

45. Surgical treatment of chronic painful sacroiliac joint dysfunction

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INTRODUCTION

Chronic sacroiliac joint (SIJ) dysfunction is increasingly recognized as an important consideration in the differential diagnosis of low back pain and sciatica (Bernard & Cassidy 1991, Bernard & Kirkaldy-Willis 1987, Daum 1995, Jamrich et al 1995, Klein et al 1993, Mooney 1993, Moore 1994, 1995, Schwarzer et al 1995). Although frequently discussed as a common cause of low back pain in the early part of the century (Albee 1909, Baer 1917, Garnet 1927, Goldthwait & Osgood 1905, Pitkin & Pheasant 1936), the medical literature and clinical research efforts became sparse after the popularization of the diagnosis of the herniated nucleus pulposus (HNP) and its relation to low back pain and sciatica (Dandy 1929, Mixter & Barr 1934).

Early reports of arthrodesis of the SIJ for patients with chronic painful dysfunction were all favorable. Smith-Petersen and Rodgers (1926) reported on 26 cases of patients treated with sacroiliac (SI) arthrodesis for low back pain and associated sciatica. They reported a clinical success rate of 89%, with 23 out of 26 patients reporting no pain at follow-up. Gaenslen (1927) reported on the results of arthrodesis in 9 patients. Failure of improvement in symptoms was only noted in 1 case. Campbell (1927) reported on an extra-articular technique used in 7 patients. Five were reported as clinically successful, and the remaining 2 patients were considered to be too near to treatment to comment on their success.

These successful reports, however, failed to distract the orthopedic and neurosurgical communities from their new-found enthusiasm for surgical procedures directed at the lumbar discs.

Several generations of orthopedic surgeons went through their clinical training without any serious consideration of the SIJ as a possible pain generator and without any experience with the technique of SI arthrodesis. After these papers, the next report of a surgical series did not occur until the paper by Waisbrod et al (1987), in which a 70% success rate was achieved. With the development of improved imaging techniques and diagnostic tests that allow distinction between pain arising from SI dysfunction and pain arising from other causes, one would expect comparable or improved results today.

The vast majority of patients with SI pain can be successfully treated by the non-surgical methods described elsewhere in this book. When conservative treatment is ineffective, however, arthrodesis remains a viable consideration. Emphasis is directed towards (1) appropriate diagnosis and patient selection, and (2) appropriate technique.

DIAGNOSIS

Patients with SIJ-mediated pain can present with complaints that appear very similar to those reported in other conditions. Careful evaluation, however, will avoid an error in diagnosis. A key feature of SI pain is that patients will clearly identify the pain as being to one side or the other of the lower back rather than at the lumbosacral junction. Figure 45.1 shows typical pain referral patterns. The pattern in Fig. 45.1A looks very similar to that produced by an L5-S1 herniated disc but may include groin pain. Figure 45.1B is frequently interpreted as a 'hysterical' pattern. It is critical that the clinician does not jump to erroneous conclusions based on a cursory review

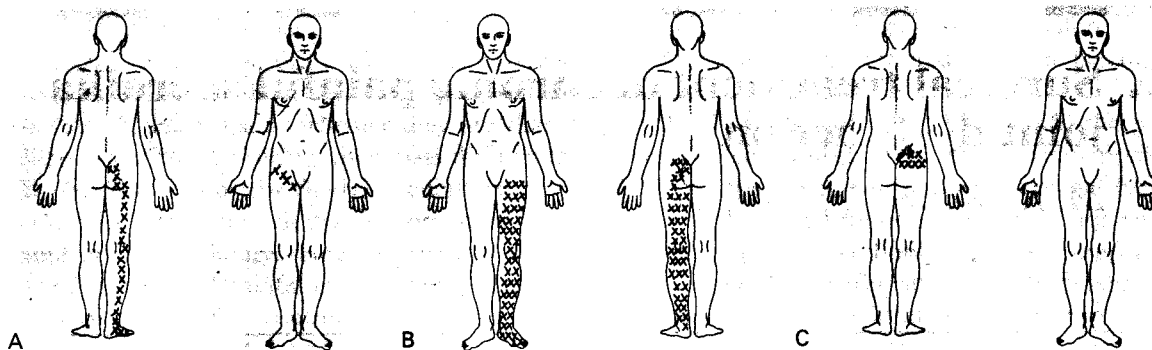


Fig. 45.1 Typical pain drawings of patients with SI dysfunction. (A) Pseudo-S1 radicular pattern. The pattern is similar to that which would be expected for an S1 radiculopathy. The patient may have associated groin pain with this or the other types of pain patterns. (B) Diffuse lower extremity pain often interpreted as 'hysterical'. (C) Pain localized directly over the SIJ and buttock.

of the pain diagrams. Figure 45.1C shows pain localized specifically over the area of the SIJ without radiation to the lower extremity.

The history may be useful in that a majority of patients can identify a specific episode of trauma associated with the onset of their symptoms (Moore 1994). Some patients will report a gradual onset without any precipitating trauma; others report persistent pain after pregnancy. Patients will frequently report difficulty in ascending stairs, and will use a non-reciprocal gait, preferring to advance the leg on the unaffected side.

Multiple physical examination maneuvers are purported to identify a painful SIJ, but several studies have identified the poor reliability of these maneuvers (Bellamy et al 1983, Dreyfuss et al 1995, Potter & Rothstein 1991). Patients with SI dysfunction demonstrate considerable overlap of symptoms with patients suffering from other conditions, such as patients with a symptomatic HNP (Norman & May 1956). Neurocompressive pathology needs to be identified or excluded. Since up to 30% of magnetic resonance imaging (MRI) scans of the lumbar spine will demonstrate some anatomic abnormality (Boden et al 1990), it is crucial to correlate the clinical picture with the results of imaging studies in order to avoid making a serious error. For example, a patient who describes pain in an S1 distribution and whose MRI shows a disc protrusion at L5-S1 should not be considered necessarily to be symptomatic from the disc protrusion. As will be subsequently described, such a patient may very well be symp-

tomatic from SIJ dysfunction, and failure to recognize this in the past has led all too often to a failed discectomy or possibly a lumbar fusion. The author concurs with other investigators that it is necessary to carry out a fluoroscopically or computerized tomography (CT)-guided injection of local anesthetic into the synovial portion of the joint in order to establish the diagnosis (Dreyfuss et al 1995, Haldeman & Soto-Hall 1938, Keating et al 1995, Steindler & Luck 1938).

Injection is accomplished by approaching the inferior portion of the joint by a skin puncture 1 cm below the most inferior portion of the joint as visualized by fluoroscopy with the patient in a prone position. A 3.5 in 25-gauge needle is usually adequate and 1 cm³ of Isovue 300 is injected to confirm the needle's location within the synovial portion of the joint. The contrast must outline the cartilaginous portion of the joint to be considered an adequate injection. This is followed by injection of 1.5 cm³ of 0.75% marcaine and 3 mg Celestone. The patient is given a pain diary and asked to record the pain level in the hours subsequent to the injection. Usually more than one injection is recommended, using local anesthetics of differing duration or with saline. If the pain relief is significant and concordant with the local anesthetic used, the diagnosis is considered to be validated. A review of 500 consecutive injections carried out at the Colorado Spine Center showed a positive confirmatory injection in 25% of cases. Thus, when the diagnosis is suspected on the basis of the history and physical examination, it is

only confirmed in one case out of four, which further establishes the lack of reliability of the history and physical examination alone.

Radiographic abnormalities are often subtle and seldom diagnostic by themselves. A small association has been found between ventral capsular tears and positive responses to diagnostic injection (Schwarzer et al 1995). Radionuclide imaging has been investigated and found to be inadequate to diagnose SIJ pain, only 19% of patients with SI pain by diagnostic block demonstrating abnormal uptake on technetium-99m phosphate imaging (Slipman et al 1996). The paucity of abnormal findings using radiographic techniques is probably explained by the relative lack of mobility of the joint, even in pathologic hypermobility (Kissling 1995). Diagnostic injection, therefore, remains essential in establishing the diagnosis.

SURGICAL TECHNIQUE

The surgical technique used was a modification of that described by Smith-Petersen (1926). Some modifications were incorporated over the period of the study and are discussed below. The procedure is illustrated in Fig. 45.2.

The patient is positioned prone on chest rolls on an image table. A Foley catheter is placed in

the bladder. An image intensifier is used to visualize the joint prior to marking the skin incision. A metal clamp is placed on the posterior superior iliac spine (PSIS). The collector is placed as close as possible to the skin surface in order to obtain the largest field of view. In the anteroposterior (AP) projection in this position, the PSIS will usually overlie the central portion of the joint, although considerable individual variation exists. The central portion of the joint is identified, and a curvilinear incision is planned centered on this point. The length depends upon the size of the patient but is usually 15 cm in length. Figure 45.2A shows a typical incision.

Dissection is carried through subcutaneous tissue with electrocautery until the facial attachments to the posterior iliac crest are identified. The fascia is incised and subperiosteal exposure of the outer table of ilium is carried out (Fig. 45.2B). It is necessary to divide some fibers of the gluteus maximus inferiorly to extend exposure down to the posterior inferior iliac spine. No attempt is made to visualize or divide the posterior SI ligaments. The sciatic notch and inferior extent of the ilium is identified. A Taylor retractor is placed deep in the wound to allow visualization of the surface of the ilium overlying the SIJ.

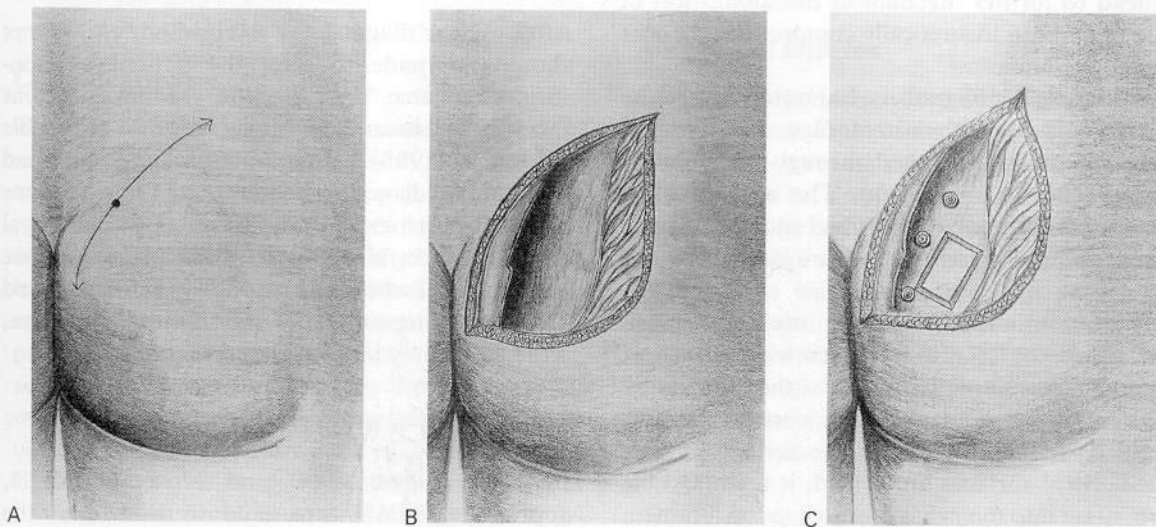


Fig. 45.2 Incision and dissection for posterior SI arthrodesis. (A) Typical incision centered on the PSIS. (B) The gluteal fascia has been incised and subperiosteal dissection of the outer table of the ilium has been carried out. (C) Typical location of a transiliac bone window and internal fixation screws.

The superior two-thirds of the joint is ligamentous and is avoided. A Midas Rex AM-8 (Midas Rex Pneumatic Tools Inc., Fort Worth, Texas, USA) dissecting tool is used to score the outer cortex and define a transiliac window overlying the synovial portion of the joint. The dimensions of the window are variable depending upon patient size, but in general the window should be as large as possible while allowing sufficient room for internal fixation screws cephalad and caudad to the window. A 2.5 cm × 3.5 cm rectangular window is usually possible. The window is completed and removed with a combination of straight and curved osteotomes. It is desirable to remove the window with intact subchondral bone and cartilage from the iliac side of the SIJ. It should then be possible to visualize the hyaline cartilage in the depths of the wound on the sacral side of the joint. The subchondral bone and cartilage are removed from the bone window and the resulting block of bone set aside. The subchondral bone and cartilage from the sacral side of the joint are removed with osteotomes and curettes. The anterior, caudad, and posterior cartilage surfaces can be seen with a head light, and these can be removed with a combination of straight and angled curettes or with a power tool. No attempt should be made to extend dissection into the ligamentous portion of the joint as this will lead to further mechanical destabilization of the joint and can theoretically compromise chances of osseous union.

Additional bone graft is harvested from the ipsilateral PSIS with osteotomes and gouges. Cancellous bone is packed through the window into the recesses of the joint. The bone block is then impacted across the joint and cancellous bone packed around it in order to secure an interference fit.

Preparation is then made for internal fixation. Two or three 6.5 mm AO screws with short (16 mm) threads are placed across the joint under image intensifier control. Three cortical surfaces should be felt when drilling the screws. If only three cortical surfaces are drilled, it is impossible to penetrate into the pelvis or into a sacral foramen. It is not recommended to attempt to pass a screw through the graft as the cancellous bone remaining in the sacrum is usually inadequate to allow

purchase by the screw. If sufficient bone is packed around the bone plug, its position should be stable without a screw. Figure 45.2C demonstrates the recommended screw placement. A depth gauge is used and cancellous screws of appropriate length are placed with metallic washers. The image intensifier is then used to visualize the screws in PA, inlet, outlet, and oblique planes. No screws should protrude into the pelvis.

The fascia is closed with absorbable suture and a drain placed in the subcutaneous space and brought out through a lateral stab wound. Skin closure is achieved in two layers with an absorbable suture.

POST-OPERATIVE CARE

The patient is mobilized the first postoperative day and is kept non-weight-bearing on the operated side for 8 weeks. The drain is removed at 24–48 h. Patients frequently experience dramatic pain relief in the early (24–48 h) time period and have to be cautioned against early resumption of weight-bearing. Two months after surgery, patients are sent to physical therapy for crutch weaning, gluteal strengthening, and gait normalization.

CRITERIA FOR SURGICAL TREATMENT

After a clear diagnosis is established, an attempt should be made to treat the patient by non-surgical means. Very specific recommendations for rehabilitation programs are now available (Mooney 1995). Manipulative therapy and prolotherapy have also been reported to have some success, even in chronic cases (Dorman et al 1995, Klein et al 1993). If these measures have been unsuccessful and the patient has severe and disabling symptoms for 6 months or more, arthrodesis may be considered.

EXPERIENCE WITH ARTHRODESIS

Between August 1990 and November 1994, approximately 6500 patients were seen at the Colorado Spine Center. Seventy-seven patients underwent arthrodesis of the SIJ for chronic painful dysfunction and failure of conservative

treatment. Data were collected prospectively on all patients, and patients were contacted for a final interview at the time of follow-up. Symptom duration ranged from 6 to 84 months. Minimum follow-up was 1 year and ranged up to 5 years. There were 29 male and 48 female patients. The left side was operated in 47 cases and the right in 27 cases, 3 patients undergoing bilateral procedures.

Patients were considered a clinical success if they were experiencing significant pain relief at follow-up, were satisfied with the operation, and stated that they would recommend the procedure to someone with a similar problem. Sixty-two out of 77 patients were regarded as successes and 15 were considered failures, giving a success rate of 80.5%. There were 28 patients who had isolated SIJ problems, had no prior spine surgery, and had no additional diagnosis related to the lumbar spine, such as discogenic pain. In this group, there were 24 successes, giving a success rate of 86%. Three out of the four failures in this group had a pseudarthrosis.

Forty patients were covered under the worker's compensation scheme. Thirty procedures were clinical successes in this group, giving a success rate of 75%. This was not significantly different from the non-worker's compensation cases (on Chi-square analysis).

Complications

There was one superficial wound infection, which was successfully treated with local care and antibiotics. There were no deep infections. One patient had an intentional penetration of the screw into the pelvis to anchor the bone plug and had radicular irritation as a result. The screw was removed 4 months after surgery, and the patient's radicular pain resolved. Early in the series, there was a fracture into the sciatic notch caused by initiation of the bone window with an osteotome. The fracture was stabilized with a single AO screw and went on to uneventful healing. This problem was eliminated in subsequent cases by scoring the outer cortex with the Midas Rex tool before completing the bone window with an osteotome.

Pseudarthrosis

There were seven pseudarthroses in the entire group. Pseudarthrosis was determined by fine-cut CT scanning. All of these patients were smokers; of the total group, only 40% were smokers. Five patients were reoperated with an attempt to repair the pseudarthrosis. Of the reoperated patients, 2 were successfully repaired and had a good final clinical result. Two patients had a persistent non-union after the second surgery, and remained clinical failures. The remaining patient is too close to the time of the second surgery to assess as a success or failure.

Various options exist for repair of a pseudarthrosis. The joint can be approached anteriorly and a reconstruction plate placed across the joint. The problem with this approach is the danger of damage to the lumbosacral trunk, as well as the difficulty of reaching the synovial portion of the joint and of achieving compression of the joint. The preferred method is to obtain a CT scan of the joint and identify what portions of the joint are available to deposit bone graft. A monopolar EBI stimulator (Electro Biology Inc., Parsippany, NJ, USA) can be used with the wire placed on the sacral side of the joint and the battery placed in a subcutaneous pocket adjacent to the incision. Supplemental bone graft can be harvested from the contralateral PSIS.

Analysis of failures

Of the 15 patients who were failures, 7 had pseudarthroses. Eight of the failures were of unclear cause and were thought to represent either a misdiagnosis or a superimposition of other problems. Six of the early failures were operated before a standardized protocol for diagnostic injection was in place. As was noted above, in patients who had no coexisting spinal problems and no prior surgery, all of the failures were accounted for by pseudarthrosis. Therefore it is clear that it is important to make an accurate diagnosis early and to intervene on the appropriate pathology.

COEXISTENT LUMBAR SPINE PATHOLOGY

It is not uncommon to identify patients with SI

dysfunction who have additional symptomatic lumbar spine pathology. Patients diagnosed with SI dysfunction will not infrequently have additional pathology in the lumbar spine that is identified by a thorough evaluation. When this situation exists, it raises several important issues for the clinician. Which condition is responsible for the patient's complaints? If more than one condition is contributing to the complaint, should these be treated sequentially or simultaneously? Below are given some recommendations for the evaluation of several clinical scenarios.

PAINFUL SI DYSFUNCTION AND COEXISTENT HNP

This is an important case to consider as the presenting symptoms and pain drawing can be very similar. In the author's initial series of 13 patients, 6 had undergone laminectomy that failed to relieve symptoms prior to the diagnosis of SI dysfunction being made. It is widely known that not all HNPs are symptomatic (Boden et al 1990). Fortin (1995) has shown arthrographic evidence of communication between the SIJ capsule and the L5 and S1 root sleeves. Such a communication in some cases could produce a false positive SI injection in the setting of a symptomatic HNP at L4-5 or L5-S1. Such a communication must be sought when determining the actual pain generator in a patient with a coexistent HNP. Conversely, it is important to rule out symptomatic SI dysfunction in a patient with a presumptive diagnosis of a painful HNP. Provocative discography should also be considered as a preoperative study if further clarification is needed.

COEXISTENT SIJ DYSFUNCTION AND DEGENERATIVE DISC DISEASE, WITH OR WITHOUT SPINAL STENOSIS

In the author's experience, this has been the most common multiple pathology situation encountered. Injection of the SIJ alleviates one component of the patient's pain but does not relieve pain experienced in the midline at the lumbosacral junction. Provocative discography reproduces the midline back pain. On occasion, the patient is able

to identify one or the other areas of symptomatology as clearly dominant. More commonly, however, the relative contributions to the overall complaint are reported as being nearly equal. Assuming that conservative measures have failed for both problems, a decision must be made about how to proceed. One approach is to treat one problem first, allow the patient to recover from that intervention, and then reassess whether or not the second condition still warrants treatment. Using this approach, we have performed an arthrodesis on the SIJ first, using the rationale that this surgery is easier to perform and has less morbidity than a lumbar spine fusion. Inevitably, when this was done and the SI pain was eliminated, the patient then regarded the midline pain as too troublesome to tolerate, and eventually, a lumbar spine fusion was carried out later. More recently, when coexistent degenerative disc disease and SI dysfunction have been identified, we have offered the patient the option of performing both surgeries at the same setting. In the two patients in whom this has been carried out, early clinical success has been achieved with minimal additional morbidity. The advantage of this approach is that the patient reaches ultimate recovery faster than would be the case if the conditions were treated sequentially (see case example 3 below).

It is also important to avoid jumping to the conclusion that spinal stenosis, as revealed by imaging studies, is responsible for a patient's symptoms. Case example 2 below illustrates a situation in which SI pain was responsible for the patient's complaint, even though significant stenosis was identified in her evaluation. Arthrodesis completely resolved the patient's symptoms, and her stenosis did not require treatment.

CASE EXAMPLES

Case 1

The patient was a 44-year-old female who had slipped on the ice. She had unremitting pain in her low back, buttock, and posterior thigh (Fig. 45.3A). An MRI scan demonstrated degenerative disc disease at L4-5 and L5-S1 (Fig. 45.3B). She underwent a diagnostic injection into the left SIJ and had complete relief of her typical symptoms.

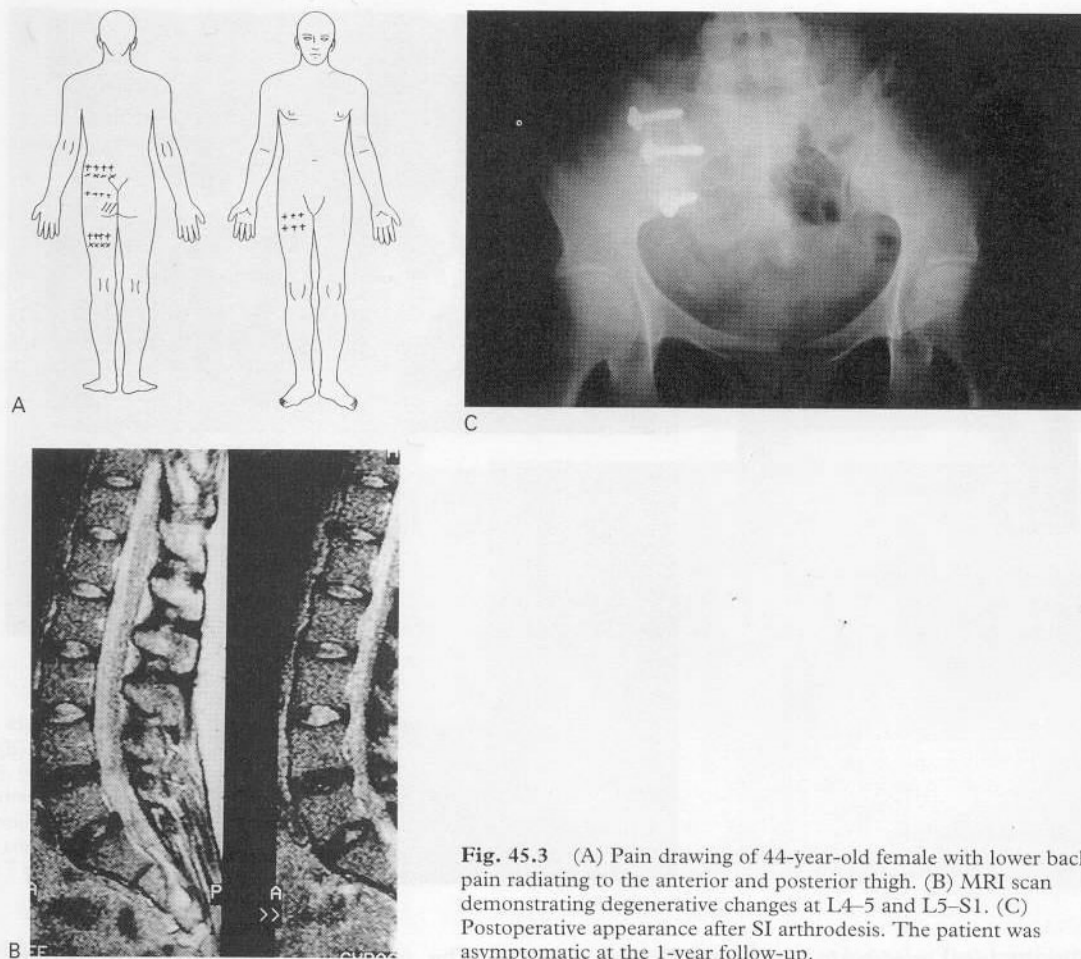


Fig. 45.3 (A) Pain drawing of 44-year-old female with lower back pain radiating to the anterior and posterior thigh. (B) MRI scan demonstrating degenerative changes at L4-5 and L5-S1. (C) Postoperative appearance after SI arthrodesis. The patient was asymptomatic at the 1-year follow-up.

She underwent a left SI arthrodesis (Fig. 45.3C) and at 1 year had no symptoms related to her back or lower extremity.

Case 2

This patient was a 70-year-old female with the complaint of back pain with radiation to the right lower extremity. X-rays demonstrated a grade II degenerative spondylolisthesis of L4 on L5, and an MRI scan demonstrated associated spinal stenosis at that level (Fig. 45.4A-B). However, physical examination suggested SI dysfunction. The patient underwent a series of diagnostic injections into the synovial portion of the SIJ, each of which produced near-complete relief of her typical symptoms. She therefore underwent

an SI arthrodesis (Fig. 45.4). She had immediate relief of her lower extremity pain and 4 months after surgery her ambulation was unlimited. She had minimal or no low back pain, no lower extremity pain, and no claudication.

Case 3

This patient was a 58-year-old female with left-sided lower back pain radiating to the left lower extremity. Her ambulation was limited by leg pain to less than one block. In addition, her physical examination suggested SIJ dysfunction, and maneuvers to stress the left SIJ reproduced her typical left-sided back pain. A CT myelogram demonstrated severe stenosis at the level of L4-5 (Fig. 45.5A-B). An SIJ injection was carried out,

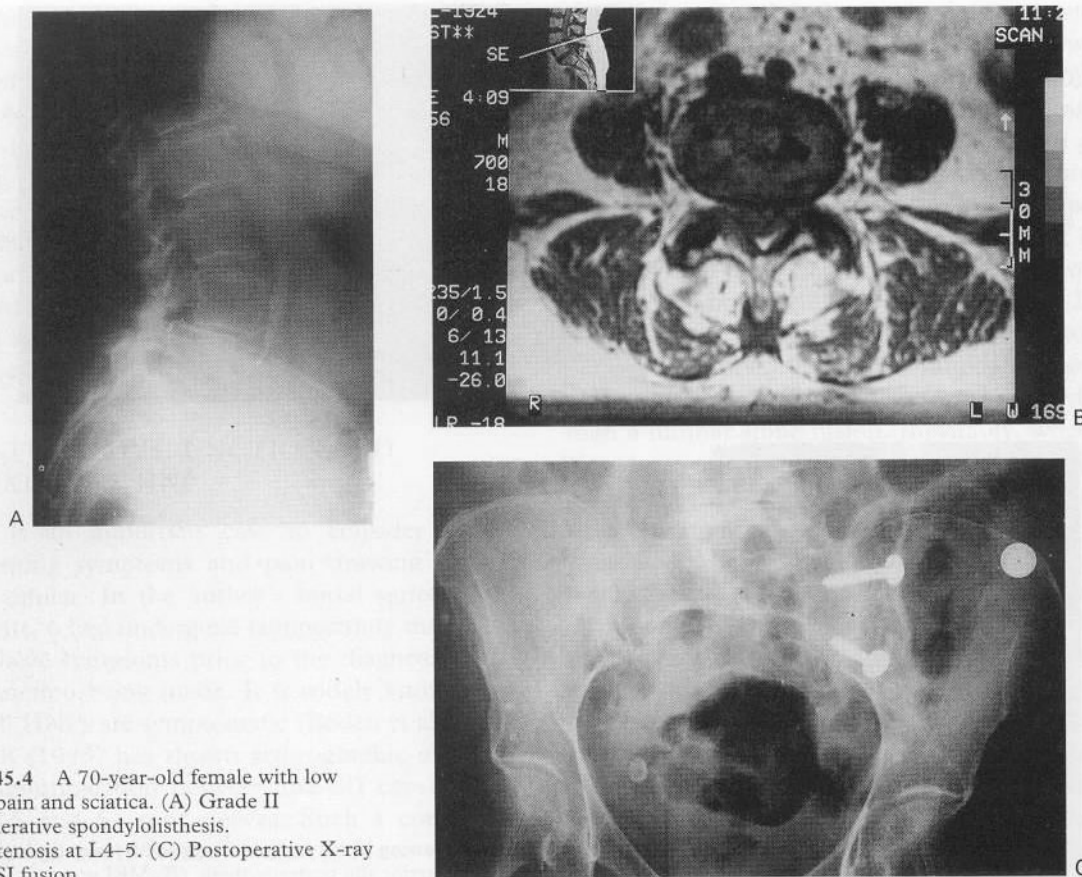


Fig. 45.4 A 70-year-old female with low back pain and sciatica. (A) Grade II degenerative spondylolisthesis. (B) Stenosis at L4-5. (C) Postoperative X-ray after SIJ fusion.

and while the local anesthetic was acting she was able to ambulate two blocks before she began to experience claudication symptoms.

Because of the apparent coexistent spinal stenosis, symptomatic claudication, lumbar instability, and SIJ dysfunction, it was elected to carry out both a lumbar spine fusion and decompression at the same time as the SIJ arthrodesis (Fig. 45.5C). The patient underwent these procedures and had an excellent outcome with immediate resolution of her SI pain. She was maintained on crutches for 2 months, after which she resumed ambulation and was able to walk 2 miles without any claudication.

CONCLUSIONS

1. SIJ-mediated pain is not uncommon and should be considered in the differential diagnosis of low back pain and sciatica.

2. The majority of patients with painful SIJ dysfunction can be treated by non-surgical means.

3. A small number of patients will not improve with conservative treatment. In the author's experience, this number is approximately 1% of all patients presenting to a spine specialty clinic.

4. Arthrodesis of the SIJ in selected patients produces satisfactory results with minimal complications and morbidity. It should be considered whenever the diagnosis is clear and conservative treatment has failed.

5. If other lumbar spine pathology coexists with SI dysfunction, clinical judgement should be used in planning treatment in a sequential versus a simultaneous manner.

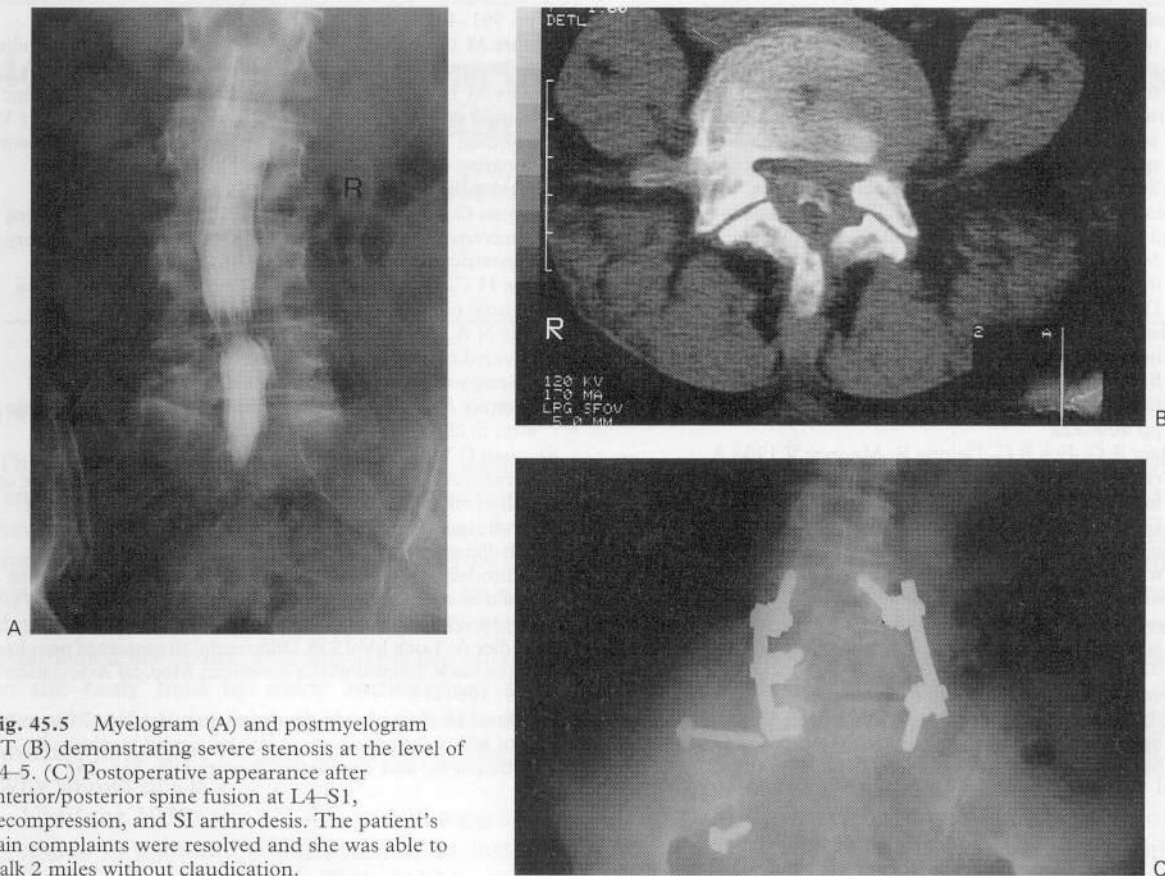


Fig. 45.5 Myelogram (A) and postmyelogram CT (B) demonstrating severe stenosis at the level of L4-5. (C) Postoperative appearance after anterior/posterior spine fusion at L4-S1, decompression, and SI arthrodesis. The patient's pain complaints were resolved and she was able to walk 2 miles without claudication.

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