The Sacroiliac Joint

Luc Peeters & Grégoire Lason
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1. Introduction

The sacrum is formed by fusion of the five sacral vertebral segments and lies between the two iliac bones of the pelvis. The sacrum articulates with the fifth lumbar vertebra by means of an intervertebral joint and two facet joints and with the iliac bones by means of the sacroiliac joints.

In osteopathy it is thought that the sacroiliac joint (SIJ) 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 and L5.

In the sacroiliac joint two long levers meet, creating significant mechanical stress. This e-book concerns examination and treatment of the sacroiliac motion. The iliosacral motion is described in the e-book 'The Iliosacral Joint'.

For those who are not familiar with the typical osteopathic terminology, we refer to chapter 9 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 bone are true synovial joints, the rest of the junction is comprised of an intricate set of ligamentous connections.

The two sacroiliac joints move together as a single unit and are considered bicondylar joints (where the two joint surfaces move correlative together) (Weissl 1955).

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.

Their functions include also:

- The transmission and dissipation of loads from the trunk to the lower extremities.
- Limiting rotation.
- Facilitating parturition.

Compared to the lumbar spine, the SI joints can withstand a medially directed force 6 times greater but only half the torsion and 1/20th of the axial compression load. These last 2 motions may preferentially strain and injure the weaker anterior joint capsule.
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 on 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 of greater magnitude 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.

The major aim in treating the sacrum and surrounding soft tissues is to maintain stability in the pelvis.

2.2. Mobility of the Sacrum Versus Both Iliac Bones

Both legs are ‘fixed’ on the ground in standing position.

The lever of the mobility in the SI joints is the spinal column.

Possible movements with the spine:

- Flexion/extension.
- Sidebending left and right.
- Rotation left and right.
- Cranial and caudal sliding movement.
**Figure 1 - Mobility of the sacrum versus both iliac bones**

**Axis of mobility:** different movements occur around different axes.

- Sidebending left
- Sidebending right
- Rotation left
- Rotation right
- Cranial and caudal sliding

**Figure 2 - Axis of mobility in the sagittal plane**

- Superior transverse axis (STA)
- Middle transverse axis (MTA)
- Inferior transverse axis (ITA)

**Axis of Sutherland**
3. Lesions - Dysfunctions - Diseases  

‘Lesion’ means that there is a loss of mobility.

Dysfunction of the SI joints can cause symptoms. Dysfunctions can be associated with either hypermobility or hypomobility.

3.1. Lesion Mechanics

3.1.1. Bilateral Sacrum Anterior Lesion

The sacrum is fixed in nutation (anterior) bilaterally between both iliac bones.

This lesion is also called instable pelvis.

**Palpation:**

- The posterior superior iliac spine (PSIS) are at the same height but closer together than normal.
- SI joint space is deeper than normal on both sides.
- Sacrotuberous ligament and sacrospinous ligament are under stretch.
- Inferior lateral angle (ILA) is bilaterally posterior.
- L₄ and L₅ follow into extension.
- Shortening of the posterior SI joint capsule and iliolumbar ligaments.
- Stretch on the anterior SI capsule.
- Compression in the caudal part of the SI joints under load.
- Short lower paravertebral muscles.
- Perineum (coccygeal muscle) stretch.
- Pubic symphysis opens.
- The sacrum descends between the iliac bones.
- Narrowing of the intervertebral foramen.
- Intervertebral disc compression posterior.
Figure 29 - Bilateral sacrum anterior lesion

Figure 30 - Bilateral sacrum anterior lesion

Figure 31 - SI joint space deep
3.1.2. Bilateral Sacrum Posterior Lesion
The sacrum is fixed in counter-nutation (posterior) bilaterally between both ilia.

Palpation:

- The PSIS are at the same height but further apart than normal.
- SI joint spaces are more superficial.
- Sacrotuberous ligament and sacrospinous ligament are shortened.
- ILA is bilaterally anterior.
- L₄ and L₅ follow into flexion.
- Stretch of the posterior SI joint capsule and iliolumbar ligaments.
- Compression in the cranial part of the SI joints under load.
- Stretched lower paravertebral muscles.
- Perineum (coccygeal muscle) short.
- Pubic symphysis closes (in compression).
- Intervertebral disc compression because of increased load.

*Figure 32 - Bilateral sacrum posterior lesion*
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 sacroilitis.

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
5. Techniques

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 be relaxed.

- Via rhythmical mobilisations and use of long lever techniques 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 contra-indicated 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.

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/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. Bilateral Anterior Lesion of the Sacrum
The patient lies prone on the table with a cushion under the abdomen.

The osteopath executes a pressure on both ILA to caudal and anterior that is increased during an abdominal inhalation.

During exhalation, the pressure is maintained and increased again during the following abdominal inhalation.

This manoeuvre is repeated several times.

Before doing this technique, the posterior ligaments and capsules must be stretched.

*Video 22 - Bilateral anterior lesion of the sacrum*
7. 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), the International Osteopathic Alliance (IOA) and the World Osteopathic Health Organisation (WOHO), as part of their mission to improve osteopathic development.

This osteopathic encyclopaedia aims to demonstrate the concept that a proper osteopathic examination and treatment is based upon the integration of three systems: the musculoskeletal, visceral and craniosacral systems.
This e-book is a product of Osteo 2000 bvba.

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