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

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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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S. Katada (ed.), *Principles of Manual Medicine for Sacroiliac Joint Dysfunction*, https://doi.org/10.1007/978-981-13-6810-3_1

Fig. 1.1 Primary facet joint mobilization technique

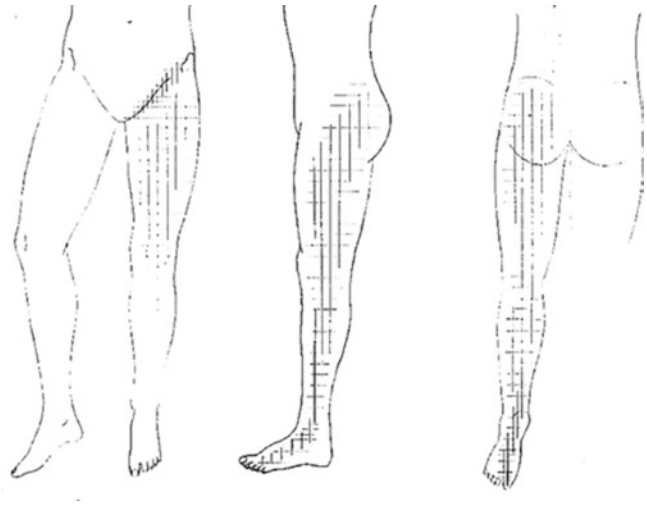

Fig. 1.2 Disappeared pain and sensory disturbance area after recovering from the sacroiliac joint movement

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. 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. 1.6 Upper distraction and sacrum counter-nutation

Fig. 1.4 Posteroinferior distraction

Fig. 1.7 Single sacrum counter-nutation

Fig. 1.5 Upper distraction and sacrum 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,

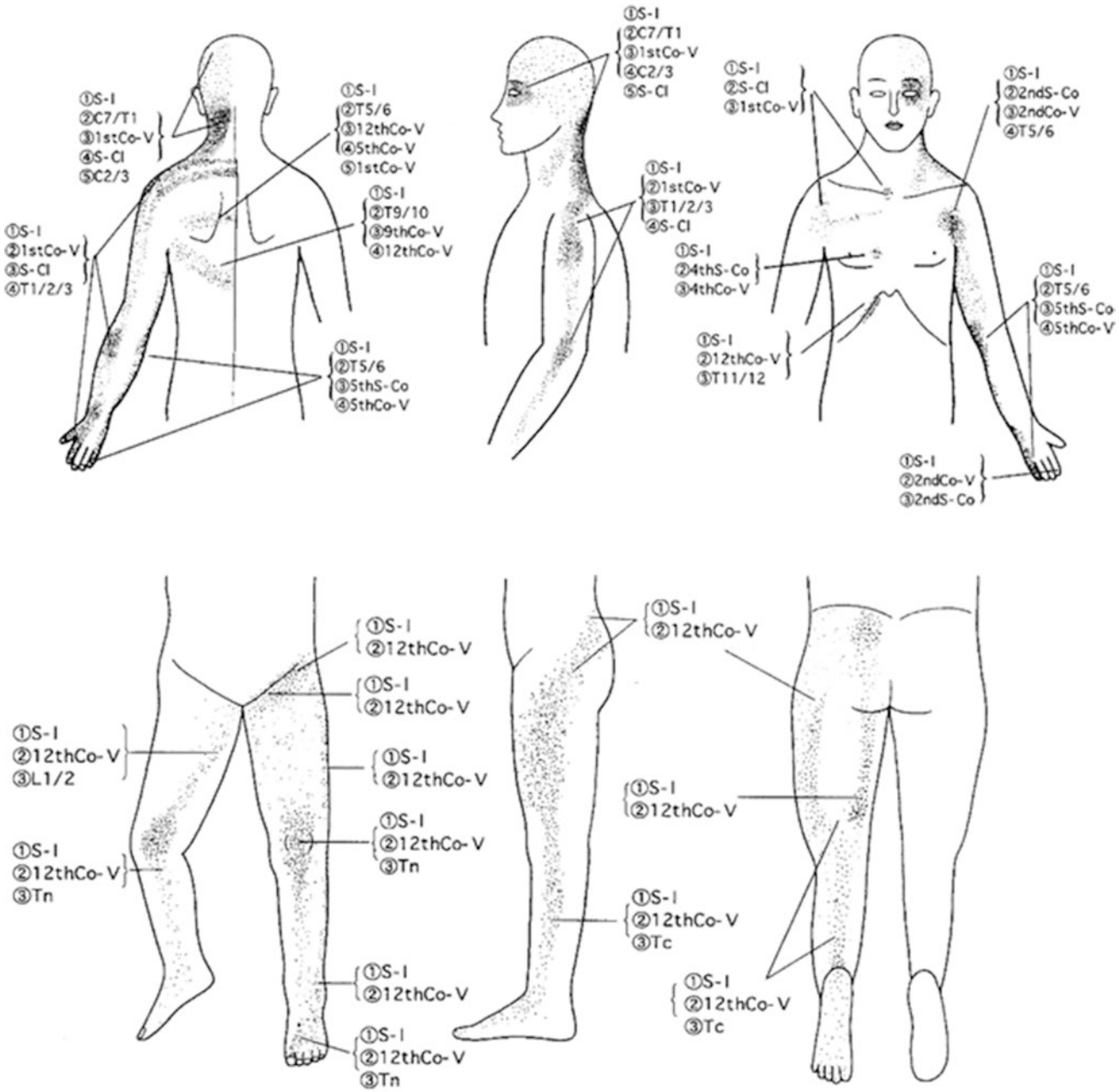

Fig. 1.15 The relationship between pain/numbness areas and treatment joints (in 2000)

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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