.

The osteopath stands on the opposite side to the anterior ilium.

The pelvis of the patient is passively translated towards the osteopath.

The leg on the side being treated is placed in external rotation and abduction with the foot resting on the other ankle.

The heel, sacroiliac joint and shoulder should be in one straight line.

Contact is made on the ilium via the ASIS with one hand while the other hand sidebends the spine towards the lesion.

The patient actively lifts the head and shoulders away from the table so as to avoid lumbar lordosis. In this way the spine is in flexion and the sacrum follows ventrally.

By lifting the PSIS very slightly away from the table, several rotations can be done between the two leverages - as mobilisations - and the manipulative thrust is in a cranial, medial and dorsal direction via the ASIS.
Video 32 - Posterior manipulation
5.2.4. Anterior Manipulation

The patient is prone.

The osteopath stands on the side being treated and places the leg in extension and adduction. The contact is via the elbow on the ilium just under the PSIS.

The leg is lifted into extension and the anterior end of range is found.

The correction is a short, direct thrust on the PSIS ventrally, laterally, cranially.

*Video 33 - Anterior manipulation*
5.2.5. Decoaptation of the Pubic Symphysis

The adductors must be of equal tone to perform the technique.

If not, this has to be corrected first.

The osteopath places his forearm between the knees and then instructs the patient to rapidly adduct both hips.

Via this symmetrical contraction of the adductors, the pubic symphysis decompresses.

*Video 34 - Decompression of the pubic symphysis*
5.3. Muscle Energy Techniques (MET)

5.3.1. General

(Mitchell 1965, Weiselfish-Giammatteo & Giammatteo 2003)

The aim of muscle energy techniques depends upon the muscular findings:

• One possibility is muscular retractions due to trophic changes. The aim in this case is to stretch the muscles so as to allow the return of normal articular biomechanics.

• Another possibility is the aim of restoring muscular tone balance between agonist and antagonist after a correction. This rebalancing is important so that the preceding joint correction can be maintained and to avoid re-occurrence of the mobility loss.

• The contractions of the muscle also have a strong vascular effect.

The muscular balance in the cervical spine is of the outmost importance. Muscular imbalance can lead to neck pain because of muscular fatigue and contribute to dysfunctions of brainstem and local blood supply disturbance.

Muscular balancing of the cervical musculature can only be done with long time effect when all articular blockages are solved and general posture is normal.

Techniques

• Concentric techniques

  • A contraction against resistance will cause a muscle to shorten. This is done over the entire range (length) of the muscle. When repeated three times the tone of the muscle will increase.
• **Isometric techniques**
  
  • A 3 second contraction against resistance at the muscle’s end of range (max. length) is done, without allowing motion.
  
  • A 3 second rest phase follows. If this is not done muscular fatigue will occur.
  
  • Then a gentle, 3 seconds stretch of the muscle is done.
  
  • This procedure is repeated 3 times.
  
  • Other variants of the same principle are suggested in other texts (longer contractions, more repetitions etc.), in the author’s experience the procedure described above is adequate to stretch a muscle. The technique has the effect of not only mechanically stretching the muscle (this can also be done passively) but also decreasing the tone.

• **Isolytic techniques**
  
  • A contraction against strong resistance so that the muscle is simultaneously contracted and stretched. This powerful technique is not for every patient and provides a very strong muscular stretch.

**Remarks:** if a muscle is painful when palpated it cannot be assumed that the muscle is retracted and needs to be stretched!

**A painful palpation can indicate:**

• Spasm (strong pain, due to hypertonia, with palpation and shortened): the related segment is the beginning point of the treatment.

• Hypertonia (strong pain with palpation and when stretched): the related joints are to be mechanically treated so that the cause of it being over-stretched is removed and the muscle can repair. The related segment is also treated.

• Congestion of the muscle (pain and swollen due to poor venous drainage): of primary concern is the opening of all drainage channels and use of repetitive contractions/relaxation.
• Structural damage: no local osteopathic treatment.

It is important to differentiate the different muscular palpations so that the findings are placed in the correct context and can be appropriately treated.

**Contraindications**

Structural damage to the muscle is a clear contra indication for local stretch techniques.

**5.3.2. Posterior Lesion of the Ilium**

The patient is supine, close to the edge of the table on the side to be treated with the leg hanging next to the table.

The other leg can be flexed so that the foot rests on the table.

The osteopath stands on the side to be treated and, with one hand, fixes the opposite ilium towards the table via the ASIS.

The other hand contacts the anterior thigh of the hanging leg, just above the knee.

The osteopath instructs the patient to lift the hanging leg against his resistance. In this way, the isometric contraction of the iliacus muscle rotates the ilium anteriorly.

During the relaxation phase the osteopath places the leg further into extension so that the next contraction occurs at the new end of range and the mobility gain in the sacroiliac joint is maintained.

This M.E.T. correction is repeated several times in a row and once completed the patient’s leg is rested with the leg in internal rotation and adduction.

It is important that this technique is done at the end of available range of the joint and that the resistance and force from the patient are equal and controlled.
5.3.3. Anterior Lesion of the Ilium – Technique 1

The patient is prone, close to the edge of the table on the side to be treated.

The osteopath stands on the side to be treated next to the patient’s knee.

The leg is hung next to the table with the hip and knee flexed 90° and the foot is supported by the osteopath’s thigh.

One hand supports the weight of the leg via the medial surface of the knee in a position of light abduction while the other hand fixes the sacrum and palpates the sacroiliac joint space.

By moving the leg forwards the end of range of the sacroiliac joint is felt.

From this position the osteopath instructs the patient to straighten the leg against his static resistance.

During the relaxation phase the osteopath places the leg at the new end of range as palpated in the joint space.
This normalisation is repeated 3 to 4 times in a row and, if indicated, can be repeated again.

This technique employs contraction of the iliac portion of the gluteus maximus muscle.

Video 36 - Anterior lesion of the ilium

5.3.4. Anterior Lesion of the Ilium – Technique 2

The patient is lying on the opposite side to that being treated.

The osteopath stands in front of the patient next to the knee and places the upper leg into hip and knee flexion of 90°.

The foot is supported against the pelvis of the osteopath.

One hand supports the weight of the leg via contact on the medial surface of the knee while the other hand fixes the sacrum and palpates the sacroiliac joint space.

By moving the hip further into flexion the sacroiliac joint end of range is felt in the joint space.
The patient is instructed to abduct the hip against the static resistance from the osteopath, whereby the mobility gain creates a new end of range in the sacroiliac joint.

This is repeated 3 to 4 times.

The patient is instructed to adduct the hip against the static resistance from the osteopath, whereby the mobility gain creates a new end of range in the sacroiliac joint.

This is repeated 3 to 4 times.

The patient is instructed to extend the hip against the static resistance from the osteopath, whereby the mobility gain creates a new end of range in the sacroiliac joint.

This is repeated 3 to 4 times.

Only this phase is demonstrated, as it is the most important of the three.
5.3.5. External Rotation Lesion

The patient is supine.

The osteopath sits on the side to be treated and hooks onto the PSIS with the fingertips and also palpates the sacroiliac joint space.

The other hand takes the patient’s knee and supports this knee with his shoulder.

The hip is placed in adduction/internal rotation, to the sacroiliac end of range.

The patient is instructed to contract towards abduction against the isometric resistance of the osteopath.

During the rest phase the osteopath pulls the PSIS laterally to maintain the mobility gain.

This normalisation is repeated 3 to 4 times.

After the correction the leg is placed on the table via internal rotation/adduction.
5.3.6. Internal Rotation Lesion

The patient is supine and the knee of the side to be treated is flexed and the hip is placed in abduction and external rotation.

The foot rests against the opposite knee.

The osteopath sits on the side to be treated and palpates the joint with one hand while the other hand contacts the leg with the hand on the knee.

The patient is instructed to complete an adduction against the isometric resistance of the osteopath.

During the relaxation phase the new end of range of the sacroiliac joint is found.

This normalisation is repeated 3 to 4 times.

After the correction the leg is placed on the table via abduction/external rotation.

Video 39 - Internal rotation lesion
5.4. Strain and Counterstrain Techniques

(Friedman et al 2000, Jones 1995, Ramirez 1989)

5.4.1. General

Strain and Counterstrain is a type of "positional release" discovered in the early 1960’s by Dr. Lawrence Jones, D.O. It is a treatment that alleviates muscle and connective tissue tightness by the use of very specific treatment positions held for 90 seconds. During the procedure, the involved tissue is "slackened" causing a relaxation of the "spasm" which, in turn, allows local areas of inflammation, trapped within the painful tissue to dissipate. Following this "release" there is an immediate reduction of pain and tension in the involved tissue. This relaxation helps restore normal joint mobility and is also beneficial to other structures in the region that may have been compressed.

This gentle and painless technique has no contra-indications and can be used in almost any condition and on patients of any age.
5.4.2. Anterior Lesion of the Ilium

**Position:** the trigger point is approximately 3 cm lateral from the PSIS.

**Correction:** the leg is placed in extension + abduction.

The patient can be prone or lying on the opposite side.

*Video 40 - Anterior lesion of the ilium*
5.4.3. Posterior Lesion of the Ilium

**First position:** the trigger point is on the upper edge of the superior pubic ramus.

**Correction:** the patient is supine with the hip flexed to approximately 90°.

*Video 41 - First position*
5.4.4. Posterior Lesion of the Ilium

Second position: a second trigger point can be found central on the descending pubic ramus.

Correction: the hip is flexed to approximately 90° together with external rotation and abduction.

Video 42 - Second position
5.4.5. In-flare Lesion of the Ilium

**Position**: the trigger point is found in the middle of a line between the PSIS and the sacro-coccygeal joint. The osteopath palpates from lateral to medial.

**Correction**: the patient is prone and the osteopath places the leg in abduction and possibly light flexion or extension.

![Image of osteopath performing treatment](image)

*Video 43 - In-flare lesion of the ilium*
5.4.6. Out-flare Lesion of the Ilium

**Position:** the trigger point is located 10 cm below and 1 cm medial to the PSIS.

**Correction:** the patient is prone and the osteopath stands on the opposite side. The leg is placed in just enough extension to allow adduction of the leg.

*Video 44 - Out-flare lesion of the ilium*
5.4.7. Hypertonic Piriformis Muscle

**Position:** the trigger point is found in the muscle belly approximately 8 cm from the greater trochanter in a medio-cranial direction.

**Correction:** the patient is prone with the leg hanging next to the table. The osteopath sits next to the hanging leg and places the patient’s foot against his thigh. One hand palpates the trigger point while the other hand supports the weight of the leg with the hip in abduction and external rotation.

*Video 45 - Piriformis muscle*
5.4.8. Hypertonic Iliacus Muscle

**Position**: the trigger point is found in the iliac fossa, just above the inguinal ligament.

**Correction**: the patient is supine and the osteopath stands facing the patient with one foot on the table. Both hips are flexed and the ankles crossed so that the knees are spread apart. Both the patient's hips are abducted and externally rotated.

*Video 46 - Iliacus muscle*
5.4.9. Inguinal Ligament Dysfunction

**Position**: the trigger point is found on the external edge of the pubis, under the insertion of the inguinal ligament.

**Correction**: the patient is supine and the osteopath stands on the opposite side. The patient’s right hip and knee are flexed to 90°. The left leg is crossed over the right. The osteopath palpates the trigger point with the right hand, while the left hand gently places the right hip in internal rotation.

*Video 47 - Inguinal ligament on the right*
5.4.10. Hypertonic Adductors

**Position**: the trigger point is in the groin very close to the pubis.

**Correction**: the osteopath places the leg in maximum adduction and light flexion.

*Video 48 - Adductors*
6. All videos

The enemy of art is the absence of limitations.
- Orson Welles
On this page you will find all multimedia of this e-book. Click on the link to view a specific video.

**Video 1** - Compression of the posterior part of the sacroiliac joint

**Video 2** - Compression of the anterior part of the sacroiliac joint

**Video 3** - Compression via the hip

**Video 4** - Direct compression of the ‘foot’ of the joint

**Video 5** - Mennel test

**Video 6** - Fabere test

**Video 7** - Dorsal view of the SFT

**Video 8** - Lateral view of the SFT

**Video 9** - Dorsal view of the SitFT

**Video 10** - Lateral view of the SitFT

**Video 11** - “Rucklauf” test – dorsal view

**Video 12** - “Rucklauf” test – lateral view

**Video 13** - In-flare test – ventral view

**Video 14** - In-flare test – lateral view

**Video 15** - Out-flare test – ventral view

**Video 16** - Out-flare test – lateral view

**Video 17** - Lengthening test – LT

**Video 18** - Shortening test – ST

**Video 19** - Patient in kyphosis

**Video 20** - Patient in lordosis

**Video 21** - Elasticity test for sacrospinosus and sacrotuberous ligaments

**Video 22** - Posterior mobilisation

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**Video 26** - Sidelying mobilisation

**Video 27** - Anterior mobilisation

**Video 28** - Posterior mobilisation

**Video 29** - Iliolumbar ligament

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**Video 31** - Anterior manipulation

**Video 32** - Posterior manipulation

**Video 33** - Anterior manipulation

**Video 34** - Decoaptation of the pubic symphysis

**Video 35** - Posterior lesion of the ilium

**Video 36** - Anterior lesion of the ilium

**Video 37** - Anterior lesion of the ilium

**Video 38** - External rotation lesion

**Video 39** - Internal rotation lesion

**Video 40** - Anterior lesion of the ilium

**Video 41** - First position

**Video 42** - Second position

**Video 43** - In-flare lesion of the ilium

**Video 44** - Out-flare lesion of the ilium

**Video 45** - Piriformis muscle

**Video 46** - Iliacus muscle

**Video 47** - Inguinal lig. on the right

**Video 48** - Adductors
7. Bibliography

Books are the quietest and most constant of friends; they are the most accessible and wisest of counselors, and the most patient of teachers. - Charles W. Eliot


22. Early American Manual Therapy (1898-1946) Several authors.


8. Osteopathic Terminology

“In adjusting bones the mechanic is governed by three principles - the lever, the screw, and the wedge” - Dr. Andrew Taylor Still - Research and Practice, p. 54.

“We must have a perfect image of the normal articulations of the bone or bones that we wish to adjust” - Dr. Andrew Taylor Still - Research and Practice, p.40.
8.1. The Three Anatomical Axes

These are the craniocaudal, transverse and anteroposterior axes.

*Figure 70 - The three anatomical axes*
8.2. The Three Anatomical Planes

These are the sagittal, the frontal and the horizontal plane.

*Figure 71 - The three anatomical planes*
The left and right translations occur along the transverse axis. The ventral and dorsal translations occur along the anteroposterior axis. The motions of compression and traction occur along the craniocaudal axis. When describing a vertebral motion or lesional motion, the description is always relative to the inferior (underlying) vertebra.
Figure 73 - The translation motions along the three anatomical axes
# 8.4. General Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
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<tbody>
<tr>
<td>AIL</td>
<td>angulus Infero-Lateralis of the sacrum</td>
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<tr>
<td>AIIS</td>
<td>anterior Inferior iliac spine</td>
</tr>
<tr>
<td>ASIS</td>
<td>anterior superior iliac spine</td>
</tr>
<tr>
<td>C</td>
<td>cervical vertebra</td>
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<tr>
<td>CS</td>
<td>cervical spine</td>
</tr>
<tr>
<td>E</td>
<td>extension</td>
</tr>
<tr>
<td>ERS&lt;sub&gt;L&lt;/sub&gt;</td>
<td>Extension, left Rotation and left Sidebending</td>
</tr>
<tr>
<td>ERS&lt;sub&gt;R&lt;/sub&gt;</td>
<td>Extension, right Rotation and right Sidebending</td>
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<tr>
<td>F</td>
<td>flexion</td>
</tr>
<tr>
<td>FRS&lt;sub&gt;L&lt;/sub&gt;</td>
<td>Flexion, left Rotation and left Sidebending</td>
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<tr>
<td>FRS&lt;sub&gt;R&lt;/sub&gt;</td>
<td>Flexion, right Rotation and right Sidebending</td>
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<tr>
<td>ITA</td>
<td>inferior transverse axis</td>
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<td>L</td>
<td>lumbar vertebra</td>
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<tr>
<td>lig</td>
<td>ligament</td>
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<td>LS</td>
<td>lumbar spine</td>
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<td>m</td>
<td>muscle</td>
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<td>MTA</td>
<td>middle transverse axis</td>
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<tr>
<td>n</td>
<td>nervus</td>
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<tr>
<td>N</td>
<td>neutral: the anatomical starting position (standing)</td>
</tr>
<tr>
<td>NS&lt;sub&gt;L&lt;/sub&gt;R&lt;sub&gt;R&lt;/sub&gt;</td>
<td>Neutral, left Sidebending, and right Rotation</td>
</tr>
<tr>
<td>NS&lt;sub&gt;R&lt;/sub&gt;R&lt;sub&gt;L&lt;/sub&gt;</td>
<td>Neutral, right Sidebending, and left Rotation</td>
</tr>
<tr>
<td>OAA</td>
<td>the occiput – atlas – axis vertebral complex</td>
</tr>
<tr>
<td>PRM</td>
<td>primary respiratory mechanism</td>
</tr>
<tr>
<td>PIIS</td>
<td>posterior inferior iliac spine</td>
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<tr>
<td>PSIS</td>
<td>posterior superior iliac spine</td>
</tr>
<tr>
<td>R</td>
<td>rotation</td>
</tr>
<tr>
<td>RS motion</td>
<td>vertebral motion involving an ipsilateral rotation and sidebending where the rotation precedes the sidebending</td>
</tr>
<tr>
<td>S</td>
<td>sacral vertebra</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
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<td>--------------</td>
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<tr>
<td>S</td>
<td>sidebending or lateroflexion</td>
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<td>SBS</td>
<td>spheno basilar symphysis</td>
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<tr>
<td>SIJ</td>
<td>Sacroiliac Joint</td>
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<td>SLR</td>
<td>straight leg raise test</td>
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<tr>
<td>SR motion</td>
<td>vertebral motion involving a contralateral rotation and sidebending where the sidebending precedes the rotation</td>
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<tr>
<td>SFT</td>
<td>standing flexion test</td>
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<tr>
<td>SitFT</td>
<td>sitting flexion test</td>
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<tr>
<td>STA</td>
<td>superior transverse axis</td>
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<tr>
<td>T</td>
<td>thoracic vertebra</td>
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<tr>
<td>TS</td>
<td>thoracic spine</td>
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</table>
8.5. Specific Terms

Bodydrop: using your own bodyweight.
Convergence: the superior processus articularis glides to caudal relative to the underlying level.
Crista: crista iliaca.
Decoaptation: the joint surfaces gap away from one another.
Divergence: the superior processus articularis glides to cranial relative to the underlying level.
Easy neutral: the patient sits relaxed.
Group: at least three vertebrae.
Isometric: a muscle is placed under stretch (maximum length) and the patient contracts the muscle against the equal resistance being applied by the osteopath so that no change in muscle length occurs.
Monolytic: single vertebral unit.
Osseous Displacement: increased motion observed on one side compared to the other. This term is almost exclusively used to describe the comparative displacement of the SIPS.
Shift: synonym for translation.
Trigger point: a point that is abnormally sensitive when palpated.
9. About the Authors

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Both authors are holders of university degrees, namely the Master of Science in Osteopathy (MSc.Ost. – University of Applied Sciences), and are very active with the promotion and academic structuring of osteopathy in Europe. In 1987 they began The International Academy of Osteopathy (IAO) and are, to this day, the joint-principals of this academy. The IAO is since several years the largest teaching institute for osteopathy in Europe. Both osteopaths are members of diverse professional organisations, including the American Academy of Osteopathy (AAO) and the International Osteopathic Alliance (IOA), as part of their mission to improve osteopathic development.
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If you are interested in publishing an e-book or if you have questions or suggestions, please contact us.