The Sacroiliac Joint: function, tissues, mechanisms of injury, clinical diagnosis and treatment options

Sacroiliac joint (SIJ) pathology may contribute to mechanical low back pain, however can be difficult to diagnose clinically[1]. There are multiple tissues to be taken into consideration when evaluating and treating a patient with SIJ pain, including the joint itself (bony articulations, cartilage, fluid, capsule), strong ligaments, multiple muscles, forces, malalignment, and patient activity[1,2]. Furthermore, SIJ provocation tests, in singularity, do not prove to have the best utility to diagnose SIJ involvement in low back pain, however in clusters may be more beneficial[3]. Once a patient is diagnosed with SIJ pathology, there are multiple treatment options available, including conservative options such as physical therapy, muscle strengthening, manipulation, taping and NSAIDs, as well as less conservative treatments including surgery, and injections[1]. In order to improve patient care, SI joint function, tissues surrounding the SI joint, mechanisms of injury, clinical diagnosis and treatment options will be discussed.

SIJ Function

The SIJ has several functions, including transmission of forces from the lower extremities (LE) to the spine, limitation of trunk and pelvis rotation, and facilitation of childbirth[1]. The SIJ is capable of withstanding more medial and lateral force than any of the lumbar spinal segments, and acts as a triplanar shock absorber[4].

There is inconsistency within the literature regarding mobility of the SIJ, with one description being approximately 2.5^{o} of rotation and 0.7 mm of translation[1] around the axis of S2[5]. However, the motion has been described as multiaxial including nutation and

counternutation[6], as well as, a “screw-axis motion of simultaneous sagittal plane rotation and translation[7].” Nutation is the movement of the base of the sacrum in an anterior and inferior direction in relation to the ilium, while counternutation is the opposite (posterior and superior movement of the sacral base)[7].

SIJ Structure and Tissues

The SIJ has been traditionally described as a diarthrodial wedge-shaped joint (“articular surfaces separated by a joint space containing synovial fluid enveloped by a fibrous capsule”) with discontinuity of the posterior capsule and various notches in the articular surfaces, which decrease movement and add stability[7,8]. However, in an imaging study by Puhakka et al., the cartilaginous portion of the SIJ was described as a symphysis (“fibrous articulation, in which the ends of the bones meeting in the joint are capped with hyaline cartilage and are joined by strong fibrous tissue, through a transitional zone of fibrocartilage”), with only the distal portion of the joint showing characteristics of a synovial joint[9]. These authors postulated that the distal portion of the joint most resembling a synovial articulation, may be the site of greatest movement within the joint[9].

The SIJ is well innervated, including nerve fibers within the joint capsule, adjoining ligaments and subchondral bone[7,10]. There is controversy within the literature about where the innervation originates, however it possibly includes fibers from ventral rami of L4 and L5, superior gluteal nerve, dorsal rami of L5, S1 and S2, and/or sacral dorsal rami[7].

The SIJ is “C-shaped” with the convex side facing anteriorly and inferiorly[8], and includes a smooth, thick hyaline cartilage along the sacral surface and a thinner fibrocartilage along the surface of the ilia, which can handle higher forces[2,8]. The size, shape and contour of the SIJ

varies among individuals and changes throughout development[4,8]. Ligaments blend with the SIJ in the anterior and posterior direction, adding compression to the joint, as well as stability with passive tension of stretched ligaments[2,4].

Strong primary and secondary ligaments support the SIJ, limiting motion in this area and acting to provide neuromuscular feedback (Figure 1[10])[11]. These ligaments contain mechanoreceptors that act in sensory-motor control feedback loops[11]. If the strain on the ligaments is altered, then there is subsequent changes in muscle activation[11]. The primary ligaments include the anterior sacroiliac, interosseous, short and long posterior sacroiliac[1,2]. The interosseous ligament is important in maintaining joint space during weight bearing, resists anterior and lateral displacement of the ilia and is proposed to be the strongest ligament within the body[2,4]. The secondary ligaments include the iliolumbar, sacrospinous and sacrotuberous ligaments[1,2]. The sacrotuberous ligament resists nutation, while the sacroiliac ligament resists counternutation[4]. The iliolumbar ligaments are a strong group of tissues that resist anterior shear of L5 on S1[2].

The contribution of the individual ligaments to pelvic stability has been debated in the literature, however, recent findings elucidate that “posterior pelvic ring cartilage and ligaments” all appear to function as pelvic stabilizers[6]. At both the acetabula and sacrum, the SIJ cartilage acts as the main restriction to joint motion, followed by the action of ligaments (with the sacrum most influenced by the interosseous, iliolumbar, anterior sacral, and posterior sacral ligaments, in that order)[6]. The influence of the ligaments on motion and force distribution throughout the sacrum and pelvis are dependent on region and stiffness[6]. For example, an increase in the stiffness of the sacrotuberous and sacrospinous ligaments (which connect ischia to distal sacrum) leads to an increase in sacral motion (axial rotation and translation)[6].

During loading, the SIJ demonstrates compression in the ventral aspect (cartilaginous region) and tension in the dorsal aspect (ligamentous region), with highest stress concentration at the cranial and dorsal portions of the interosseous, posterior sacroiliac and iliolumbar ligaments[6]. There is overall, greater ligament strain in the standing position when compared to sitting[6].

In addition to the ligaments, other forces also help stabilize the SI joint, including gravity, and muscle activation[2]. Gravity acts as a primary stabilizer of the SIJ[2]. When body weight is anterior to the axis of the SIJ, gravity imposes a force in the direction of the close-packed position (nutation)[2]. Furthermore, there are more than 30 muscles within the pelvic girdle that impose forces across the SIJ, impacting the rotation of the ilia[2]. For example, activation of iliopsoas and recuts muscles impose an anterior tilt of the ilium, while the erector spinae and abdominal muscles impose a posterior tilt of the ilium[2]. Additionally, gluteus maximus, piriformis, and latissimus dorsi through the thoracolumbar fascia have also been established as prominent influences in mobility and stability of the SIJ[7].

The SIJ demonstrates changes throughout the lifetime, as well as distinct variation dependent on gender. In the first decade of life the SIJ grows proportionately with the body and develops into a pliable, yet well-formed fibrous structure[8]. In the second and third decades of life the SIJ develops uneven articular surfaces and differences amongst males and females become most prominent, including decreased mobility in males due to ligamentous thickening and increased ligamentous pelvic laxity in females to facilitate childbirth[7,8]. At the end of the 3rd decade, the SIJ has demonstrated thickening of the capsule and decreased pliability, along with regions of fibrous plaques[8]. In decades six through eight, the SIJ displays significant progressive advancement of degenerative changes with peripheral osteophytes, thickening

and stiffening of the capsule, irregularities in the articular surfaces, and restrictions in mobility[8]. At the microscopic level, with increasing age the capsule becomes less cellular, contains more collagen and decreases in vascularity[8]. The thickness of the tissues grow until decades 6 through 8 where the chondrocytes begin to cluster, fibrous tissue increases, tissues thin and are subject to degenerative changes[8].

SIJ Mechanisms of Injury and Risk Factors

Sacral joint pathologies have been broadly described as pain and abnormal mobility of the SIJ (hyper- or hypo- mobility), impacted by surrounding tissues[2,12]. Pain at the SIJ can originate from ligament or capsule tension, excess or abnormal loading leading to excess shear or compression, abnormal mobility, irregular joint mechanics, muscle or kinematic discrepancy, and inflammation[13]. These factors can lead to chronic conditions such as arthritis and degeneration of the bone, ligamentous pathology, or “enthesopathy” (disorder of attachment of ligament or ligament to bone)[13]. While many authors use SIJ pain and dysfunction interchangeably, Laslett has recently distinguished these terms from one another[14]. Specifically, SIJ dysfunction relates to the “malfunctioning of the joint and the complexity of aberrations that occur,” as it relates to the function of the SIJ in transferring mechanical loads from the pelvis to the spine[14]. Whereas, SIJ pain refers to the notion that the SIJ can act as a sole source of pain, as seen in patients who are asymptomatic until provoked and those whose pain can be diminished with solely injection of local anesthetic[14].

Risk factors for SIJ pathology include ligamentous laxity (resulting from recent pregnancy, childbirth, or breastfeeding)[1], polyarthritis[7], lumbar fusion surgery[7,10,15], leg length discrepancies[10], biomechanical abnormalities[10], prolonged low-grade trauma (jogging)[10], and

scoliosis[10]. For example, patients who have had lumbar fusion demonstrate greater degeneration of the SIJ than patients without fusion[13], which is possibly due to increase motion and stress at the SIJ following the procedure[15]. Furthermore, differential diagnosis of SIJ pathology includes spondylarthrosis, fracture of the sacrum or pelvis[16], lumbosacral (L5/S1) disc pathology[1], as well as metabolic etiology and infection[1] (Table 1[1]).

There are multiple mechanisms of injury that can lead to SIJ pathology, including a sudden jarring motion[2] (such as a motor vehicle accident, step into an unexpected hole, or unexpected height[7]), fall on buttocks[2,7], lift/twist motion[2], prolonged or heavy lifting[4], and athletic injuries[1,10].

In comparison to other lumbar segments, the SIJ is much more vulnerable to axial compression and torsional loading due to the impact of imbalanced loading on sacral congruency, in terms of mechanics, bony fixation and ligament alignment[7]. Therefore, people who regularly engage in activities or motions that impose unbalanced forces along the SIJ are at a higher risk of pathology in this area[7]. For example, athletes such as figure skaters, golfers, bowlers[1,4,7], and gymnasts[1].

As there are so many muscle groups that act on the SIJ and pelvis, imbalances or deficiencies in muscle control/strength/length can also lead to SIJ pathology. In a study by Massoud et al., individuals with low back pain, with and without SIJ dysfunction were studied. These authors found that the incidence of gluteal muscle weakness in those with SIJ pathology was significantly higher than for those without SIJ involvement[17]. Massoud et al. hypothesized that weak gluteal muscles could result in decreased stability of the SIJ[17]. In a result of the decreased stability, compensations could occur such as tight hamstring muscles[17]. Furthermore, patients with SIJ pathology may display a described pattern of muscle imbalance

wherein tightening occurs at the postural muscles (iliopsoas, quadratus lumborum, piriformis, gluteus maximus, hamstrings, tensor fascia lata) while there is concurrent weakening of other muscles (gluteus maximus, abdominal obliques, multifidus, and vastus medialis obliques)[4].

Nerves that lay within the SIJ and iliolumbar ligaments can lead to low back pain when strain is induced on these ligaments, especially in sitting or slouched positions[6]. For example, the L4-L5 nerve root runs over SI joint (and can also be impacted by the piriformis muscle, scar tissue adhesions, or hamstring irritation)[2].

SIJ Clinical Diagnosis

The best diagnostic measure for SIJ pathology has been found to be SIJ blocks, utilizing the International Association for the Study of Pain criteria (pain in the area of the SIJ that is reproducible with pain provocation tests, or relieved by injection of local anesthetics)[7,18,19]. This test is considered positive for SIJ pathology with a reduction of the visual analogue pain scale of at least 80% from before the block to after[4]. However, there are some clinical considerations that have been recommended for use by physical therapists.

Common clinical presentation includes pain and tenderness at SIJ, buttocks region, sacrotuberous ligament, piriformis muscle, and pubic symphysis.[3,7] The SIJ also regularly refers pain in the region of the posterior superior iliac spine (PSIS)[7], which has also been described using the “Fortin’s finger test[7,20]” (Figure 2[5]). The Fortin finger test was further studied by Murakami et al., whom expanded that if a patient points within 2 cm of the PSIS (not just 1 cm inferiomedial), then SIJ pathology should be further explored[21]. The authors report that this site is specific due to the structures that attach to this area, which include the long and short posterior sacroiliac ligaments, sacrotuberous ligament, interosseous ligament and

gluteus maximus muscle[21]. Furthermore, in close proximity to the PSIS is the "axial sacroiliac joint," including the axial interosseous ligament, which is weak and has been described as a major site of degeneration[21]. SIJ pathology can also refer pain to the groin, greater trochanter, posterior thigh to knee, and sometimes lateral or posterior calf to ankle, foot and toes[12]. Common aggravating factors for SIJ pathology include sitting, laying on affected side, weight bearing on affected side when standing or walking, Valsalva, and forward flexion in standing with knee's extended[4]. Conversely, pain may be relieved with standing on contralateral extremity and flexion of affected extremity[4]. Furthermore, the patient may display asymmetry in movement strategies involving the SIJ and pelvis[12]. In a recent study by Adhia et al., innominate movement patterns were studied in patients who have low back pain with and without SIJ pathology, with results indicating that patients with SIJ involvement have altered innominate kinematics[22]. Specifically, these individuals display an asymmetric, unilateral movement of the innominate, which could indicate uneven stiffness within the SIJ[22]. Given the diversity and complexity of the clinical presentation for patients who have SIJ pathology, clinical tests and diagnostic measures should also be utilized when making a diagnosis[4].

There are several special tests that have been developed in diagnosing SIJ pathology including tests for position, movement and stress[23] (Figure 3 and 4[14]). These tests include: seated flexion-standing test, Gillet's test, Patrick's maneuver, Gaenslen's test, distraction test, compression test, and others[7,23]. These tests can be difficult to interpret due to their impact on surrounding tissues, hip and spine[23].

SIJ clinical tests demonstrate low sensitivity and/or specificity when used in singularity[7,23]. Therefore, clinical provocation test clusters have been recommended for use in order to improve diagnostic accuracy[3]. In a study by Laslett et al., the use of a cluster of tests

was examined, including the distraction test, thigh thrust, Gaenslen's test, compression, and sacral thrust[3]. In use of these assessments, if a patient tests negative for all tests then a pathology of the SIJ can be ruled out[3]. However, if 3 or more tests yield positive results for SIJ involvement, then there is higher diagnostic accuracy (sensitivity 93.8% and specificity 78.1%)[3]. Laslett et al. also determined that the Gaenslen's test did not positively contribute to the diagnosis of SIJ pathology and can be omitted from the cluster[3]. The authors proposed that the best method for performing the cluster of tests (inducing the least amount of discomfort on the patient) was to complete the distraction (most specific), thigh thrust (most sensitive), compression and sacral thrust tests, stopping once two positive results were found (sensitivity 88% and specificity 78%)[3].

In another study by Wurff et al., a combination of the distraction test, compression test, thigh trust test, Patrick sign, and Gaenslen test were evaluated and found to be useful for diagnosing SIJ pathology when three or more of the tests show positive results (sensitivity 85%, specificity 79%)[24]. Additionally, these authors conclude that with two or fewer positive results there is between 72% and 99% probability that the pain is not originating from the SIJ[24].

Furthermore, Laslett has divided the tests into those which test for SIJ dysfunction and those that are aimed at provoking SIJ pain[14]. He postulates that there is very little diagnostic value to any of the tests that have been developed for diagnosis of SIJ dysfunction; however, clusters (3 or more positives) of tests aimed at diagnosing SIJ pain, in patients who display non-centralizing patterns of pain can significantly improve the utility of the tests (specificity 87%, sensitivity 91%)[14]. These tests must also be performed proficiently by the clinician, with sufficient force to stress the SIJ[14].

While these clusters of tests can be useful in the clinical setting, sound medical judgement must be used when interpreting the results. For example, if the patient exhibits severe pain with any movement, other red flags or sources of pain (fracture), then these tests may be inappropriate[3].

SIJ Treatment Options

There are multiple treatment options available for SIJ pathology including: radiofrequency (RF) denervation[25], SIJ fusion with titanium implants[26,27], dextrose prolotherapy[28], SIJ manipulation[12,29], treatment of other biomechanical problems such as the subtalar joint[29,30], individual strengthening for gluteus medius[31], taping[32], NSAIDS[1], steroid injections[1,7], osteopathic manipulation[1], SIJ belts[1,7,11,33] and physical therapy including to target any muscle imbalance (ie. weakness or tightness), activity modification[5], joint mobilization[5] and gait abnormalities[1,13]. In order to build the most effective treatment plan, the clinician must first determine the cause of the pain and tissues suspected to be involved (ie. inflammation of the joint, instability of the joint due to surrounding soft tissue laxity)[14]. For example, if articular cartilage is suspected to be involved and the cause of discomfort, then one suggestion for patients is to provide exercises that utilize fluid film lubrication (less weight, quicker sets of exercise), in order to lower the coefficient of friction in attempts to decrease frictional abrasion[34]. This can be coupled with activity modification in determining how to minimize load in the painful ROM, where the abrasion to articular cartilage is being irritated[34].

That being said, some general recommendations for treatment have also been made including that conservative treatment should be attempted before surgical or more invasive techniques are considered[7]. In the acute phase, rest, ice, and anti-inflammatory medication

can be utilized to reduce pain[7]. Further efforts should then focus on restoring mechanics by use of manual techniques, enhancing functional postural control via exercises to improve pelvic stabilization, and correcting for any muscular imbalances[7]. Muscles that cross multiple joints, and act on the SIJ can exert high torsional or shear loads leading to SIJ dysfunction (such as the gluteus maximus and biceps femoris)[7]. For example, if a patient has a flexed sacrum, tight iliopsoas muscles, and weak gluteal muscles and hamstrings, they may be experiencing abnormal loading and motion at the SIJ, and would benefit from targeted therapy to correct the imbalance[7]. Moreover, if the person exhibits a malalignment of the joint, it would be in their best interest to correct that as much as possible, in order to improve the contact area, thus improving contact pressure across the joint[34]. Furthermore, if SIJ pathology involves the ligaments, it would be beneficial to include proprioceptive training due to the injury to the receptors and reflexes[35]. Once the patient demonstrates improved postural stability, higher impact exercises or activity-specific exercises can be performed such as plyometrics, in order to allow the patient to return to prior levels of function including recreational or sporting activities[4,7].

In a recent study of patients with radiating pain below the buttocks, it was found that 41% of those included in the study showed clinical signs of SIJ involvement[19]. For these patients, manual techniques applied to the sacrum, including high-velocity-low-amplitude thrusts has proven successful in diminishing pain and discomfort (specifically, 72% of the patients in the manual therapy group experienced relief)[19].

Other conservative treatment options that have been successful include the use of SIJ belts[7], taping[32], and treatment of other biomechanical problems[1]. SIJ belts for pelvic stabilization have been found to provide proprioceptive awareness and changes in mobility of

the SIJ (decrease in mobility around the transverse axis, and increasing motion at the sagittal axis[11]), decreasing pain[7]. SIJ belts have demonstrated ligamentous relief for all of the SIJ ligaments with most relief of the sacrospinous, sacrotuberous, and the interosseous ligaments[11]. SIJ belts have been recommended for use as an adjunct to therapy and not in isolation of other interventions and techniques[7]. Additionally, orthoses have been used to treat leg length discrepancies greater than ½ inch, which have demonstrated negative impact on the SIJ[4].

Intra-articular injections into the SIJ are not only used as a diagnostic tool, but can also be utilized as a therapeutic technique if conservative treatment fails to provide relief[7]. Additionally, the use of fluoroscopy in order to optimize placement of injections within the joint space has been recommended for best benefit[7]. If these injections provide little or temporary relief, then other techniques should be considered, such as radiofrequency neurotomy/denervation (rhizotomy)[5] and cryotherapy (though there has been only limited evidence for use of these techniques)[7]. Another type of injection that may be successful is termed prolotherapy[7]. This treatment is utilized when joints are weak due to deficiencies within surrounding soft tissues, such as ligaments[7]. Prolotherapy, which is the injection of an irritant into a deficient tissue in order to stimulate collagen proliferation and healing, has been shown to increase the stabilization of the SIJ[7].

Lastly, if all conservative treatment options fail then surgery can be considered[7]. Arthrodesis, surgical fusion, has been performed successfully for patients with chronic, non-traumatic and painful SIJ pathology with up to a 70% proposed success rate[4,7]. Moreover, several minimally invasive techniques have now been described for use at the SIJ, including dorsal and lateral transarticular[5]. Implants used for surgical fusion at the SIJ include allograft

fibular dowels, autograft iliac crest, and titanium cages plus a graft, with the most common implants being either screws with bone graft or triangular titanium devices[5]. Minimally invasive techniques have demonstrated improved patient outcomes in comparison to open surgery in respect to hospital stay, blood loss, recovery time, pain outcomes and quality of life[5]. Therefore, the North American Spine Society and the International Society for the Advancement of Spine Surgery have both published policy information supporting coverage of these techniques for patients who have not benefitted from conservative treatment, appropriate diagnostic workups have been performed, and experience at least 75% reduction in pain from an SIJ block[5].

Conclusion

Low back pain is a common pathology that can impact function and overall quality of life. SIJ pathology has been shown to be a cause of low back pain in a subset of patients. However, the source of low back pain can be difficult to elucidate, especially given the number of distinctive tissues present. Furthermore, clinical presentations of SIJ pathology amongst patients is highly variable, demonstrating the need for accurate and efficient diagnostic tools. Current literature suggests that a positive cluster of 3 or more provocative SIJ tests can indicate SIJ involvement, for patients who have no centralizing pain or the presence of other red flags[14]. Furthermore, treatment plans should be individualized to the patient and modified to allow for most effective healing strategies of tissues that are involved, including correction of any biomechanical abnormalities, increasing pelvic stability, and improving muscular imbalance. Invasive techniques should only be considered if conservative treatments fail to provide relief.

Tables

Table 1: As described in Poley et al., differential diagnosis for SIJ pathology[1].

Table 2. Differential Diagnoses Sacroiliac Joint Dysfunction (SIJ) Dysfunction

Differential Diagnoses	Characteristics
Stress fracture/spondylolysis/spondylolisthesis	Young athletic population; activities involving repetitive lumbar extension; pain exacerbated by normal sport activities; positive one-leg stork test.
Ankylosing spondylitis	15–30 years old; morning low back pain (LBP) and stiffness; family history of LBP.
Lumbo-sacral radiculopathy	LBP with sharp "electrical" shooting pain down either or both legs; pain or symptoms follow a dermatomal distribution.
Lumbo-sacral discogenic pain	Pain that increases with valsalva or increased intra-abdominal pressure (cough, sneeze, etc.).
Facet syndrome	Commonly in age 40+ years, pain with back movements; located cervical, thoracic, and/or lumbar spines.
Diffuse idiopathic skeletal hyperostosis (DISH)	Age 50+ years, slow insidious onset; lower thoracic spine and lumbar vertebrae involved; stiffness and loss of normal spine range of motion; males > females.
Piriformis syndrome	Pain localized generally in the buttock(s); worse with sitting, or climbing stairs; piriformis stretch reproduces symptoms; may be associated with sciatica symptoms.
Malignancy/metastasis	History of cancer (prostate); strong family history of cancer; unexplained weight loss; fatigue.
Hip fracture	Recent fall, unilateral pain with ambulation/weight bearing; osteopenia; elderly population.
Psoriatic arthritis	History/presence of psoriatic lesions (skin lesions do not need to be widespread or severe).
Infection/discitis	Fever, pain out of proportion to examination, elevated white blood cell count; concomitant infection (sometimes).

Figures

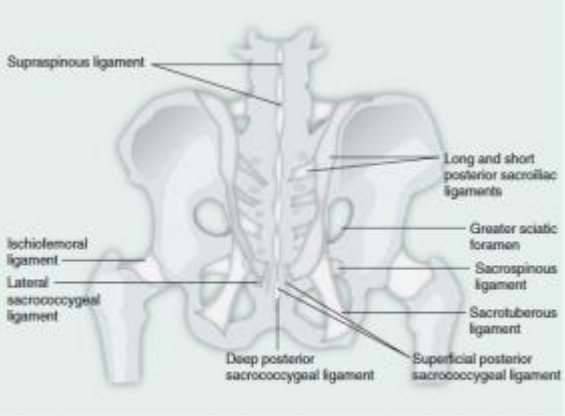

Figure 1.Posterior view of the articulations and associated ligaments of the sacroiliac joint and surrounding structures.
Drawing by Jee Hyun Kim. Adapted from [9].

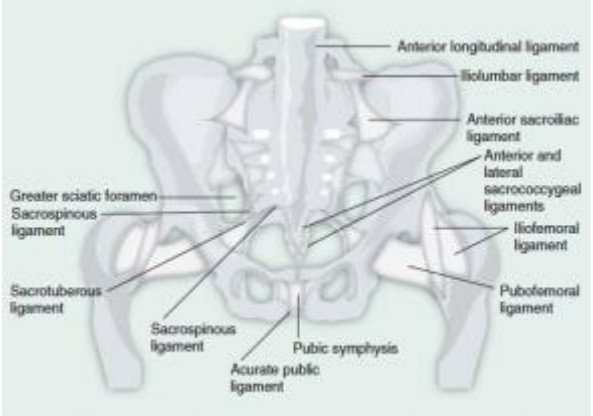

Figure 2. Anterior view of the articulations and associated ligaments of the sacroiliac joint and surrounding structures.
Drawing by Jee Hyun Kim. Adapted from [9].

Figure 1: Pelvic views of ligaments and structures of SIJ from Cohen et al.[10].

FIGURE 3. Fortin finger test is considered indicative of sacroiliac joint with the patient, using 1 finger to point to the site of his/her primary pain, points to the area over the joint.

Figure 2: Rashbaum et al., Fortin Finger test[5].

FIGURE 6. The drop test (testing the left SIJ).

Note: The patient raises the heel from the floor taking near full bodyweight, then drops the heel to the floor with a bump, retaining the knee in extension at all times, producing a cranially directed shear force at the left SIJ. Reprinted with permission[19]

Figure 3: From Laslett, drop test[14].

FIGURE 1. The distraction test (testing right and left SIJ simultaneously).

Note: Vertically oriented pressure is applied to the anterior superior iliac spinous processes directed posteriorly, distracting the sacroiliac joint.

FIGURE 2. The thigh thrust test (testing the right SIJ).

Note: The sacrum is fixated against the table with the left hand, and a vertically oriented force is applied through the line of the femur directed posteriorly, producing a posterior shearing force at the SIJ.

FIGURE 5. The sacral thrust test (testing right and left SIJ simultaneously).

Note: A vertically directed force is applied to the midline of the sacrum at the apex of the curve of the sacrum, directed anteriorly, producing a posterior shearing force at the SIJs with the sacrum nutated.

FIGURE 3. Gaenslen's test (testing the right SIJ in posterior rotation and the left SIJ in anterior rotation).

Note: The pelvis is stressed with a torsion force by a superior/posterior force applied to the right knee and a posteriorly directed force applied to the left knee.

FIGURE 4. The compression test (testing right and left SIJ).

Note: A vertically directed force is applied to the iliac crest directed towards the floor, i.e., transversely across the pelvis, compressing the SIJs.

Figure 4: From Laslett, images depicting SIJ provocation tests[14].

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