Shigehiko Katada
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Principles of Manual Medicine for Sacroiliac Joint Dysfunction

Arthrokinematic Approach-Hakata Method

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Preface

The sacroiliac joint is a movable synovial joint. Movement disorder in the sacroiliac joint is termed sacroiliac joint dysfunction, which causes low back pain. Therapeutic exercise has been the traditional means of treating sacroiliac joint dysfunction, but this has not been entirely effective. This is because movement in the sacroiliac joint is so small that traditional therapeutic exercise has not been able to detect it.

Arthrokinematics is the study of intra-articular movement. Dr. Setsuo Hakata has made an in-depth analysis of the intra-articular movement in every joint, including the sacroiliac joint, and in 2007 introduced his new method of treatment for low back pain. This is called the arthrokinematics approach (AKA-Hakata method).

In our book, we introduce techniques from the AKA-Hakata method for the treatment of sacroiliac joint dysfunction in an easy-to-understand way. By using this method, it is now possible to cure back pain of hitherto unknown causes. Furthermore, leg pain that may occur together with low back pain related to the sacroiliac joint is also curable, thanks to this method of treatment.

I would like to convey my deepest appreciation to Dr. Setsuo Hakata for all his support and advice during the production of this book.

Odawara, Japan — Shigehiko Katada MD, PhD
March 2019

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English Work

- Jun Yoshida: Chapters 3, 8, and 10.
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Contents

1 The History of Developing the AKA-Hakata Method for Sacroiliac Joint Dysfunction

Daisuke Kurosawa

Setuo Hakata, M.D., is the founder of arthrokinematic approach (AKA)—Hakata method. History of his clinical experience as an orthopaedic surgeon and a physiatrist is also history of the development of AKA-Hakata method for 40 years.

AKA-Hakata method consists of accessory movement techniques using accessory movement of a joint, and component movement techniques using component movement of a joint. The former techniques are used to treat a joint contracture and dysfunction, while the latter techniques are used to improve motor function. In this chapter, the history of developing accessory movement techniques in AKA-Hakata method to treat joint dysfunction is described.

1.1 Background

When Dr. Hakata worked in the US in the 1960s, the main therapeutic skills used by physical therapist were the neurological approach (NPA) and the arthrokinematic approach (AKA) [1]. After coming back to Japan in 1971, he understood that the traditional therapeutic exercise was not sufficient in clinical settings for pathological conditions in neurons, muscles, bones, and joints. At that time, the traditional therapeutic exercise showed limited effectiveness because one of the reasons of it was that the theory of the traditional therapeutic exercise ignored arthrokinematics, osteokinematics, and articular neurology.

In 1979, when he learned about the joint mobilization technique developed in Europe, he speculated that the therapeutic technique, taking into account intraarticular movement, could correct the defects of the traditional therapeutic exercise. Although the joint mobilization was a non-thrust technique, a strong force was required to adjust the joint movement [2–4]. He considered that it was not different from the other thrust techniques [5–11] including manipulation or chiropractic and it was not usable in clinical settings. Therefore he developed a modified joint mobilization technique using the gliding, the distraction, and the convex–concave rules, which were theoretically acceptable joint mobilization techniques.

1.2 Trial to Treat Joint Pain

First, he tried to treat several joint disorders using the modified joint mobilization technique. When he tried it on a patient with rheumatoid arthritis who could not walk due to severe pain, the pain was dramatically decreased after the procedure and the patient was able to walk. However, the patient showed severe pain again the next day. As a result, it was determined that joint mobilization was not suitable for inflammatory joint diseases. Instead, he tried to use this technique for less-inflammatory facet syndrome because the technique had immediate effects to reduce the joint pain.

He used a modified version of the facet joint mobilization technique described by G. P. Grieve [4] and the lumbar facet joint distraction described by S. V. Paris [12] (Fig. 1.1), which were explained in literature he had at that time.

Low back pain and lower extremity pain disappeared or were dramatically reduced in many cases by the modified lumbar facet joint mobilization technique. The fact that the referred pain area in the trunk and lower extremities originated from lumbar facet joints was discovered, as a result. Subsequently, cervical and thoracic facet joint gliding techniques were developed and these were effective for pain in the trunk and upper and lower extremities. According to these facts, he was convinced that various kind of musculoskeletal pain, which he had been unable to treat as an orthopaedic surgeon or physiatrist since 1959, must originate from joints, not from neurons or muscles.

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Fig. 1.1 Primary facet joint mobilization technique

After that, he devoted himself to investigating the pathophysiology of joint dysfunction as described by J. McM. Mennell and to develop arthrokinematic approach (AKA) manual techniques to recover intraarticular movement and to treat patients with joint dysfunction related to their musculoskeletal pain. Several patients with low back pain could not be treated by AKA techniques applied to facet joints. The sacroiliac joint was not touched because it was considered an immovable joint and was not a therapeutic target.

1.3 Focus on the Sacroiliac Joint

In 1980, a patient with acute low back pain came to his hospital. The patient showed no response to any conventional therapy including epidural injections of local anaesthetics and AKA for facet joints. He only understood that the sacroiliac joint could be the origin of the patient's pain. In the end, he administered local anaesthetics into the sacroiliac joint and it was dramatically effective. He acquired an understanding about the pain originating from the sacroiliac joint and it was an opportunity to develop AKA technique to correct sacroiliac joint dysfunction.

At first, both manual techniques of posterior superior distraction and posterior inferior distraction for the sacroiliac joint were tried as well as the technique to lumbar facet joint; however, these were not effective. Therefore, anterior superior distraction, anterior inferior distraction, and gliding were added based on the shape and width of the sacroiliac joint. Physical assessments of the sacroiliac joint were performed using provocation tests such as trunk forward bending, backward bending, and side bending, straight leg raising test (SLR), and modified Fabere (flexion-abduction-external rotation-extension of the hip joint). These provocation tests and Fadire (flexion-adduction-internal rotation-extension of the hip joint), which was described by P. C. Williams [13], were not sufficient to evaluate the sacroiliac joint; therefore, Fadirf (flexion-adduction-internal rotation-flexion of the hip joint) was added as new method to aid in the evaluations.

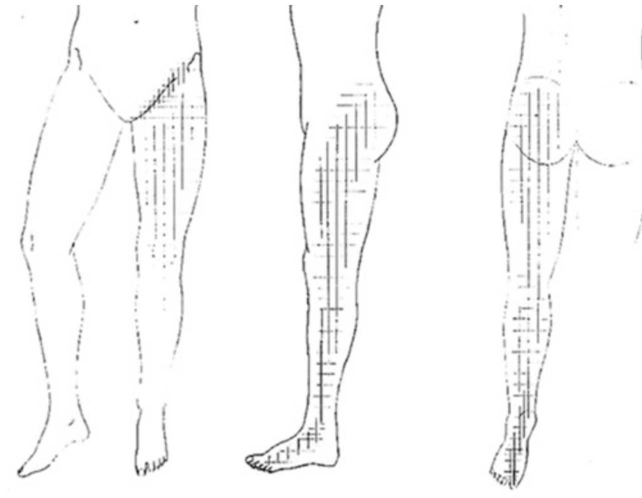

Fig. 1.2 Disappeared pain and sensory disturbance area after recovering from the sacroiliac joint movement

SLR, Fadirf, Fabere, and Fadirf (flexion-adduction-internal rotation-flexion of the hip joint), listed here in order of usefulness, were performed as a provocation test in supine position; however, these did not always trigger the pain. Therefore, these tests were utilized to evaluate the range of motion of the hip joint and how it was influenced by sacroiliac joint dysfunction rather than to trigger the pain in the sacroiliac joint region. Fadire was excluded for this reason.

At that time, the therapeutic manual technique for the sacroiliac joint was not sufficient. According to post-treatment questionnaires, only 30% of 1028 patients were cured. Therefore ultra-sound therapy, cold therapy, and range of motion (ROM) exercise had to be added. Figure 1.2 showed disappeared pain and sensory disturbance area after manual treatment for sacroiliac joint dysfunction at that time.

1.4 Development of Manual Technique for Sacroiliac Joint

In 1985, there were six techniques for the sacroiliac joint. They are as follows: posterosuperior distraction, posteroinferior distraction, upper distraction and sacrum nutation, upper distraction and sacrum counter-nutation, single sacrum counter-nutation, and upper distraction (Figs. 1.3, 1.4, 1.5, 1.6, 1.7, and 1.8).

After 5 years, these techniques were developed into eight techniques: sacrum nutation and upward gliding, sacrum nutation and downward gliding, sacrum counter-nutation and downward gliding, sacrum counter-nutation and upward gliding, superior distraction, inferior distraction, posterior superior distraction, and posterior inferior distraction.

In 1989, acute aseptic sacroiliac arthritis was discovered as a pathological condition in the sacroiliac joint, which was different from simple dysfunction. The acute sacroiliac

Fig. 1.3 Posterosuperior distraction of the sacroiliac joint

Fig. 1.4 Posteroinferior distraction

Fig. 1.5 Upper distraction and sacrum nutation

Fig. 1.6 Upper distraction and sacrum counter-nutation

Fig. 1.7 Single sacrum counter-nutation

Fig. 1.8 Upper distraction

arthritis was cured by AKA performed once 2 weeks for 2 months. In 1990–1991, a chronic type of sacroiliac arthritis was found.

1.5 The First Turning Point of Manual Technique for Sacroiliac Joint: Intensity of Procedures

In 1992, many patients with severe and different type of sacroiliac joint pain came to his private clinic. The patients had quite limited intraarticular movement of sacroiliac joint. A rubber-like feeling was sensed during distraction and gliding in the sacroiliac joint. In these cases, severe pain occurred after AKA. It was speculated that over-usage of AKA caused this kind of severe pain post-treatment. To overcome this fact, technical improvement was necessary with regard to the intensity of the manual procedures; therefore, the intensity "weak" was developed at that time. This technical improvement was effective for these patients. The intensity of manual procedures was divided into three grades: "strong", "medium", and "weak". The "strong" classification involved overextension of the joint capsule and the articular ligament. The "medium" classification involved extending the joint capsule and the articular ligament until the loosening disappeared. The "weak" classification involved extending less than half of the extension applied in the medium classification. It was considered that the appropriate duration of manual procedure for "weak" was 0.5 s, and the duration of "strong" was from 1 to 2 s.

1.6 Classification of Pathological Condition in Sacroiliac Joint

Based on the response to AKA procedures, the definitive diagnostic criteria for three conditions, chronic sacroiliac joint dysfunction, chronic simple sacroiliac arthritis, and chronic complex sacroiliac arthritis, were established. AKA could recover intraarticular movement of the joint fully in sacroiliac joint dysfunction and simple sacroiliac arthritis. However, in cases of chronic complex sacroiliac arthritis, limitations of intraarticular movement remained and the pain recurred even after AKA.

After struggling to treat this sacroiliac arthritis, the techniques were developed to six elements: forward upward gliding, backward downward gliding, superior distraction, inferior distraction, posterior superior distraction, and posterior inferior distraction (Figs. 1.9, 1.10, 1.11, 1.12, 1.13, and 1.14).

Fig. 1.9 Forward upward gliding

Fig. 1.10 Backward downward gliding

Fig. 1.11 Superior distraction

Fig. 1.12 Inferior distraction

Fig. 1.13 Posterior superior distraction

Fig. 1.14 Posterior inferior distraction

Figure 1.15 shows the relationship between pain areas and treated joints by using these modified techniques.

1.7 The Second Turning Point: Articular Neurology

The existence of joint receptors described by B. Wyke [14] was known. B. Wyke reported the classification of joint receptors into four types, from type 1 to type 4, according to morphology of the nerve endings. He also described the function of each joint receptor. In these receptors, type 1 was considered important because the stimulation of the joint could cause arthrostatic reflex. At that time, their clinical meanings were not clear for Dr. Hakata in his clinical settings. However, he knew that various joints including sacroiliac joint could be moved easily by using mild and slow manual technique. He experienced that when one side of sacroiliac joint was attempted to move by strong and quick manual technique, not only the sacroiliac joint but also the spinal facet joints, upper and lower extremities on the same side could be stiff. These facts were considered as arthrostatic reflex described by B. Wyke. Dr. Hakata found out that the arthrostatic reflex could be occurred in multi-joints, which he named arthrostatic hyper reflex chain.

Although the manual techniques for joint distraction and gliding were being performed, a joint approximation had not yet been tried. In 2002, trials of a joint approximation technique produced the second turning point. When approximation procedures were performed on one side of the thoracic facet joints, muscle tones decreased and muscle strength for voluntary movement increased on the same side of upper extremity. These facts inspired Dr. Hakata that operations of trunk joints could affect extremities. Contrary to this phenomenon, grasping around joints in extremities could affect trunk joints. The joint approximation technique revealed and reproduced that arthrostatic reflex and arthrostatic hyper reflex chain phenomenon in clinical settings.

One side of sacroiliac joint dysfunction could affect the function of extremities on the same side, which could be caused by arthrostatic reflex. When the arthrostatic reflex is occured during the treatment procedures, the joint itself becomes to be stiff, then we could not recover intraarticular movement by the joint movement and relieved dysfunction by manual technique, dysfunction of upper and lower extremities on the same side also could be treated. The articular neurology could explain the pathomechanism of these phenomena in clinical experiences.

Arthrostatic reflex itself in the joint to be treated should be considered, in particular, to recover intraarticular movement sufficiently in a joint with little joint movement, such as the sacroiliac joint. Mild and slow manual techniques which do not stimulate the joint receptors, mainly type 1 and 2,

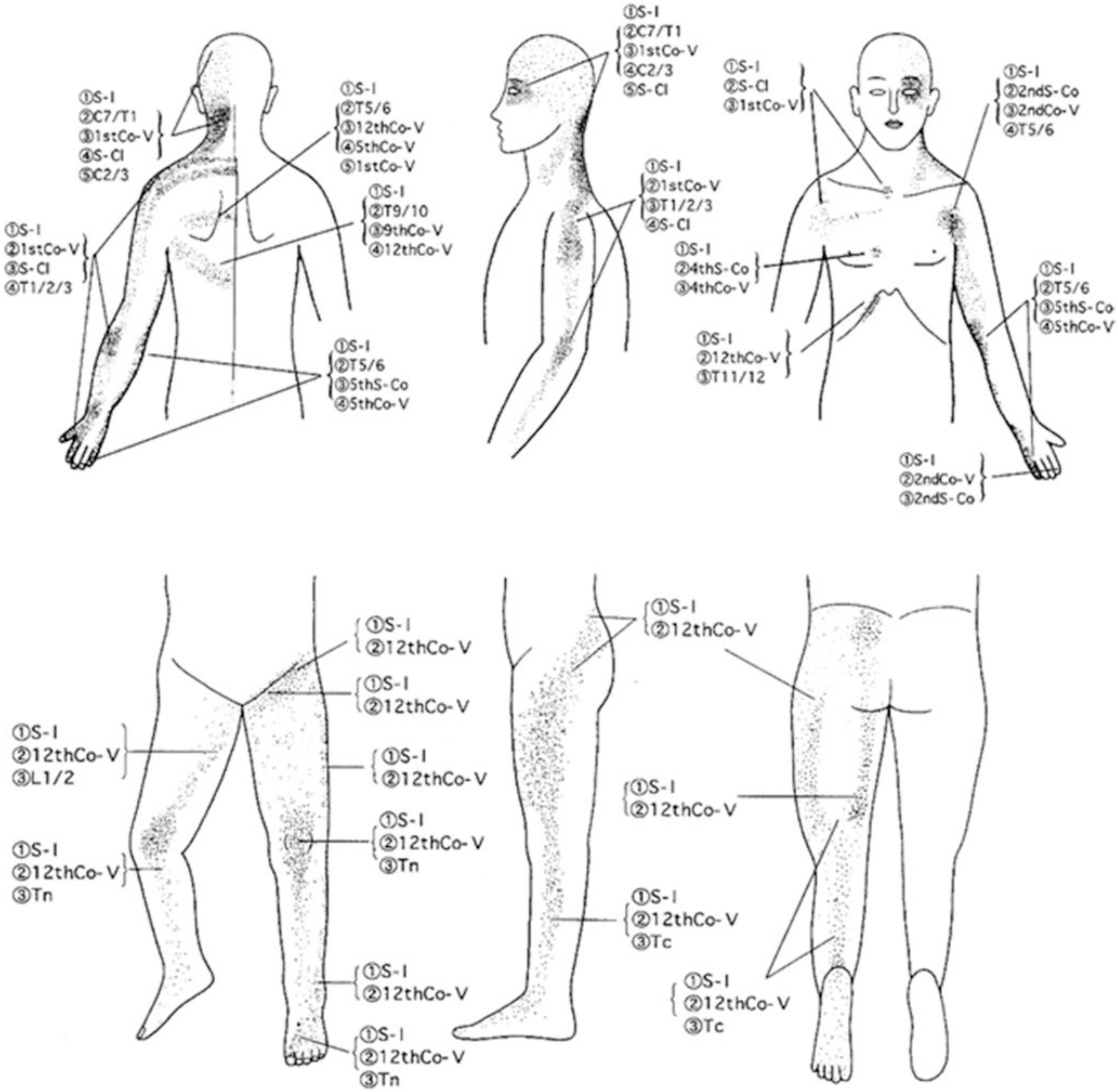

Fig. 1.15 The relationship between pain/numbness areas and treatment joints (in 2000)

were important for this purpose. When the arthrostatic reflex is occured during the treatment procedures, the joint itself becomes to be stiff, then we could not recover intraarticular movement.

This idea contributed to the development of AKA into a more gentle and slow technique. After consideration of articular neurology, AKA technique was refined and it brought good results. In 2007, the AKA technique for the sacroiliac joint was simplified to only four elements: superior distraction, inferior distraction, upward gliding, and downward gliding (Figs. 1.16, 1.17, and 1.18).

Fig. 1.16 Upward gliding of the left sacroiliac joint

Fig. 1.17 Upward gliding of the right sacroiliac joint

Fig. 1.18 Downward gliding of the left sacroiliac joint

1.8 The Name of the Technique: AKA-Hakata Method

In 2003, AKA techniques developed in Japan were introduced in the general assembly of the International Federation for Manual/Musculoskeletal Medicine. Dr. Hakata named his technique as "The Arthrokinematic Approach (AKA)-Hakata method", because the AKA technique developed in Japan was much different from conventional AKA or joint mobilization, which had been often used in Europe.

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Introduction to the Principle of the AKA-Hakata Method and Sacroiliac Joint Dysfunction

2

Shigehiko Katada

2.1 Definition of AKA-Hakata Method

The arthrokinematic approach (AKA) is a method to treat abnormalities of the intra-articular movements such as joint play, sliding, rolling, and spinning of the joint surface. The technique of the AKA-Hakata method is developed based on arthrokinematics, considering articular neurology [1].

2.2 Pain in Joint Dysfunction

Musculoskeletal pain could originate from either organic disorder or functional disorder. Although functional disorders are quite prevalent, modern medical standards, including imaging equipment and surgical technology, could not detect functional disorders. Joint dysfunction is one of the essential causes of the so-called musculoskeletal pain. The AKA-Hakata method is a manual technique to treat the joint dysfunction caused by abnormalities of intra-articular movement. There may be simultaneous organic disorder and related functional disorder in the joint. The AKA-Hakata method is also useful to treat functional joint disorder under organic pathological conditions, such as deformity of the knee and hip joint due to osteoarthritis confirmed in X-ray imaging.

A joint dysfunction often occurs particularly in the synovial joint having a small range of motion (small movement joint) such as the sacroiliac joint, facet joints, costovertebral joints, sternoclavicular joints, acromioclavicular joints, carpal joints, subtalar joint, intertarsal joints, and so on. These joints work to support the near joint having a large range of motion (large movement joint) such as hip joint, glenohumeral joint, wrist joint, ankle joint, and so on. When these small movement joints work normally, large movement joints could work normally without stress. However, when abnormalities of the intra-articular movement in the small movement joint occur, the large movement joint by these small movement joints does not move normally.

Restricted joint surface movement in an intra-articular lesion could cause functional joint disorder.

2.3 Sacroiliac Joint Dysfunction

Sacroiliac joint dysfunction holds a unique position among various joint dysfunctions, and it may be related to other forms of joint dysfunction. As a result, miscellaneous symptoms appear in not only the sacroiliac joint region but also the systemic regions.

Sacroiliac joint dysfunction frequently causes lower back and buttock pain, and it may be the most frequent cause of the so-called non-specific lower back and buttock pain. We should always consider sacroiliac joint dysfunction as an origin of the pain, even when MRI shows lumbar disc herniation or lumbar spinal canal stenosis, because the patient's symptoms may actually originate from joint dysfunction rather than radiculopathy.

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3 Anatomical Aspects of the Sacroiliac Joint and Their Clinical Applications

Shigehiko Katada

3.1 Arthrokinematics and Osteokinematics

Arthrokinematics is the area of kinesiology which focuses on the motion between articular surfaces of synovial joints. *Osteokinematics* is the area of kinesiology which focuses on geometrical bone movements in a space. Measurement of range of motion in orthopedic medicine is based on osteokinematics (Fig. 3.1). In order to understand sacroiliac joint (SIJ) dysfunction, knowledge of "joint position" and "accessory movement" is required.

Regarding "joint position," there is a close-and a loose-packed position. The maximal congruency of the articular surface pair is the close-packed position. In this position, most ligaments and parts of the joint capsule are pulled taut, which provides stability to the joint. All positions other than the close-packed position are loose-packed positions and every joint has the least-packed position, in which the joint capsule is the most relaxed.

For example, when the knee is fully extended, it is the close-packed position of the knee. This position provides stability for weight bearing when standing and walking (Fig. 3.2). The other positions are the loose-packed positions. The slightly flexed position, which indicates the least-packed position, is unstable but relaxes the knee during the swing phase. This position is, however, weak against the external force and the soft tissue around the joint can be easily damaged [1, 2].

These joint positions are determined according to each joint structure in the human body. The collateral ligament of the knee is attached in a posterior femoral condyle manner and becomes tense at the knee extension. The surface of the articular region of the tibia slides backward in a flexed position and generates loosening of the ligament. This position is the loose-packed position [1] (Fig. 3.3).

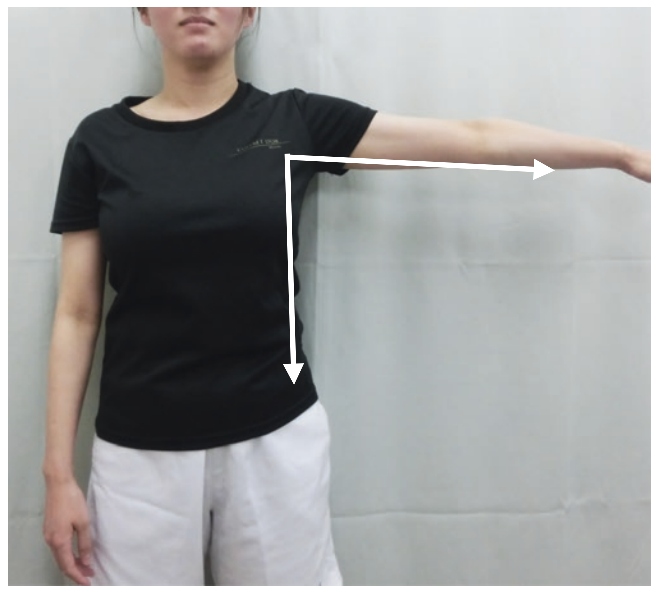

Fig. 3.1 Osteokinematics. Osteokinematics is the area of kinesiology which focuses on geometrical bone movements in a space

If humans did not have a close-packed position in a joint position, we would not be able to achieve a stable upright posture when walking, which means that it would require huge amounts of muscle strength and a lot of energy to stand and walk, like a gorilla. In this way, we would not be able to walk for a long distance. Human beings might have started walking out of Africa to the rest of the world when the mechanism of the close-packed position developed. In the standing position, the joint

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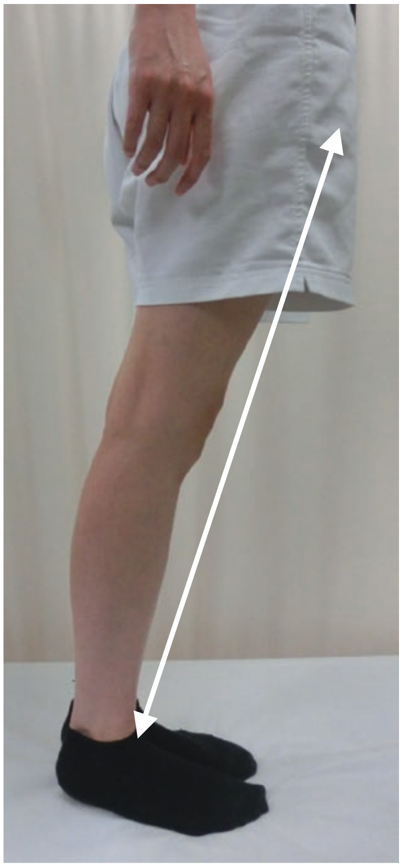

Fig. 3.2 The close- and loose-packed position of a joint. Knee extension and ankle dorsiflexion provide stability for weight bearing when standing and walking

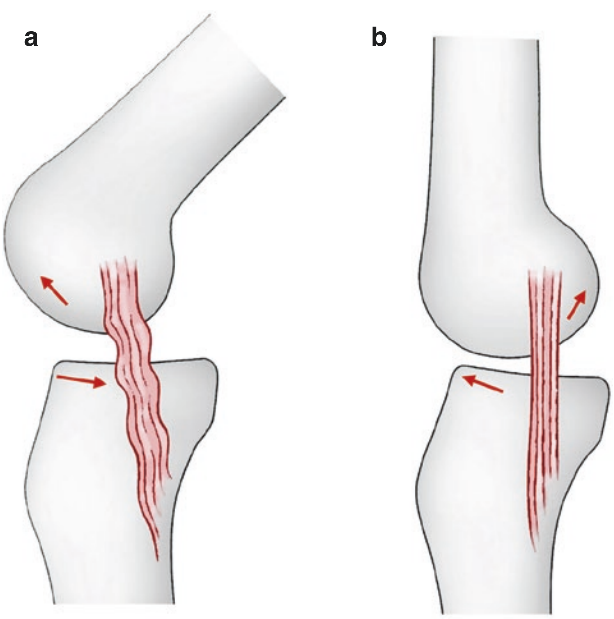

Fig. 3.3 The loose- and close-packed positions of the knee. (**a**) Loose-packed position: the collateral ligament attaches at the back of the medial femoral condyle. The surface of the tibia slides backward in the knee-flexed position, loosening the ligament. (**b**) Close-packed position: the ligament becomes taut with knee extension, securing stability without much muscle strength

position of the knee, hip, SIJ, and spinal facet is close-packed. In the other postures, a joint state is a loose-packed position.

3.2 Bone Movements of the SIJ

3.2.1 Nutation, Counter-Nutation, and Rotation

The SIJ is the synovial joint between the sacrum and the ilium. A part of this joint is the syndesmosis. The joint surface becomes less smooth at age 50 and up [3]. In the standing posture, the sacrum is caught and hanging down between the bilateral iliac bones, and bears the weight of the upper half of the body. For this purpose, the posterior sacroiliac ligaments mainly work for bearing vertical loads.

Kapandji defined nutation as an anterior inferior movement of the sacral promontory. Meanwhile, the iliac bones are approximated, whereas the ischial tuberosities move apart. The movement of counter-nutation involves displacements in the opposite direction. The sacral promontory moves superiorly and posteriorly. Also, the iliac bones move apart and the ischia tuberosities are drawn together [4].

Regarding axial rotation, there are several theories, but there is still disagreement among researchers on the true axis of rotation. Among individuals, there are differences which, in clinical settings, are thought to vary due to posture. SIJ should have the complex movements of rotation accompanying the translation.

The movement of the SIJ cannot be observed visually like other joints in the extremities. Therefore, many researchers have tried to understand complicated SIJ movements. Kissling et al. reported [5] on a three-dimensional stereophotogrammetric method for measuring the mobility of the SIJ. Intraosseous markers were put on for a total of 24 healthy volunteers. It was revealed that the average values for rotation and translation were low, being 1.8°/0.7 mm for males and 1.9°/0.9 mm for females. Individual variability was also found for both the measurements of the rotation and the translation. This study indicated that the opinion “SIJ was an immobile joint” should be rejected.

3.2.2 The SIJ in Standing Posture

The center of gravity line in standing passes through the front of the SIJ’s center of rotation and through the center or posterior of the hip joint [6]. This gravity line and the position of the SIJ and hip joint could generate two rotary movements in the pelvis. The gravity force rotates the sacrum forward at the SIJ, and rotates the pelvis backward

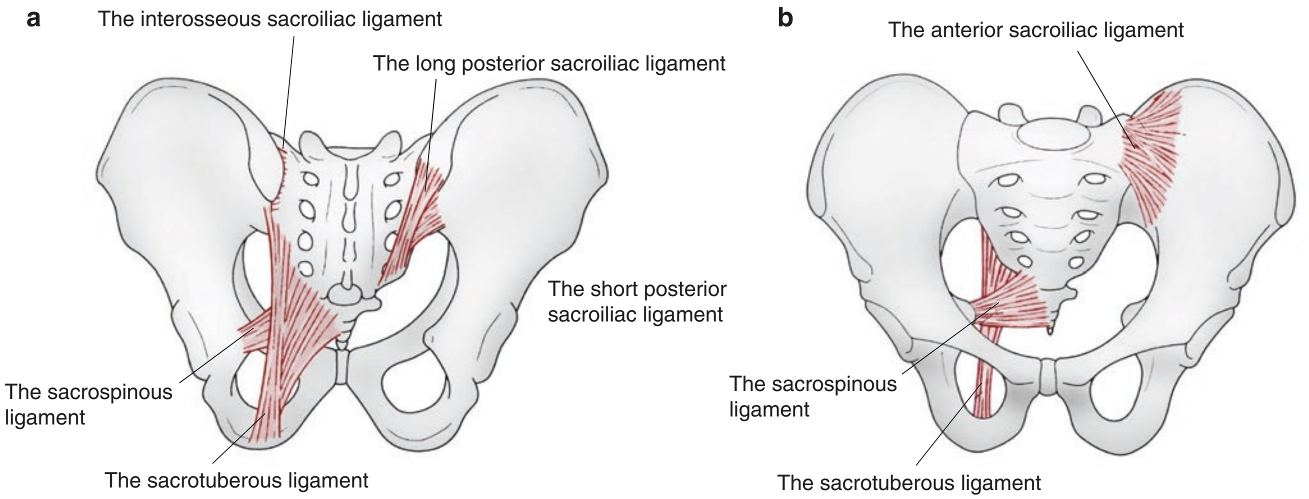

Fig. 3.4 The ligaments around the sacroiliac joint related to the movement of the joint. (**a**) Posterior ligaments. (**b**) Anterior ligaments

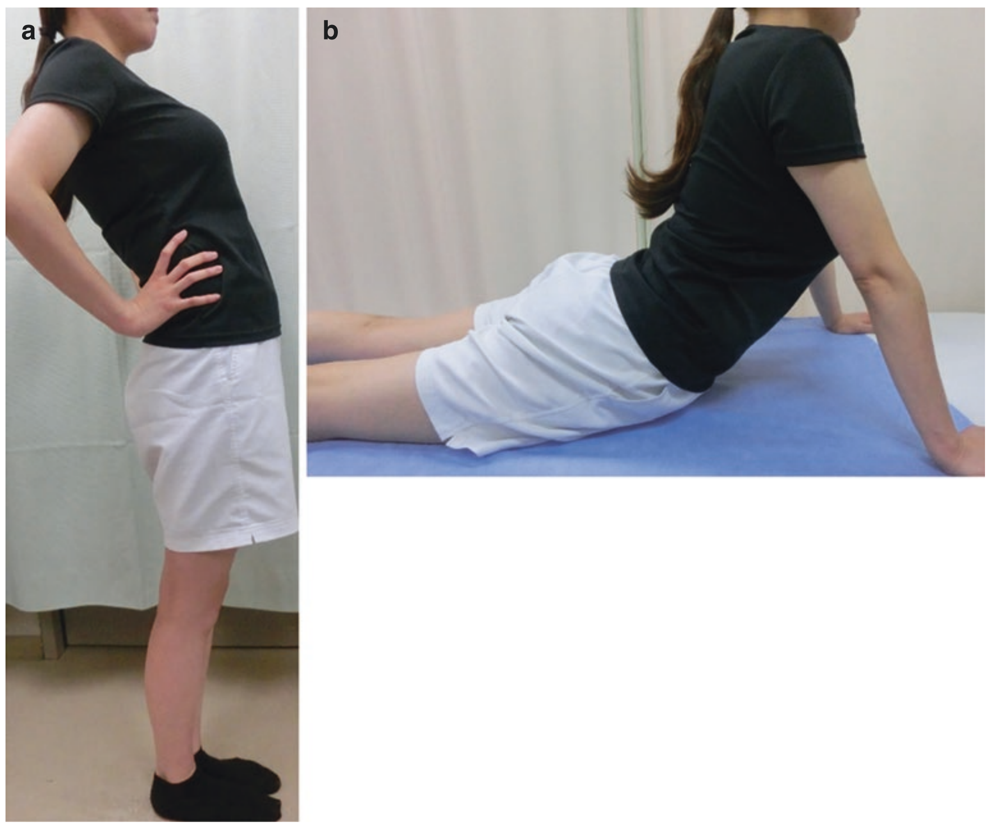

Fig. 3.5 The close-packed position of the sacroiliac joint. (**a**) The position of maximal lumbar extension: This position gives the most stability and is suitable for lifting heavy things. (**b**) Maximal extended position when prone: In this position, the sacroiliac joint cannot move. Pressing on the sacrum in this position can harm the sacroiliac joint

at the hip joint. When the sacrum is rotated forward, the interosseous ligaments are stretched. Caudal tip of the sacrum moves backward and the sacrotuberous ligament and the sacrospinous ligament are stretched [7]. The tension of the sacrotuberous and sacrospinous ligaments stabilizes SIJ (Fig. 3.4). Vleeming reported that the tensile force of the sacrotuberous ligament generated the friction force in the joint surface between the sacrum and the ilium [8]. Standing posture with intensified lumbar lordosis is the most stabilized form for SIJ. This is the close-packed position of the SIJ (Fig. 3.5).

3.2.3 Osteokinematics of SIJ in Walking

In normal walking, pelvic movement is asymmetrical at heel contact. The right coxal bone rotates backward at right heel contact and the left coxal bone rotates forward (Fig. 3.6). The sacrum flexes toward to right lateral direction. The right joint surface approximates at the upper cranial, and the left joint surface approximates at the lower caudal portion. The SIJ dysfunction restricts SIJ movement of the involved side, resulting in claudication. Intermittent claudication is often caused by SIJ dysfunction.

Fig. 3.6 Bone movement of the sacroiliac joint in walking. (**a**) Bone movement of the coxal can be felt by palpating with both hands when walking. (**b**) When walking with maximal lumbar extension, less bone movement can be felt

3.2.4 Osteokinematics of the SIJ in Sitting

The sacrum is in the nutation position when sitting in intensified lumbar lordosis, and is in the counter-nutation position in lumbar kyphosis.

3.3 Articular Neurology and Clinical Applications

Articular neurology [9, 10], which was studied by B. Wyke, is useful when trying to understand synovial joint dysfunction and pain. Four types of joint receptors were identified, and each had a specific role in joint function. Particularly, an understanding of the function of type I and IV receptors is important when applying AKA-H treatments (Table 3.1).

The type I joint receptor, which is similar to the Ruffini corpuscle, is distributed in the peripheral layers of each fibrous capsule of a joint. These kinds of joint receptors are more often distributed in the proximal joints than in the distal joints. In the spine segment, type I receptors are often observed in cervical facet joints. These receptors respond to the mechanical stress on the fibrous capsule with a low threshold, slowly adapting. Type I receptors provide information concerning the static position of a joint by firing constantly. The receptors discharge constantly at frequencies of 10–20 Hz. Wyke described that articular mechanoreceptor reflexogenic effects due to the type I receptors were arthrostatic reflexes. This kind of reflex was expressed as low-grade tonic motor unit activity in muscles in the body in response to the continuous afferent discharge of the type I receptors located in the joint capsules of immobile joints upon tonic fusimotor neurons. However, the function of type I receptors was to increase the tension of not only muscles, but also soft tissues, including the joint capsule and ligaments. This was identified by Dr. Hakata in his clinical settings. These findings showed that the joint dysfunction causes hyper-tension of the soft tissues around the joint. He also discovered that the hypertensive state could be observed in other ipsilateral joints, which were named "*the arthrostatic hyper-reflex chain*" by Dr. Hakata.

The type II joint receptors, which are a Vater-Pacinian-like corpuscle, are distributed in the deep layer of the fibrous capsule. They are located more frequently in the distal joints. They respond with low thresholds, quickly adapting, and fire only on quick changes in joint movements. They do not respond in the static position of a joint at all. This type of joint receptor provides information concerning acceleration and deceleration of joint movement. Arthrokinetic reflexes, which are operated during active or passive joint movement, are produced by the combined effects of the altered discharge of the type I receptors and the brief discharges induced from the type II receptors. Arthrokinetic reflexes involve coordinated facilitatory and inhibitory effects on motor unit activity in the body musculature in response to joint movement.

The type III joint receptors, which are similar to the Golgi end organ, are located in the ligaments of the joints in extremities and in spinal facet joints, and are also located in crucial ligaments in knee joints and ligaments of the head of the femur. They are absent from the longitudinal ligaments and the interspinous ligaments of the vertebrae. They are slowly adapting, and are high threshold mechanoreceptors, which work for monitoring directions of a joint movement. This type of receptor has reflex effects on muscle tone to provide a "braking" mechanism against over movement of the joint.

The type IV joint receptors are the free nerve ending (type IVb) or a plexus (type IVa). These nerve endings are very small myelinated or unmyelinated fibers, which are located in the fibrous joint capsule of the extremities, spinal facet, and temporomandibular. They are also located in the periosteum near a joint, fat pad, and the outer membrane of blood vessels in a joint. They work as nociceptors.

The soft tissues around the joint will become tense due to the responses of the type I receptors. Type I immediately responses against pressure to the bone, ligament, and joint capsules. This type of reaction is called an "arthrostatic reflex." For example, an arthrostatic reflex in an elbow joint, when a physician examines the range of motion (ROM) of passive flexion by using his palm on the distal forearm, the ROM of flexion is larger than when grasping the forearm. When a physician flexes the elbow joint slowly by grasping

Table 3.1 The classification of joint receptors

	Description	Location	Related fiber	Action
Type I	Similar to Ruffini corpuscle	Superficial joint capsule	Small (6–9 μ) myelinated	Slowly adapting low threshold: mechanoreceptor
Type II	Similar to Pacinian corpuscle	Joint capsule (deeper layers) fat pads	Medium (9–12 μ) myelinated	Rapidly adapting low threshold: dynamic mechanoreceptor
Type III	Similar to Golgi end organ	Intrinsic and extrinsic joint ligament	Large (13–17 μ) myelinated	Very slowly adapting. High threshold: dynamic mechanoreceptor
Type IV	Free nerve endings and plexus	Fibrous capsule intrinsic and extrinsic ligaments, fat pads, periosteum	Small (2–5 μ) myelinated and unmyelinated	Non-adapting high threshold: pain receptors

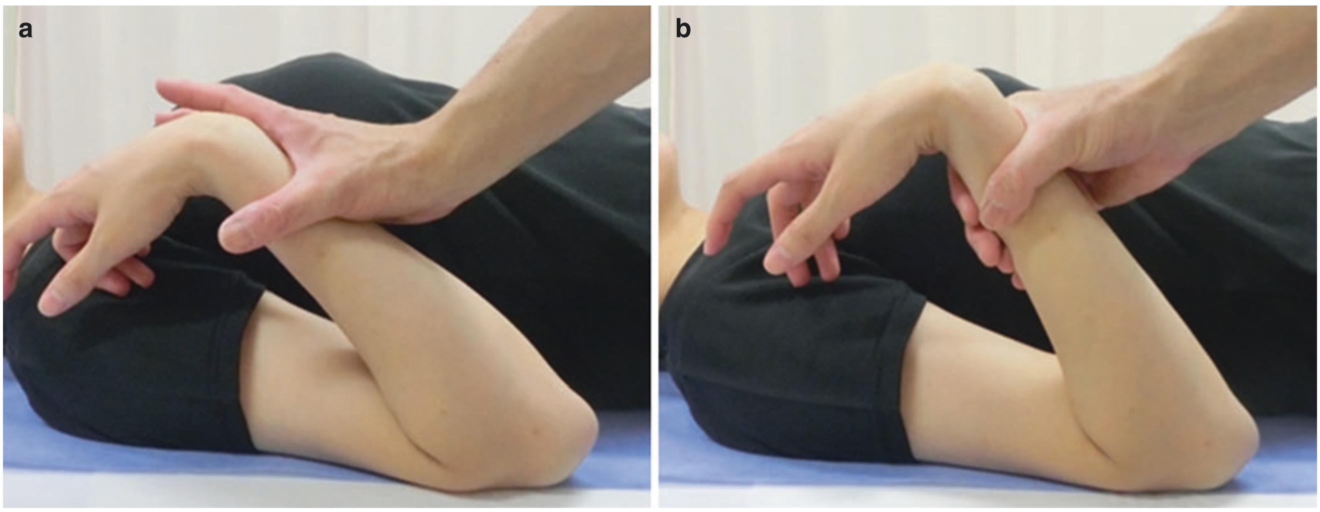

Fig. 3.7 Elbow movement and arthrostatic reflex. (**a**) Passive flexion with the palm on distal forearm can provide 160° flexion of the elbow joint. (**b**) Passive flexion with holding distal forearm elicits the arthrostatic reflex and restricts flexion of the elbow joint

the forearm, end feelings at the elbow joint flexion become stiff, and a resistance force from the joint can be noticed (Fig. 3.7). This experience indicates that the ROM of a joint could decrease when an arthrostatic reflex occurs, because a soft tissue around the joint tenses up. This type of reflex, however, is not elicited when moving the forearm fast.

An arthrostatic reflex is a mechanical reflex, and it could occur with type I responses in every joint. This reflex protects a joint from external forces or stimulations. When doing sports, immediate responses via an arthrostatic reflex are useful. For example, a tennis player's wrist becomes tense at the instant the racket hits the ball, followed by a relaxed swing (Fig. 3.8).

The arthrostatic reflex continues to be active in the case of joint injuries. The reflex influences soft tissues around the joint. Muscle tension increases, and numbness and swelling are also often observed in clinical settings in the remote regions in related ipsilateral upper and/or lower extremities. For example, when an arthrostatic reflex in the SIJ continues for a long time, it could influence ipsilateral knee and/or ankle joints and cause pain and contracture of these joints.

Type IV is the nociceptive receptor which is located in the fibrous capsule, periosteum, fat pad, and outer membrane of

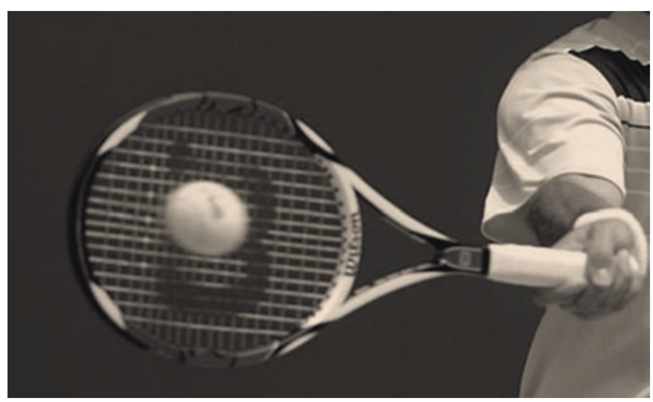

Fig. 3.8 Example of the arthrostatic reflex. Regarding hitting a tennis ball (speed of 200 km/h) with the wrist in dorsiflexed position, when the ball just hits the racket, the joint and soft tissues around the hand tense up by the arthrostatic reflex and the fast ball can be returned

blood vessels, but which is absent in articular cartilages. Theoretically, the articular cartilage does not cause joint pain because type IV receptors are not located there. This is why degenerative changes of the joint cartilage of the hip or knee as well as the extent of joint deformity don't correspond to the severity of pain.

3.4 Accessory Movements of Joints and Clinical Applications

It is important to know joint position to understand joint movement. In the close-packed position, joint surfaces are fully contacted and the joint is stiff and tight. The hip joint is typical of the ball and socket joint, which is maximally congruent in the position of extension and internal rotation. In this position, the high tension of the joint capsule and ligaments causes joint surfaces to come in close proximity to each other. Therefore, elderly people easily suffer from femoral neck fractures when they fall down in this close-packed position. In any other joint position except for the close-packed position, the hip joint can move without restriction because the periarticular soft tissues are loosened. This loosening positions of this joint are useful for swing phases in walking, for instance.

Joint positions such as close and loose are very important for free joint movements. In most kinds of joint structures, curves of the joint surface do not completely resemble each other, even if the joint shape is classified as a convex and concave structure. The fundamental structure of every joint includes loose states in the joint movement. Therefore, in the case of osteoarthrosis, the congruence of the joint surface is lost, and joint movements are restricted. However, a certain joint mobility can be maintained.

As mentioned above, the looseness and tightness of the joint depend on the structure of a joint and ligaments around a joint. In case of the metacarpophalangeal (MP) joint, firm grasping is the close-packed position, and the rest are loose-packed positions (Fig. 3.9). The close-packed position of the MP joint can deliver the "strong punch" to opponents in a boxing match, but are often susceptible to fractures of the metatarsal neck (boxer's fracture). In the loose-packed position, the MP joint is susceptible to finger sprains and ligament damage (Fig. 3.10).

Intra-articular movements such as distracting, twisting, and shaking in the loose-packed position of the joint are called "joint play," which is not obtained in voluntary move-

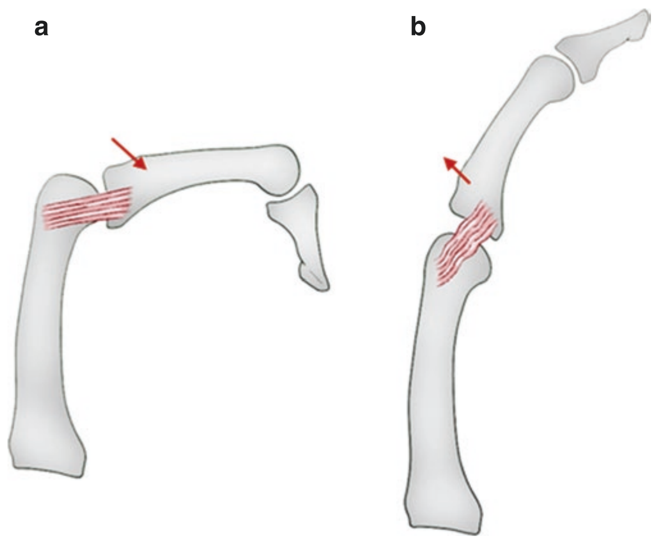

Fig. 3.9 The close- and loose-packed positions of the MP joint (part 1). (**a**) The close-packed position: The joint surface of the proximal phalanx slides ventrally in maximally flexed position. In this position, ligaments are tightened and the joint is stabilized. (**b**) The loose-packed position: The joint becomes loose in extended position giving better mobility but less stability

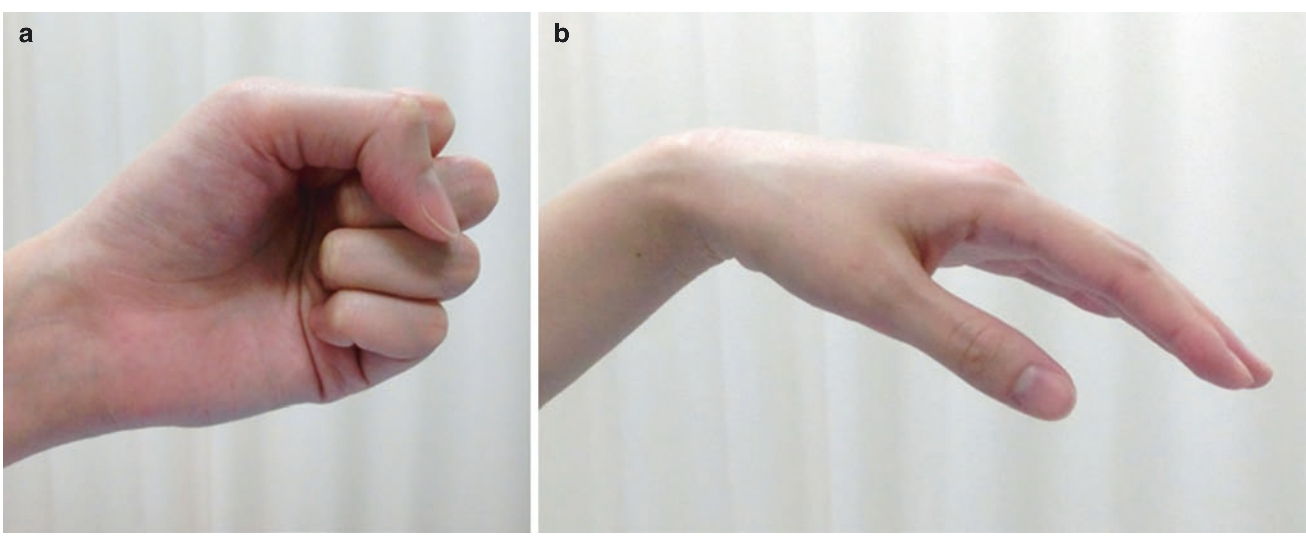

Fig. 3.10 The close- and loose-packed positions of MP joint (part 2). (**a**) The close-packed position: In this position, MP joint can deliver a strong punch, but is often susceptible to fractures of the metatarsal neck (boxer's fracture). (**b**) The loose-packed position: In this position, the MP joint is susceptible to finger sprains and ligament damage

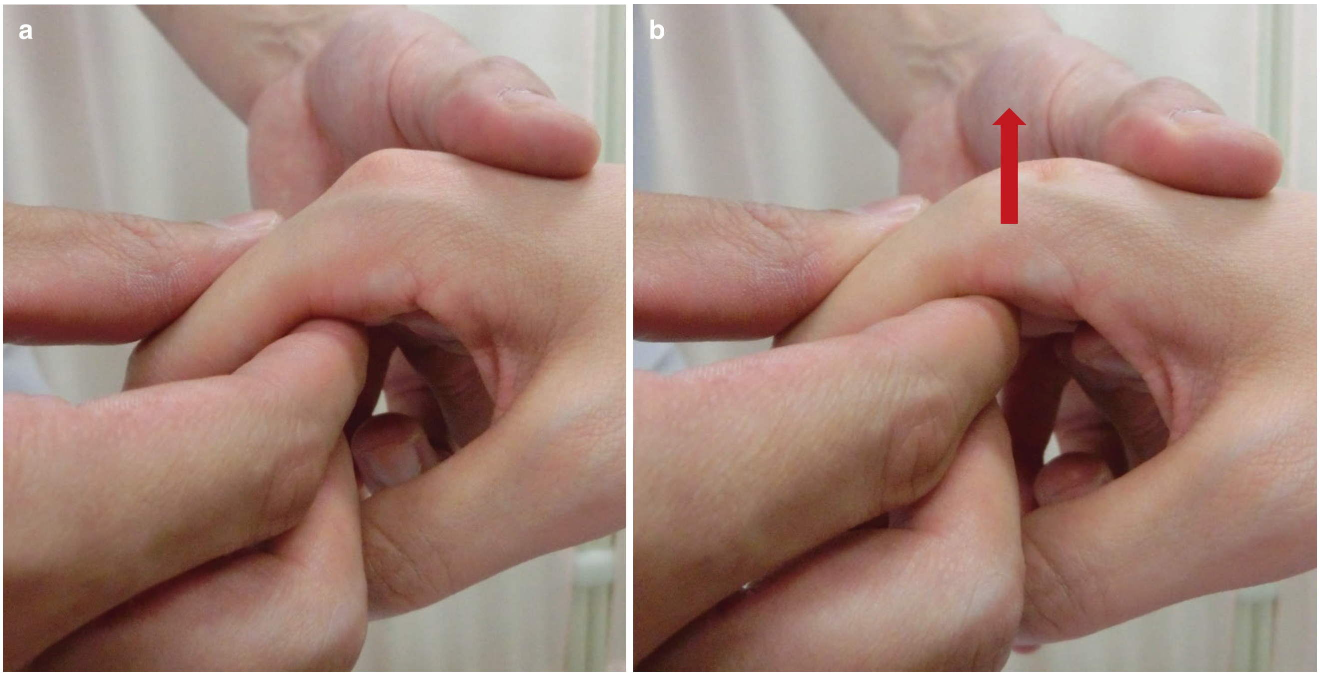

Fig. 3.11 Accessory movement 2nd type in the MP joint. This type of movement can be felt by gliding the bone. (**a**) Gently hold the proximal phalanx. (**b**) Glide dorsally. Pinching the bone decreases the joint play

ments. In the AKA-H theory, this joint play is defined as the "accessory movement 2nd type." There are glides, as well as distraction and axial rotation in this type of joint movement. These joint movements can be observed in the MP joint (Fig. 3.11).

The accessory movement 2nd type (movement in the joint capsule) has a close relation with the joint movement. Initially, the limitation of the accessory movement 2nd type restricts the joint movement. Secondary, accessory movement 2nd type is under the control of the mechanoreceptors. The arthrostatic reflex generated by type I joint receptors restricts the accessory movement of the 2nd type as a result of tensing up of the joint capsule and ligaments. In this state, the joint does not move in the same way as in the close-packed position of the joint (Fig. 3.12).

Another such movement is "the accessory movement 1st type," which is the movement at the terminal phase of a joint motion. This is an available movement at the terminal range. We can take the Japanese sitting position "Seiza" due to the accessory movement 1st type (Fig. 3.13). When falling down on the ground, the femoral joint surface of the knee moves forward to minimize the damage. This is also the work of the accessory movement 1st type. The accessory movement 1st type is also observed in flexion of the MP joints. When grasping a baseball, the rotation range of the MP joint becomes larger than when grasping the hand without a ball. This available range of motion of the MP joint is given by the accessory movement 1st type (Fig. 3.14).

Fig. 3.12 Restriction of the 2nd type of accessory movement due to arthrostatic reflex, which is triggered by pinching the bone

This available movement at the terminal range is sensed by examiners as the "end feel" sensation. The end feel is sensed softly in a normal joint, but tightly in case of joint dysfunction. The accessory movement first type is also influenced by an arthrostatic reflex. In passive flexion of the knee, for instance, the range of motion differs depending on the way of holding the leg. The end feel is not soft and the motion is limited when gripping the leg firmly. Firm gripping triggers an arthrostatic reflex, and periarticular soft tissues

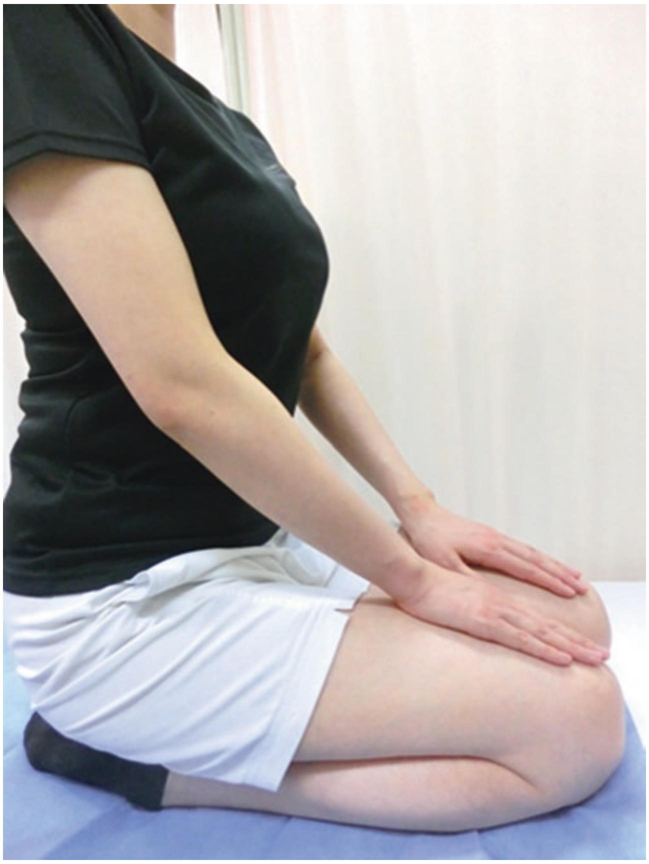

Fig. 3.13 The 1st type of accessory movement in taking the Japanese sitting position “Seiza.” The knee flexion is about 150° with hip flexed position. The 1st type of the accessory movement in the terminal phase of the knee joint flexion enables to take this sitting position

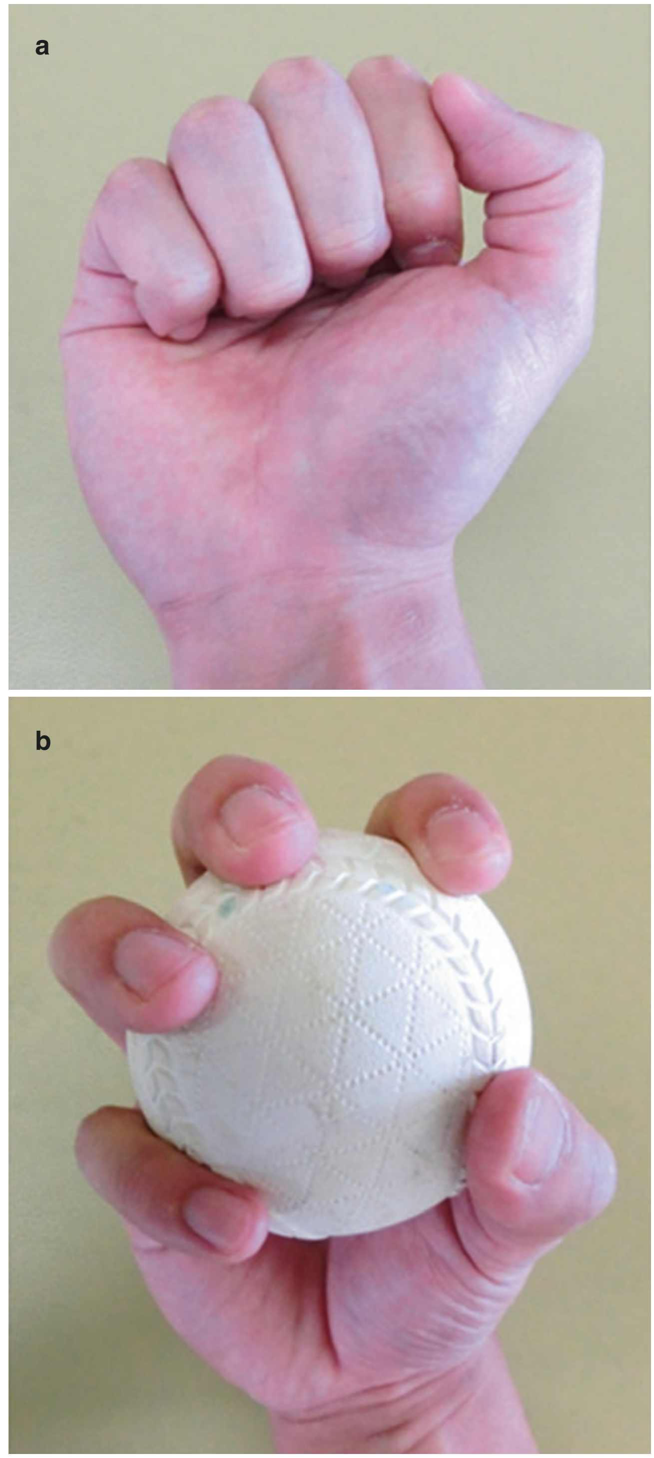

Fig. 3.14 The 1st type of accessory movement of the MP joint. (**a**) Gripping without a ball: The MP joints rotate to some degree. (**b**) Grasping a ball: The range of motion of the MP joint becomes larger than in (**a**). This available range of motion of the MP joint is given by the accessory movement 1st type

become tense, resulting in restriction of the first type of accessory movement (Fig. 3.15). The end feel is applied for the diagnosis of SIJ dysfunction, such as sensing the end feeling in the straight leg raising (SLR) test. Training for sensing the end feel in the SLR test is very important to evaluate an SIJ dysfunction.

3.5 Accessory Movements of SIJ and Dysfunction

The accessory movement 2nd type of SIJ includes sliding and distraction. The range of the 2nd type is different in each person. Examiners feel the range of the joint motion from 0.5 mm to 3 mm with the sensation of their hand. In the case of normal SIJ or SIJ dysfunction with slight inflammation, the accessory movement type 2nd is felt soft. However, in the case of SIJ dysfunction with severe inflammation, the feeling is restricted. In case of SIJ contractures after repeated inflammation of the joint, the accessory movement 2nd type becomes narrower.

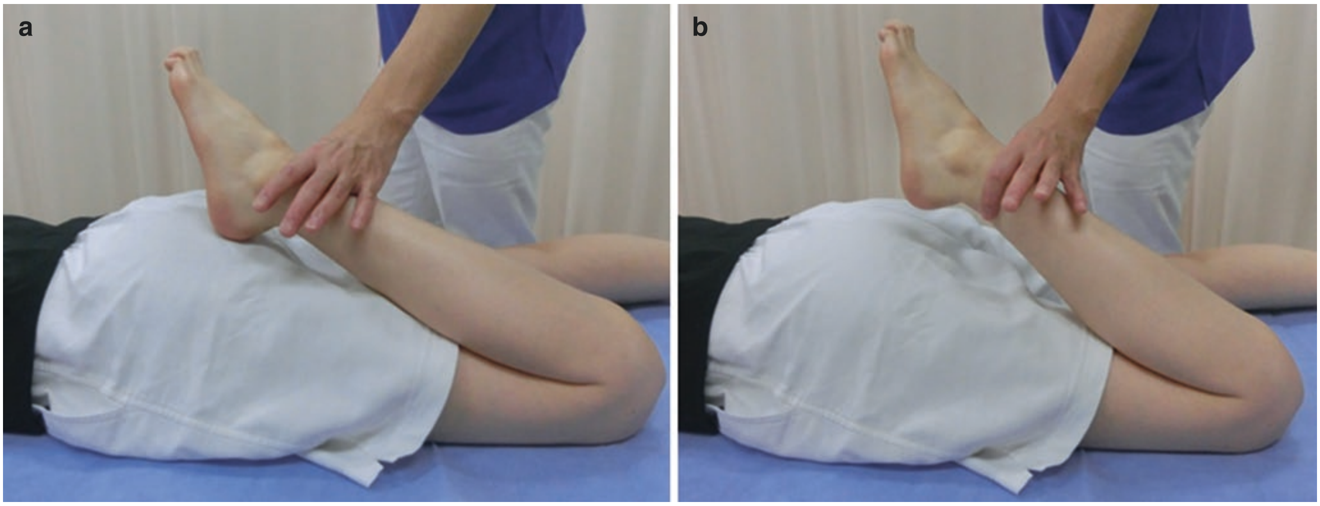

Fig. 3.15 The 1st type of accessory movement of the knee. Passive flexion of the knee in prone position. Sensing the end feel in the joint is quite important to know the 1st type of accessory movement. (**a**) The end feel is soft when the tibia is flexed by the examiner's palm. (**b**) The end feel is not soft and the motion is limited when gripping the leg firmly

3.6 Symptoms Originating from SIJ Dysfunction

Observations of patients after AKA-H treatments for SIJ revealed symptoms originating from SIJ dysfunction as follows: low back pain, buttock pain, and restricted trunk movements, as well as referred pain, numbness, edema, and muscle tightness in the lower extremities.

3.7 Causes of SIJ Dysfunction

3.7.1 Primary SIJ Dysfunction

SIJ can be in a subluxation state when it is caused by accidental damage in the loose-packed position. In the joint having a small range of motion, such as SIJ, spinal facet joints, and so on, some subluxation of the joint can continue for a long time and symptoms originating from the joint cannot be relived. Because SIJ does not have muscles to move by itself, it is difficult for the subluxation to be adjusted at will by patients. If the same thing occurs in the joint having a large range of motion, such as the hip joint, the glenohumeral joint, etc., a little subluxation will be no problem and will adjust naturally with daily life joint movement.

Acute low back pain often occurs in the stooping position when lifting heavy baggage. Acute subluxation of the SIJ can occur in such a loose-packed position, and is the origin of acute low back pain (Fig. 3.16).

Fig. 3.16 The stooping position for lifting heavy baggage. This position is a loose-packed position in the sacroiliac joint. Acute subluxation of the sacroiliac joint can occur in this position, and a patient complains of acute low back pain

3.7.2 Secondary SIJ Dysfunction

The limitation of the knee extension due to osteoarthrosis of the knee joint can cause a loose-packed position of the knee joint. SIJ also could occur in the loose-packed position when standing while keeping heel contact. This has a risk of SIJ dysfunction. Kyphosis due to degenerative spondylosis could cause spinal facet joint dysfunction and SIJ dysfunction. Additionally, an overload in the adjacent segment of the spine after spinal fusion surgery as well as a pelvic inclination and scoliosis due to leg length discrepancy could cause SIJ dysfunction.

3.8 Arthrostatic Hyper-Reflex Chain

SIJ dysfunction causes ipsilateral joint dysfunction via an arthrostatic hyper-reflex chain. SIJ dysfunction causes ipsilateral joint dysfunction of the hip joint, the knee joint, the ankle joint, facet joints, costovertebral joints, and other joints having a small range of motion, but on the same side of the body. For example, right SIJ dysfunction caused ipsilateral joint dysfunction only on the right side of the body. The contralateral SIJ alone can be influenced by SIJ dysfunction on the opposite side of the body (Fig. 3.17).

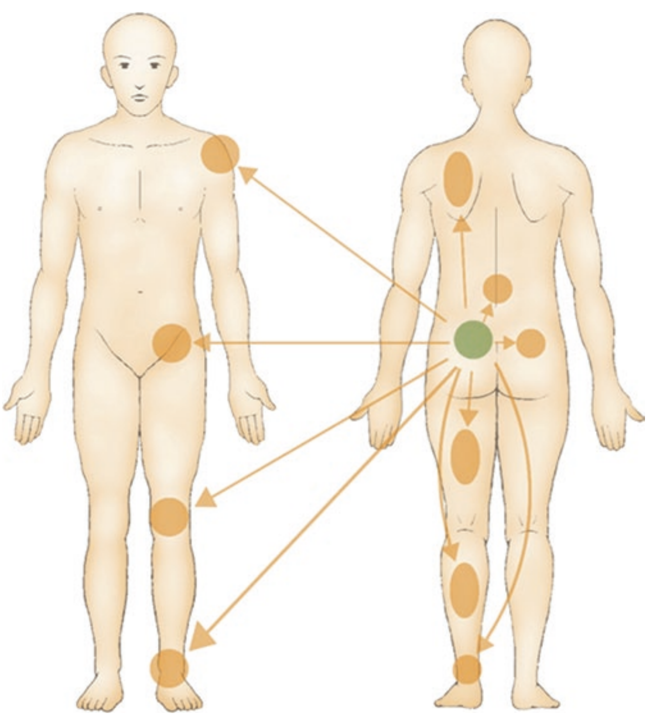

Fig. 3.17 The arthrostatic hyper-reflex chain. The sacroiliac joint dysfunction causes ipsilateral joint dysfunction of the hip joint, the knee joint, the ankle joint, facet joints, costovertebral joints, and other joints having a small range of motion. The contralateral sacroiliac joint alone can be influenced by sacroiliac joint dysfunction on the opposite side of the body

3.9 Joint Dysfunction and Inflammation

Aseptic inflammation is sometimes observed in the knee, shoulder joint, and so on. Simple arthritis of the hip in infants and adults is also one type of aseptic inflammation of joints. Hydrarthrosis often accompanies aseptic inflammation of joints. Overuse could cause such primary inflammation in joints. In general, this kind of inflammatory state could continue for several days, or occasionally, for 2 or 3 months. Aseptic inflammation also occurs in SIJ and can continue for 2 or 3 months. The AKA-H for these inflammatory conditions is not effective.

The primary inflammation of the SIJ is named “simple sacroiliac arthritis,” which is similar to simple arthritis of the hip. The onset of this condition is either acute or chronic. The pain is very severe in acute simple sacroiliac arthritis and is relieved only after several days, disappearing in 2–3 months. Complication of SIJ dysfunction with simple sacroiliac arthritis could lead to chronic pain. If the AKA-H treatment for SIJ dysfunction is performed, SIJ pain will not continue for over 2 or 3 months, this is a period when simple sacroiliac arthritis disappears naturally.

3.10 Silent Afferent Neurons

Type IV joint receptors, which are nociceptive receptors, are inactive for stretching a joint capsule or ligaments in normal conditions. Degeneration or deformity of an articular cartilage alone doesn’t cause the pain, because nociceptive receptors are absent in the cartilage.

Type IV joint receptors respond with a high threshold and become active against nociceptive mechanical stimulation. Type IV is inactive in the normal physiological state of joint movements. In case of joint dysfunction, the type I receptor reacts, resulting in a hyper-state of arthrostatic reflex. Strained joint capsules and ligaments lead to a response of the type IV receptors, which cause the joint pain.

About 30% of type IV receptors are called “silent afferents” and react only to inflammation. Michaels et al. reported that numerous silent afferent neurons were located in visceral and deep somatic tissue, and they didn’t response to physiological stimulation. However, they did respond to inflammatory stimulations. The silent afferents contain neuropeptides, and these peptides are released when activated under inflammation stimulations, triggering vasodilation and swelling. Under activation of silent afferents, joint pain could occur when a joint capsule and ligaments are stretched. Tenderness of a joint, painful sensation with soft palpitation, and rest pain could also occur under inflammatory conditions [11, 12]. Complication of SIJ dysfunction with severe inflammation could lead to severe SIJ pain.

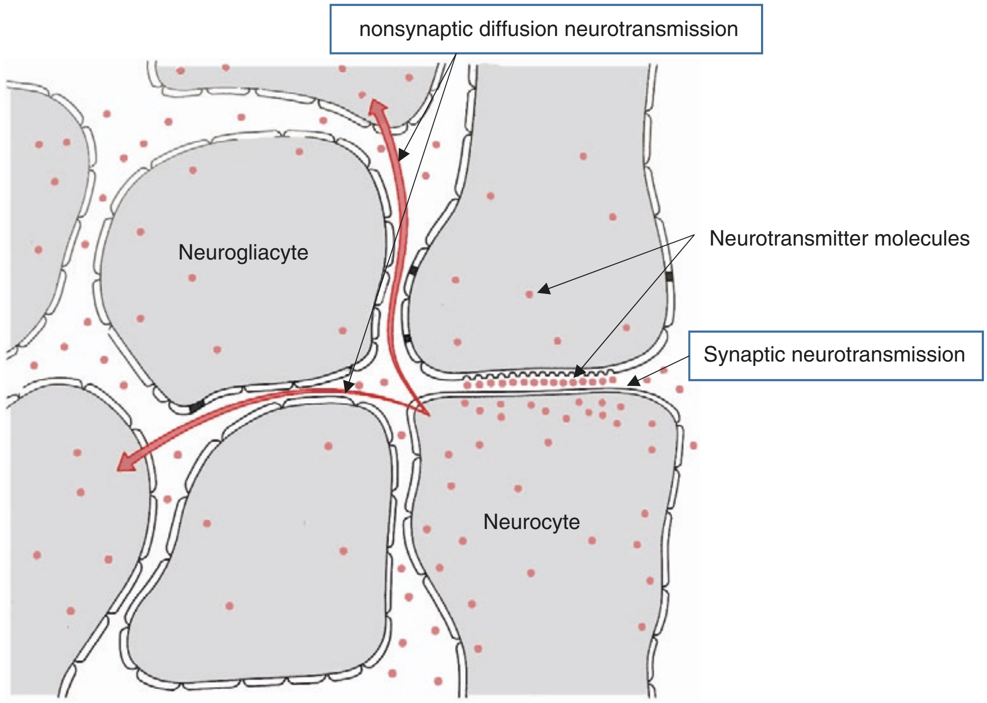

Fig. 3.18 Nonsynaptic diffusion neurotransmission (NDN). This schema is cited from Ref. [15]—with slight modification

3.11 The Transmission Pathway of Joint Pain

Pain is recognized when stimulation caught by nociceptive receptors is transmitted to the brain. Synaptic neurotransmission and neuroendocrine secretion are well known. Additionally, nonsynaptic diffusion neurotransmission (NDN) has become known recently (Fig. 3.18) [13–16]. Initially, stimulation is received by nociceptive joint receptors and is transmitted quickly via the synaptic transmission pathway. On and off transmission is clear in this synaptic pathway. For example, signals of bone fractures and ligament injuries are transmitted quickly.

In the NDN pathway, neuropeptides released from silent afferents are transmitted to an algesthesia center of the brain bypassing the synaptic pathway. These signals reach and diffuse in the algesthesia center of the brain a little bit behind the synaptic neurotransmission. Both pathways transmit stimulations around the joint to the algesthesia center of the brain and joint pain is recognized. Therefore, it is considered that pain immediately relieved after an AKA-H treatment is pain transmitted via synaptic neurotransmission, and pain relieved 3–10 min after an AKA-H treatment is via the NDN.

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Principles of Manual Treatment for Sacroiliac Joint Dysfunction

4

Shigehiko Katada

4.1 Joint Dysfunction and Restriction in Movement

Dysfunction of the joint causes restriction in movement. Joint motion consists of both bone and intra-articular movements (accessory movement). The interaction of these movements eases the operation of the joints. Joint dysfunction simultaneously disturbs both the bone and intra-articular movements. The sacroiliac joint (SIJ) is an amphiarthrosis that has less movement, and as a result, the SIJ frequently causes joint dysfunction resulting in low back pain or, to a lesser extent, pain in the lower extremities. Therapeutic exercises have traditionally been performed for the treatment of low back pain and lower extremities pain. However, these exercises have had little effect on the SIJ. They are not able to approach the SIJ, but rather, are often the cause of pain.

4.2 Development of Techniques for the Accessory Movement

The arthrokinematic approach-Hakata method (AKA-H) is a technique that improves joint movement based on arthrokinematics and articular neurology. The intra-articular movement (accessory movement) is necessary for the free movement of joints. If the intra-articular movement (accessory movement) is improved, bone movement will also improve. The technique of the accessory movement for SIJ, which was introduced in 1990 and completed in 2007 by Dr. Hakata, is very important in this field. At present (2019), the AKA-H is being used only in Japan and has proved to be a very effective method for the treatment of low back pain.

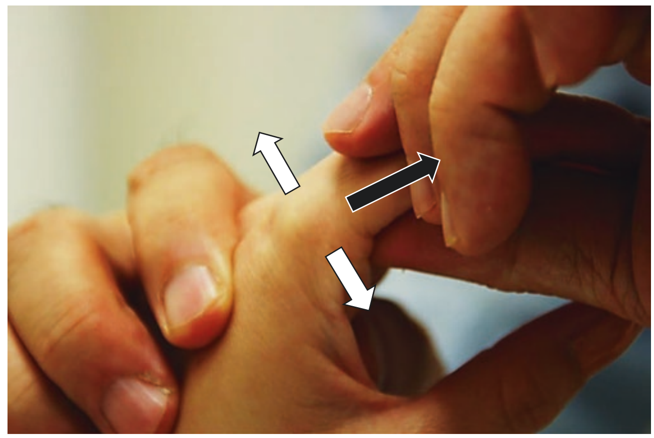

Fig. 4.1 Gliding on the finger MP joint (white arrows) and distraction (black arrow)

4.3 The Accessory Movement and Its Techniques

The accessory movement can only be recognized in normal joints by means of palpation. However, in exceptional circumstances, it is visible at the MP joint of the finger (Fig. 4.1). Visible accessory movements of the MP joint are distractions, which move the articular surfaces away from each other, and articular surface gliding.

4.4 The Accessory Movement of SIJ

Regarding the SIJ, there are two types of accessory movements: gliding and distraction. Imagine taking two books one on top of the other and then touching part of the two

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Fig. 4.2 Gliding model

Fig. 4.3 The distraction model

covers of each book as the articular surface. The action in Fig. 4.2 shows how pressure should be applied along the articular surface (i.e. the gliding process). Opening one part of the articular surface (Fig. 4.3) is the distraction method.

There are two types of gliding methods: upward and downward gliding, and also two types of distraction methods: the superior and the inferior. By using these techniques, the accessory movement in SIJ becomes normal, and as a result, pain or numbness is significantly reduced.

4.5 Techniques of the Accessory Movement and "Joint Position"

There are two positions in joints: the unstable position (loose-packed position) and the stable position (the close-packed position). The most unstable position is termed the least-packed position. The technique of accessory movement should be applied in the least-packed position. The least-packed position of the SIJ is a hip joint flexion of 45° and a knee joint flexion of 90° (Fig. 4.4).

Fig. 4.4 The least-packed position of the SIJ

4.6 The Joint Receptor and Techniques for the Accessory Movement

According to studies done by Wyke, there are four types of receptors in joints. Type I, the mechanoreceptor, creates an arthrostatic reflex by joint stimulation. According to Dr. Hakata, this reflex causes not only an increase in muscle tension, but also an increase in the soft tissue tension. In the stooping posture, SIJ may often be unstable. However, the reason why dysfunction does not occur immediately is that even though it may be unstable, there will be a momentary arthrostatic reflex which stabilizes the SIJ. This safety guard mechanism prevents the occurrence of dysfunction in SIJ. However, since the arthrostatic reflex is suppressed while the joint is in motion, any twisting movement may easily cause SIJ dysfunction.

4.7 Improving the Accessory Movement Without an Arthrostatic Reflex Occurrence

When strong stimulation is applied around the SIJ, the mechanoreceptor in the SIJ reacts immediately and becomes fixed and unmovable. The SIJ itself is located under deep soft tissues. Therefore we cannot touch it directly. When we move the SIJ, we use the processes of the ilium and sacrum. If we grasp the bone processes with our finger, an arthrostatic reflex will occur. When we apply a force to the bone processes in the tangential direction, the arthrostatic reflex does not occur.

4.8 Strength and Frequency Required for Techniques of the Accessory Movement

The techniques in accessory movements may be divided into three grades: "strong", "medium", and "weak". "Medium" is the strength required to glide or distract the joint surface up to the disappearance of laxity of the articular soft tissue (capsule and ligaments) in the least-packed position.

"Strong" refers to the strength that stretches the joint capsule exceeding the limits of "medium". "Weak" is the strength required to move less than half the distance of the "medium". "Weak" requires 0.5 s; "strong" requires between 1 and 2 s.

Regarding operation methods for the SIJ, "strong" and "weak" are applied for the distraction method, while only "weak" is required for the gliding method.

The movable distances for the SIJ are: a maximum of 2–3 mm for "strong", and 0.5–1 mm for "weak". An interval of more than 2 weeks is required for each treatment. Should the frequency exceed this, the symptoms may deteriorate. The optimum frequency for the treatment is once a month.

4.9 Mastering the Points of the AKA-H Techniques

1. The therapist's feet should be positioned at a distance that is shorter than the width of the shoulders.
2. Place your body weight on your tiptoes.
3. Transfer your body weight from left to right and right to left using your waist and knees.
4. Ensure that there is no tension in your hands.
5. Firmly bring your finger bone close to the patient's pelvic bone.
6. Do not apply sudden strong pressure to your hand.

5 Evaluation Maneuvers of Sacroiliac Joint Dysfunction Before and After the AKA-H Treatment

Shigehiko Katada

5.1 Diagnosis and Evaluation of Sacroiliac Joint Dysfunction

When the motility of the sacroiliac joint (SIJ) is limited, it is not possible to make a direct assessment. Therefore the motility of the SIJ should be estimated indirectly with bone movement in the adjacent structures.

One indirect evaluation is measuring the flexion and extension of the trunk in the standing position. This trunk movement is a composite movement, which consists of SIJ, spinal facet joint, and hip joint movements (for example, when the trunk bends at a finger–floor distance (FFD) of 30 cm before applying the AKA-H treatment to the SIJ and the FFD improves to a distance of 10 cm after that). This 20 cm distance of the FFD is due to impairment resulting from the dysfunction of the SIJ (Fig. 5.1). The extension of the trunk is also observed as the angle of extension. When the degree of extension improves after the AKA-H treatment to the SIJ, it means that the patient had a dysfunction of the SIJ (Fig. 5.2).

The straight leg raising (SLR) test, the Fadirf test, and the Fabere test are also performed to estimate the limitation of the SIJ mobility, while the patient is in a supine position. These movements comprise a composite motion of the SIJ and the hip joint.

SLR is a motion combining the SIJ and the hip joint (Fig. 5.3). For instance, when the original 20° of the SLR increased to 40° after an AKA-H treatment of the SIJ, it indicates that this 20-degree difference is due to impairment resulting from the dysfunction of the SIJ (Fig. 5.4). The SLR test should be performed passively (the therapist should raise the patient's leg). Occasionally, patients raise their legs by themselves. The examiner should avoid any voluntary movement in this test. Both the degree of raising and tension in the posterior femoral muscles should be assessed. The examin-

Fig. 5.1 Assessment of the trunk flexion (finger–floor distance: FFD). The trunk flexion is the composite motion of the vertebral column, the hip joint, and the sacroiliac joint. Nutation of the sacrum occurs. After the AKA-H is applied to the sacroiliac joint, a re-assessment is performed to measure the degree to which improvement in movement has been accomplished

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Fig. 5.2 Measurement of the extension. The trunk extension is a composite motion of the vertebral column, the hip joint, and the sacroiliac joint. Counter-nutation of the sacrum occurs. This extension can be improved after AKA-H to the sacroiliac joint when the patient has SIJ dysfunction

Fig. 5.3 The SLR test to assess the sacroiliac joint dysfunction. Evaluate the angle immediately before the knee joint bends. The examiner's hand supports the Achilles tendon without touching the heel. Pain should not be induced during this procedure

Fig. 5.4 Re-assessment of the SLR angle. The SLR improves by more than 20° when the accessory movement of the sacroiliac joint improves after AKA-H to the sacroiliac joint

Fig. 5.5 Assessment of the angle in the straight leg raising (SLR) test. The lower extremities should be raised in the straight leg position slowly, and the resistance *in* passive raising is assessed. The angle just before the knee bend is evaluated for dysfunction of the sacroiliac joint

er's hand should be placed lightly on the patella until tension in the muscle can be felt. When the feeling of the muscle tension begins, the knee joint will begin to bend (Fig. 5.5). The angle is assessed just before this occurs. After comparing the right and left SLR angle, the SLR angle which rose less is regarded as the affected side. The SLR test should not be used to assess the intensity of pain. The supporting hand should not come into contact with the heel because holding the heel can provoke muscle tension in the leg, which makes an accurate evaluation of the SLR test impossible. The SLR test is often used for finding the tension sign of the nerve root when a patient complains of radiculopathy due to a lumbar disc herniation. However, the gentle maneuver of SLR can be a test for evaluating SIJ dysfunction because the nutation

Fig. 5.6 The Fadirf test. With both the hip and knee joint flexion at 90°, the hip joint is rotated internally at 90° to the inguinal ligament, and then adducted and flexed. By making a comparison of both the right and left hips, the limits of resistance to movement are assessed. This test assesses nutation of the sacrum

Fig. 5.7 The Fabere test. From the 90-degree flexed position of the hip and knee joints, the hip joint is extended and rotated externally at right-angles to the inguinal ligament. At this time, a comparison is made of the resistance and motion in both the right and left hip joints. When the SLR angle shows improvement as a result of the AKA-H to the sacroiliac joint, the Fabere test also shows a simultaneous improvement

of the sacrum begins in the SLR test at 20°, which often occurs in this test before the nerve root tenses up.

For the Fadirf test, there is a 90-degree bend of the hip joint, and the hip joint is rotated internally, adducted, and flexed at right-angles to the inguinal ligament (Fig. 5.6). In the Fadirf test, the SIJ and the hip joint move together. The nutation of the sacrum can be assessed in this test. While a 0° to plus degree reading is regarded as normal, a minus reading indicates a movement disability (dysfunction) of the hip and the SIJ. Assessments in this test are performed by comparing the difference between the right side and left side.

For the Fabere test, the hip joint and knee joint are bent at 90°, same as in the Fadirf test, and then the hip joint is abducted and rotated externally to the inguinal ligament. This is a composite motion of the hip and SIJ. When the hip joint is intact and without disorder, such as osteoarthrosis, this test can be regarded as an assessment tool for SIJ alone (Fig. 5.7). The nutation of the sacrum can be assessed in this test. The Patrick test, which is similar to the Fabere test, places the calcaneus onto the opposite side of the knee joint. The Patrick test was developed as a provocative test. On the other hand, in the Fabere test, the heel is placed on a bed, which is intended not to cause pain provocation. We can observe the limits of tension in the femoral muscles and the movement of the hip joint against passive motion by slowly rotating the hip joint externally. The relief of the tension can be felt after the AKA-H treatment of SIJ, which indicates the improvement of the SIJ movement as a result of the therapy.

5.2 Maneuvers of the AKA-H to Treat SIJ Dysfunction

In this chapter, the AKA-H techniques for the right side of the SIJ are shown. When the left side is the affected side, the opposite hand is used in the technique of superior and inferior distraction.

Based on arthrokinematics, the patient's position for AKA-H to the SIJ is lying on the side with hip flexion from 45 to 70° and knee flexion 90°, which indicates the least-packed position of the SIJ. In this position, we can recover the joint play of the right side of the SIJ effectively (Fig. 5.8). The therapist stands on the patient's ventral side.

(A) The routine method on either side is performed in the following order:
1. Gliding upward or downward,
2. Distraction superior and then inferior, and
3. Gliding upward or downward again.

5.2.1 Gliding Method for the SIJ

The routine gliding method is performed upward or downward (Fig. 5.9). A detailed description of the maneuver is shown below.

Fig. 5.8 Patient's position for AKA-H *to the right SIJ*. A patient lies on the side with hip flexion from 45° to 70° and knee flexion 90°, which indicates the least-packed position of SIJ

Fig. 5.9 Upward gliding method for the right SIJ

5.2.2 The Distraction Method of the SIJ

There are two ways for the distraction of the SIJ: the superior distraction and the inferior distraction (Fig. 5.10). A detailed description of the manual maneuver is shown in a separate section.

(B) The AKA-H technique is performed in the following order:

1. Affected side,
2. Non-affected side, and
3. Affected side.

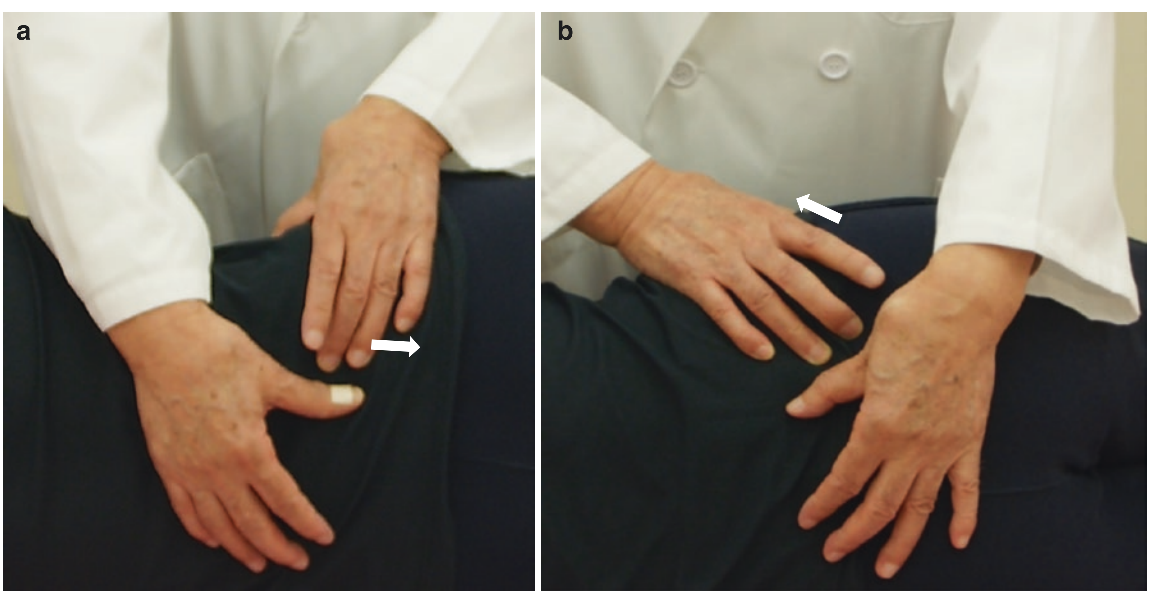

Fig. 5.10 The distraction method for SIJ. (**a**) The superior distraction of the right SIJ. (**b**) The inferior distraction of the right SIJ

Initially, the affected side faces up with the patient in a side-lying position and AKA-H to the SIJ is performed.

Next, the non-affected side faces up with the patient in a side-lying position. Slight dysfunction often occurs to the non-affected side of the SIJ as well. The maneuver for the non-affected side utilizes the same procedure and mirrors the image of the affected side. Finally, the same procedure with "weak" grade is performed to the affected side again.

5.3 Assessing the After-Treatment

Regarding the improvement by comparing the condition prior to and after the treatment, an improvement in excess of 20° of the SLR angle is considered as effective (Fig. 5.11).

Further, the Fafirf and Fabere tests as well as flexion and extension of the trunk while in a standing position are also evaluated.

Fig. 5.11 Final evaluation of the SLR. Confirming by evaluation that SLR has been improved. An improvement in excess of 20° indicates that the AKA-H method has been effective

6 Manual Techniques for Sacroiliac Joint Dysfunction

Shigehiko Katada

In this chapter, manual techniques for right sacroiliac joint (SIJ) are presented. The left side is simply a mirror image of the right side.

6.1 The Superior Distraction (Fig. 6.1)

The superior distraction refers to the dilating technique for the superior part of the SIJ.

Procedures

1. The therapist stands with his feet apart at a distance less than the width of his/her shoulders.
2. The left hand is used for operating the ilium, in order to treat the right SIJ.
3. The wrist joint is in the neutral position (do not perform a palmar flexion of the wrist joint). The wrist joint should maintain the ulnar abduction.
4. The left-hand ring finger is used.
5. Keep extending the DIP and PIP joints while slightly flexing the MP joint of the ring finger.
6. The ulnar side of the DIP joint of the ring finger (Fig. 6.2) touches the cranial portion of the posterior superior iliac spine (PSIS) (Fig. 6.3a, b).

Fig. 6.1 The superior distraction of right sacroiliac joint

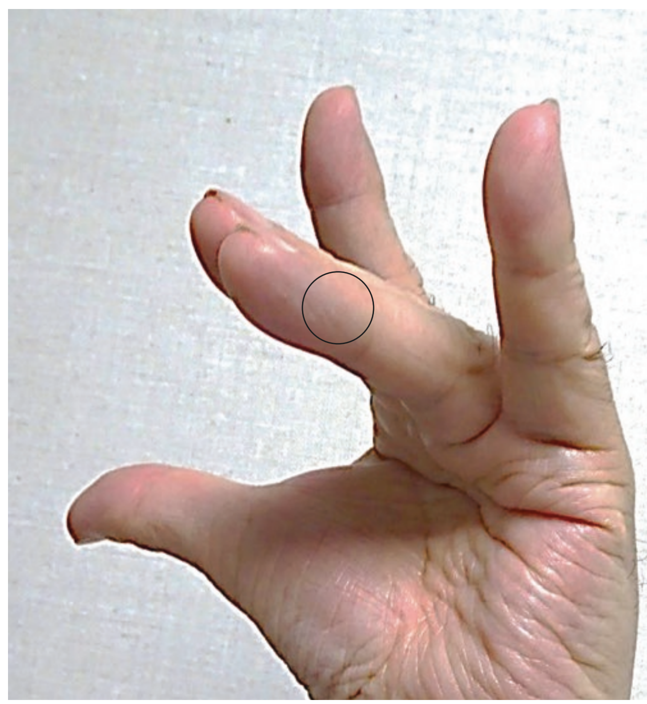

Fig. 6.2 The ulnar side of the DIP joint of the ring finger (black circle)

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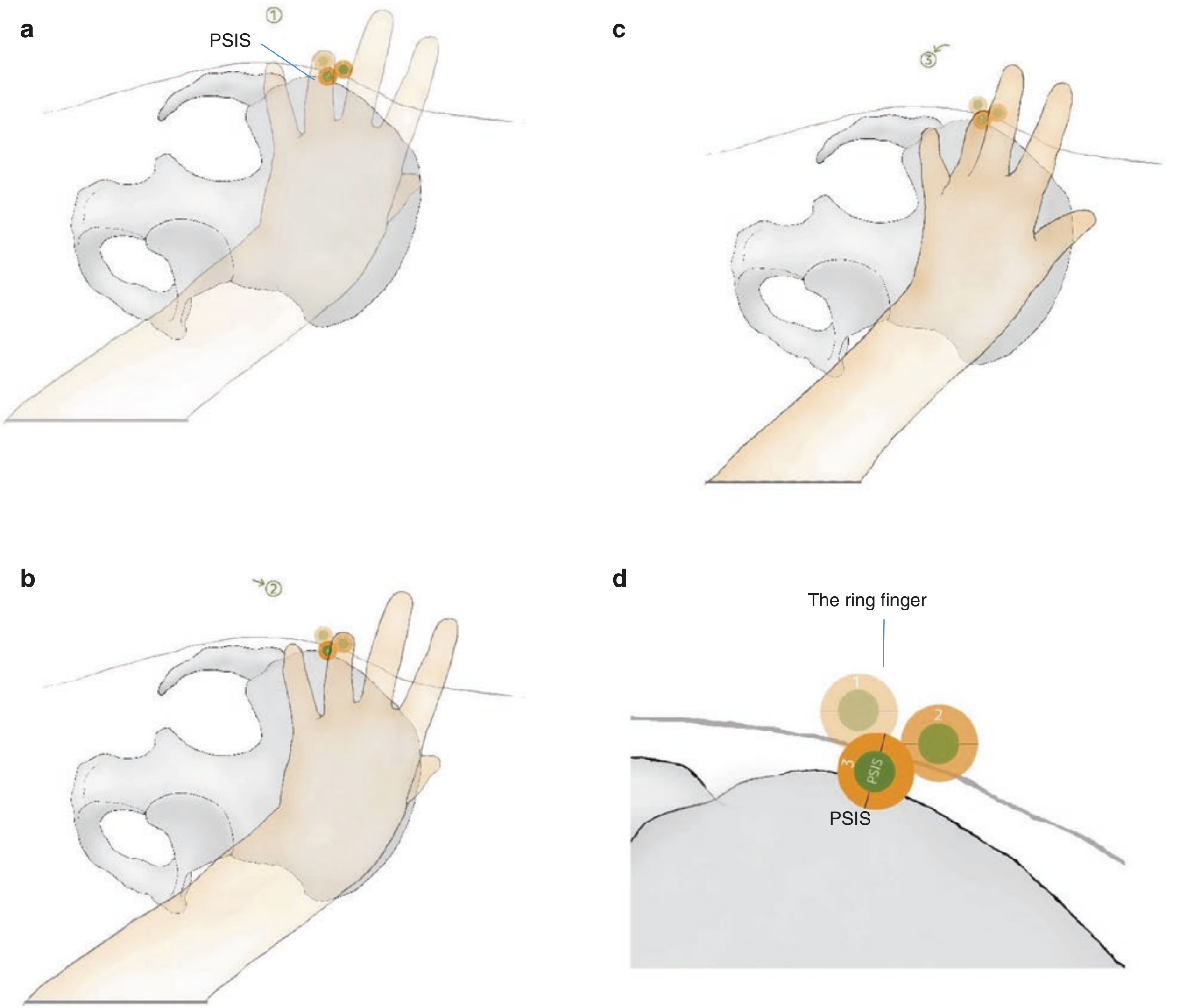

Fig. 6.3 Techniques to gently approach the cranial portion of the PSIS. (**a**) Check the location of the bone processes of the PSIS. (**b**) Move the left hand slightly toward the cranial portion of the PSIS. (**c**) Supination of the forearm. The ulnar side of the DIP of left ring finger touches the cranial portion of the PSIS firmly. (**d**) The location of the ring finger during this procedure

7. Using supination of the forearm, the ulnar side of the DIP of the ring finger touches the cranial portion of the PSIS firmly (Figs. 6.2 and 6.3c, d).
8. The middle and ring fingers are set firmly together (Fig. 6.3).
9. The index finger and the little finger are slight extended (Fig. 6.2).
10. Place the thumb lightly on the iliac crest.
11. Touch the first spinous tubercle of the sacrum (S1) with the palmar side of the right thumb.
12. The force generated by the abductor of the upper arm provides the power to move the ilium caudally by using the ring finger, which touches the cranial portion of the PSIS.
13. Additionally, the therapist transfers his/her weight from right to left (Fig. 6.4).
14. The direction to move the ilium caudally is along the axis of the therapist's forearm. (Fig. 6.5).

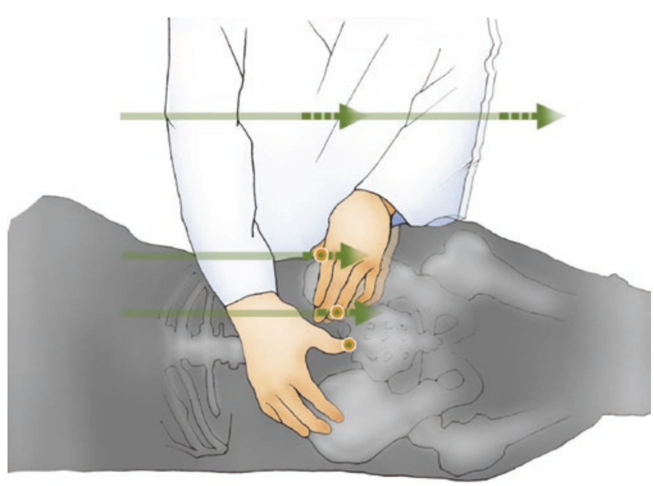

Fig. 6.4 Superior distraction of the right sacroiliac joint. The therapist transfers his/her body weight from right to left, by placing body weight on tiptoes

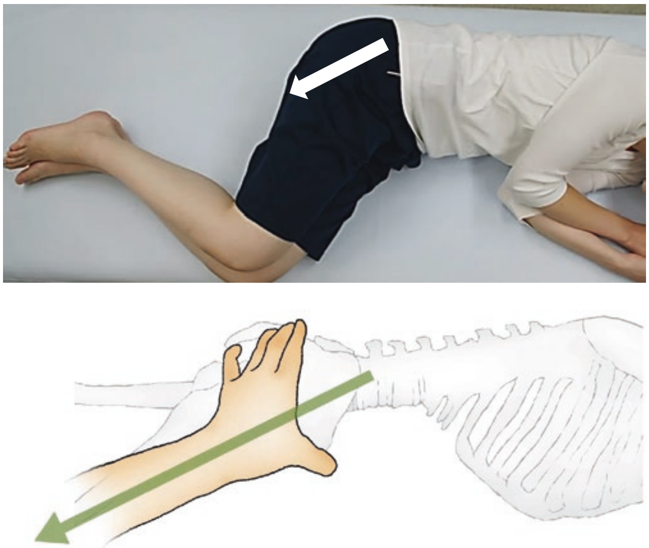

Fig. 6.5 The force direction to move the ilium caudally is slightly dorsal (about 20°) of the femur axis. This direction can provide good movement of the ilium

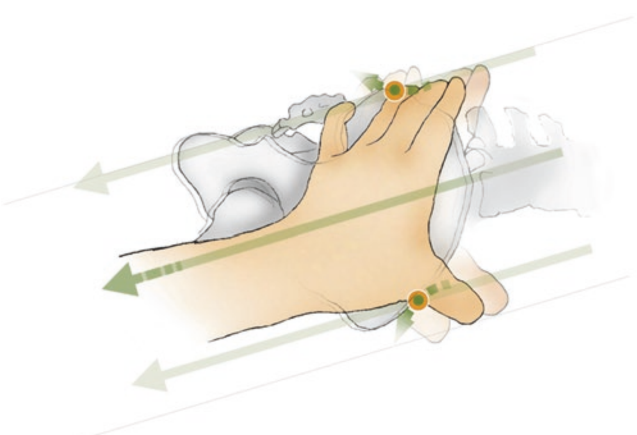

Fig. 6.6 The therapist's fingers should not grasp the bone processes. To be able apply a force to the bone processes in the tangential direction, their should be a wide distance between the thumb and ring finger

15. When moving the ilium caudally, the therapist's fingers should not grasp the bone processes, to avoid causing an arthrostatic reflex. The therapist should keep or slightly widen the distance between the thumb and ring finger to be able to apply a force to the bone processes in the tangential direction (Fig. 6.6).
16. During the procedure, the therapist senses the motion of the ilium with the left ring finger and the motion of the sacrum with the right thumb (Fig. 6.7).

6.2 The Inferior Distraction (Fig. 6.8)

The inferior distraction is the dilating technique for the inferior part of the SIJ. The ilium is moved cranially mainly by using the right thumb, which touches the anterior superior iliac spine (ASIS).

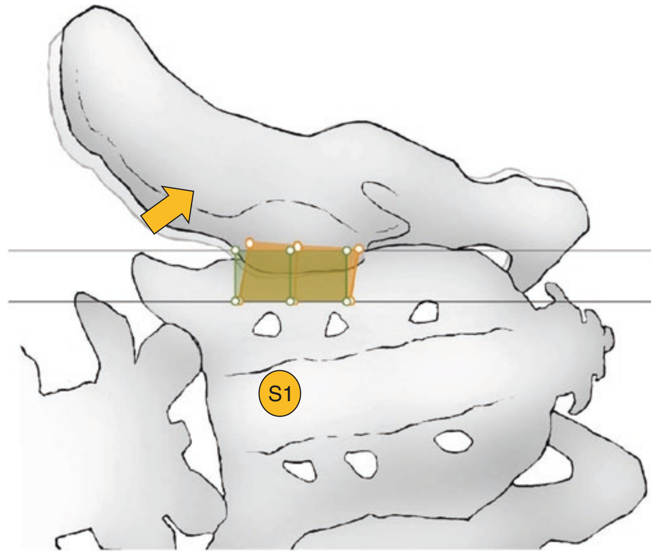

Fig. 6.7 The movement of right sacroiliac joint in superior distraction

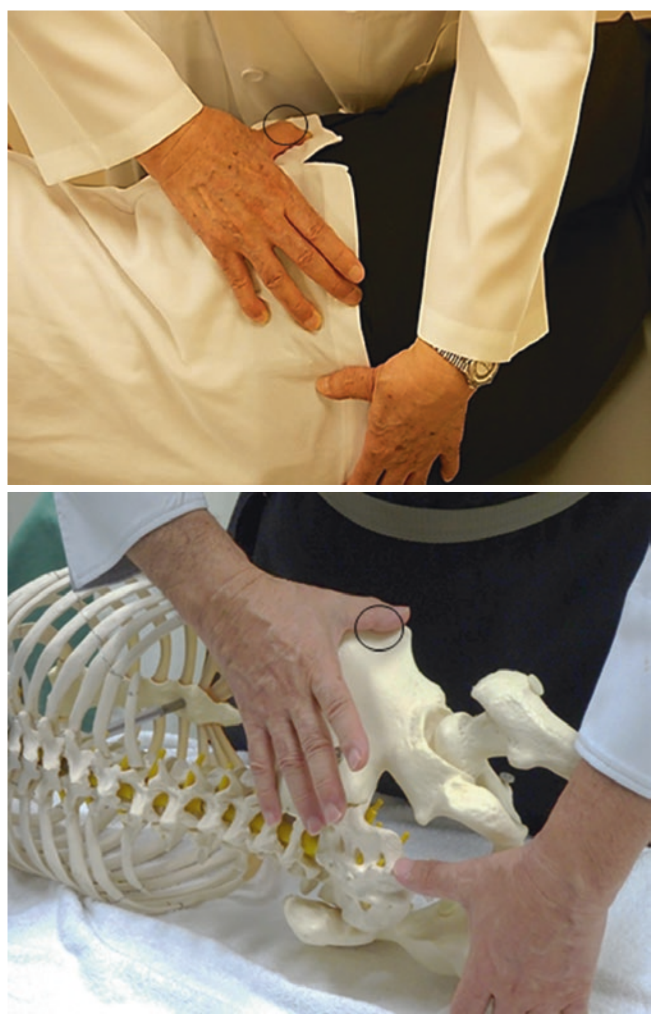

Fig. 6.8 Inferior distraction of the right sacroiliac joint. The right thumb touched the recess below the anterior superior iliac spine (black circle). The right ring finger touches the place near the PSIS

Procedure

1. The right hand is the operating hand for the right SIJ (the left hand for the left SIJ).
2. The main finger is the right thumb. The right ring finger is used in a supportive role. The other fingers or palm should not be used.
3. Place the distal phalanx of the right thumb on the ASIS, and the right ring finger near the PSIS (Fig. 6.9).
4. The therapist's elbow slightly pushes in the anterior while maintaining the position of the thumb and ring finger. The therapist's forearm and thumb are pronate (Fig. 6.10). In this position, the radial side of the thumb makes contact with the ventral side of the ASIS (Fig. 6.11).
5. Lift the wrist up while keeping the tips of the thumb and ring finger in the same place (Fig. 6.11). Then, the distal phalanx of the thumb glides into the ventral side of the recess below the ASIS (Fig. 6.12). Here, the thumb touches the ilium firmly and the ilium moves cranially in this procedure (Fig. 6.13).
6. Touch the third spinous tubercles of the sacrum (S3) with the left thumb.
7. The force generated by the shoulder abductors and by the transfer of the therapist's weight from his/her left leg to right provides the force to move the ilium cranially (Fig. 6.14).
8. The direction to move the ilium cranially is along the axis of the therapist's forearm (Fig. 6.15).
9. During the procedure, the therapist senses the motion of the ilium with the right thumb and the motion of the sacrum with the left thumb (Fig. 6.16).

Fig. 6.9 Place the distal phalanx of the thumb on the recess below the ASIS (white dots line) and the ring finger near the PSIS (white arrow head)

6.3 The Gliding Method

There are two gliding methods: the upward gliding method and the downward gliding method.

6.3.1 The Upward Gliding for the Right SIJ (Fig. 6.17)

Procedure

1. The right hand is placed in the ilium.
2. The distal phalanx of the left index finger is placed on S1, with the thumb, middle finger, and index finger arranged together.
3. The thumb of the right hand is placed on the ASIS and the distal phalanx of the ring finger on the PSIS.
4. The therapist turns his/her hand while turning the pelvis in a clockwise direction (Fig. 6.18).

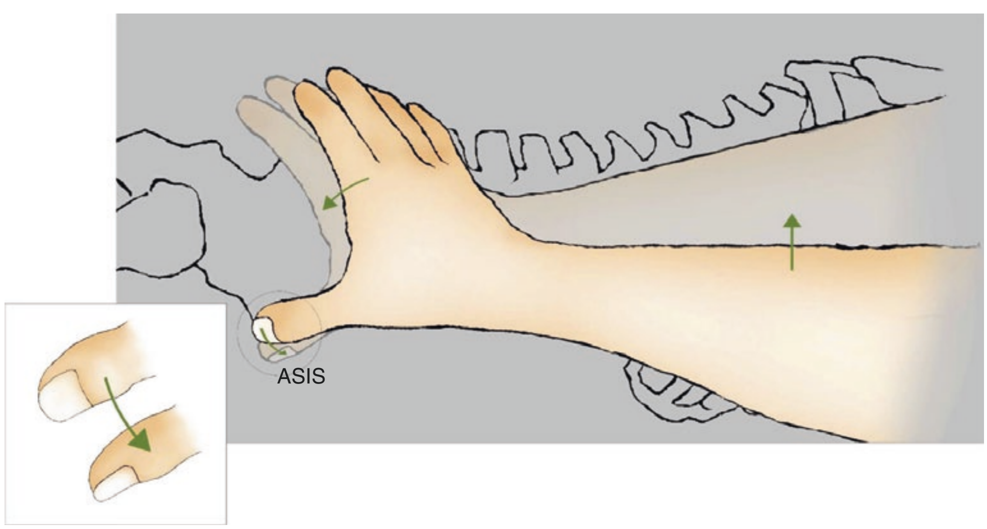

Fig. 6.10 The therapist's elbow slightly pushes in the anterior while maintaining the position of the thumb and ring finger. The therapist's forearm and thumb are pronate. Then, the radial side of the thumb makes contact with the ventral side of the ASIS

Fig. 6.11 Contact point. Showing the contact point of the thumb (black circle). The radial side of the distal phalanx makes firm contact with the recess of the ASIS . Lift the wrist up while keeping the tips of the thumb and ring finger in the same place

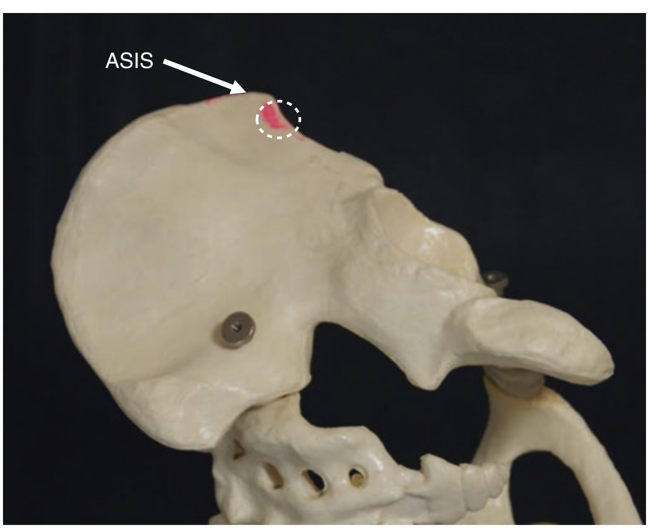

Fig. 6.12 Contact position in the recess below the ASIS (white bow)

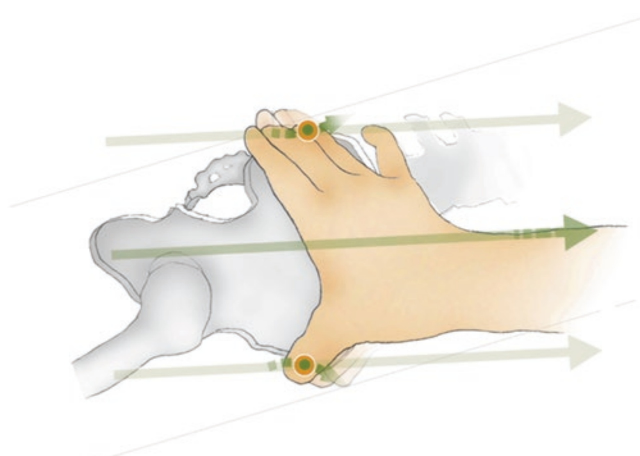

Fig. 6.13 The thumb touches the ilium firmly and the ilium moves cranially. As same as the procedures of the superior distraction, therapist's fingers should not grasp the bone processes

Fig. 6.14 Inferior distraction of the right sacroiliac joint. The therapist transfers his/her body weight from left to right, by placing body weight on tiptoes

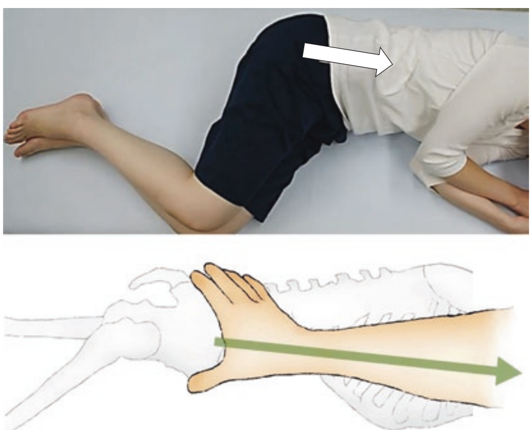

Fig. 6.15 The force direction to move the ilium cranially is slightly dorsal of the trunk axis. This direction can provide good movement of the ilium

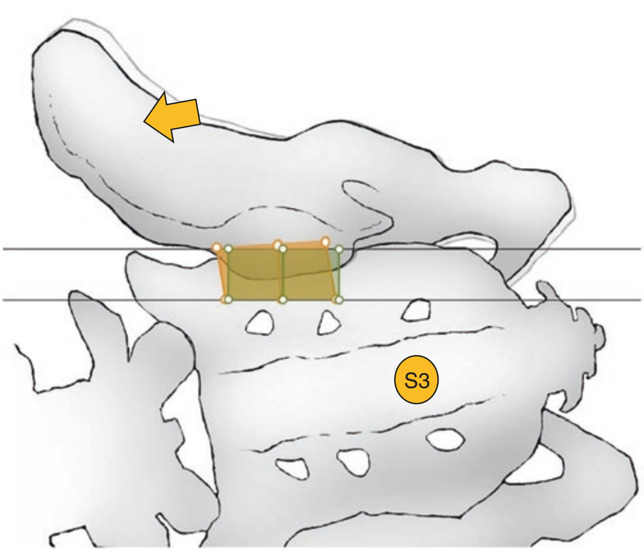

Fig. 6.16 The movement of right sacroiliac joint in inferior distraction

Fig. 6.17 The upward gliding for right sacroiliac joint

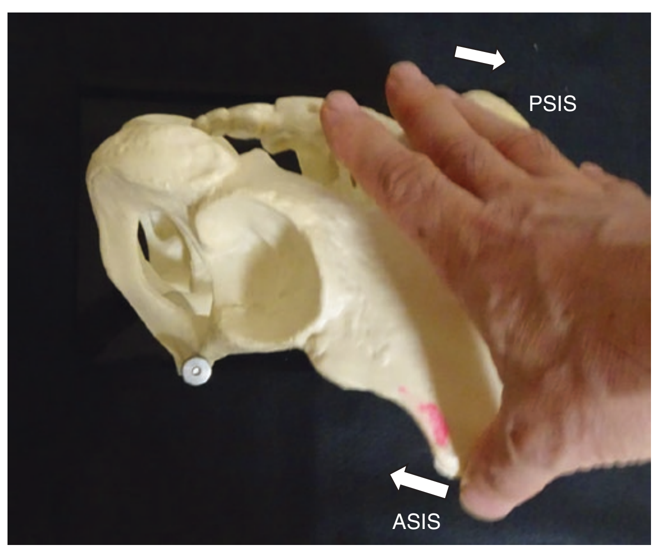

Fig. 6.18 Direction of turning. Turn the ilium in a clockwise direction

5. When the ilium moves, the index finger of the left hand pushes S1 slightly, moving it upward (cephalad), almost simultaneously (Fig. 6.19).
6. The sacrum moves with anterior rotation and ventral gliding (Fig. 6.20).

6.3.2 The Downward Gliding for the Right SIJ (Fig. 6.21)

Downward gliding is performed in the same way, using the index finger of the left hand to push the third spinous tubercle of the sacrum (S3) slightly, moving it downward (caudal) (Figs. 6.22 and 6.23).

The gliding method for the left SIJ is described as follows because it is not a complete mirror image of the right SIJ.

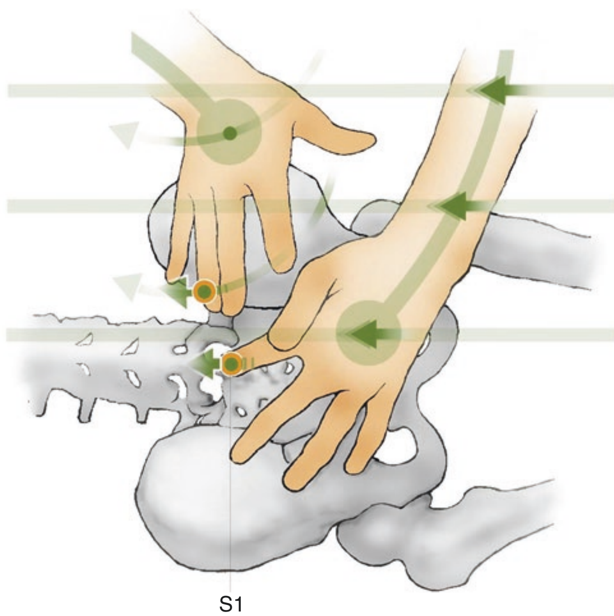

Fig. 6.19 Upward gliding for the right sacroiliac joint. When the ilium moves, the index finger of the left hand pushes S1 slightly, moving it upward (cephalad)

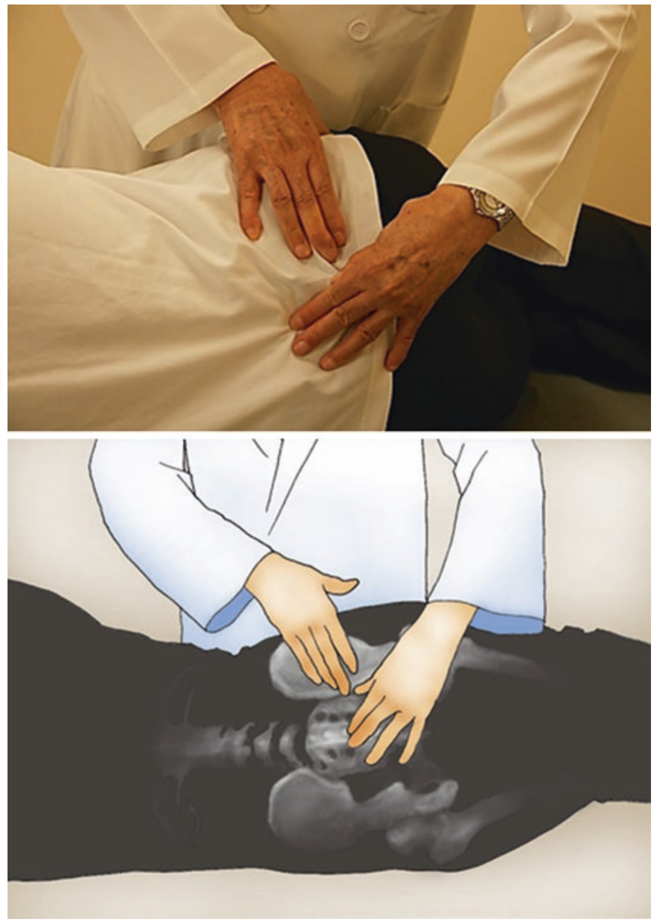

Fig. 6.21 The downward gliding for right sacroiliac joint

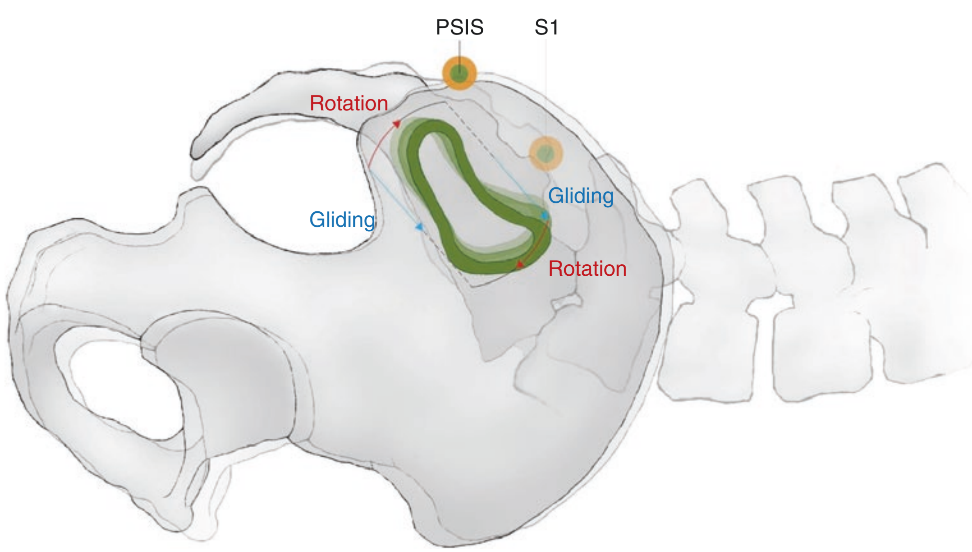

Fig. 6.20 Therapist's view of upward gliding technique. The sacrum moves with anterior rotation and ventral gliding

6.3.3 Upward and Downward Gliding for the Left SIJ (Fig. 6.24)

The procedures are basically the same as for the right SIJ, using the right hand to move the ilium and the left hand to glide the sacrum upward or downward.

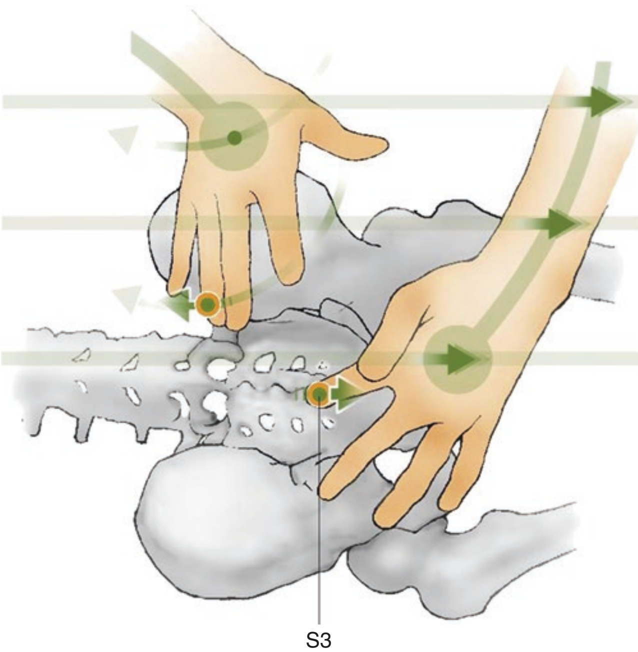

Fig. 6.22 The downward gliding for the right sacroiliac joint. When the ilium moves, the index finger of the left hand pushes S3 slightly, moving it downward (caudal)

Fig. 6.24 Upward gliding for the left sacroiliac joint

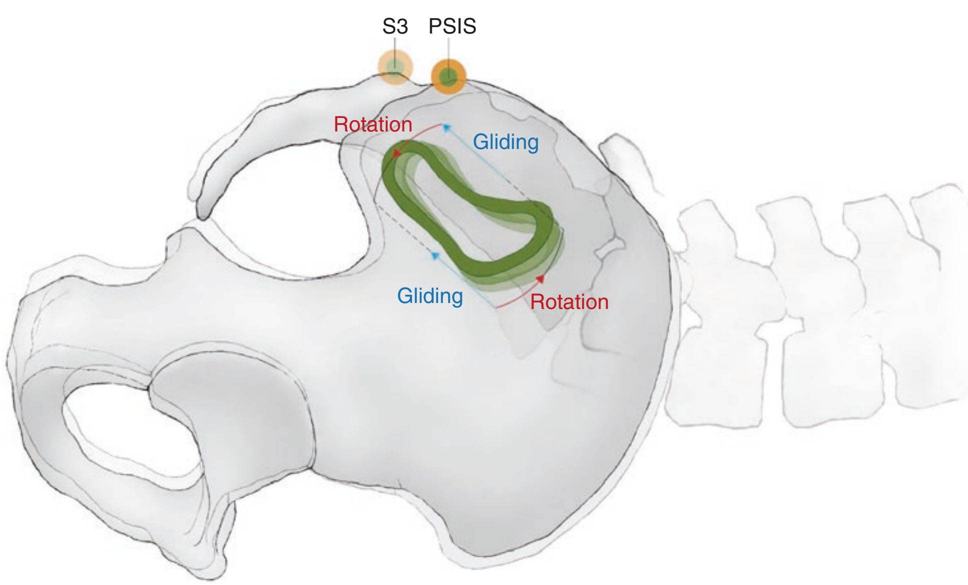

Fig. 6.23 Therapist's view of downward gliding technique. The sacrum moves with posterior rotation and dorsal gliding

1. The right thumb is placed on the ASIS, and the right ring finger is on the PSIS.
2. The distal phalanx of the left index finger is placed on S1, with the thumb, middle finger, and index finger arranged together.
3. The therapist turns his/her hand while turning his/her pelvis in a counter-clockwise direction (Fig. 6.25).
4. When the ilium moves, the index finger of the left hand pushes S1 slightly upward (cephalad), almost simultaneously.
5. When downward gliding is performed, the index finger of the left hand pushes S3 slightly downward (caudal), almost simultaneously (Figs. 6.26 and 6.27).

6.4 Points Requiring Extra Attention During the Procedure

Regarding the application of the accessory movement of the SIJ, there are several points that should be noted.

1. Do not grasp the bone.
2. Do not press on the bone using vertical force.
3. The maneuver utilizes only the thumb and ring finger.
4. Loosen the finger tips and operate with the shoulder and the waist.
5. The therapist stands on the patient's ventral side with his feet at a distance shorter than his shoulder-width. The

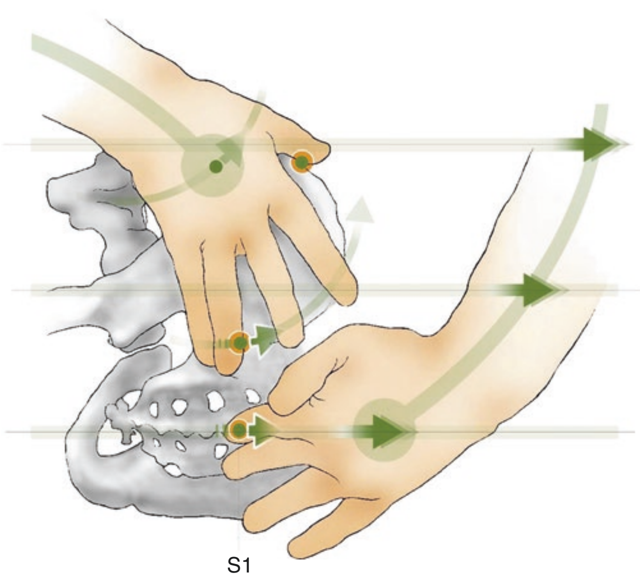

Fig. 6.25 Upward gliding for the left sacroiliac joint. The ilium is rotated with the right hand in a counter-clockwise direction and the left index finger pushes the S1 upward for upward gliding

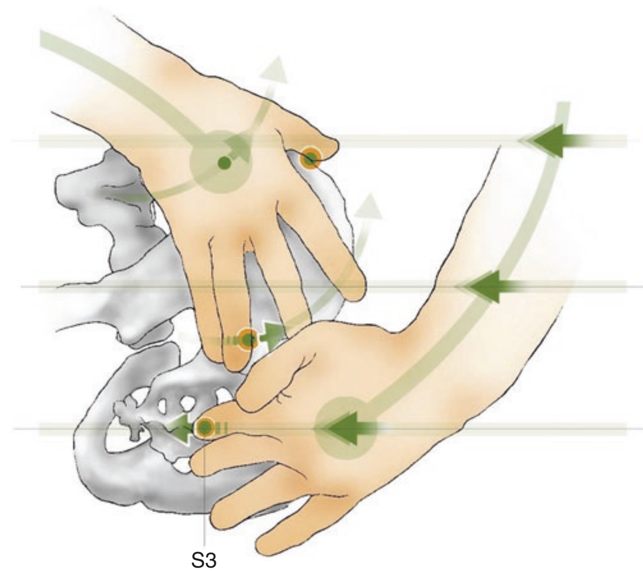

Fig. 6.27 Downward gliding for the left sacroiliac joint. Using the same gliding method and rotating the ilium in the same way as with upward gliding, the left index finger slightly pushes the S3 downward

Fig. 6.26 Downward gliding for the left sacroiliac joint

therapist's umbilicus should be at the same position as the patient's iliac crest (Fig. 6.28).

6. Place the toes 2–3 cm under the edge of the treatment table. The maneuver is performed while standing on the tiptoes (Fig. 6.29).

7. The therapist assumes a posture so that his hip joints are flexed at about 20° and his lumbar spine is extended. In this way, the therapist can perform the maneuver on the SIJ using only the motion of his hip (Fig. 6.30).

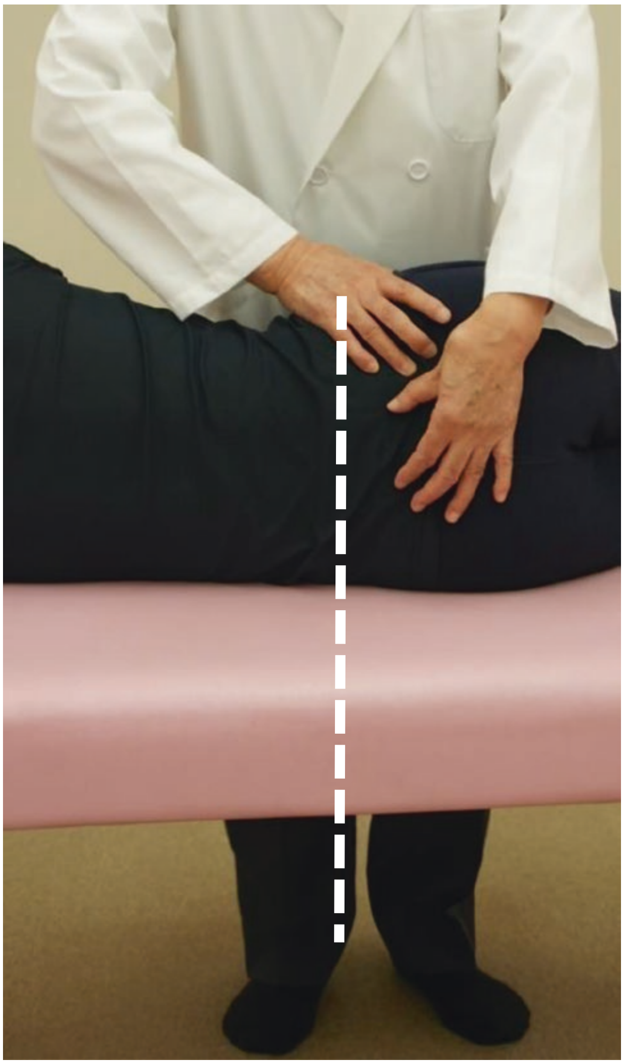

Fig. 6.28 Regarding the therapist's standing position, his center should come to the same position as the patient's iliac crest. His feet should be at a distance shorter than his shoulder-breadth

Fig. 6.29 The feet should be positioned slightly under the edge of the treatment table, and the maneuver performed while standing on tiptoes. The maneuver cannot be controlled from the hip if one's weight is placed on the heels

Fig. 6.30 The therapist stands with his hip joints flexed at about 20° and with the lumbar spine extended

6.5 Summary of Each Technique

6.5.1 Distraction Method

Table 6.1 Use of fingers for each technique

		Superior distraction	Inferior distraction	Upward gliding	Downward gliding
Right SIJ	The ilium	Left ring finger to the PSIS	Right thumb to the ASIS	Right ring finger (ulnar side) to the PSIS	Right ring finger (ulnar side) to the PSIS
	The sacrum	Right thumb to S1	Left thumb to S3	Left index finger to S1	Left index finger to S3
Left SIJ	The ilium	Right ring finger to the PSIS	Left thumb to the ASIS	Right ring finger (radial side) to the PSIS	Right ring finger (radial side) to the PSIS
	The sacrum	Left thumb to S1	Right thumb to S3	Left index finger to S1	Left index finger to S3

It should be noted that the procedures for the superior distraction and for the inferior distraction are completely different. The operative fingers used to move the ilium and the sacrum are summarized in Table 6.1.

6.5.2 The Gliding Method

The right hand is always used, in order to rotate the ilium. The direction of rotation for the right and left ilium is different. The sacrum is glided either upward or downward by the index finger of the left hand.

In order to treat SIJ dysfunction effectively, it is necessary to master all eight techniques summarized in Table 6.1. Treatment of the SIJ should be routinely completed in 5–10 min for each patient. The treatment begins with the afflicted side, then the non-afflicted side, and finally with the afflicted side again. The intensity of the manual procedures is as follows:

A "strong" grade of intensity for the manual procedures in the same direction is acceptable to be performed up to three times. However, the final procedure should be performed at a "weak" grade in any technique.

7 Classification of Sacroiliac Joint Pathological Conditions in the AKA-Hakata Method

Shigehiko Katada

There are three conditions which can be treated by the AKA-Hakata method (AKA-H), namely, joint dysfunction, simple arthritis, and complex arthritis. The diagnostic criteria for these conditions were clinically defined based on symptoms, physical findings, and responses after the AKA-H treatment.

7.1 Sacroiliac Joint Dysfunction

A joint dysfunction is said to be the condition in which intra-articular movements of the joint surfaces are impaired without any pathological changes in the joint. The joint surface could be locked just beyond the joint play in the joint dysfunction. Diagnostic criteria of joint dysfunction is shown in Table 7.1. Having no neurological deficits is a mandatory item in the criteria. A neurological examination must be carried out in all cases with pain and/or paresthesia. When pain, paresthesia, and muscular weakness are not consistent with dermatome, myotome, or the innervation of the peripheral nerve, they are considered to be originating from the joint. At the initial evaluation, two or more of the following are required: (1) mild SLR limitation comparing to sound side; (2) mild restriction in the truncal flexion; (3) pain with limitation in the truncal extension, and/or pain on the stretched side in truncal lateral bending; (4) pain in Fadirf or Fabere (ipsilateral or contralateral); (5) pain in the low back or lower extremities by SLR (ipsilateral or contralateral). The most important point is that physicians should feel and evaluate the decrease in the joint play of the sacroiliac joint with their hand. A definitive diagnosis of the joint dysfunction is made when the symptoms, including pain and/or paresthesia, decrease immediately after the initial treatment with AKA-H, and completely or nearly completely disappear within 3 weeks after one or two treatment sessions.

Table 7.1 Diagnostic criteria of the sacroiliac joint dysfunction

A.		No neurological deficits
B.		Pain, paresthesia, and muscular weakness are not consistent with dermatome, myotome, or peripheral nerve innervation
C.		At the initial evaluation, 2 or more of the following are required:
	1	Mild SLR limitation comparing to sound side
	2	Mild restriction in truncal flexion (finger–floor distance, FFD)
	3	Pain with limitation in the truncal extension, and/or pain on the stretched side in truncal lateral bending
	4	Pain in Fadirf or Fabere (ipsilateral or contralateral)
	5	Pain in the low back or lower extremities by SLR (ipsilateral or contralateral)
D.		Decrease in the joint play of the sacroiliac joint
E.		The symptoms, including pain and/or paresthesia, decrease immediately after the initial treatment with AKA-H, and completely or nearly completely disappear within 3 weeks after one or two treatment sessions

7.2 Simple Sacroiliac Arthritis

Symptoms of simple arthritis are the same as in the joint dysfunction, except that the pain is much more intense in acute arthritis than in dysfunction. The symptoms and physical findings are similar to joint dysfunction. However, these are not relieved completely in the initial treatment. ROM in the truncal extension, flexion, Fadirf, and Fabere are not sufficient, particularly in the SLR angle. The diagnostic criteria of simple aseptic arthritis are shown in Table 7.2. Response to AKA-H improves remarkably within 2 months, and the symptoms completely disappear within 3 months.

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Table 7.2 Diagnostic criteria of the simple sacroiliac arthritis

A.	No neurological deficits	
B.	Pain, paresthesia, and muscular weakness are not consistent with dermatome, myotome, or peripheral nerve innervation	
C.	At the initial evaluation, 2 or more of the following are required:	
	1	Mild SLR limitation comparing to sound side
	2	Mild restriction in truncal flexion (finger–floor distance, FFD)
	3	Pain with limitation in the truncal extension, and/or pain on the stretched side in truncal lateral bending
	4	Pain in Fadirf or Fabere (ipsilateral or contralateral)
	5	Pain in the low back or lower extremities by SLR (ipsilateral or contralateral)
D.	Immediately partial improvement after the initial treatment with AKA-H, 2 or more of the following are required:	
	1	10°or more improvement of SLR
	2	Improvement of ROM and/or pain relief in truncal flexion, extension, lateral bending, Fadirf, or Fabere
	3	Decrease in pain and/or paresthesia
	4	Increase in muscle strength
	5	Improvement in mobility and ADL
E.	Decrease in the joint play of the sacroiliac joint	
F.	Response to AKA-H improves remarkably within 2 months, and the symptoms completely disappear within 3 months	

7.3 Complex Sacroiliac Arthritis

Symptoms of complex arthritis are also the same as in joint dysfunction, but the pain in this condition is peculiar, as shown in Table 7.3, and usually more severe than in dysfunction. Complex arthritis is differentiated from simple arthritis because of its peculiar pain, accompanying autonomic dysfunction, and repeated recurrences. In complex arthritis, the main site of the involvement is the sacroiliac joint, complicated with multiple arthritis and dysfunction of the spinal facet joints, the costal joints, and extremity joints. The pain in this arthritis is partially responsive to AKA-H in the first treatment session, although in a few cases, it was not responsive at all. With monthly or biweekly AKA-H treatment sessions, the pain becomes fairly well responsive in about 2 or 3 months and can disappear completely in 3 months. However, accessory movement of the sacroiliac joint might not become normal even if the symptoms decrease. Moreover, the pain of complex arthritis could be aggravated by rough treatment or by sessions which are too frequent. The autonomic symptoms in this arthritis include hyperhidrosis, cold-feeling, edema, muscular atrophy, bony atrophy, deformed nails, nausea, blurred vision, tinnitus, etc. Because of these autonomic symptoms, this arthritis may be considered an incomplete reflex sympathetic dystrophy (RSD).

Table 7.3 Diagnostic criteria of chronic complex sacroiliac arthritis (RSD type)

A.	No neurological deficits
B.	Pain, paresthesia, and muscular weakness are not consistent with dermatome, myotome, or peripheral nerve innervation
C.	3 or more of the signs and symptoms described in 1–3 below
D.	1 or more of the response to AKA-H described in 4
E.	Decrease in the joint play in the sacroiliac joint and other joints
F.	No improvement for more than 2 months, ore repeated recurrence in more than 3 months
	1. Pain and tenderness (a) Rest pain: increase or decrease with exercise (b) Marked pain lasting more than 1 month (c) Pain upon rolling over lasting more than 1 month (d) Pain attack (e) Fluctuation of intensity of pain (f) Broad painful area (g) Severe pain on initiating motion (h) Marked paresthesia (i) Hypesthesia (j) Multiple tenderness areas in trunk (k) Chest oppressive feeling (l) Weakness of limb or part of limb
	2. Autonomic symptoms and signs (a) Hyperhidrosis or circumscribed hypohidrosis (b) Cold or hot feeling, subjectively and/or objectively (c) Mild edema in extremities (d) Mild effusion in joints (e) Muscular atrophy (f) Bony atrophy (g) Deformity or discoloration of nail (h) Discoloration of skin (i) Nausea and/or vomiting (j) Blurred vision, dizziness (k) Tinnitus
	3. Restriction of ROM: painful or painless (a) Marked restriction of truncal flexion (FFD), and/or extension (b) Restriction of FFD without limited SLR (c) Marked restriction of SLR (d) Marked restriction of Fabere (e) Lumbar scoliosis (f) Limited neck ROM
	4. Response in the AKA-H treatment (a) Tenderness to AKA-H (b) Pain increases with too forceful AKA-H (c) Pain increases with frequent AKA-H treatment (d) Location of pain and paresthesia changes immediately after AKA-H (e) AKA-H to multiple joints is required (f) Unawareness of changes of symptoms and signs immediately after AKA-H (g) Recurrence of pain or paresthesia within 1 month (h) Recurrence of limited ROM within 1 month

8 Articular Originating Referred Pain Area

Jun Yoshida

This chapter describes the pain location and the joint which should be treated, which have been revealed by Dr. Hakata's huge amount of clinical experience.

In this chapter, the chiefly treated joints are shown for pain area in each patient. The articular originating referred pain area is described, which is revealed by clinical experiences by using the AKA-H method.

8.1 Introduction

Pain, such as low back pain, neck pain, and pain in the extremities, is one of the most common reasons for patient complaints. Most of the causes were not always identifiable by imaging such as radiography, CT, and MRI. Therefore, the symptomatic treatments didn't work well. Recently, the manual medicine is noticed as a diagnostic method for functional disorders.

Dating back to the 1960s, there was a report about pain in joints with no pathologic conditions, which was caused by the joint dysfunction, leading to musculoskeletal pain. The treatment results were poor because they were treated by manipulation techniques. The relationship between the pain area and the dysfunctional organ by traditional manipulation techniques was unclear because it usually regarded many joints or muscles as treatment targets. The AKA-Hakata method (hereafter AKA-H), focusing on treating one joint at a time, made it clear by clinical experience that the pain caused by the intra-articular joint dysfunction and the referred pain is area affected by it.

The important thing is that the pain origin is not always just in the pain area. Most of the pain derives from the dysfunctional joint relatively far from the pain area. Several joints may cause referring the pain to certain areas and plural joints need to be treated on a case by case basis.

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8.2 The Principles of Treatment by the AKA-H Method

It is necessary to identify the affected joint when we treat the pain originating from the joint. The pain referral maps, which were made based on the huge amount of clinical experience of the AKA-H methods, are useful for this purpose. Dr. Hakata revealed through his clinical experience that the most primarily affected joint was the sacroiliac joint (SIJ). Other joint dysfunction occurred secondarily following the SIJ dysfunction. Therefore, the treatment should start for SIJ first, and if necessary, the treatment for other secondarily affected joints should be added.

8.3 The Order in which the Joints Should Be Treated Is Shown in the Figures

1. The head (Fig. 8.1)
   ① SIJ, ② C7/T1 facet joints, and ③ C2/3 facet joints.
   Most headaches related to joint dysfunction are caused by SIJ dysfunction and C7/T1 facet joints dysfunction occurring together with SIJ dysfunction.
2. The face (Fig. 8.2)
   ① SIJ, ② C7/T1 facet joints, and ③ C2/3 facet joints.
   Similar to the treatment for headache originating from the joint dysfunction, the pain around the eyes and cheeks can be treated by the AKA-H method for SIJ and C7/T1 facet joints. Occasionally, temporomandibular joint pain can be related to sternoclavicular joint dysfunction.

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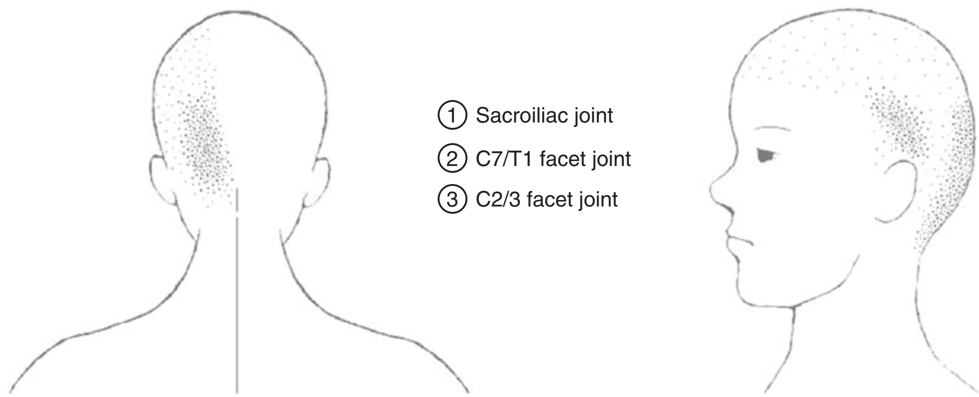


Fig. 8.1 The order in which the joints cause the head pain

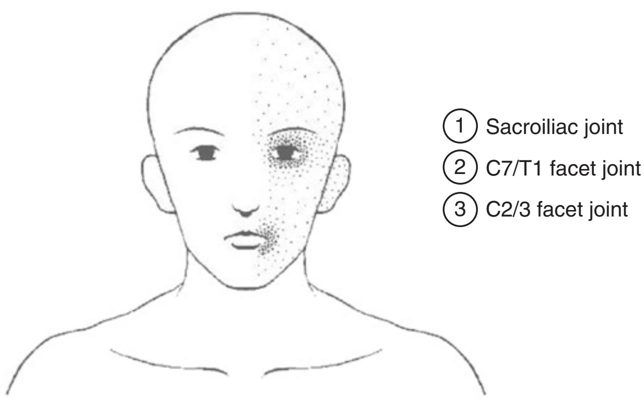


Fig. 8.2 The order in which the joints cause the face pain

3. The neck (Fig. 8.3)

   Back: ① SIJ, ② 1st costovertebral joint, ③ Sternoclavicular joint, and ④ C7/T1 facet joint

   Front: ① SIJ, ② Sternoclavicular joint, and ③ 1st costovertebral joint.

   Upper shoulder girdle: ① SIJ, ② 1st costovertebral joint, ③ Sternoclavicular joint, ④ T1/2 facet joint, and ⑤ C7/T1 facet joint.

   Pain from the occipital region of the head to the shoulders is a common complaint. Pain in the head, face, and upper back region accompanies it occasionally. SIJ dysfunction is basic to the joint dysfunction around the neck, and it causes this neck pain in most cases. The 1st costovertebral joint dysfunction follows SIJ dysfunction as the main cause of neck pain. Tenderness of this joint often suggests that the recovery of the accessory movement of SIJ is not complete. Treatments for SIJ dysfunction should be tried again.

   The front of the neck pain can originate from the dysfunction of the sternoclavicular, 1st costovertebral joints followed by SIJ.

4. The back (Fig. 8.4)

   ① SIJ, ② 1st costovertebral joint, ③ Sternoclavicular joint, ④ Thoracic facet joint, and ⑤ Sternocostal joint

   Back pain can occur together with the pain and/or numbness in the upper extremities. SIJ dysfunction primarily causes these symptoms, and the spinal facet joints, the costovertebral joints, and sternoclavicular or sternocostal joint dysfunction are secondary pain origins. Pain in the paravertebral, scapula, and posterior axillary area is often observed. Checking from the T1/2 to the T5/6 facet joints, from the 1st to the 5th costovertebral joints, and from the 2nd to the 3rd sternocostal joints is necessary when the back pain is treated by the AKA-H method.

5. The precordia (Fig. 8.5)

   ① SIJ, ② Sternoclavicular joint, ③ Sternocostal joint, and ④ Costovertebral joint.

   Visceralgia, such as angina pectoris and pleurisy, should be differentiated from the cause of precordialgia. The tenderness of the chest wall (bone or muscle) suggests joint dysfunctions.

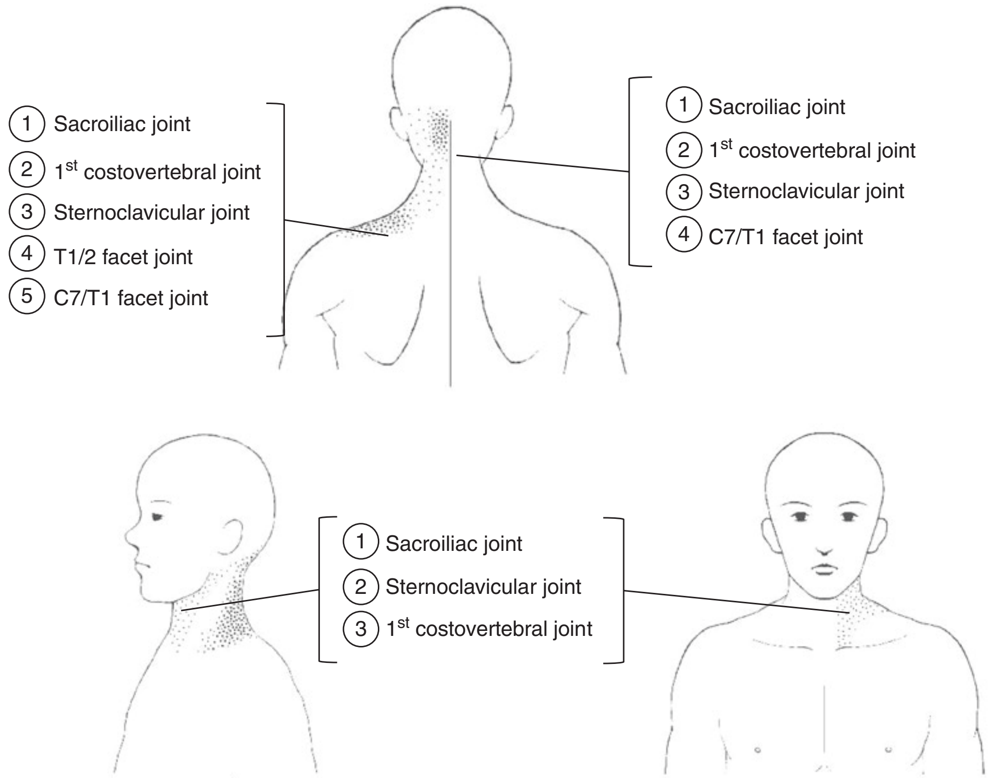
   The sternoclavicular joint influences the entire chest wall. Therefore, this joint should be treated following SIJ.

6. The low back (Fig. 8.6)

   ① SIJ and ② L1/2-L5/S facet joints

   Almost all affected joints in patients with low back pain come from SIJ dysfunction. Occasionally, lumbar facet joint dysfunction can accompany it. Radiculopathy, tumors, and fractures should be checked to differentiate them from joint pain. Lumbar facet joint dysfunction

Fig. 8.3 The order in which the joints cause the neck pain



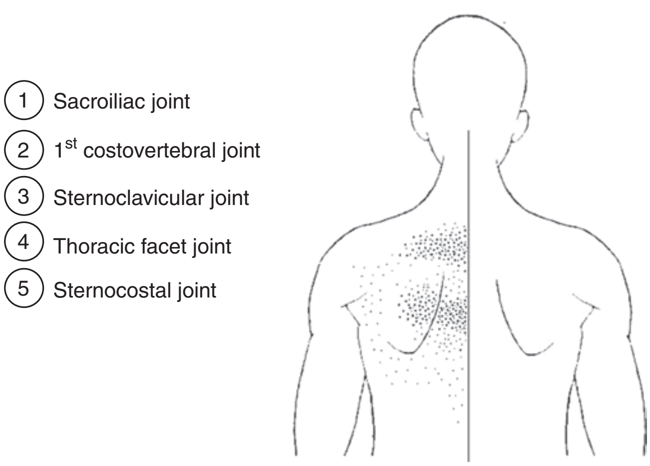


Fig. 8.4 The order in which the joints cause the back pain

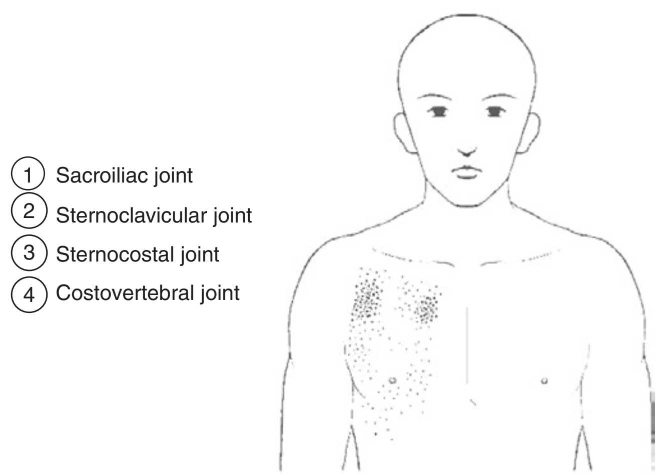


Fig. 8.5 The order in which the joints cause the pecordia

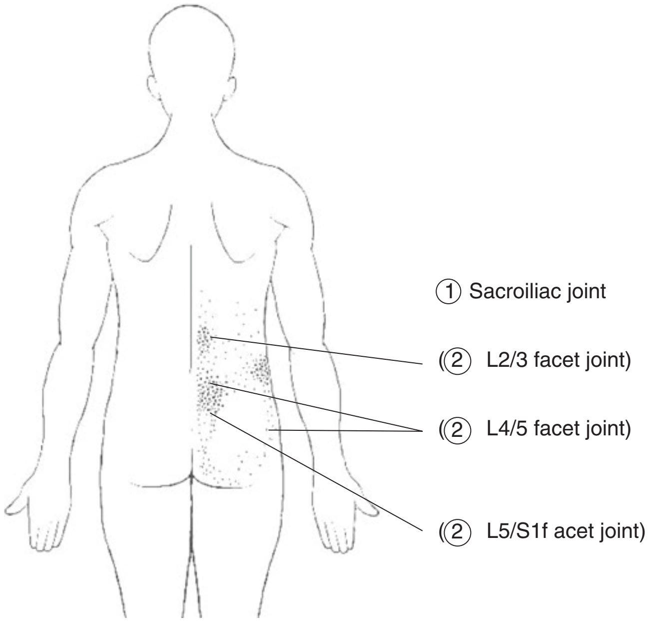


Fig. 8.6 The order in which the joints cause the low back pain

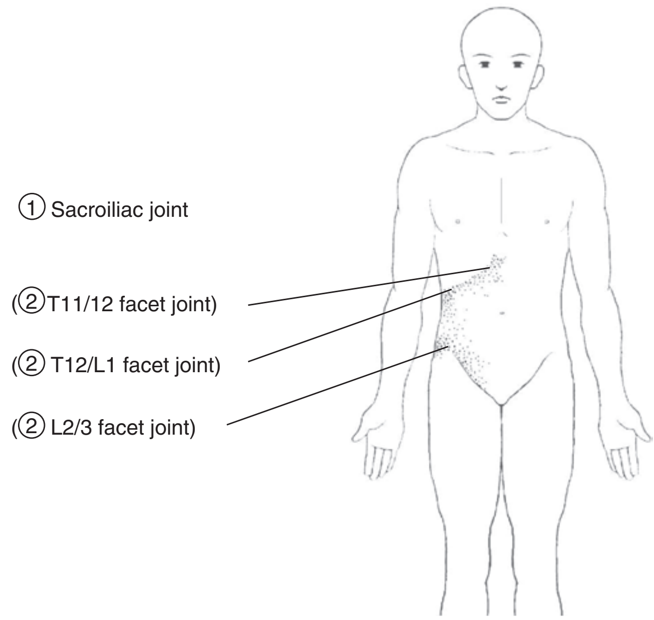


Fig. 8.7 The order in which the joints cause the abdominal pain

secondary to the compression vertebrae fractures or post-lumbar surgeries can occur, and the AKA-H for lumbar facet joints would be necessary to treat these.

7. The abdomen (Fig. 8.7)

   ① SIJ and ② T11/12 facet joint (for pain at epigastria), 7th sternocostal joint (for pain at costal arch), L1/2 facet joint (for pain at lateral abdominal), and L2/3 facet joint (for pain at lower abdominal and inguinal area).

   Pain in the abdominal region can originate from SIJ dysfunction and from secondary-affected joints in the trunk when there are no abnormal findings from the examinations of the internal organs.

8. The upper extremities

   ① SIJ, ② sternoclavicular, 1st costovertebral, ③ II–V sternocostal and costovertebral joints, and ④ T1/2-T5/6 facet joints.

   Articular originating pain and numbness in the upper extremities are observed locally around the affected joint or over the extremity related to the joint. Dysfunction of the upper costovertebral, sternocostal, thoracic facet, and sternoclavicular joints are secondary ones.

   (a) Over the upper extremities

   The articular originating pain and/or numbness doesn't completely correspond to dermatome or peripheral innervation areas. These could be treated by the AKA-H for SIJ alone. Occasionally, additional AKA-H to several joints related to the symptoms could be required.

   - The dorsal (Fig. 8.8)

     Pain and numbness in the dorsal upper extremities is caused by the dysfunction of the costovertebral, sternoclavicular, sternocostal, and thoracic facet joints, which often occur together with SIJ dysfunction. Dysfunction of the 1st costovertebral and sternoclavicular joints are key joints because they could affect the whole upper extremity.

   - The palmar (Fig. 8.9)

     Pain in the whole palmar area is caused by dysfunction of the SIJ and sternoclavicular joints. Pain in the palmar-radial humeral and the thenar eminence could be treated by the AKA-H for the sternoclavicular and/or 1st costovertebral joint.

   (b) The upper extremities; local pain

   - Shoulder (Fig. 8.10)

     Most shoulder pain should be treated by the AKA-H to the SIJ and to related joints as follows:

     – The anterior region
       The sternoclavicular or 2nd sternocostal joint.
     – The posterior region
       1st costovertebral, sternoclavicular, and T1/2 or T 2/3 facet joints.
     – The lateral region
       1st costovertebral, sternoclavicular, 2nd costovertebral, and T1/2 and T2/3 facet joints

   - The elbows

     The pain and numbness on either the radial or ulnar elbow are common complaints. These are usually diagnosed as lateral or medial humeral epicondylitis. The 1st costovertebral and sternoclavicular joints are responsible for the pain.

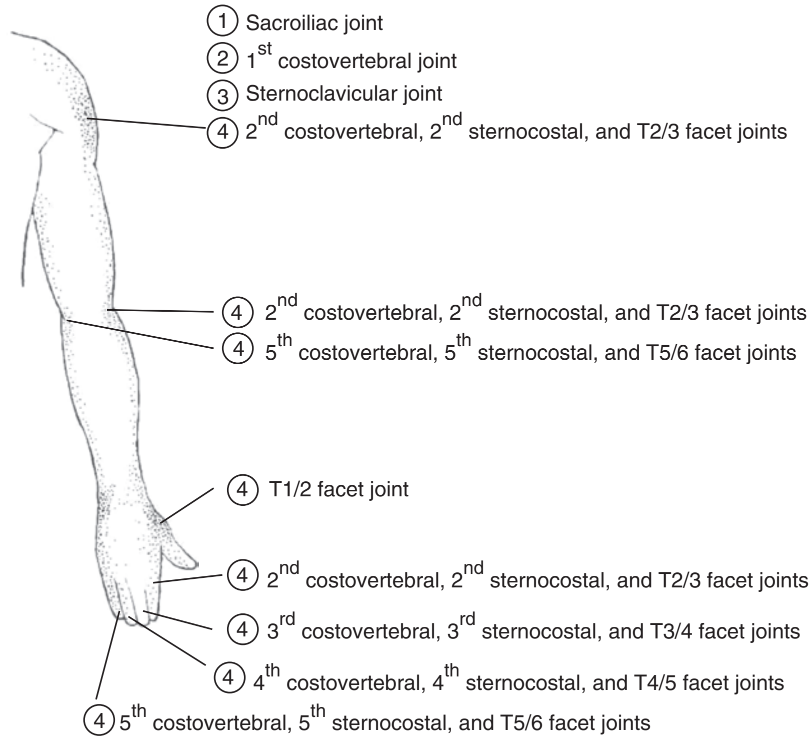


Fig. 8.8 The order in which the joints cause pain in the dorsal upper extremities

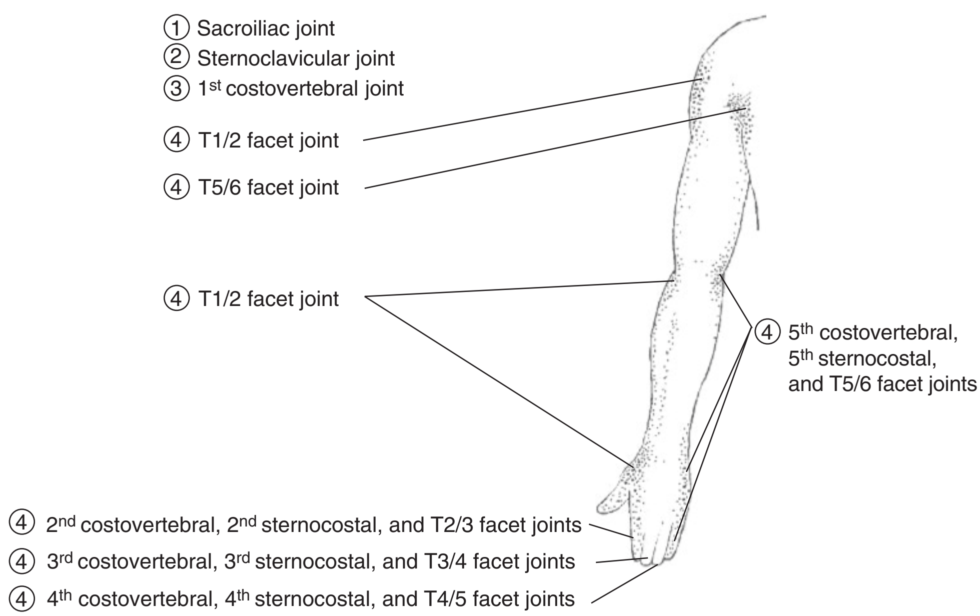


Fig. 8.9 The order in which the joints cause pain in the palmar upper extremities

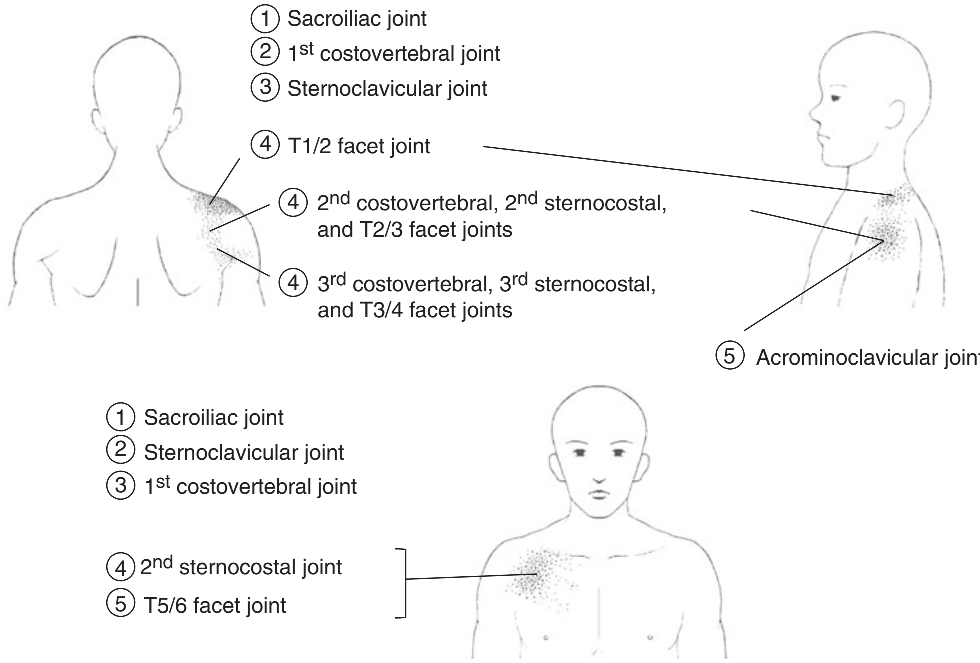


Fig. 8.10 The order in which the joints cause the shoulder pain

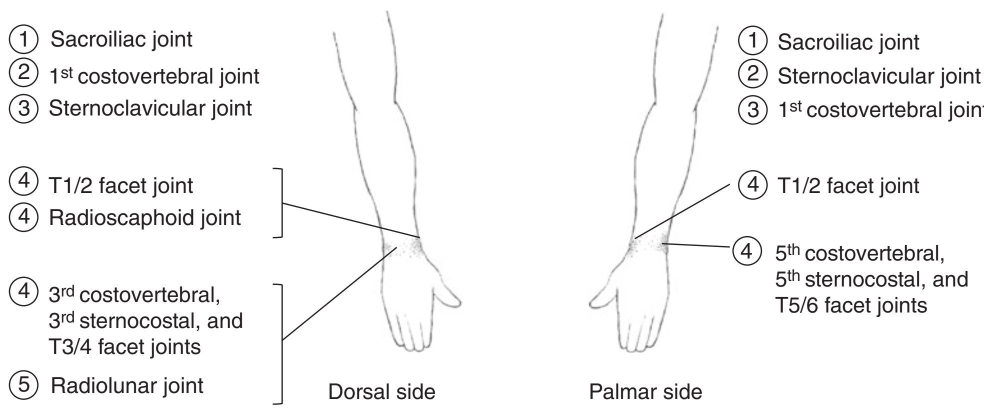


Fig. 8.11 The order in which the joints cause the wrist pain

- The wrists (Fig. 8.11)

  In general, the pain and numbness around the wrist joint area is diagnosed as tendinitis. However, these symptoms could be treated by the AKA-H for the radioscaphoid and radioulnar joints.
- The hands

  Most pain and numbness in the dorsal thumb and index finger area could be relieved by the AKA-H for the 1st costovertebral joint.

9. The lower extremities

   Pain in the lower extremities is most often related to dysfunction of the SIJ wherever the pain is located. Occasionally, it is due to dysfunction of the lumbar facet joints.

(a) All the lower extremities (Fig. 8.12)

① SIJ and ② L1/2~L5/S facet joint

Local pain and numbness (paresthesia) in the lower extremities is common. Posterior thigh down to leg and ankle pain is usually diagnosed as sciatica. However, most of them could be the referred pain originating from SIJ dysfunction.

(b) The local lower extremities

- The hip region

  Most of the buttock, great trochanter, and groin pain could be treated by the AKA-H for the SIJ.
- The knees (Fig. 8.13)

  Pain and numbness in the knee could be affected by the tarsal joint dysfunction together with dysfunction of the SIJ and lumbar facet

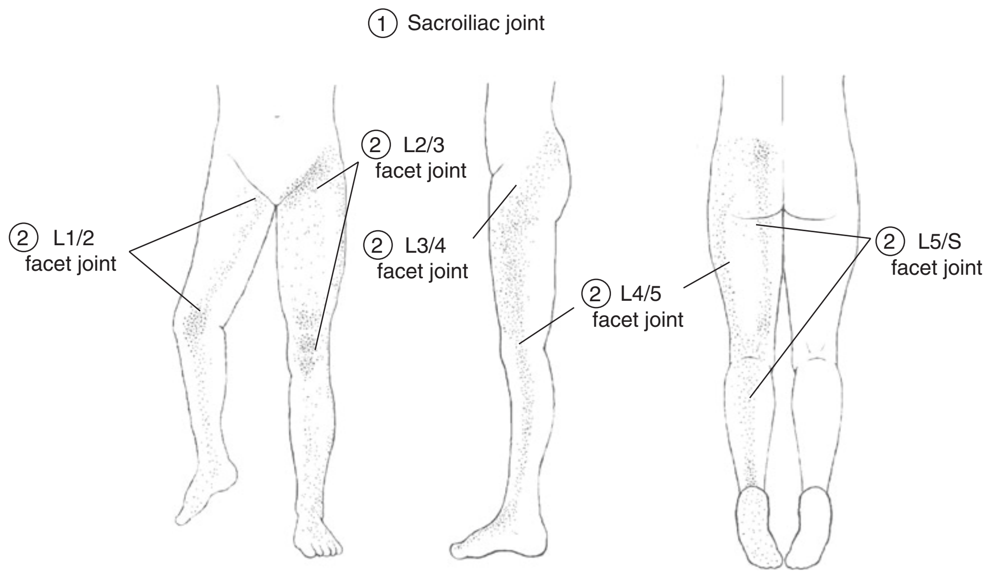


Fig. 8.12 The order in which the joints cause pain in the lower extremities

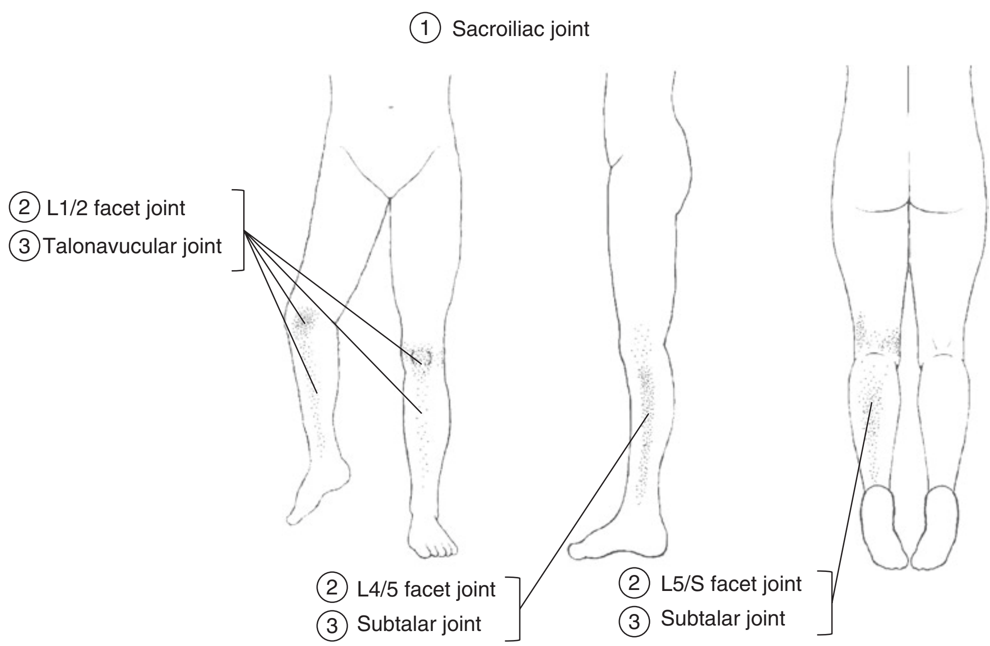


Fig. 8.13 The order in which the joints cause the knee pain

joints. Pain around the knee joint is easily diagnosed with injury of the ligament or meniscus. However, most of this is referred pain from SIJ dysfunction. Additionally, the talonavicular or subtalar joint should be checked.

- The ankle joint (Fig. 8.14)

  Pain in the Achilles tendon area quite often accompanies subtalar joint dysfunction.

- The foot

  Pain and numbness in the foot has the same origin as ankle joint pain. In some cases, pain is affected by tarsometatarsal joint dysfunction. Heel pain, which persists after the AKA-H for the SIJ, could be treated by the AKA-H for the subtalar joint. The dysfunction of the tarsal and tarsometatarsal joints should be checked as well.

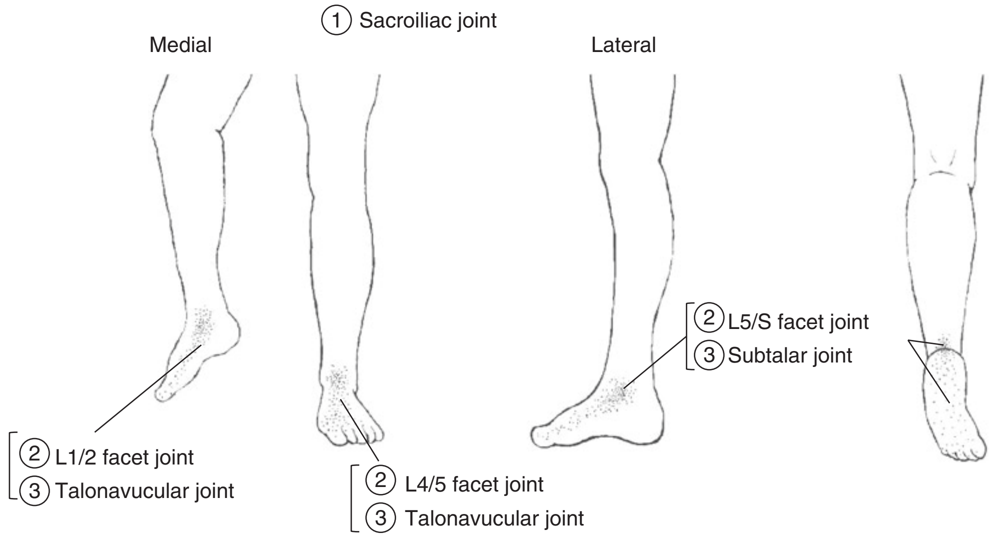


Fig. 8.14 The order in which the joints cause the ankle and the foot pain

9 Evidence of the AKA-Hakata Method

Akira Kogure

9.1 Randomized-Controlled Trial and EBM

The randomized-controlled trial (RCT) is used to determine whether one treatment method is better than another. The RCT is indispensable to "evidence-based medicine" (EBM), and serves as a basis for the approval of numerous therapies implemented in modern medicine. The RCT was first reported in 1948 in a study on the use of streptomycin for pulmonary tuberculosis [1].

The concept of EBM was introduced by Guyatt in Canada in 1991 [2]. He described that diagnostic methods based on scientific evidence are the future of medical care, using methods in the diagnosis of anemia as an example. The contents of the paper were not new, and followed the methods of clinical epidemiology, which has played a key role in medical examination, treatment, and research since the 1970s. Clinical epidemiology unravels causal relationships quantitatively and examines the effectiveness and efficiency of examination and treatment methods for disease by taking advantage of a variety of epidemiological techniques that are used in other fields such as statistics and social psychology. Clinical epidemiology is considered by some to be identical to EBM. While clinical epidemiology is considered to have a stronger research implication, EBM collects answers and information concerning problems and questions related to patients and diseases, considers whether the information helps patients based on clinical epidemiological methods, and applies the information to the treatment of the patient.

In other words, EBM can be considered a medical procedure that indicates the best medical treatment for individual patients. Furthermore, the RCT, which is an essential research method for EBM, is considered an effective method to demonstrate objectively that a certain treatment is effective. Thus, the RCT can provide powerful evidence to determine the efficacy of the AKA-Hakata method.

9.2 A Randomized-Controlled Trial of the AKA-Hakata Method for the Treatment of Chronic Low Back Pain

There are various methods to evaluate pain [3]. Of the methods, the visual analogue scale (VAS) is the most simplest and widely used [4, 5]. Of two RCT manuscripts examining the AKA-Hakata method published in international journals as of February 2016 [6, 7], one of them is concerned with chronic low back pain. In that report, the effects of VAS on chronic low back pain were reported, as outlined below.

Approximately 60–85% of people have been reported to suffer from low back pain at least once during their lifetime [8]. Many of these individuals have multiple relapses [9], and 75% have low back pain that persists for more than a year after onset [10]. In Japan, in "Health situation in household members: Subjective symptoms" (Fig. 9.1) of the *Outline of the Comprehensive Survey of Living Conditions 2010* by the Ministry of Health, Labour and Welfare, low back pain showed the highest symptom prevalence in males, with a rate of 89.1 per 1000 persons [11]. The symptom with the highest prevalence in females was shoulder stiffness, followed by low back pain at 117.6 per 1000 persons.

There are a variety of conservative treatments for chronic low back pain; however, each, including medication therapy, exercise therapy, massage, cognitive behavioral therapy, and manual treatment, has advantages and disadvantages. In addition, different countries and areas have published guidelines for the treatment of low back pain. In Japan, the *Clinical Practice Guidelines for Low Back Pain 2012* from the Japanese Orthopaedic Association and the Japanese Society

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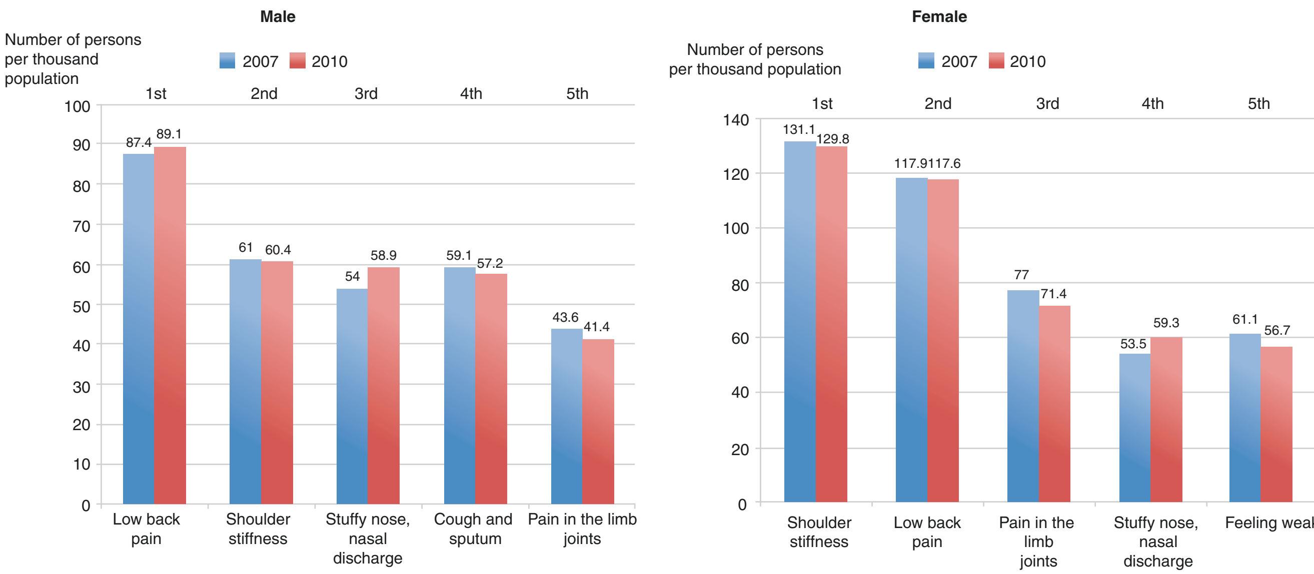

Fig. 9.1 Top five symptoms by gender (multiple answers) in Japan. Source: *The outline of the Comprehensive Survey of Living Conditions 2010*. Website of the Ministry of Health, Labour and Welfare

for the Study of Low Back Pain provides detailed evidence ranging from the definition of low back pain to its epidemiology, diagnosis, and treatment [12]. Furthermore, the *Clinical Practice Handbook for Chronic Pain in the Locomotor System* (Japanese Orthopaedic Association) was published in November 2013 [13]. However, none of the treatments described in these handbooks are absolutely effective for chronic low back pain, which frustrates orthopedists and primary care physicians in clinical practice.

Recently, an outline of the RCT for chronic low back pain conducted by the authors has been described. The subjects were patients with low back pain lasting more than 6 months, with chronic low back pain being defined as lasting 12 weeks or more. However, this study aimed to show the effects on symptoms lasting for a prolonged period. Thus, patients with low back pain lasting more than 6 months and those having a previous history of treatment for the low back pain were included. Patients who received lumbar surgery in the past 6 months were excluded.

Included patients were divided randomly into 2 groups of equal patient number. One group was treated by the AKA-Hakata method alone, and the other group was treated by a sham procedure. The effects were compared over time. Patients received sufficient explanation that they may receive the sham procedure at a 50% chance, and written consent for the study was obtained from all patients. VAS was used as the index for effect. For the evaluation, patients recorded VAS values everyday themselves from a month before the start of treatment to the completion of the study (6 months after the start of the treatment). The recording sheets were collected once a month during an outpatient visit.

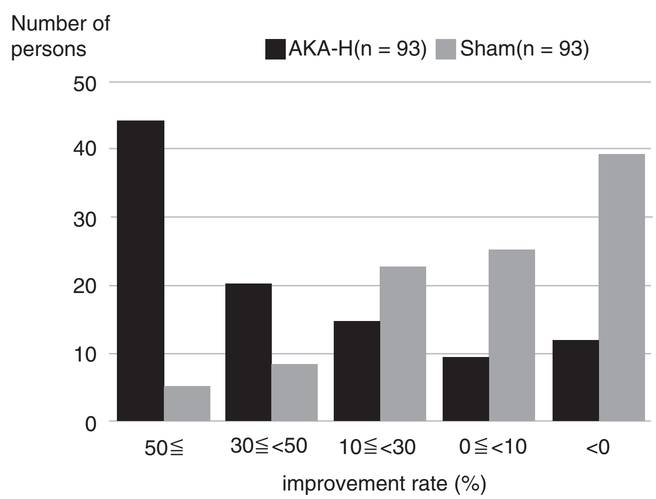

Fig. 9.2 Comparison at the VAS improvement rate before and at 6 months after treatment

The results of the comparison of the VAS improvement rate between groups are shown in Fig. 9.2. The rate of the subjects with much improvement was high in the AKA-Hakata group compared to the sham group. Furthermore, when changes in VAS was compared continuously between these 2 groups for 6 months, statistically significant differences were observed at 3 months and later after the start of treatment (Fig. 9.3). These results suggest that the therapeutic effect of the AKA-Hakata method on chronic low back pain is not a placebo effect and that this method can be an effective treatment for chronic low back pain.

Future studies plan that the supervisory physicians specified by the Japan Medical Society of Arthrokinematic

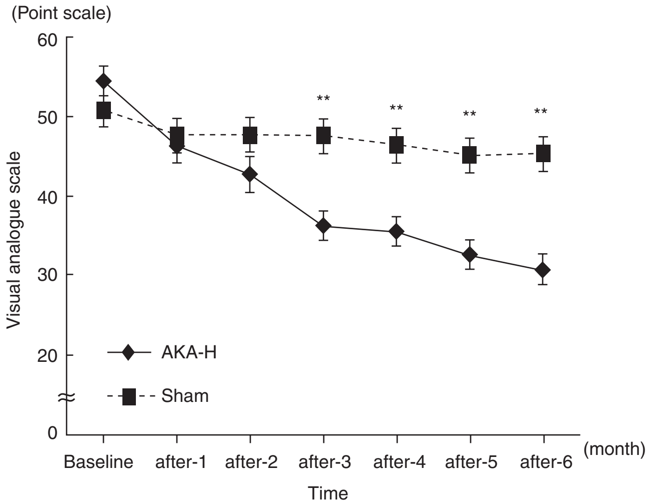

Fig. 9.3 Temporal changes in the average VAS values in patients treated using the AKA-Hakata method and in patients treated with the sham technique. **Statistical significance ($P < 0.01$: Two-way [group and month] ANOVA). From Kogure A et al. Plos One 2015

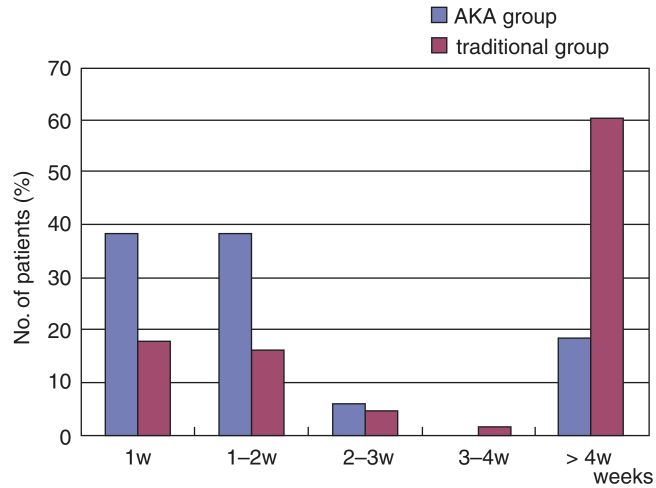

Fig. 9.4 Comparison of AKA group and traditional group in the periods to procedure complete relief of pain. (Cited from *Manuelle Medicine*)

Approach (AKA) will perform a large-scale, multicenter research study to accumulate further data concerning the AKA-Hakata method.

9.3 RCT of AKA-Hakata Method for Acute Low Back Pain

The first paper concerning acute low back pain and the AKA-Hakata method was published in *Manuelle Medizin* (Springer; in German), which specializes in manual treatment [6]. Hakata et al. examined the efficacy of the AKA-Hakata method in the treatment of acute low back pain. The study included patients with low back pain at less than 1 month after onset in accordance with the definition of acute low back pain by the Japanese Orthopaedic Association. For the RCT method, 118 patients who visited clinics were assigned randomly into the AKA group, in which patients receive treatment by AKA-Hakata method, and the traditional group, in which patients receive traditional conservative treatment such as epidural anesthesia injection, oral medicines including NSAIDs, thermotherapy, and corset fixation. Effect was judged in accordance with the score rating system for low back pain established by the Japanese Orthopaedic Association [14].

Results showed that the rate of patients whose low back pain completely disappeared was 76.4% in the AKA group and was 33.3% in the traditional group. On the other hand, low back pain was persistent in 18.2% of patients in the AKA group and 60.3% of patients in the traditional group at 1 month or later (Fig. 9.4). These results are consistent with the long-term prognosis of low back pain published previously [10], which described that an average of 62% of patients report persistent low back pain at 12 months after onset, and a recurrence rate of 60%.

Even if limited to acute low back pain alone, the results showed that the AKA-Hakata method, which can treat the cause of the symptoms, exerted superior therapeutic effects.

9.4 Effects of the AKA-Hakata Method on Health-Related Quality of Life (QOL)

The 36-Item Short Form Health Survey (SF-36) [15, 16] is a QOL questionnaire used to measure health-related function with subscales. Currently, the SF-36 is translated to over 130 languages and is used widely internationally. The website of iHope International [17], an authorized NPO, defines the SF-36 as "not structured based on the contents limited to a certain disease, but a concept about health common to all people, and can measure QOL in patients with various diseases and healthy persons without disease. It is also possible to compare among patients with different diseases or compare health conditions of patients with people in general."

Our study mentioned above used the SF-36 in addition to the VAS as a major indicator of effects. We asked patients to fill out the questionnaire at every monthly office visit. Answers were processed statistically by a standardized scoring algorithm. The statistical processing was designed so that scores are automatically calculated by entering the results of the answers in to an Excel sheet. Norm-based scoring (NBS) was employed, such that the standard value of the entire Japanese population became 50 ± 10 points (mean ± standard deviation).

In our study, the AKA-Hakata method showed a significant improvement in all subscales at 6 months after the start of treatment as compared with a sham group, indicating that AKA provided improvement of pain and physical functions. Even social function and mental health may also be improved. In other words, the AKA-Hakata method shows great promise in terms of improvement of QOL.

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Cases

10

Shigehiko Katada

10.1 Acute Low Back Pain (LBP) and Pain in the Lower Extremity with No Trigger

- *Diagnosis*: SIJ dysfunction
- *Patient*: 52-year-old woman
- *Chief complaint*: Left (Lt.) buttock and posterior lower leg pain (Fig. 10.1a)
- *Previous diagnosis*: Lumbar disc herniation
  Pain in Lt. buttock and posterior calf occurred 1 week prior without any triggering event. The painkiller was not effective.
- *Intensity of pain*: RDQ (Roland Morris Disability Questionnaire) 11, VAS (Visual analogue Scale, mm) 90.

Physical findings

Trunk flexion: FFD 70 cm, extension: not feasible

SLR test: Right (Rt.) 80°, Lt. 30°, Fadirf and Fabere test: normal

Image findings

X-p: Mild scoliosis

Post AKA-Hakata method therapy (AKA-H) to the SIJ: second type of accessory movement (second type) was improved. The degree of Lt. SLR changed from 30° to 80°. Pain in the buttock and posterior calf was alleviated. One week later, symptoms had decreased but tight feeling in the buttock remained at re-examination. The remaining tightness disappeared two weeks after treatment (Fig. 10.1b), and at that time, RDQ was 0 point and VAS was also 0 point.

Remarks

The patient showed limitation of Lt. SLR angle and improvement of it after AKA-H to the SIJ alone. This case was diagnosed as SIJ dysfunction. Lt. posterior calf pain was considered as referred pain from the SIJ.

10.2 Acute LBP from a Triggering Event

- *Diagnosis*: SIJ dysfunction
- *Patient*: 33-year-old man
- *Chief complaint*: LBP
  LBP occurred after lifting a heavy load two 2 days earlier. He complained greatly when staying standing or in a supine position for sleeping due to severe LBP.
- *Intensity of pain*: RDQ 8, VAS 70

Physical findings

Trunk flexion: FFD 20 cm, trunk extension: not feasible

SLR test: Rt. 30°, Lt. 30°

Image findings

X-p: normal

Post AKA-H to the SIJ: The degree of bilateral SLR changed to 90° and his pain disappeared. One week later, he had no pain and RDQ was 0 point and VAS 0 mm (Fig. 10.2).

Remarks

This kind of LBP is SIJ dysfunction caused by strain of the SIJ, which responds well to AKA-H.

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S. Katada (ed.), *Principles of Manual Medicine for Sacroiliac Joint Dysfunction*, https://doi.org/10.1007/978-981-13-6810-3_10

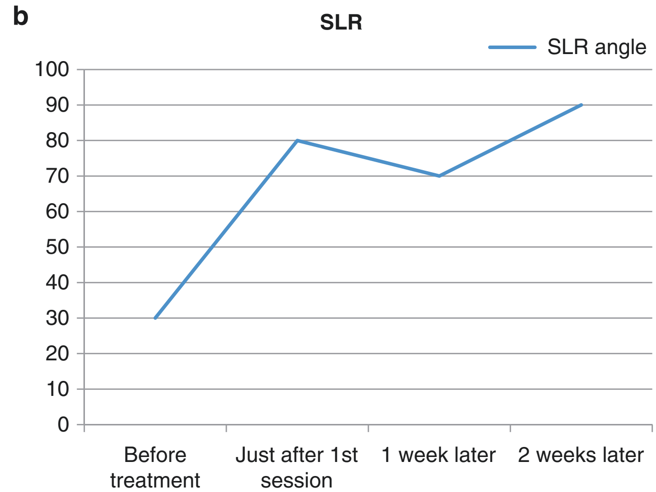


Fig. 10.1 Case 1. (**a**) Pain region (red area): Lt. buttock and posterior calf. These are the referred pain from the SIJ. (**b**) Degrees of SLR. Good response just after AKA-H, normalized 2 weeks later

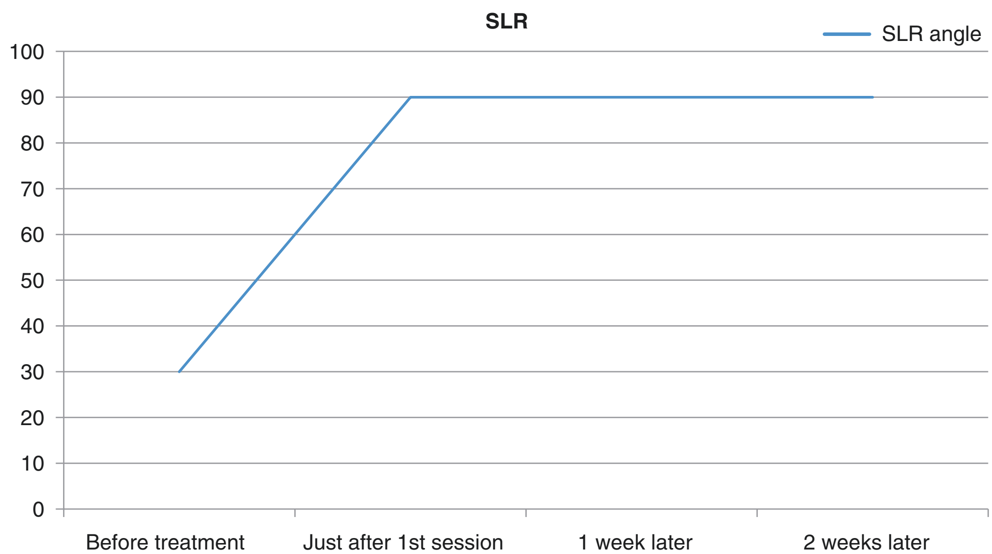


Fig. 10.2 Case 2. Pain disappeared just after AKA-H and SLR was normalized

10.3 Acute LBP with Lower Extremity Numbness

- *Diagnosis*: SIJ dysfunction
- *Patient*: 60-year-old man
- *Chief complaint*: LBP and numbness in Rt. lower extremity (Fig. 10.3a)
  The patient suffered from LBP and numbness in Rt. lower extremity for 1 month with no remarkable causes. Drugs were ineffective. Symptoms worsened after manipulation by a bone setter.
- *Intensity of pain*: RDQ 12, VAS 75

Physical findings

Trunk flexion: FFD 0 cm, extension: hard

SLR test: Rt. 60° Lt. 90°, Fadirf and Fabere test: normal

Fig. 10.3 Case 3. (**a**) Rt. LBP and Rt. leg numbness (blue area). (**b**) Degree of SLR

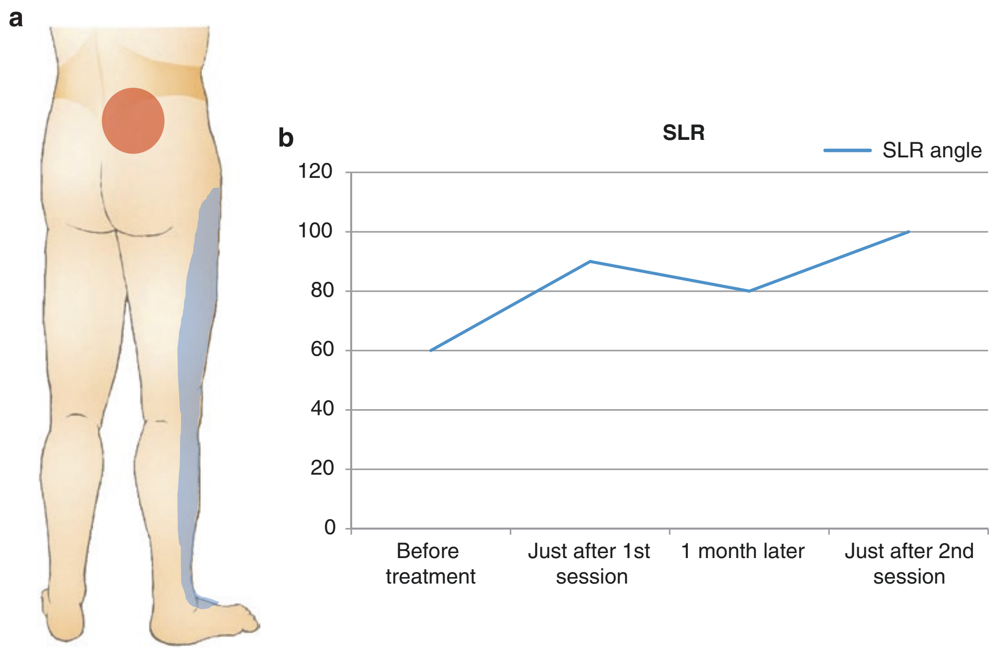


Image findings

X-p: Lumbar spondylosis

Post AKA-H to the SIJ: Bilateral SLR improved to 90° just after first treatment session. The patient was able to extend the trunk without pain. Numbness in lower extremity also disappeared; however, symptoms reappeared 1 month later. He was not able to extend the trunk and showed as follows: SLR: Rt. 80, Lt. 90, and RDQ 50, VAS 50. After AKA-H to the SIJ was performed again, SLR changed to 100° bilaterally. Trunk extension was normalized and pain disappeared (Fig. 10.3b).

Remarks

This patient had slight inflammation in the SIJ. The symptoms disappeared just after initial AKA-H, but they recurred 1 month later. The lumbar extension difficulty with LBP often implies lumbar facet joint pain; however, in this case, it originated from SIJ dysfunction. When patients have SIJ dysfunction with slight inflammation, we should take care about the symptoms returning.

10.4 Acute LBP with Spondylolisthesis and Scoliosis

- *Diagnosis*: SIJ dysfunction
- *Patient*: 63-year-old woman
- *Chief complaint*: LBP and Lt. buttock pain
  Three days prior, the patient suffered from LBP and Lt. buttock pain suddenly when she stood up and twisted her low back after a long time working in a sitting position. Her pain was exacerbated by coughing. She had to walk slowly due to pain and she found it hard to roll over on a bed and change her socks.
- *Intensity of pain*: RDQ 7, VAS 50

Physical findings

Trunk flexion/extension: normal

SLR test: Rt. 70°, Lt. 50°. Fadirf test: Lt. 10° with pain and limitation. Fabere test: normal

Image findings

X-p: scoliosis and slight spondylolisthesis at L3-4 (Fig. 10.4a)

Post AKA-H to the SIJ: Bilateral SLR changed to 90° and Lt. Fadirf improved to 30° with no pain (Fig. 10.4b).

Remarks

Acute low back strain often occurred when standing after sitting for a long time (especially after using a computer). This case showed SLR, Fadirf limitation and pain at Fadirf. The patient had SIJ strain. Lumbar spondylosis and scoliotic deformity were not related to her LBP and buttock pain because her symptoms were curable by AKA-H to the SIJ alone.

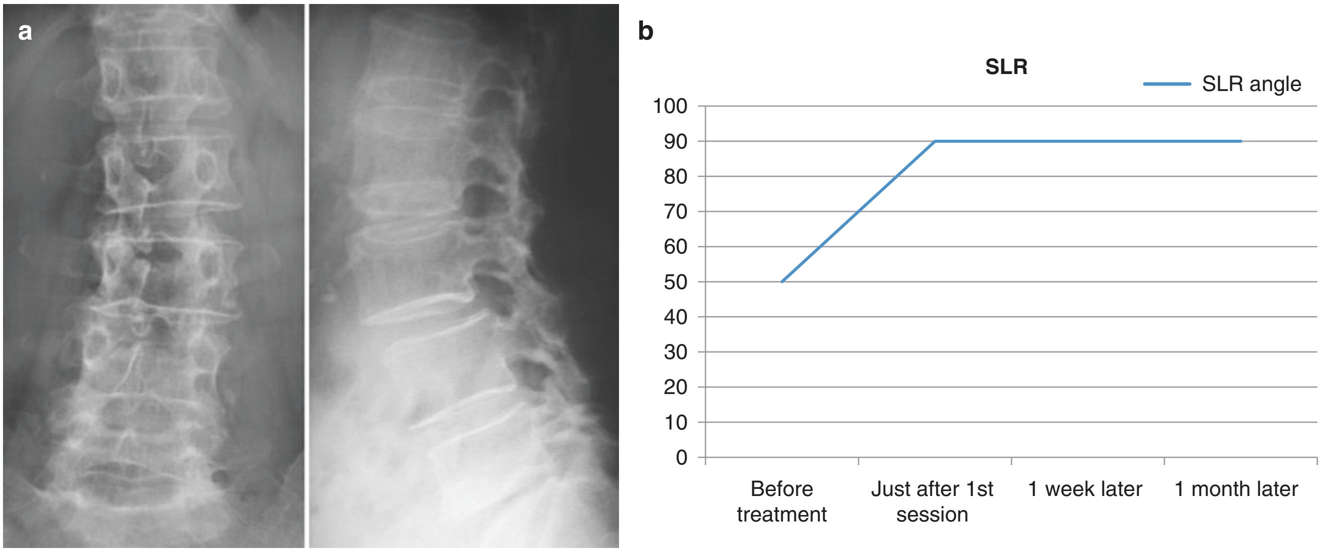


Fig. 10.4 Case 4. (**a**) X-p: Slight spondylolisthesis and scoliosis at L3-4. (**b**) Degree of SLR. Pain disappeared just after AKA-H and did not recur

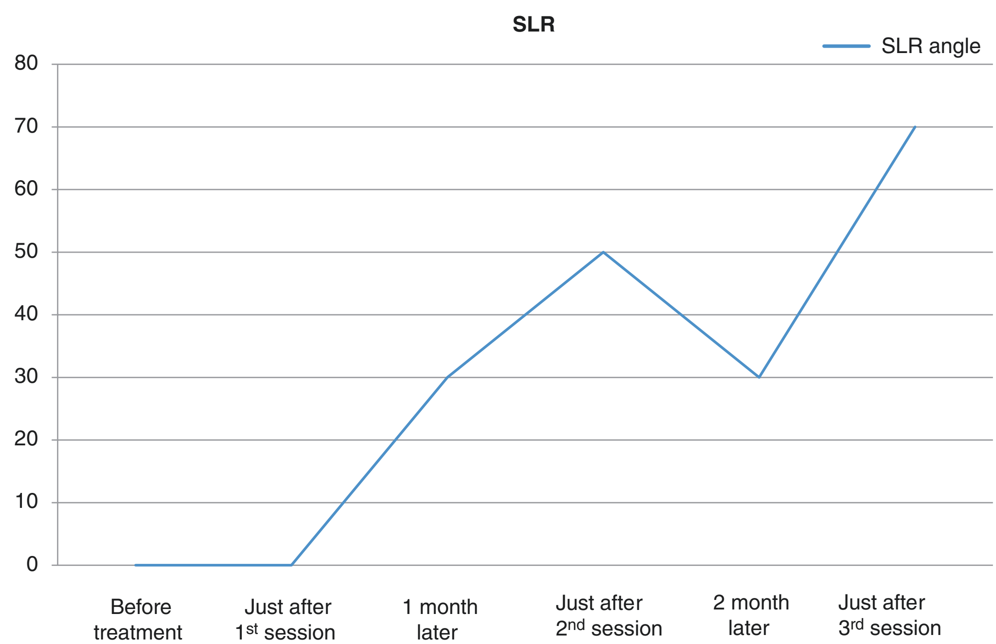


Fig. 10.5 Case 5. Pain was not alleviated enough at first AKA-H. Response to AKA-H improved in the second therapy session, and almost normalized SLR was found in the third session

10.5 Acute Severe LBP

- *Diagnosis*: Acute simple sacroiliac arthritis
- *Patient*: 28-year-old woman
- *Chief complaint*: Severe LBP
  The patient suddenly suffered from severe LBP without trigger 1 day before she came to my clinic. She stood with a trunk-flexed 20° posture.
- *Intensity of pain*: RDQ 15, VAS 100

Physical findings
She could not maintain a supine or Lt. side lying position.
Tenderness point on Lt. SIJ region existed.

Post AKA-H to the SIJ: Initially, AKA-H to Lt. SIJ alone was performed because she could not lie on her Lt. side. The response to AKA-H was unknown. After resting for 1 month, she recovered and could walk slowly. RDQ improved to 2 points, and VAS was 70 mm. She could maintain a supine position and SLR was 30° bilaterally and improved to 50° bilaterally after the second session of AKA-H to the SIJ. Severe pain was relieved 2 month after onset, and her SLR improved to 70° (Fig. 10.5).

Remarks
Some cases of this type of severe LBP can originate from simple sacroiliac arthritis. Patients have sudden severe LBP

with no specific trigger in several hours and cannot move or take any posture. Dysfunction of the SIJ often combines with this arthritis. It takes 2–3 months for the aseptic inflammation to subside. Remarkable SLR improvement is not observed in the first AKA-H treatment session due to inflammation. One month after onset, recovery of the joint play of the SIJ is found and pain is slightly relieved. Two months after onset, response to AKA-H to the SIJ is good, and pain disappears. This is a typical course of patients with simple sacroiliac arthritis. The inflammation is predominant and disappears gradually. AKA-H can recover SIJ dysfunction accompanied by arthritis. AKA-H cannot treat arthritis directly; however, recovery of the joint play (accessory movement) of the SIJ prevents LBP from becoming chronic.

10.6 Chronic LBP with No Pain Relief by Epidural Injections

- *Diagnosis*: Chronic simple sacroiliac arthritis
- *Patient*: 39-year-old woman
- *Chief complaint*: LBP, Lt. buttock and Lt. thigh pain, Lt. leg numbness (Fig. 10.6a)
  The onset of her symptoms was 6 months prior, diagnosed as L5-S1 disc herniation by an orthopaedic surgeon at a university hospital. Epidural injections were administered for 3 months, but these did not work at all. Surgical treatment was recommended.
- *Intensity of pain*: RDQ 19, VAS 90

Physical findings

Trunk flexion: FFD 70 cm, extension: 10°

SLR test: Rt.60° Lt.30°, Lt. Fabere test: limited at 60° with pain, Fadirf test: normal

Sensory system and muscle strength: normal

Image findings

X-p: L5-S1 disc space narrowing

Post AKA-H to the SIJ: After the first session of AKA-H, SLR improved to 60° and Lt. Fabere showed no limitation, and her pain was relieved for several days. Two weeks later, RDQ was still 18 and VAS was also still 80; however,

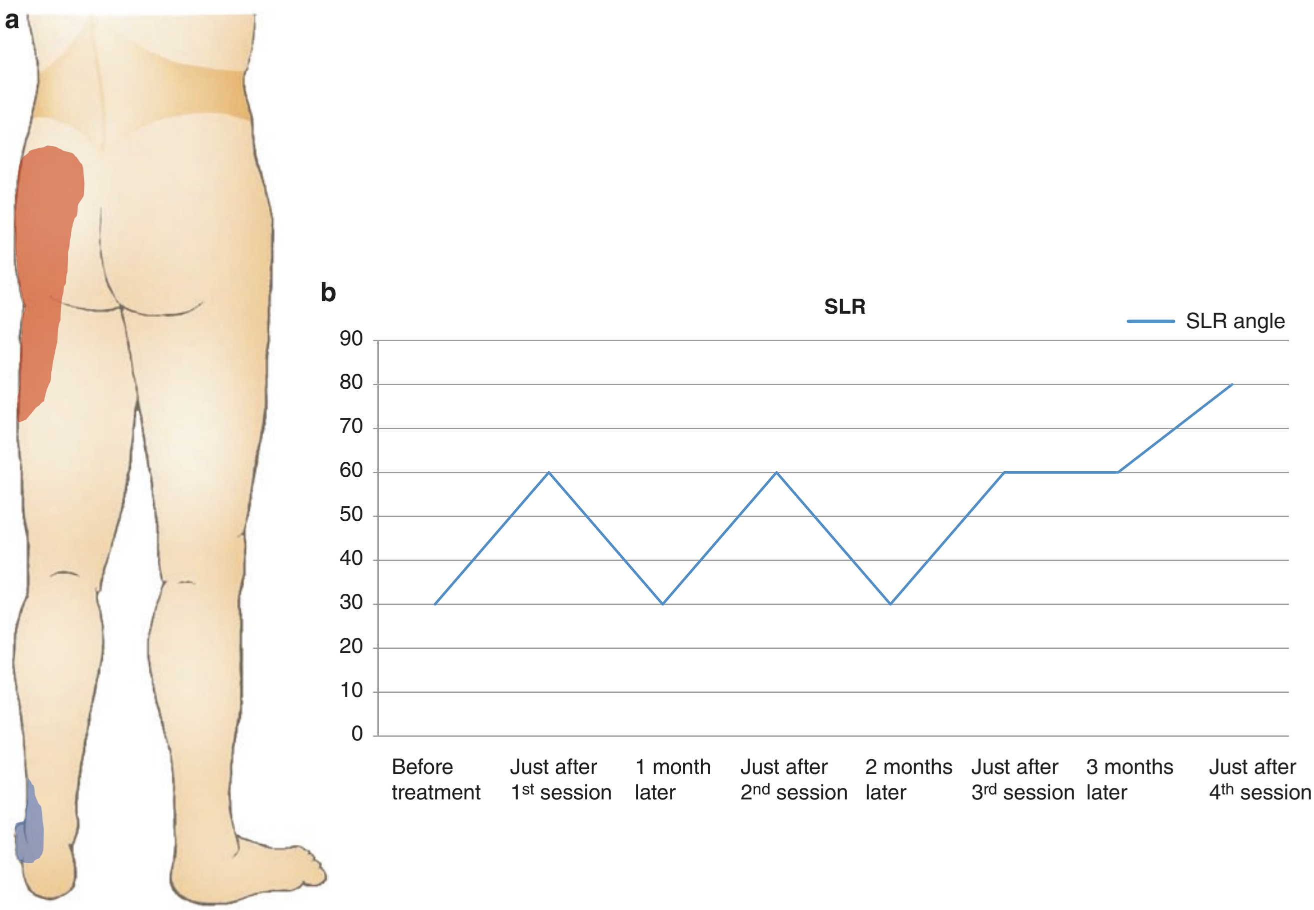


Fig. 10.6 Case 6. (**a**) Lt. buttock and thigh pain, and Lt. leg numbness. (**b**) Degree of SLR

Fabere was still normal. After three AKA-H treatment sessions a month, her symptoms continued to be relieved (Fig. 10.6c).

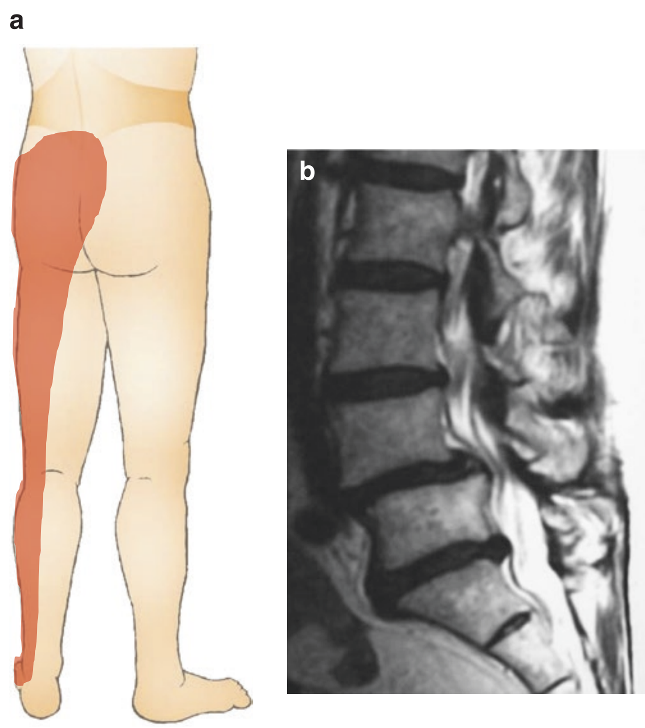
Remarks

This patient was diagnosed as having chronic simple sacroiliac arthritis in AKA-H, which had been misdiagnosed as lumbar disc herniation. This patient did not have neurological deficit and showed Lt. Fabere limitation, findings which did not indicate symptoms of lumbar disc herniation.

10.7 Chronic LBP with Lumbar Spondylolisthesis and Stenosis

- *Diagnosis*: Chronic simple sacroiliac arthritis
- *Patient*: 74-year-old woman
- *Chief complaint*: LBP and Lt. lower extremity pain (Fig. 10.7a)

  Three months prior, the patient could not walk for a long time due to LBP and Lt. lower extremity pain. She had to take a rest after walking 50 m.



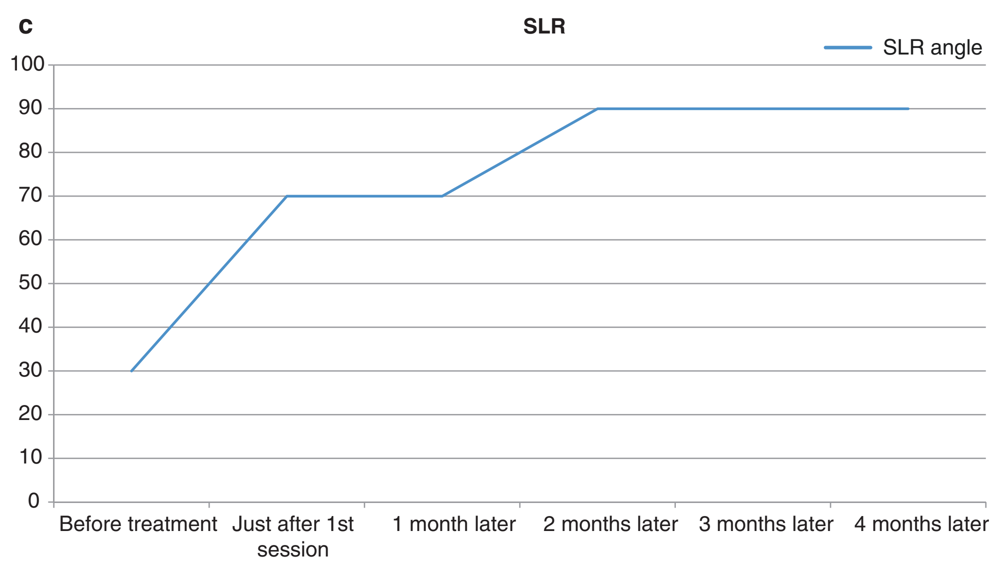


Fig. 10.7 Case 7. (**a**) LBP and Lt. lower extremity pain originating from the SIJ. (**b**) MRI: L4-5 spondylolisthesis and stenosis. (**c**) Degree of SLR

Physical findings

Trunk flexion: FFD 50 cm, extension: limited to severe pain

SLR test: Rt.80° and Lt.30°

Image findings

MRI: L4-5 spondylolisthesis and stenosis (Fig. 10.7b)

Post AKA-H to the SIJ: After first session of AKA-H, Rt. SLR improved to 90° and Lt. SLR improved to 70°. LBP was also relieved immediately. One month later, LBP was relieved and the patient came to be able to walk for 200 m. Three months later, she could walk as far as before onset (Fig. 10.7c). She enjoyed walking exercise.

Remarks

Older patients with spondylolisthesis and stenosis are often recommended lumbar surgery due to MRI findings; however, among them, we can often find SIJ problems and related symptoms by AKA-H. Spondylolisthesis and stenosis may cause LBP and lower extremity pain in the future, but these MRI findings do not always indicate current status.

10.8 Chronic LBP, Which Was Relieved by AKA-H After Removal of Lumbar Implants

- *Diagnosis*: Chronic sacroiliac arthritis
- *Patient*: 32-year-old woman
- *Chief complaint*: LBP

The patient suffered from LBP since the age of 20. When she was 25 years old, she could not walk and was diagnosed with lumbar disc herniation. At 29 years old, a lumbar laminectomy was performed, but her symptoms became worse. L5-S1 interbody fusion was performed due to lumbar spine instability when she was 32 years old (Fig. 10.8a). However, her symptoms worsened further after lumbar surgery using instrumentation and implants. She went to another hospital, where she received sacroiliac joint injections and was diagnosed as having SIJ pain. After that, AKA-H to the SIJ was performed.

Post AKA-H to the SIJ: AKA-H was effective for only one day. After removal of lumbar implants, response to AKA-H was better than before. Her LBP remained relieved, at VAS 10–20, by one AKA-H session a month (Fig. 10.8b).

Remarks

Lumbar implants harmed peripheral tissue due to foreign-body responses. In this case, removal of the implants was effective for relief of pain after AKA-H session. Many spine surgeons do not recognize bad effects of lumbar implants and they often deny requests for removal.

10.9 LBP Misdiagnosed as Psychogenic Pain

- *Diagnosis*: Chronic complex sacroiliac arthritis
- *Patient*: 36-year-old woman

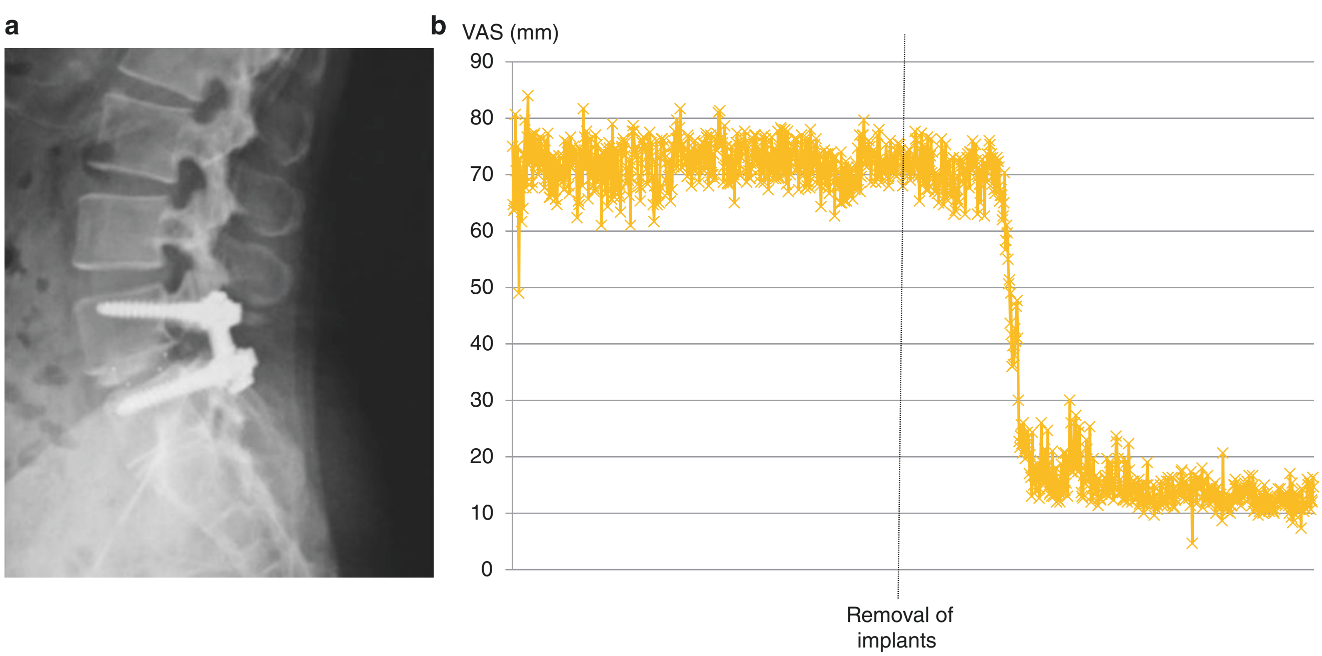


Fig. 10.8 Case 8. (**a**) X-p: Post L5-S1 interbody fusion by implants. (**b**) Changing of pain intensity evaluated by VAS

- *Chief complaint*: LBP
  Two years prior, the patient suffered from Rt. buttock pain and was not able to walk due to severe pain. She had to live with a wheelchair. She visited many university hospitals, but most physicians and orthopaedic surgeons diagnosed her as having psychogenic pain because of a lack of specific findings in MRI. She suspected her pain was SIJ pain, and requested SIJ injections for diagnosis. As a result, SIJ injections were temporarily effective for the buttock pain and the patient was diagnosed with SIJ pain. Next, she went to see a physician who is specialized in AKA-H techniques.

Physical findings

Walking generated severe pain immediately. Sitting for a long time was impossible.

Trunk flexion: FFD 70 cm, extension: not feasible

SLR test: Rt. 50°, Lt. 80°, Fabere test: Rt. 40° with severe pain, Lt. 70° with mild pain, Fadirf test: Rt. 10°, Lt. 30°

Tenderness on S3 spine

Image findings

X-p: normal

Post AKA-H to the SIJ: After first session, the degree of Rt. SLR changed to 70°. Fadirf and Fabere also improved and severe buttock pain was alleviated. VAS changed from 80 to 30 immediately. One month later, she was able to walk with a stick after the second session. For 10 months, her pain was controlled by AKA-H treatment each month. One year later, she returned to work. Her pain returned when she was under stress of minor trauma, exercises and examinations by a gynaecologist, but she recovered through one session of AKA-H a month (Fig. 10.9).

Remarks

This case was considered to be typical complex sacroiliac arthritis (RSD type). This type of sacroiliac disorder is often misdiagnosed as psychogenic problems. This patient was lucky because she found a physician who could diagnose SIJ pain by SIJ injections, and she got AKA-H treatment. In AKA-H treatment, it is difficult to recover completely from this type of sacroiliac arthritis; however, regular AKA-H treatment could control her state.

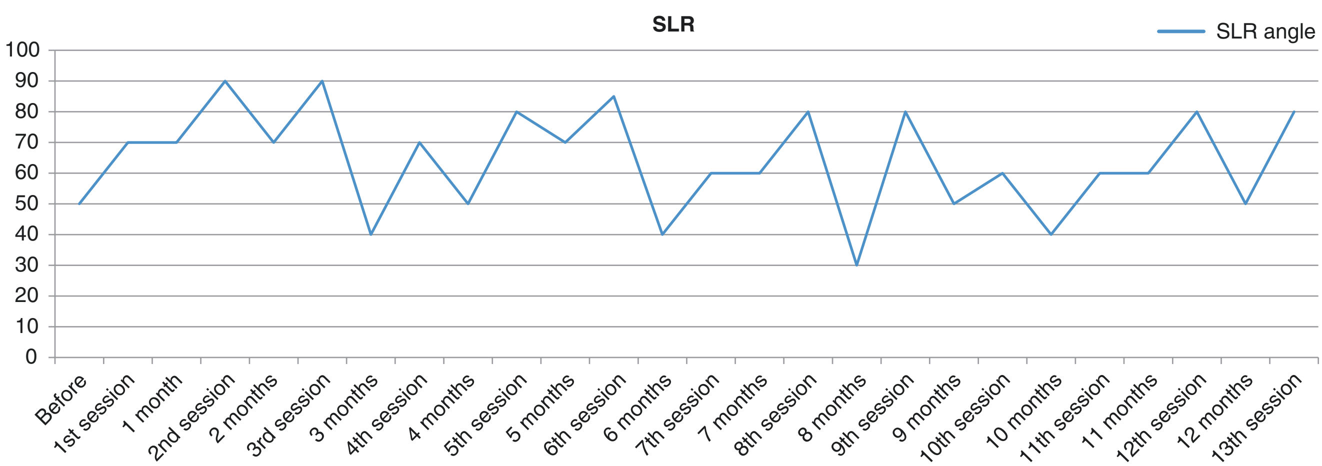


Fig. 10.9 Degree of SLR