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Key Concepts

- The sacroiliac joint (SIJ) joins the sacrum to the pelvis transmitting the forces from the axial skeleton above to the lower extremities. SIJ dysfunction is a common cause of low back pain.
- History will reveal pain with maneuvers that stress the pelvic ring.
- Look for contributing factors such as a history of pelvic girdle trauma, repetitive asymmetric axial loading, pregnancy, or spondyloarthropathy (ankylosing spondylitis).
- No single physical exam maneuver is indicative of sacroiliac joint dysfunction, but a composite of exam maneuvers has been positively correlated to confirmatory diagnostic joint injection.
- The diagnostic gold standard remains image-guided intra-articular joint injection.
- There are myriad treatment options including corticosteroid injection and radiofrequency ablation.

Introduction

Sacroiliac joint (SIJ) arthropathy is a common cause of acute and chronic low back pain. It is estimated to be the cause of up to 30% of low back pain. In a recent multicentric study, Cher and colleagues found that the overall health

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burden endured by chronic SIJ pain sufferers was greater than cohorts with COPD, coronary artery disease, and asthma.

The SIJ is a mechanical relay station – transmitting loads to and from the trunk and lower extremities while simultaneously providing logic functions as position sense and loading behavior. As such, it provides a unique role in human locomotion and serves as the driving impulse of truncal counterrotation.

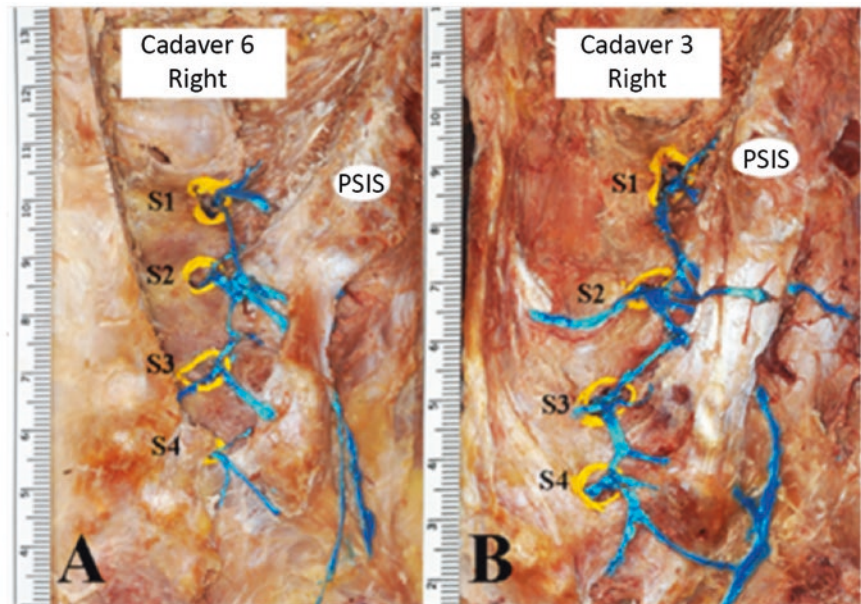
SIJ pathology is commonly associated with other conditions including: trauma to the pelvis, ankylosing spondylitis, psoriatic arthritis, Reiter's syndrome, inflammatory bowel disease, and pregnancy.

Anatomy

The sacroiliac joints are a pair of diarthrodial L-shaped joints that join the sacrum to the ilium bones. The articular surface of the ilium is made up of fibrocartilage, while the sacral surface is made up of much thicker hyaline cartilage. There are interosseous sacroiliac ligaments that maintain tight adherence between the sacrum and ilium. In addition to the primary SI ligaments, the sacrotuberous and sacrospinous ligaments further stabilize the sacrum to the pelvic girdle. These ligaments have also been implicated as potential pain generators. The orientation of the SIJs within the pelvis renders them particularly vulnerable to axial loading to failure. In fact, Miller found the SIJ to be twenty times more susceptible to axial overloading than the lumbar motion segments. Commensurate with Miller's report, Fortin and Roberts observed a high incidence of SIJ pain in competitive figure skaters – who repetitively land their jumps on the same lower extremity.

Normal motion within the paired joints include a small amount of movement (2–18°) in the transverse plane called nutation (forward rotation of the sacrum between the ilia) and counternutation (backward rotation of the sacrum between the ilia). In addition to the amount of nutation/

Fig. 49.1 (a, b) Cadaveric specimens demonstrating dense SIJ innervation inferior and medial to the PSIS. Lateral branches of the dorsal rami emanate from the S₁ to S₄ dorsal foramina (Reproduced with permission from Cox and Fortin [2]. © American Society of Interventional Pain Physicians)



counternutation, the existence of an oblique axis (implicated in normal reciprocal gait mechanics) has been the subject of debate.

Innervation

The common pathways of innervation revealed by recent investigations include: the lateral branches of the sacral dorsal rami, the medial branch of the L5 dorsal rami, and variable innervation from the superior gluteal nerve (Fig. 49.1). Several investigators have also reported on the branches from the lumbosacral plexus and obturator nerve. Innervation of ventral rami origin has been questioned by the absence of ventral receptors in fetal SIJ capsules. This complex innervation pattern has implications for the treatment of SIJ arthropathy.

Physical Examination

Patients with symptomatic sacroiliac joints often present to their physicians pointing at the SIJ (immediately medial and inferior to the PSIS) as the source of their pain (i.e., a positive Fortin finger test or FFT). Upon experimental stimulation of the SIJ capsules of asymptomatic volunteers, Fortin and co-workers observed that all volunteers referred evoked symptoms below their PSIS with some extending toward the ipsilateral greater trochanter. These observations are congruent with the aforementioned cadaveric reports demonstrating dense innervation in the same area below the PSIS. While primary buttock pain is the most common presentation, it is not unusual for patients with symptomatic SIJ's to report

symptoms radiating as far distal as the foot. Accordingly, Fortin and colleagues employed arthrography, post-arthrography CT, and capsular immunohistochemical techniques to link the SIJ to sciatica.

There are a number of physical examination provocative maneuvers for identifying symptomatic sacroiliac joints including: Gillet's test, Patrick's maneuver (FABER), Gaenslen's test, anterior-posterior compression, thigh thrust, and sacral compression (Table 49.1). While no single exam maneuver is diagnostic for SIJ pathology, Laslett and others have demonstrated that combining multiple stress tests greatly enhances the diagnostic yield. As the pelvic girdle is a ring (consider Pascal's principle), examine patients with putative SIJ pain for tenderness of the surrounding ligaments, as well as the pubic symphysis.

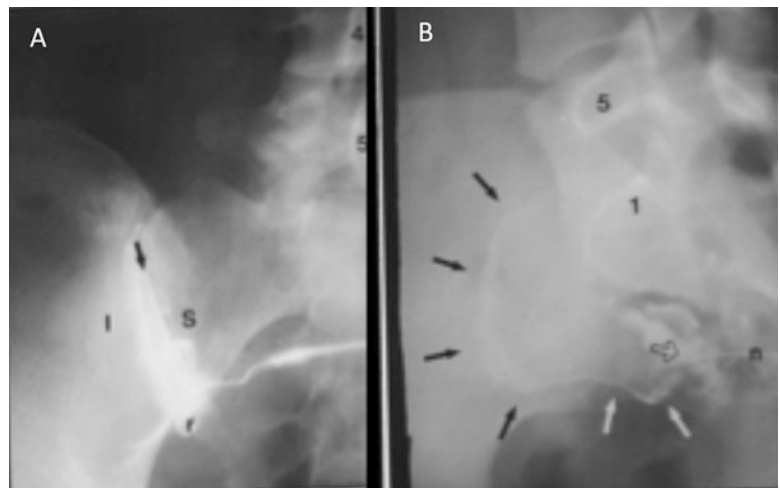
Diagnostic Modalities

Plain films (X-rays) are a common screening method for suspected sacroiliac joint pathology, but are often nondiagnostic for early stages of degenerative or inflammatory pathology. They do play an important role in the setting of trauma; when evaluating a patient for gross fracture, dislocation, or dynamic instability. CT can show evidence of degenerative, erosive, or destructive joint changes earlier than radiographs. While MRI is more sensitive than CT or scintigraphy for evaluating the evolution of marrow space pathology (associated with stress fracture or inflammatory sacroiliitis), CT outperforms MRI when assessing osseous contour abnormalities. Structural findings on imaging studies are not *prima facie* evidence of pain. In fact, degenerative changes in asymptomatic SIJ's are common, after the age of 30.

Table 49.1 Provocative physical exam maneuvers

Exam maneuver	Description	Patient position	Action	Findings
Distraction or anterior-posterior compression	This test applies anterior-posterior shear stress on the bilateral sacroiliac joints	Supine, legs in neutral position	Apply gradual, sustained downward pressure on the bilateral anterior-superior iliac spine.	Reproduction of pain localized to the sacral sulcus or sacroiliac joint
Thigh thrust	This test applies anterior-posterior shear stress on unilateral the sacroiliac joint	Supine, hip flexed to 90° with the knee relaxed	Apply gradual, sustained, vertically directed force through the femur	Reproduction of pain localized to the sacral sulcus or sacroiliac joint
Sacral thrust	This test applies forces to the bilateral sacroiliac joint	Prone, legs in neutral position.	Apply gradual, sustained downward pressure on the superior sacrum	Reproduction of pain localized to the sacral sulcus or sacroiliac joint
Patrick's maneuver (FABER)	This test applies tensile forces to the anterior sacroiliac joint ligaments	Supine, the hip flexed, abducted, and externally rotated and the foot resting on the opposite knee	The examiner then applies gradual, sustained downward pressure on the flexed knee	Reproduction of pain localized to the sacral sulcus or sacroiliac joint, NOT the anterior groin which would suggest femoral-acetabular dysfunction
Fortin finger test	The patient is asked to point to the area of maximum pain	Standing	The patient points with one finger	Patient points immediately posteromedial to PSIS

Fig. 49.2 SIJ injection and arthrography injection. (a) AP arthrography S (sacrum) I (ilium) r (inferior recess of capsule) arrow – bead of contrast in joint margin. (b) Enface oblique arthrography. Arrows indicate the capsule – delineating the auricular shape of the synovial joint (Reproduced with permission from Fortin and Sehgal [16])



While image-guided anesthetic blockade of a putatively painful joint is the standard for diagnosis (as no single physical exam maneuver is indicative of sacroiliac joint dysfunction), the intervention should be considered an extension of a careful history and physical.

Treatment Options

Conservative treatment should include cold application, anti-inflammatory medication or anti-inflammatory nutritional supplements, and relative rest (in the acute stage). Once pain has subsided, further efforts should be employed to restore normal mechanics, including manual medicine techniques,

pelvic stabilization exercises to allow dynamic postural control, and muscle balancing of the trunk and lower extremities. SIJ belts or pelvic stabilization orthoses will provide confidence and proprioceptive awareness for sacroiliac joint dysfunction sufferers. A properly positioned cinch-type pelvic stabilization orthotic (worn directly superior to the greater trochanters) can significantly limit sacroiliac motion and thereby decrease pain.

If conservative treatment fails, SIJ intra-articular injections should be considered, not only as a therapeutic intervention but also to confirm the diagnosis (Fig. 49.2). Mitigation of symptoms by analgesic block is the most reliable and reproducible means by which a painful SIJ can be identified.



Fig. 49.3 AP plain film projection. Radiofrequency probes (with 10 mm tips) are oriented across the S1 to S4 dorsal foramina (medial to lateral)

Once the diagnosis is confirmed by profound relief of symptoms (lasting at least as long as the duration of the local anesthesia) following a diagnostic block, long-standing relief can often be obtained by radiofrequency ablation treatment of the sacral lateral branches and dorsal ramus of the L5 nerve (Fig. 49.3).

Dorman and co-workers observed *in vitro* that injecting chemical irritants into ligamentous tissue incites collagen proliferation. Theoretically, scarring and tightening of the ligaments results in stabilization of the joint. Hence, proliferant therapies may have a role in addressing an unstable SIJ.

Autologous mesenchymal stem cells (which morph in to bone, cartilage, and connective tissue) combined with platelet-derived growth factors have also been the subject of considerable research focus for joint conditions, including the SIJ. These biologic media are generally administered by image-controlled injections. While more research and development of this technology is warranted, regenerative approaches to SIJ pathology hold great promise.

Arthrodesis of the sacroiliac joint for chronic, non-traumatic, painful dysfunction is controversial but may be considered if all nonsurgical treatments have failed. Moore found a 75% success rate employing an open, modified Smith-Petersen fusion technique with AO hardware.

Since Moore's study there have been at least ten reports in the peer review literature suggesting that minimally invasive ("closed") fusion with instrumentation approaches are also effective for a subset of patients. Clinical judgment should be used if lumbar spine pathology coexists with sacroiliac joint dysfunction, as this information should factor in the treatment algorithm.

Summary

On balance, look for a history of trauma to the pelvic ring or repetitive asymmetric axial loading. Many patients with SIJ dysfunction present with primary buttock pain, as well as some who point directly at the joint as the source of their symptoms (i.e., positive FFT). Some patients will report symptoms suggestive of instability – the so-called "slipping clutch" syndrome. Palpatory examination reveals sacral sulcus, joint line, and surrounding ligamentous tenderness. Pubic symphysis tenderness further implicates pelvic girdle versus primary lumbar pathology. Several PE stress maneuvers also substantiate the diagnosis of SIJ dysfunction.

The history and physical findings should be confirmed by an image-guided direct intra-articular diagnostic block. Treatment options range from anti-inflammatory medications and physical therapy to radiofrequency ablation, stem cell therapy, and surgical fusion.

Suggested Reading

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