Continuing Education

Diagnosis and Treatment of the Sacroiliac Joint

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- **Medical School:**
  - University of Oklahoma
- **Residency:**
  - Orthopedics
  - University of Oregon Health Sciences
- **Fellowship:**
  - Orthopedic Spine
  - San Francisco Spine Institute, San Francisco
- **Practice:**
  - Southern Oregon Orthopedics
  - Medford, OR

James Berking, PA-C

- **Bachelor of Science:**
  - University of Vermont, Burlington, VT
- **Master's in Physician Assistant Studies:**
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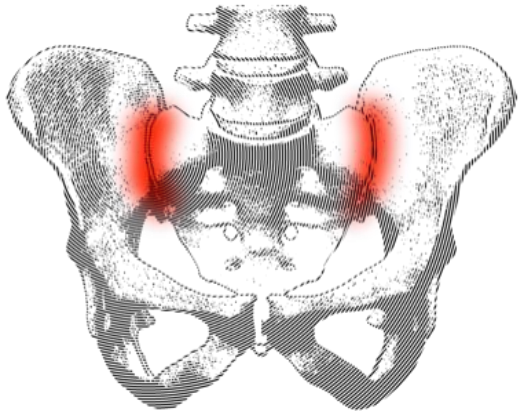
- **Practice:**
  - Southern Oregon Orthopedics
  - Medford, OR

Learning Objectives

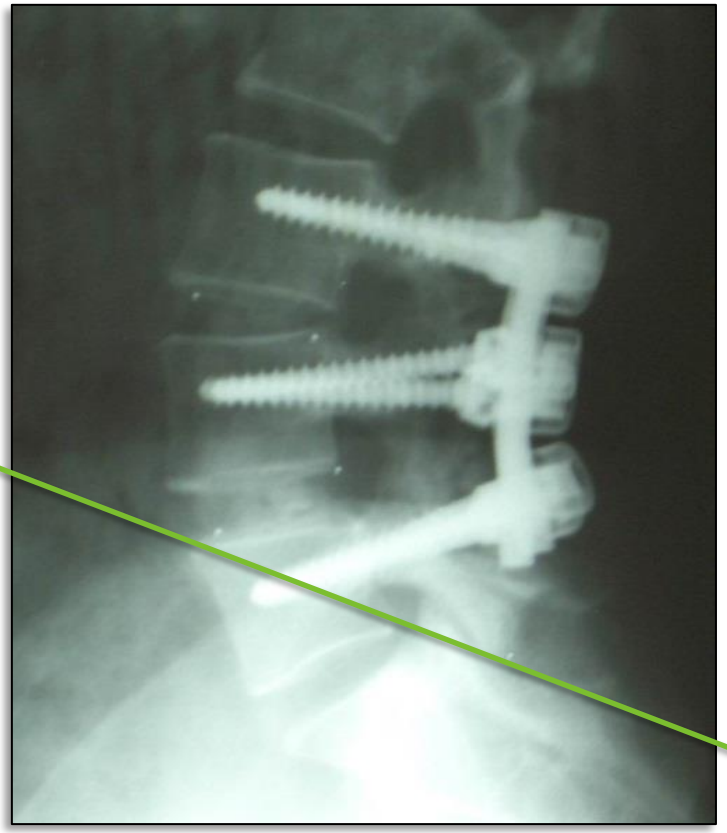
At the completion of this educational activity, the course participant will:

1. Understand the prevalence of SI joint dysfunction
2. Understand the biomechanics & anatomy of the SI joint
3. Learn the standard protocol for SI joint diagnosis
4. Know the basic steps of MIS SI joint fusion surgery
5. Review the published clinical results of MIS SI joint fusion surgery
6. Understand reimbursement considerations for MIS SI joint fusion



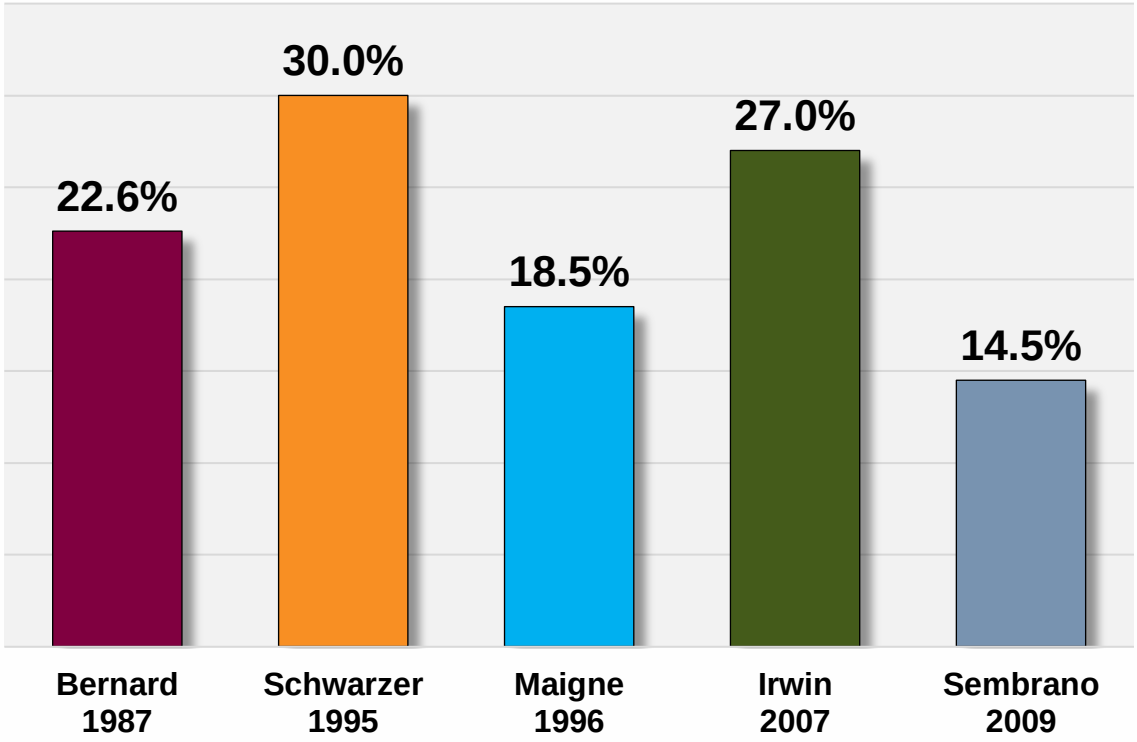
Prevalence of SI joint pain

Prevalence of SI joint pain

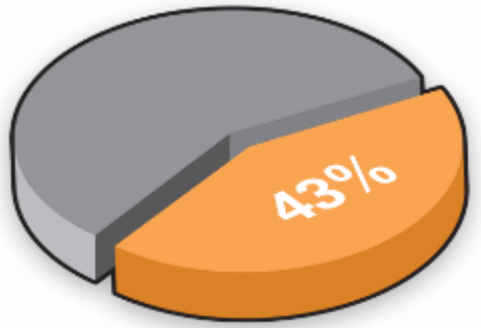


Prevalence of SI Joint Pain

15-30%
Component of Chronic LBP



32-43%
Symptomatic Post-Lumbar Fusion



DePalma – *Pain Med* 2011

32% **Katz 2003**
35% **Maigne 2005**
43% **DePalma 2011**
40% **Liliang 2011**

Adjacent Segment Degeneration[1,2]

75% of post-lumbar fusion patients showed SI joint degenerative changes on CT scan 5 years after

vs.
only 38% age- and gender-matched controls without prior lumbar fusion

Ha 2008

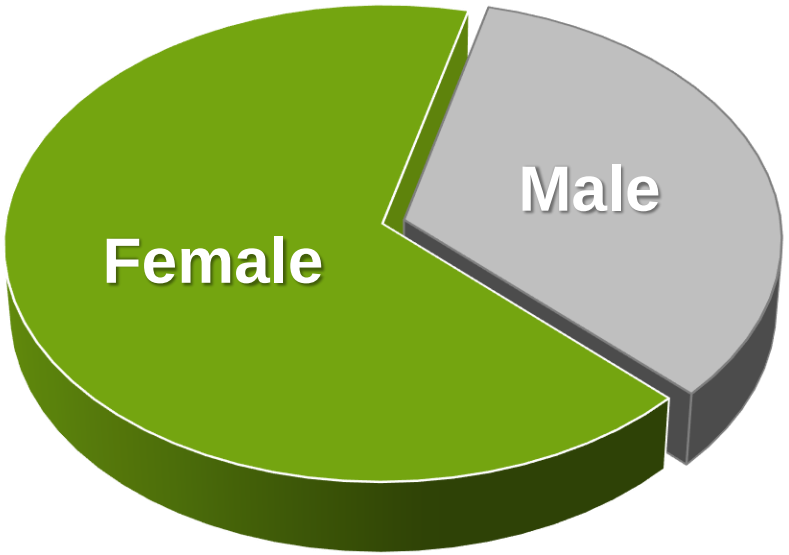
Lumbar fusion leads to increases in angular motion and joint stress at the SI joint

Ivanov 2009

1. Ha – *Spine* 2008
2. Ivanov – *Spine* 2009

Higher Prevalence of SI Joint Pain in Females

Approximately 2/3 of patients with SI Joint Dysfunction are women*



* *Based on multiple prevalence and treatment studies: Schwarzer - Spine 1995, Irwin – Am J Phys Med Rehabil 2007, Sembrano – Spine 2009, Katz – J Spinal Disord Tech 2003, Maigne - Eur Spine J 2005, DePalma – Pain Med 2011, Liliang – Pain Med 2011, Ha – Spine 2008, Rudolf – Open Orthrop J 2012, Smith – Ann Surg Innov Res 2013, Ledonio Med Devices 2014, Polly Int J Spine Surg 2016, Sturesson – Int J Spine Surg 2017, Duhon – Int J Spine Surg 2016, Bornemann – Technol Health Care 2017, Spain – Int J Spine Surg 2017 (1824 total patients, 1204 female = 66%)*

Pregnancy-related Pelvic Girdle Pain (PPGP)

45% of pregnant women have lower back and/or pelvic pain[1]

25% of pregnant women report severe pain[1]

5% of ALL pregnant women had pain 3 years later [2]

1. Wu – *Eur Spine J* 2004
2. Norén – *Eur Spine J* 2002

Chronic Low Back Pain:

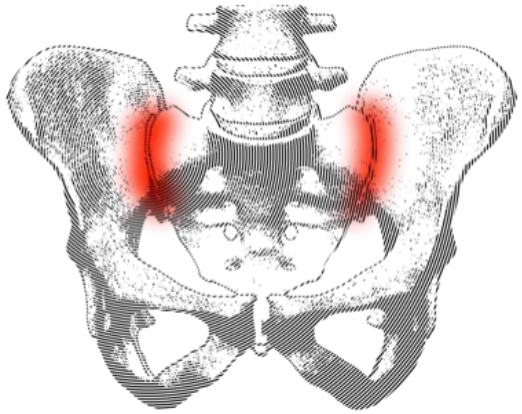
Relationship with Gender, Age, & BMI

Condition[1]	More prevalent in…
Lumbar internal disc disruption (IDD)	Young males
Facet joint pain (FJP)	Females with increased BMI
Sacroiliac Joint Pain (SIJP)	Female and low BMI

SIJP and PGP Contributing Factors:

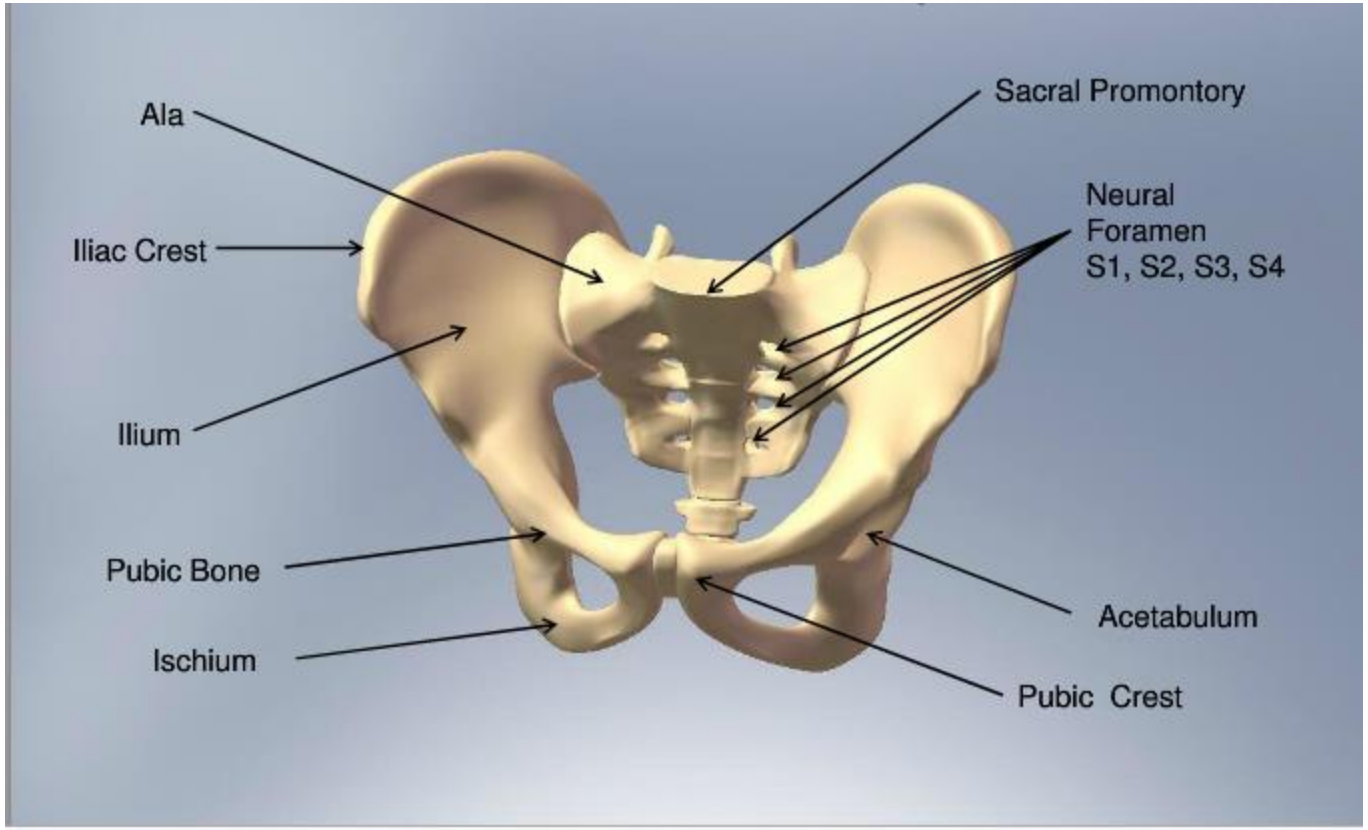
Mechanical[2], Traumatic[3], Hormonal[4], Degenerative[5]

1. DePalma – *Pain Med* 2012
2. Abramson - *Surg Gynecol Obstet* 1934
3. Wist – *Ann Chir Gynaecol Fenn* 1968
4. MacLennan – *The Lancet* 1986
5. Walde - *Acta Obstet Gynecol Scand Suppl* 1962

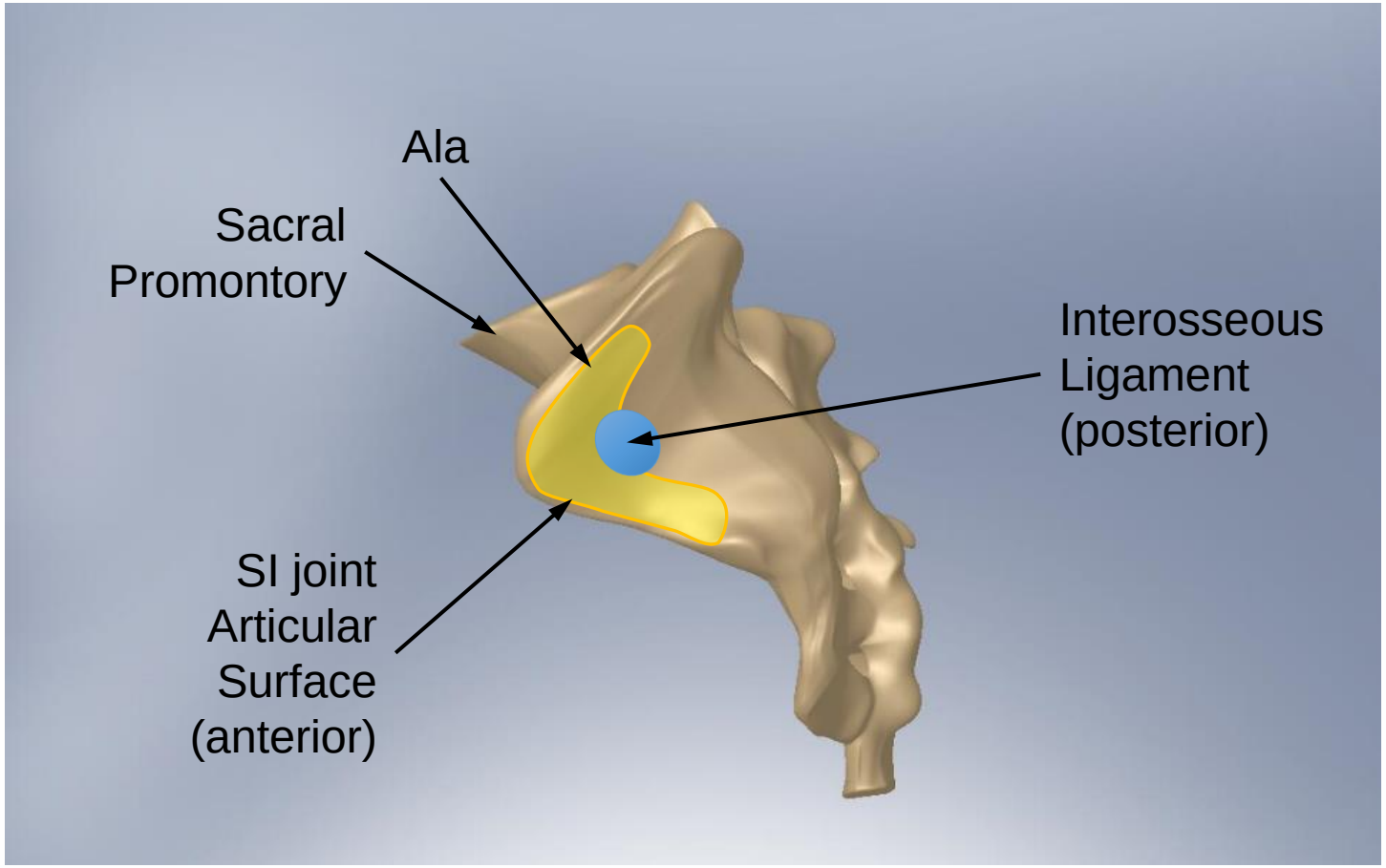


Anatomy of the SI joint

Anatomy of the Sacroiliac Joint

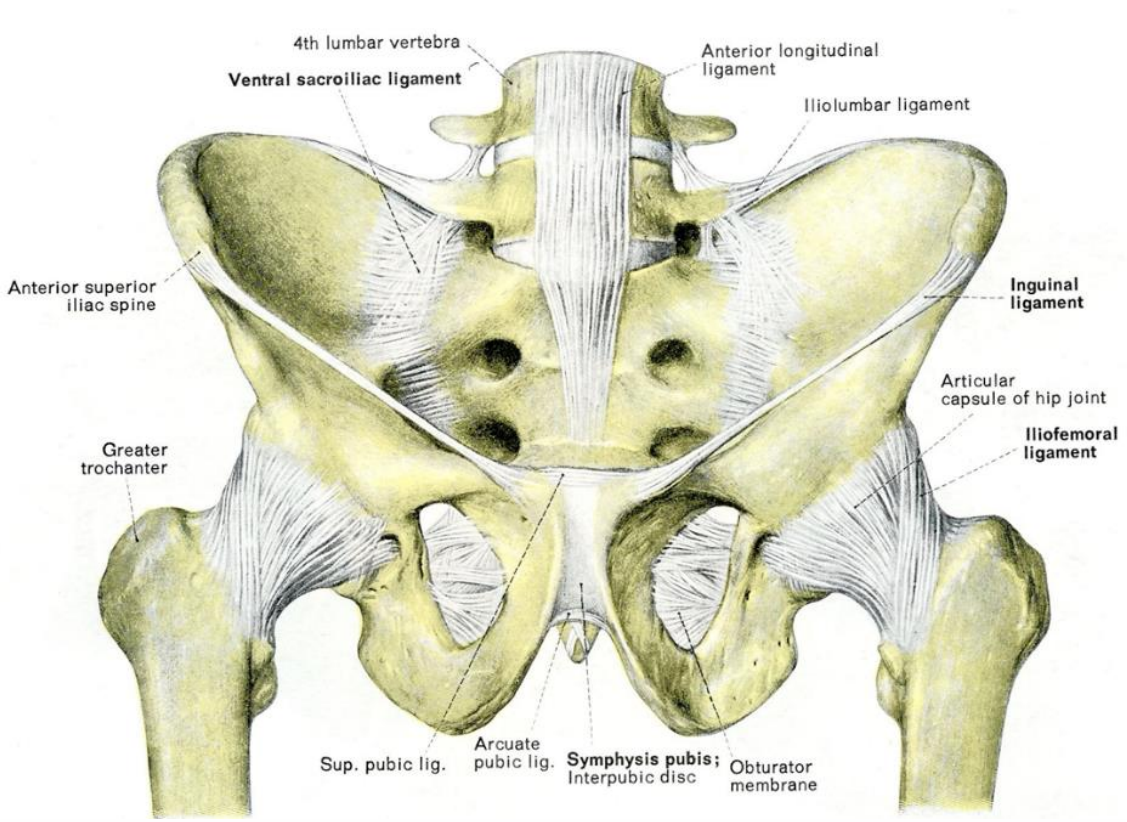


Anatomy: Lateral Sacrum

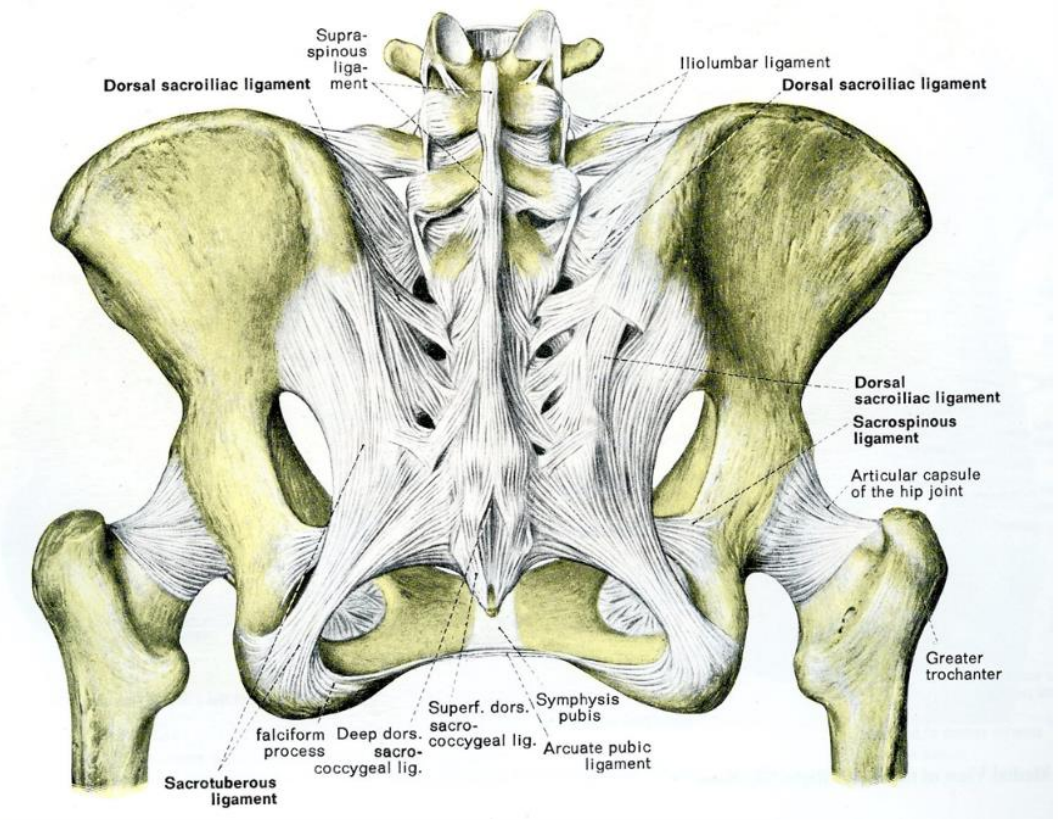


Sacroiliac Ligaments

Ventral Ligaments



Dorsal Ligaments

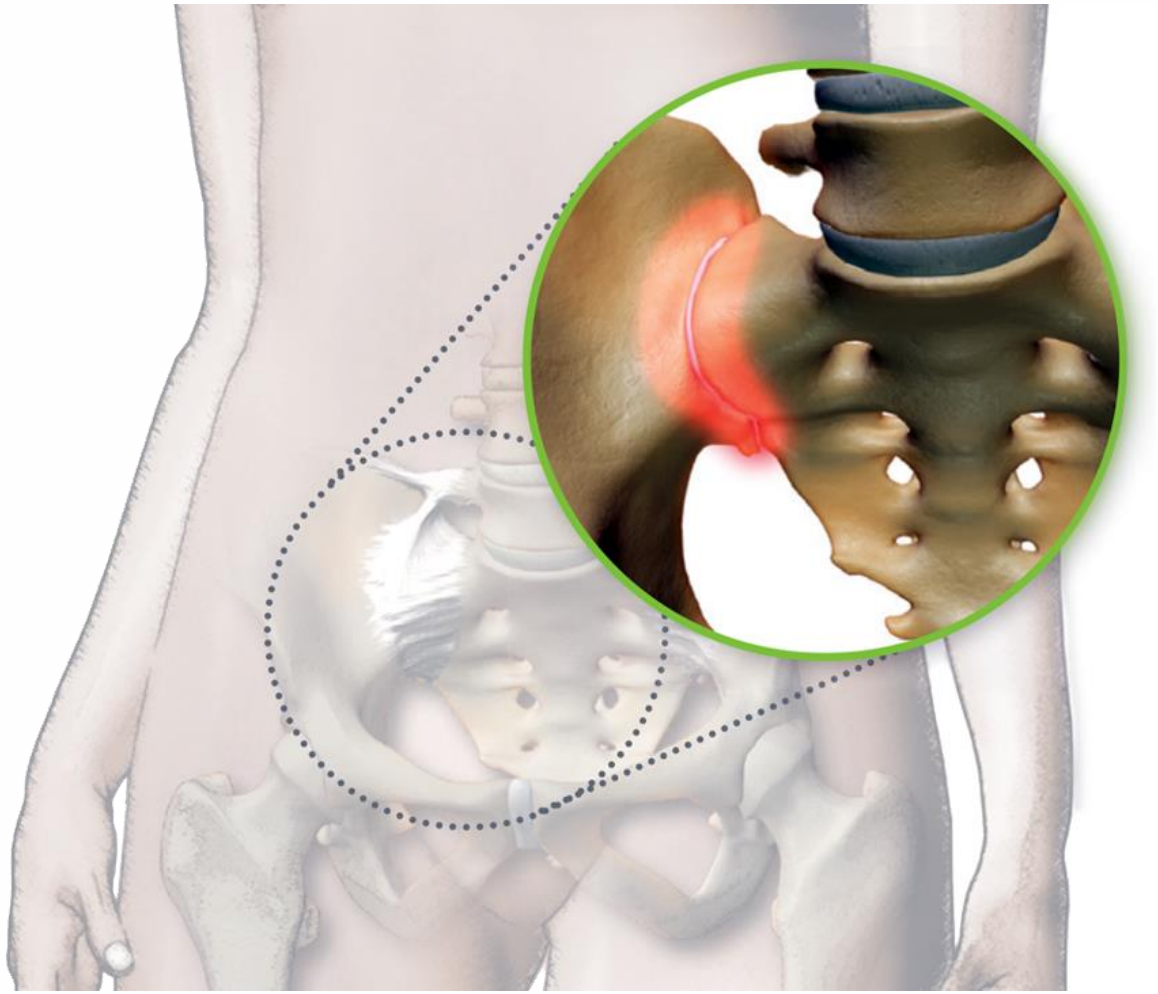


What we know about the SI joint:

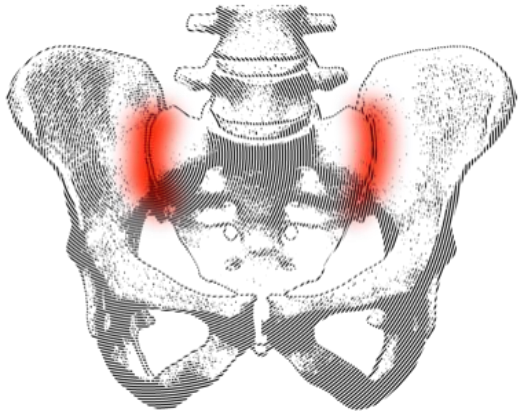
- **True synovial / diarthrodial joint**[1-3,7]
  - Hyaline cartilage, Type II collagen, synovial membrane
  - Subject to same pathology that affects other major joints
- **Moves**[1,3,4-7]
  - Nutation / Counternutation up to 4°
  - Sacral translation up to 1.6 mm
  - Motion not different in painful vs. non-painful patients
- **Does not typically ankylose over time**[7]

1. Forst – *Pain Physician* 2006
2. Dar – *Spine* 2005
3. Vanelderen – *Pain Practice* 2010 (Evidence-Based Medicine. 2010. Chapter 13. SI joint Pain)
4. Sturesson – *Spine* 1989
5. Sturesson – *Spine* 2000(a)
6. Sturesson – *Spine* 2000(b)
7. Vleeming – *J Anat* 2012

Why does it hurt?



- **Functionally Unstable**
  - Unable to accommodate load
- **Multifactorial**
  - Form: bones and ligaments
  - Force: ligaments and muscles
  - Motor control
  - Regional / Global alignment

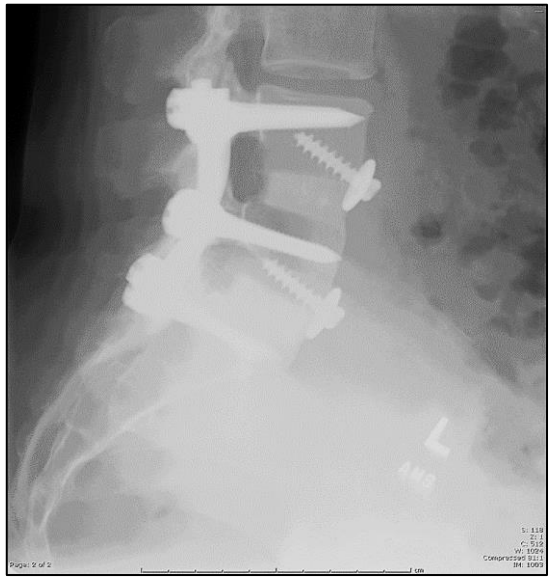


Differential diagnosis of the SI joint

Three Primary Groups of Patients

SI joint patients may be young or old.
There are three primary groups of patients.

Post lumbar fusion



Trauma

Postpartum

Differential Diagnosis:
Shooting at the Right Target

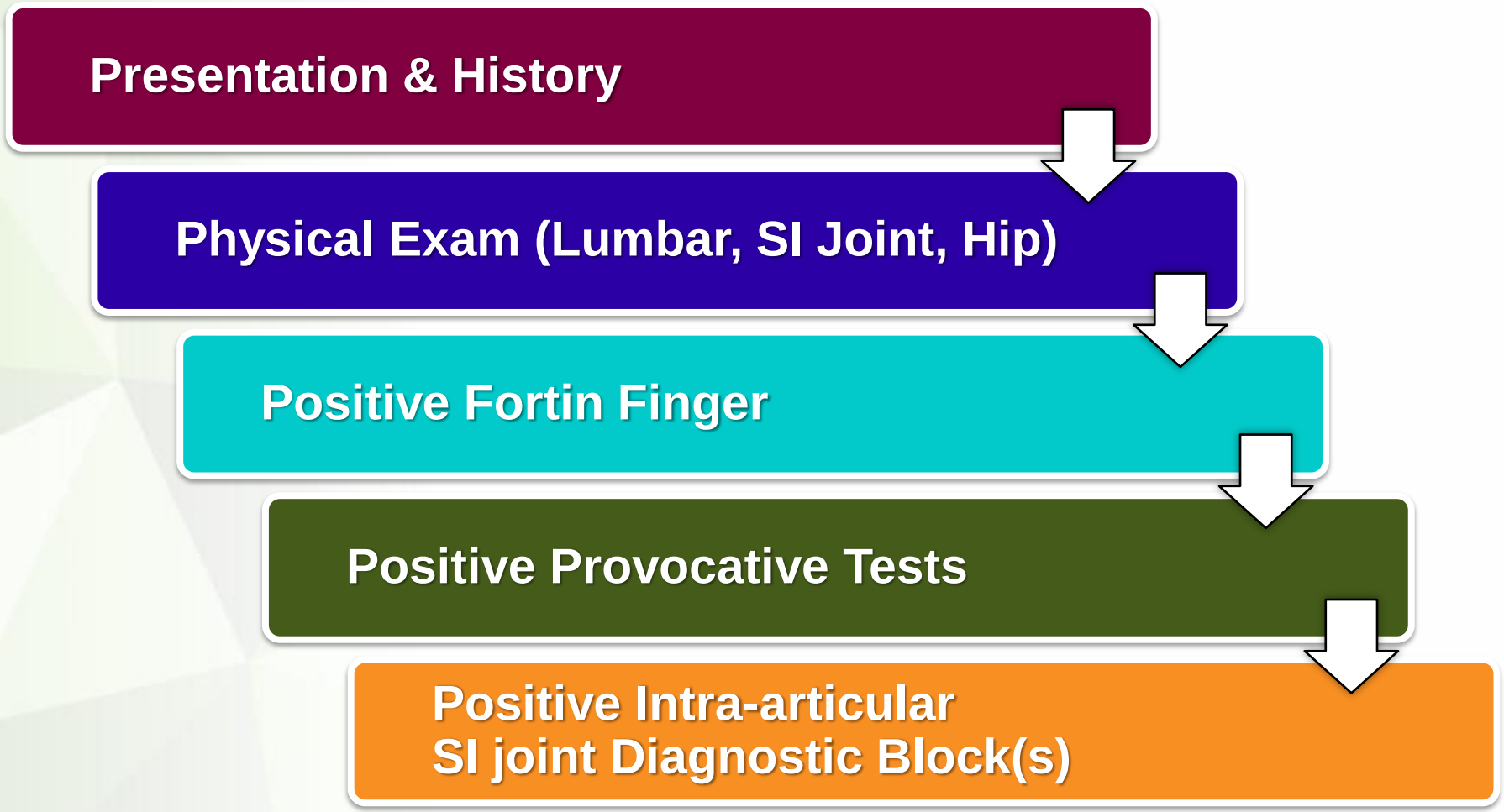
Multiple Possible Pain Generators

Lumbar Spine

SI Joint

Hip

Diagnostic Algorithm



Differential Diagnosis, Physical Exam: Hip, SIJ, Lumbar

LUMBAR SPINE

- **Range of Motion:** Forward flexion, extension, lateral flexion, rotation, combination
- **Neuro Exam**
  - Motor, Sensory, Deep Tendon Reflexes (DTRs)
  - Dural tension tests

SI JOINT

- **Palpation**
  - PSIS
  - Iliac crest
  - Dorsal Ligament
  - Sacral Sulcus
- **Provocative Tests**
- **Active Straight Leg Raise (ASLR)**

HIP and PELVIS

- **Range of Motion:** Flexion, extension, internal / external rotation
- **Scour Test:** (loaded circumduction)
- **Gait evaluation**
- **Palpation:** Piriformis, trochanteric area, ischial area

History and Complaints

History

When did the pain start?

- Prior trauma
  - A fall on the buttock
  - Car accident
  - Lift/Twist
  - Other
- Prior lumbar fusion
  - Prior iliac bone graft harvest
- Pregnancy

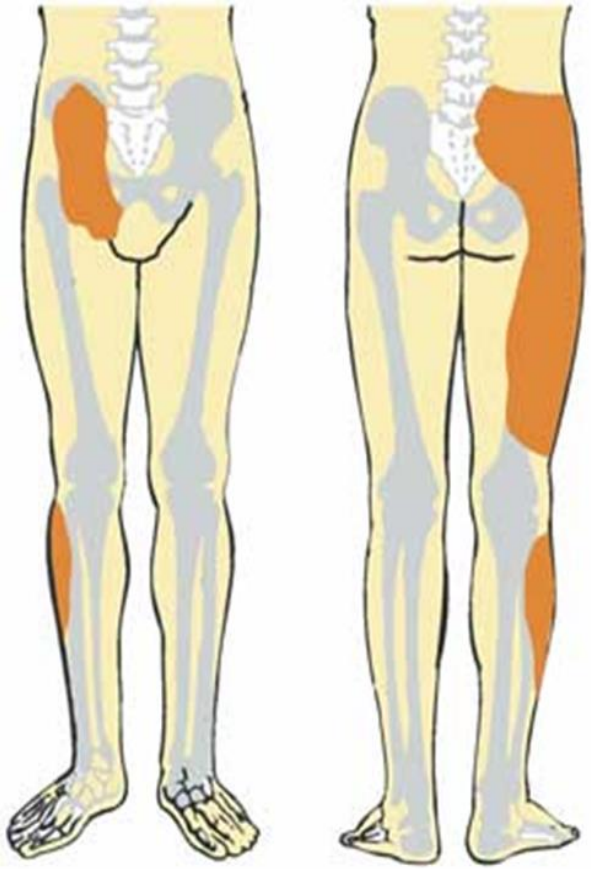
Complaints

- Lower back pain
- Sensation of lower extremity numbness, tingling, weakness
- Pelvis / buttock pain
- Hip / groin pain
- Feeling of unilateral leg instability (buckling, giving way)
- Disturbed sleep patterns
- Disturbed sitting patterns (unable to sit for long periods, on one side)
- Pain going from sitting to standing

SI Joint Pain Presentation

Pain Diagram

- **Pain in buttock and posterior thigh**
  - Usually not midline
  - Usually below L5
  - At or lateral to PSIS
  - Occasionally groin
- **Secondary pain in lateral thigh, groin, and/or lateral calf**



Fortin – *Spine* 1994

Exacerbating activities

Unilateral Weight Bearing

- Putting on Socks/Shoes
- Ascending/Descending Stairs
- Getting in and out of Car
- Prolonged Walking

(85% of gait cycle is single leg stance)

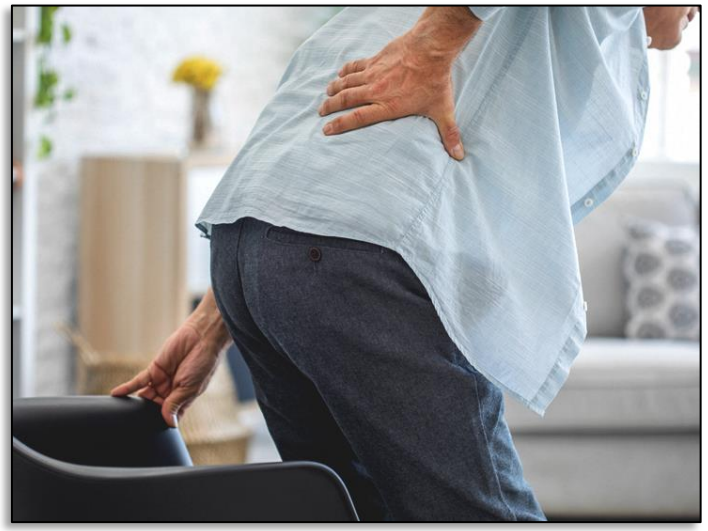
Janda - *Aust J Physiotherapy* 1983

Pain with Transitional Motions

- Supine to painful side
- Sit to stand
- Rolling over in bed
- Getting in /out of bed

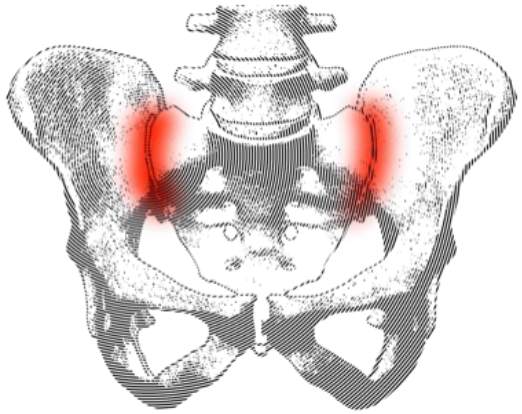
Pain while Stationary

- Sitting on affected side
- Prolonged standing/sitting



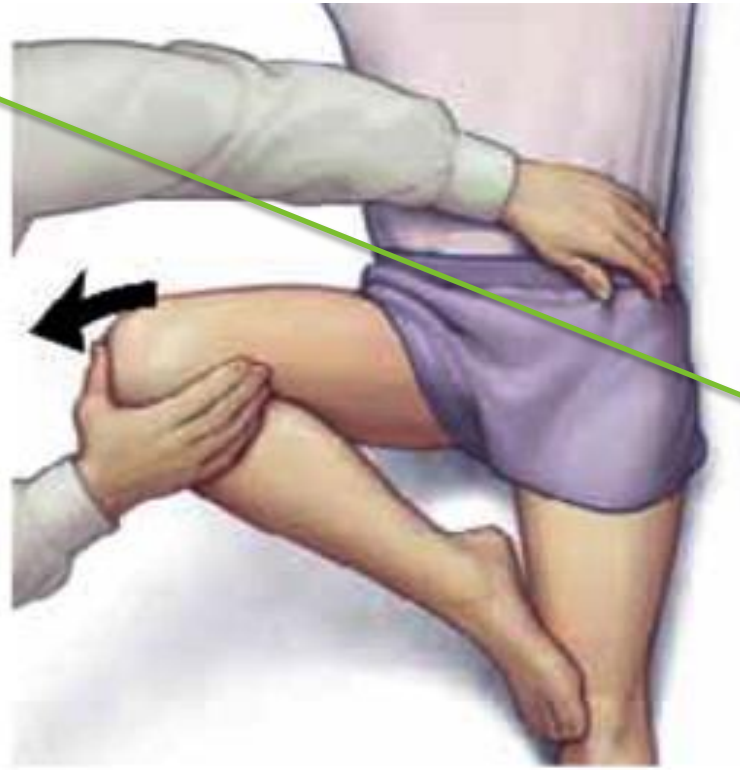
Relieving activities

- Bearing weight on unaffected side
- Lying on unaffected side
- Manual or belt stabilization



SI joint Physical Exam

Physical Exam



SI Joint Physical Exam

- Palpation
  - Tenderness over PSIS and sacral sulcus
  - Tenderness over dorsal ligament insertion
  - Tenderness over pubic symphysis
- Gait assessment
- Single leg stance
- Functional testing (stairs, sit-to-stand)
- Active SLR
- Provocative Testing (must have 3 of 5 positive tests)

Fortin Finger Test

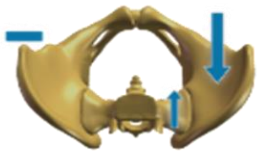
- **Localization of pain**
- **Patient points to pain while standing**
  - Able to localize pain with one finger
  - Within 1 cm of PSIS (inferomedial)
  - Consistent over at least 2 trials

Fortin – *Am J Ortho* 1997

SI joint provocative tests

Distraction

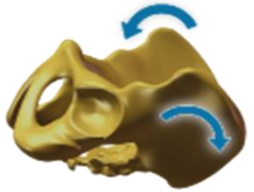
Thigh Thrust



FABER

Compression

Gaenslen's



3 of 5 positive tests
provides discriminative power for diagnosing SI joint pain

Szadek – *J Pain* 2009
Laslett – *J Man Manip Ther* 2008

SI Joint: Provocative Tests

The following five provocative tests, when performed in combination, are proven to have a high degree of sensitivity and specificity:

1. **Distraction*** (Highest PPV**)
2. **Thigh Thrust***
3. **FABER**
4. **Compression***
5. **Gaenslen's Maneuver**

	Laslett[1,2]	Szadek[3]
	3 or more positive tests	
Sensitivity	91%	85%
Specificity	78%	76%

* Most sensitive of tests
** PPV = *positive predictive value*

1. Laslett – *Man Ther* 2005
2. Laslett – *J Man Manip Ther* 2008
3. Szadek – *J Pain* 2009

When to Proceed with SI Joint Injection

Positive
History

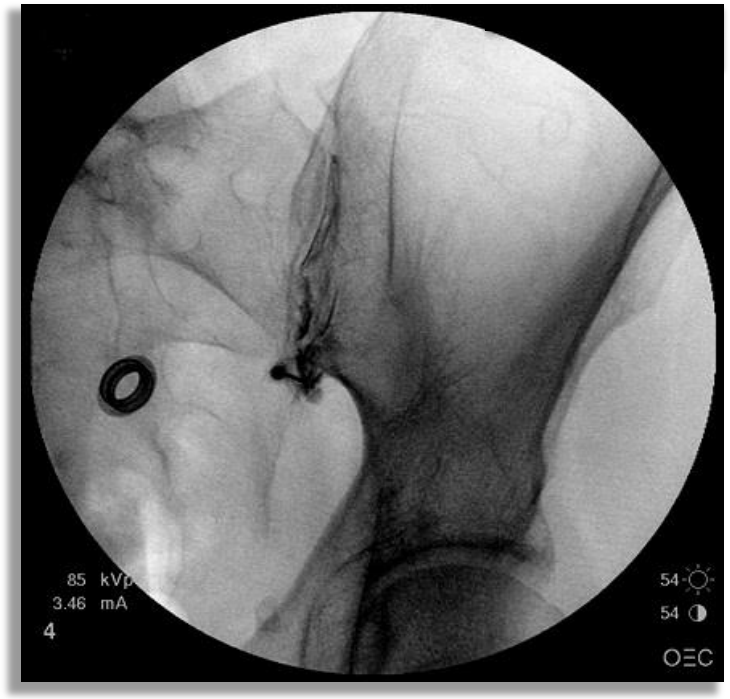
Positive
Fortin Finger Test
and
Physical Exam

(Lumbar Spine, SI Joint, and Hip)

Positive
Provocative
Testing

What's the Reference Standard for Diagnosis?

Injection Under Fluoroscopy



Diagnostic Injection

- Confirm with contrast and imaging
- Low volume, local anesthetic
- Pain reduction for positive test*
  - ≥ 75% required per NASS Recommendations[2]
  - ≥ 50% required per ISASS Guidelines[1]
  - < 50% = maybe SIJ, but consider other pain sources

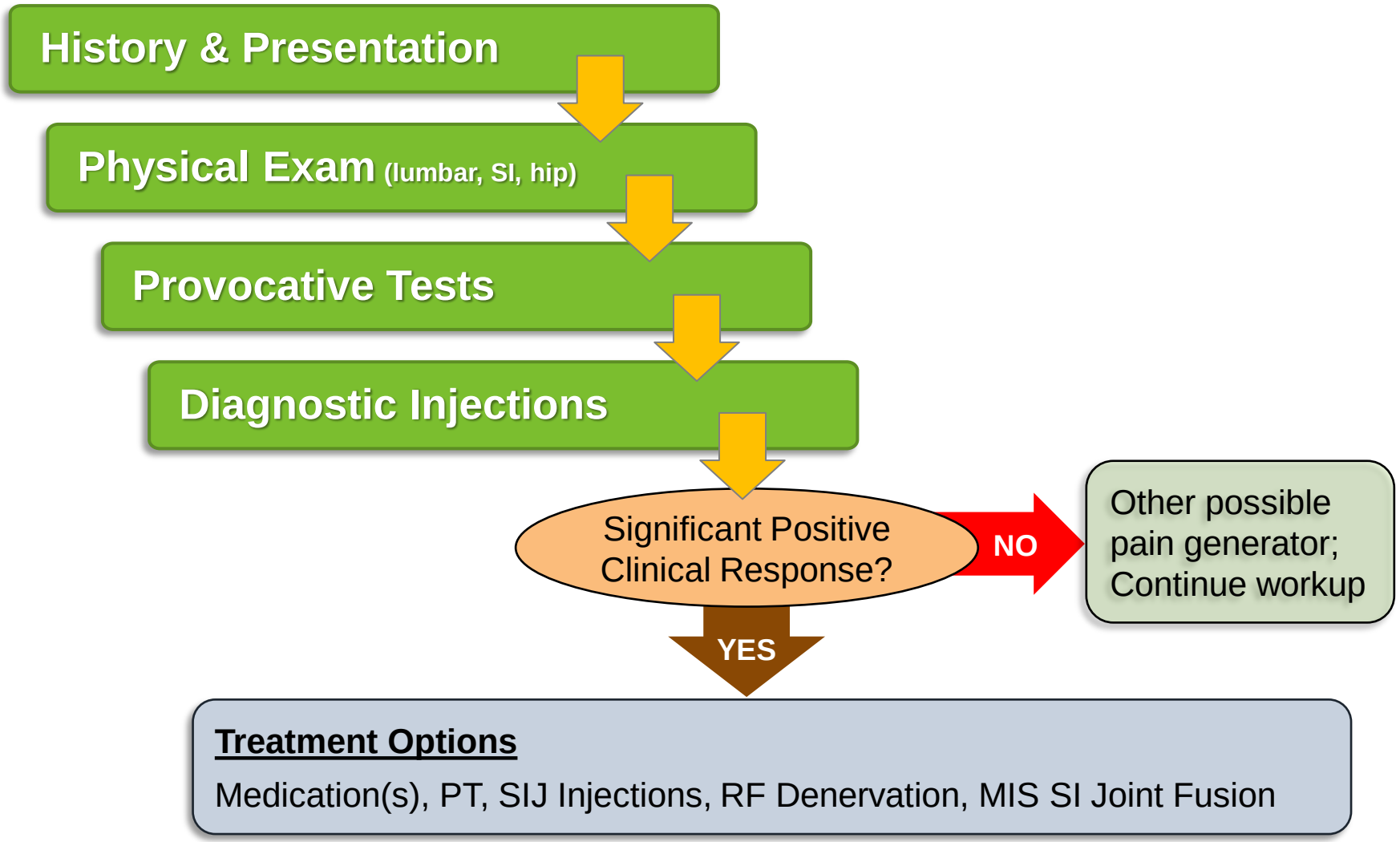
Therapeutic Injection

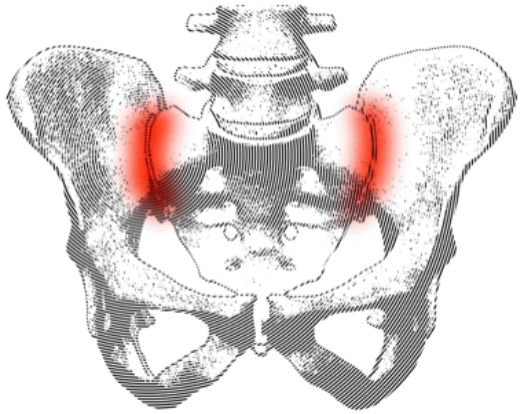
- Local anesthetic + corticosteroid
- May provide intermediate or long-term relief

1. Lorio – *Int J Spine Surg* 2016 (ISASS Policy 2016 Update - Minimally Invasive Sacroiliac Joint Fusion)
2. Bono, et al. NASS Coverage Policy Recommendations: Percutaneous Sacroiliac Joint Fusion. June 9, 2015.

* Check payor policy for positive test criteria

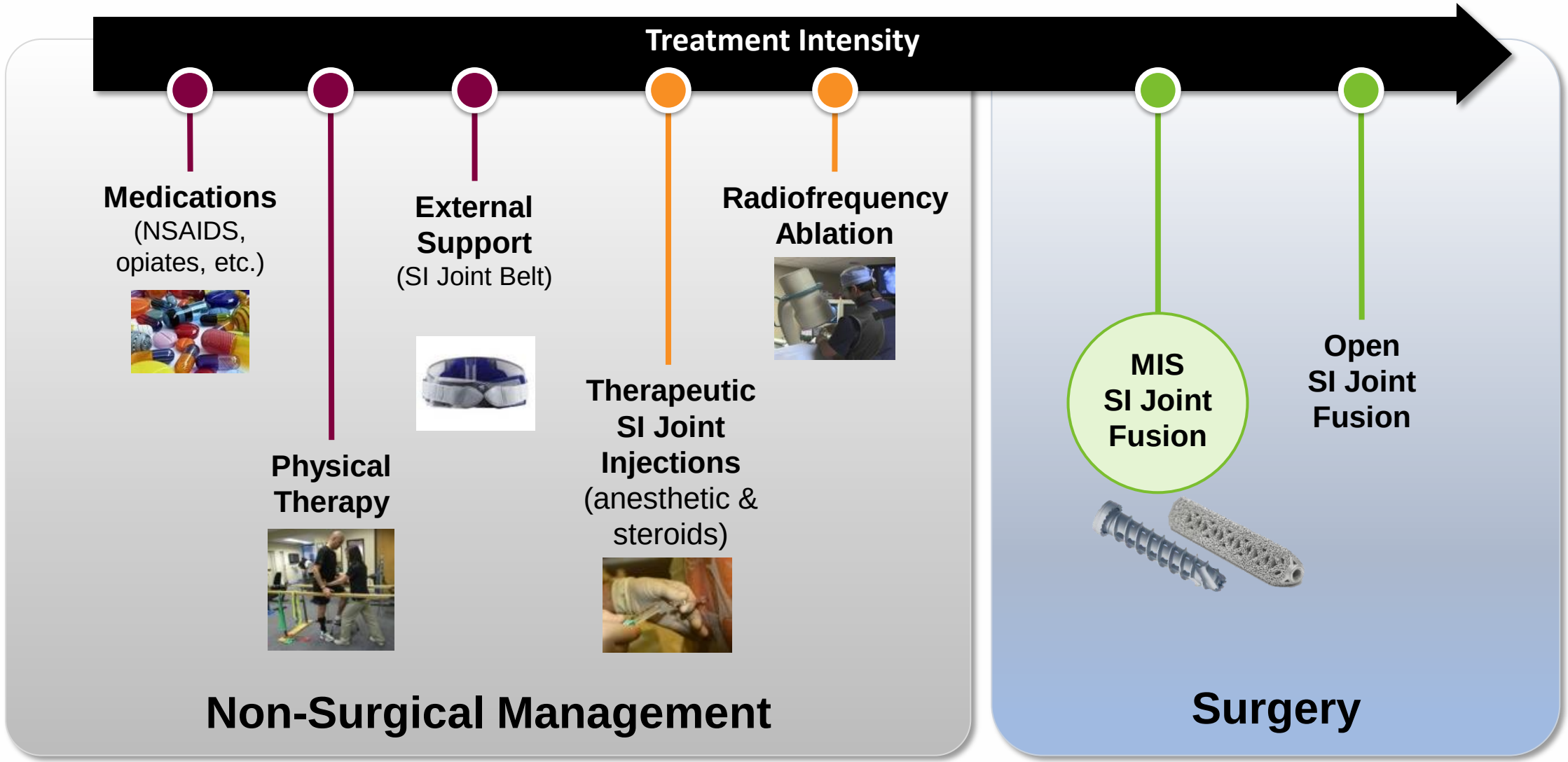
Diagnostic Algorithm for SI Joint Pain





Non-Surgical Management

SI Joint Treatment Continuum



Non-surgical Management

Symptom Management

Medications	NSAIDs, Oral Steroids, & other pain meds	No high-level evidence
External SI joint stabilization	Belting	No high-level evidence
Physical Therapy	• Motor control & core strength • Restore functional stability • Mechanics modification	Some evidence for modest improvement

1. Sembrano – *Current Orthopedic Practice* 2011
2. Cohen – *Anesth Analg* 2005
3. Sasso – *Orthopedics* 2001

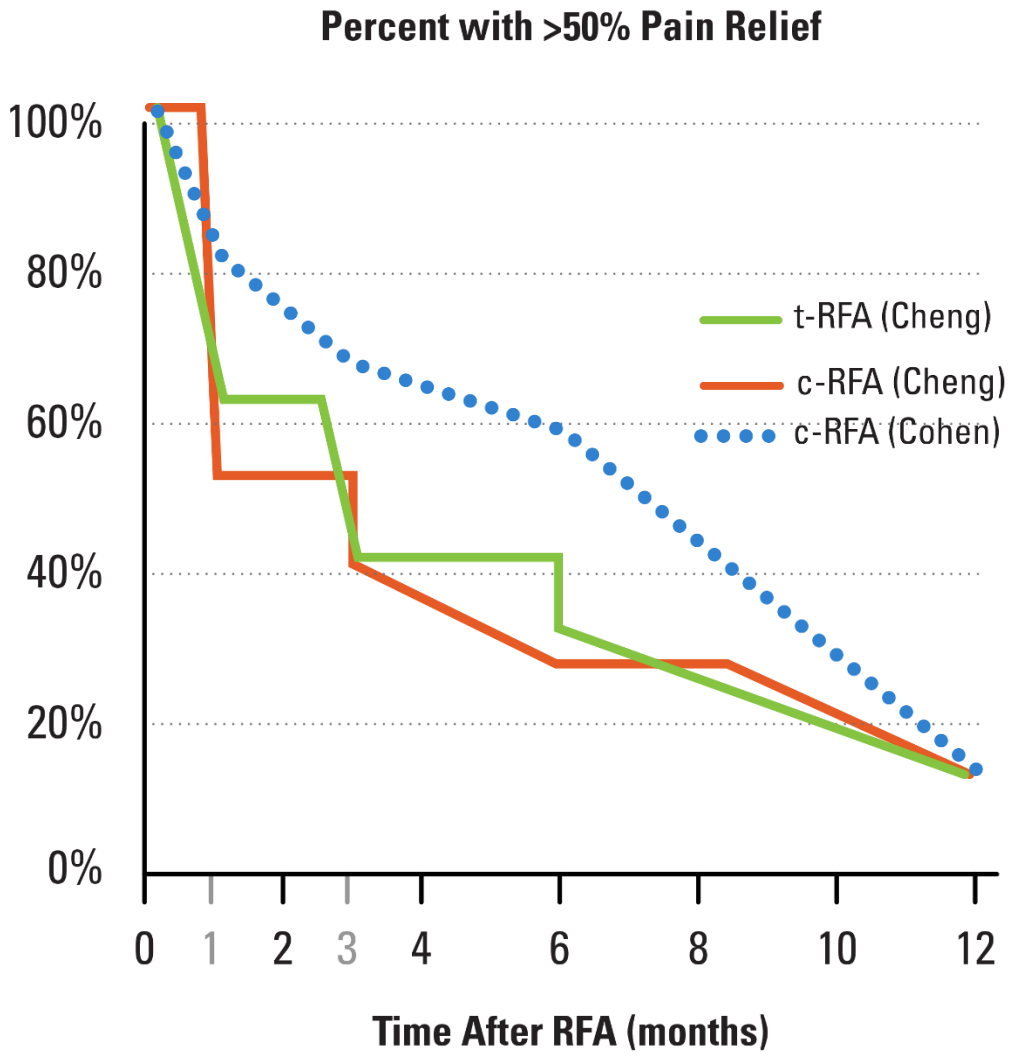
Non-surgical Management

Therapeutic Injections

- Typically 1-4 injections per year
- Some high-level evidence but for ONLY short-term relief

Hawkins - *Pain Med* - 2009

RFA for SI Joint Pain



Cheng et al. 2012[1]

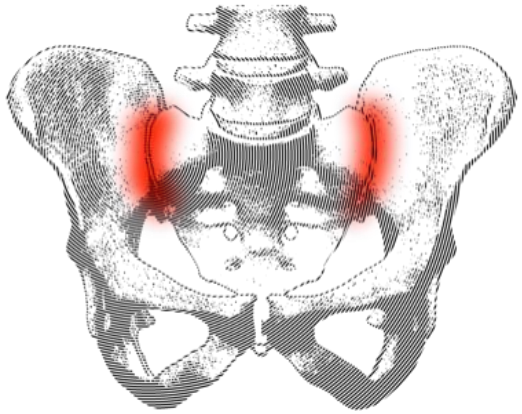
- 88 patients
  - 30 traditional RF
  - 58 cooled RF

Cohen et al. 2008[2]

- 28 patients

"…benefit constrained by nerve regeneration to between 6 months and 1 yr."

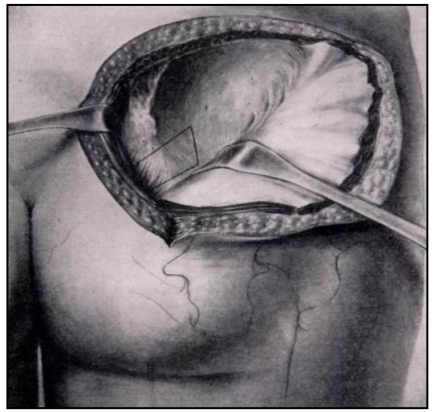
1. Cheng – *Clin J Pain* 2013
2. Cohen - *Anesthesiology* 2008



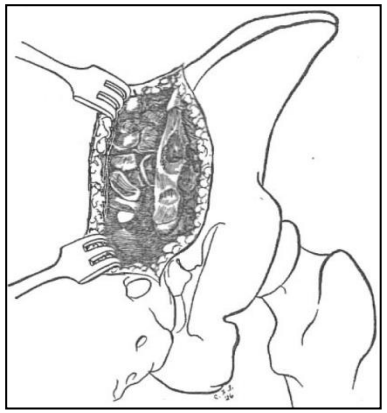
Surgical treatment of the SI joint

Surgical Treatment

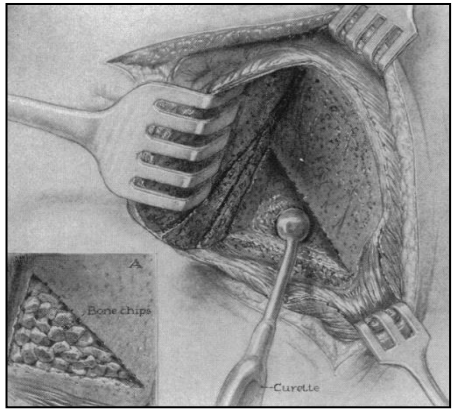
Historical: Open, invasive



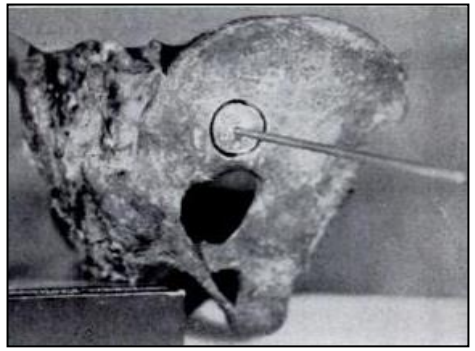
1926 Smith-Petersen
J Bone Joint Surg Am

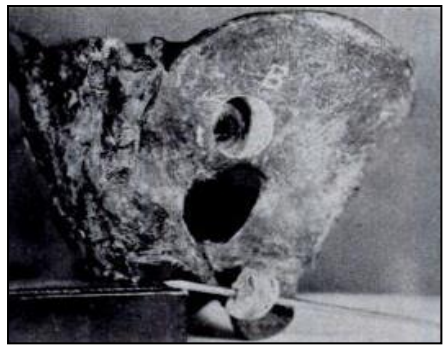


1927 Campbell
Gynecol Obstet



1927 Gaenslen
JAMA





1937 Bloom – *J Bone Joint Surg*

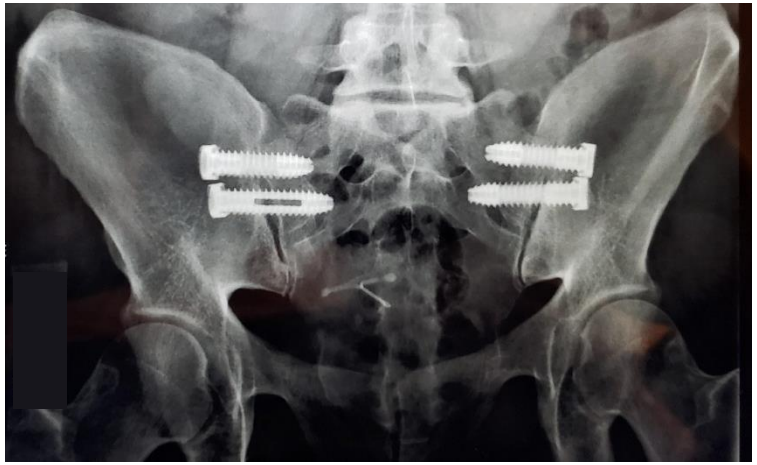
Modern: Minimally invasive

Minimally invasive SIJ fusion 2008:
Wound size compared to a dime

Treatment with ilio-sacral screws

Design

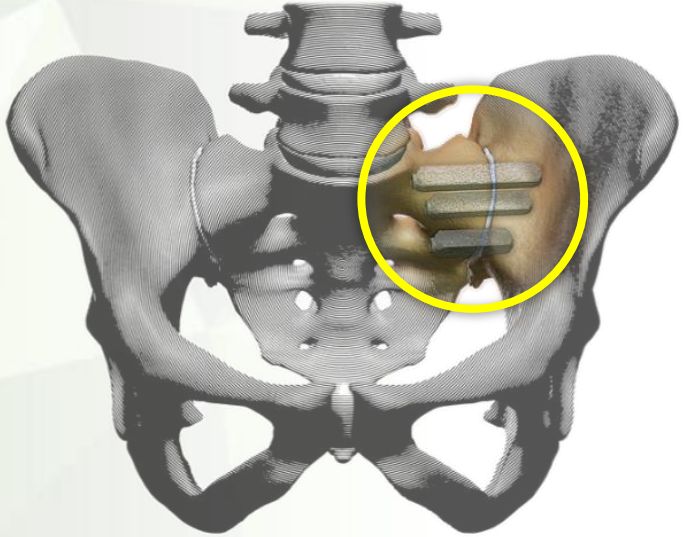
- Minimally invasive
- Stabilizes SI joint to stop movement and pain
- Screw features (fenestrations) designed to allow fusion of SI Joint

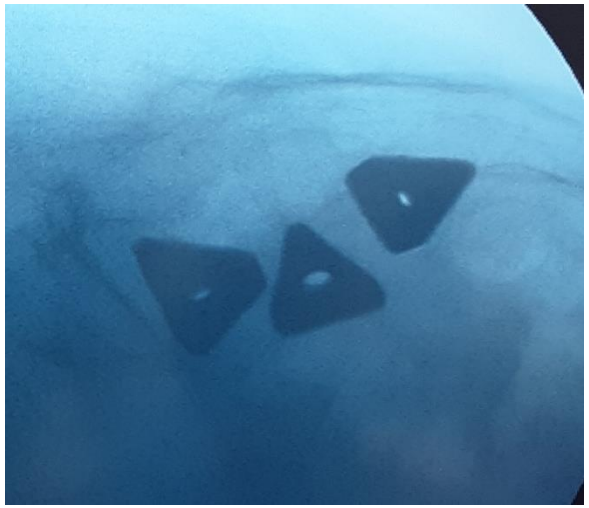


Treatment with triangular titanium implants (TTI)

Design

- Minimally invasive
- Triangular shape (minimizes rotation)
- Interference press fit (immediate fixation)
- Porous titanium surface
  (to promote bony ongrowth/ingrowth for long-term fusion)



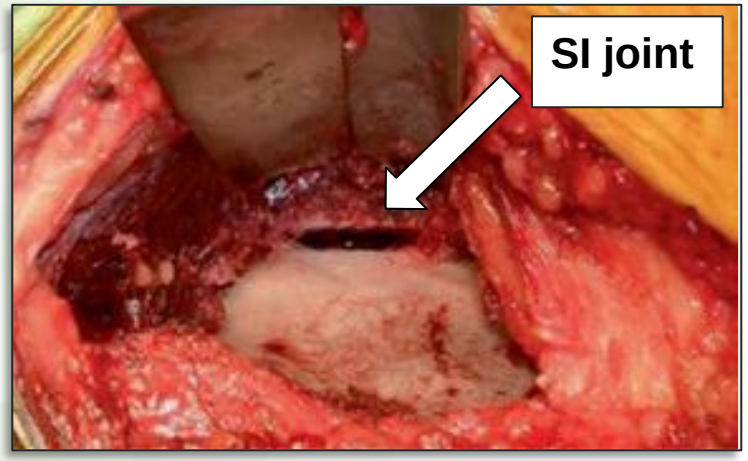


Treatment with screws or TTI is minimally invasive

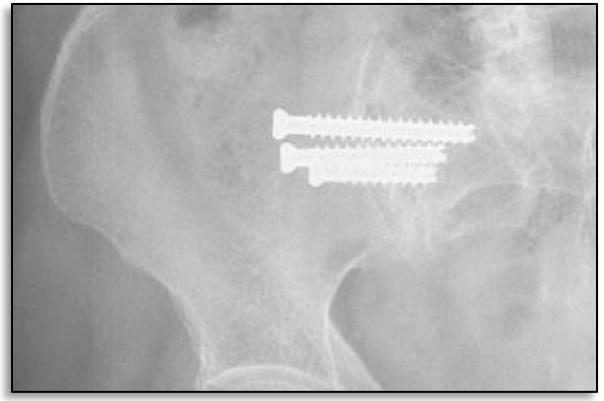
Advantages over open surgery

- Small incision only
- Minimal blood loss
- Low complication rates

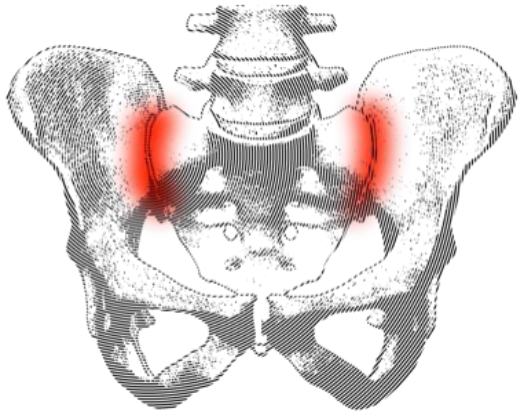
Anterior, open



vs. MIS

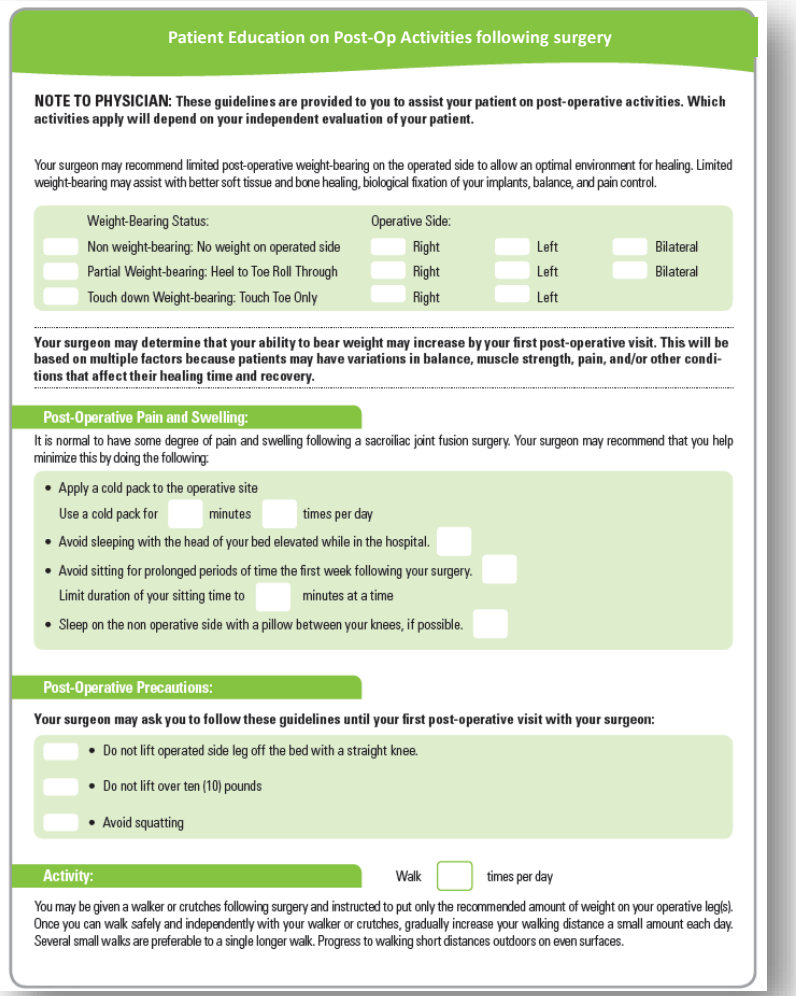


Murakami – *Sacroiliac Joint Disorder* 2018



Post-op considerations

Post-Operative Guidelines and Precautions



Patient Education on Post-Op Activities following surgery

NOTE TO PHYSICIAN: These guidelines are provided to you to assist your patient on post-operative activities. Which activities apply will depend on your independent evaluation of your patient.

Your surgeon may recommend limited post-operative weight-bearing on the operated side to allow an optimal environment for healing. Limited weight-bearing may assist with better soft tissue and bone healing, biological fixation of your implants, balance, and pain control.

Weight-Bearing Status:	Operative Side:		
☐ Non weight-bearing: No weight on operated side	☐ Right	☐ Left	☐ Bilateral
☐ Partial Weight-bearing: Heel to Toe Roll Through	☐ Right	☐ Left	☐ Bilateral
☐ Touch down Weight-bearing: Touch Toe Only	☐ Right	☐ Left	

Your surgeon may determine that your ability to bear weight may increase by your first post-operative visit. This will be based on multiple factors because patients may have variations in balance, muscle strength, pain, and/or other conditions that affect their healing time and recovery.

Post-Operative Pain and Swelling:

It is normal to have some degree of pain and swelling following a sacroiliac joint fusion surgery. Your surgeon may recommend that you help minimize this by doing the following:

- Apply a cold pack to the operative site
  Use a cold pack for ☐ minutes ☐ times per day
- Avoid sleeping with the head of your bed elevated while in the hospital. ☐
- Avoid sitting for prolonged periods of time the first week following your surgery. ☐
  Limit duration of your sitting time to ☐ minutes at a time
- Sleep on the non operative side with a pillow between your knees, if possible. ☐

Post-Operative Precautions:

Your surgeon may ask you to follow these guidelines until your first post-operative visit with your surgeon:

- ☐ Do not lift operated side leg off the bed with a straight knee.
- ☐ Do not lift over ten (10) pounds
- ☐ Avoid squatting

Activity: Walk ☐ times per day

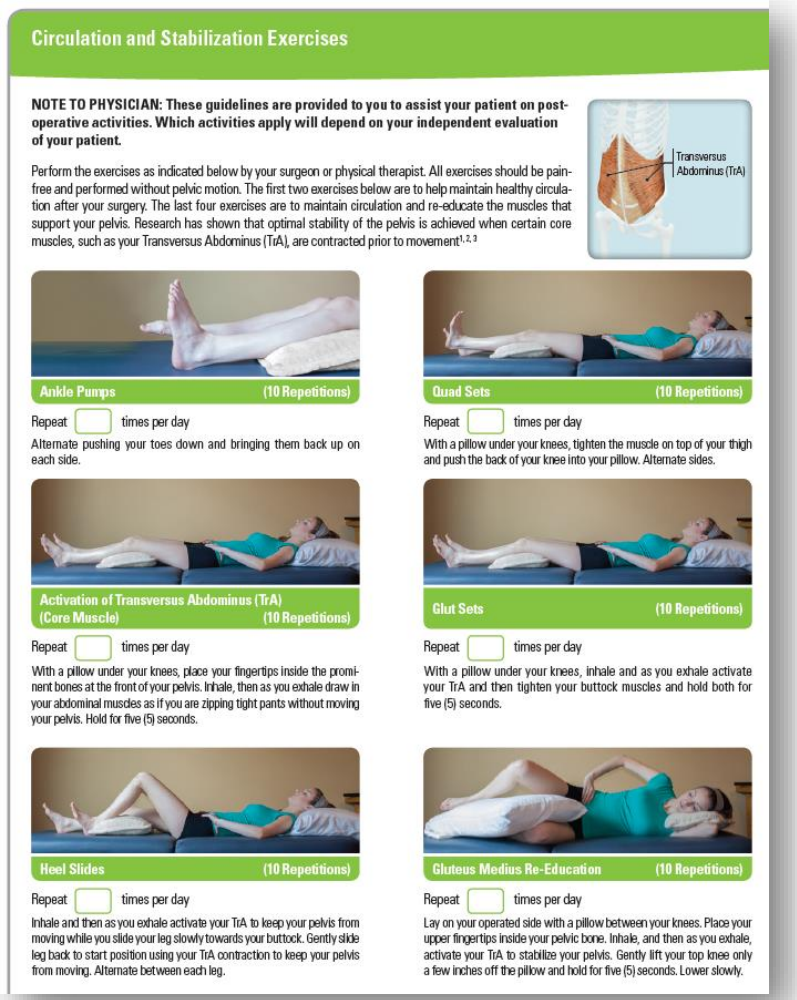
You may be given a walker or crutches following surgery and instructed to put only the recommended amount of weight on your operative leg(s). Once you can walk safely and independently with your walker or crutches, gradually increase your walking distance a small amount each day. Several small walks are preferable to a single longer walk. Progress to walking short distances outdoors on even surfaces.

Weight-bearing Status

Post-Operative Swelling Prevention

Precautions and Activity Guidelines

Circulation and Stabilization Exercises



Circulation and Stabilization Exercises

NOTE TO PHYSICIAN: These guidelines are provided to you to assist your patient on post-operative activities. Which activities apply will depend on your independent evaluation of your patient.

Perform the exercises as indicated below by your surgeon or physical therapist. All exercises should be pain-free and performed without pelvic motion. The first two exercises below are to help maintain healthy circulation after your surgery. The last four exercises are to maintain circulation and re-educate the muscles that support your pelvis. Research has shown that optimal stability of the pelvis is achieved when certain core muscles, such as your Transversus Abdominus (TrA), are contracted prior to movement[1,2,3]

Ankle Pumps (10 Repetitions)

Repeat ☐ times per day

Alternate pushing your toes down and bringing them back up on each side.

Quad Sets (10 Repetitions)

Repeat ☐ times per day

With a pillow under your knees, tighten the muscle on top of your thigh and push the back of your knee into your pillow. Alternate sides.

Activation of Transversus Abdominus (TrA) (Core Muscle) (10 Repetitions)

Repeat ☐ times per day

With a pillow under your knees, place your fingertips inside the prominent bones at the front of your pelvis. Inhale, then as you exhale draw in your abdominal muscles as if you are zipping tight pants without moving your pelvis. Hold for five (5) seconds.

Glut Sets (10 Repetitions)

Repeat ☐ times per day

With a pillow under your knees, inhale and as you exhale activate your TrA and then tighten your buttock muscles and hold both for five (5) seconds.

Heel Slides (10 Repetitions)

Repeat ☐ times per day

Inhale and then as you exhale activate your TrA to keep your pelvis from moving while you slide your leg slowly towards your buttock. Gently slide leg back to start position using your TrA contraction to keep your pelvis from moving. Alternate between each leg.

Gluteus Medius Re-Education (10 Repetitions)

Repeat ☐ times per day

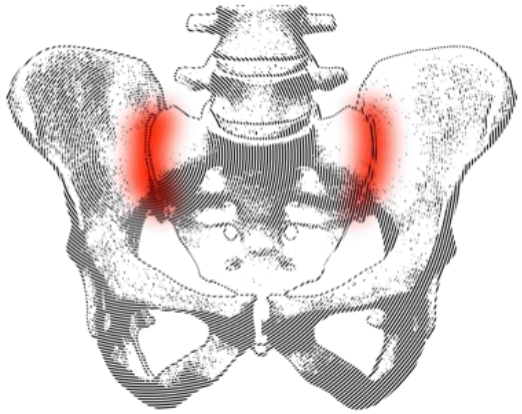
Lay on your operated side with a pillow between your knees. Place your upper fingertips inside your pelvic bone. Inhale, and then as you exhale, activate your TrA to stabilize your pelvis. Gently lift your top knee only a few inches off the pillow and hold for five (5) seconds. Lower slowly.

Description of Core Strengthening

Exercises for DVT Prevention combined with basic core strengthening

Post-Operative physical therapy objectives

- Patient Education: Positioning, Posture, and Body Mechanics
- Gait Training
- Balance Assessment and Training
- Timing and Engagement of Core Local/Global Stabilizers
- Achieve Normal Muscle Strength and Length Balance



Clinical data

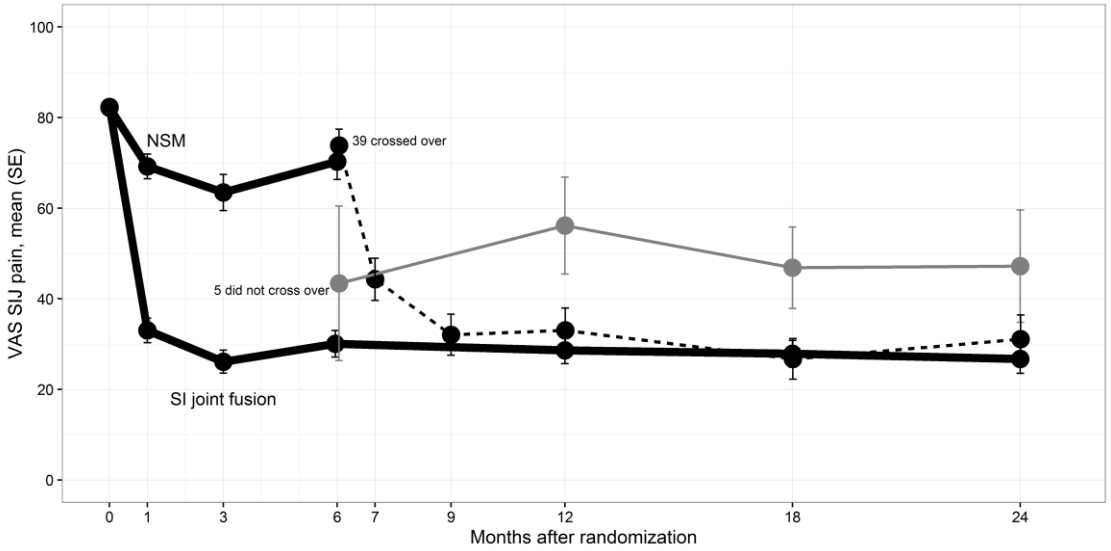
2-year RCT: SIJ Fusion With TTIs vs. NSM

Two-Year Outcomes from a Randomized Controlled Trial of Minimally Invasive Sacroiliac Joint Fusion vs. Non-Surgical Management for Sacroiliac Joint Dysfunction

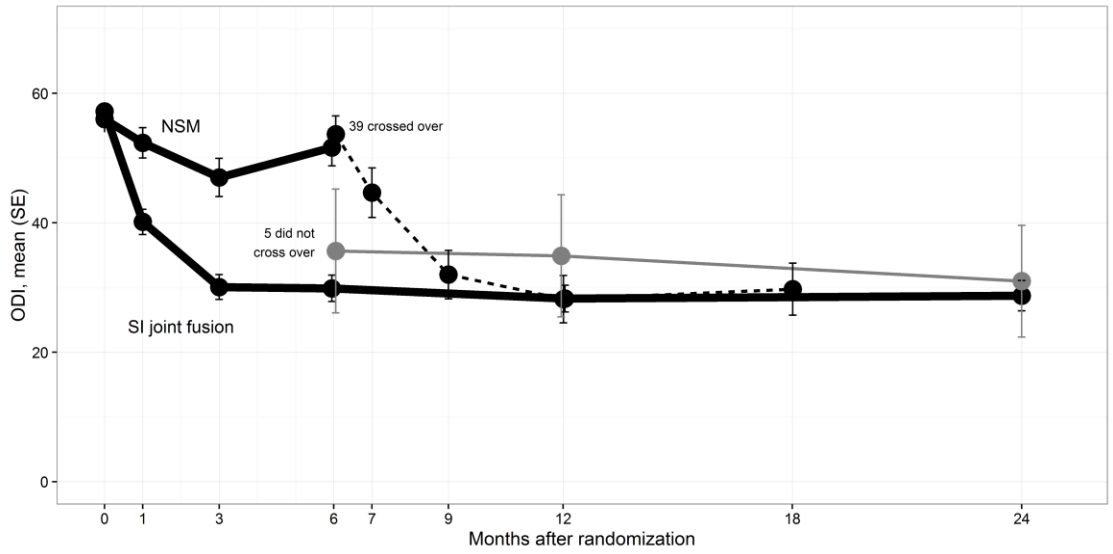
David W. Polly, MD,[1] John Swofford, MD,[2] Peter G. Whang, MD,[3] Clay J. Frank, MD,[4] John A. Glaser, MD,[5] Robert P. Limoni, MD,[6] Daniel J. Cher, MD,[7] Kathryn D. Wine, MPH,[7] Jonathan N. Sembrano, MD,[8] and the INSITE Study Group.

[1]Departments of Orthopedic Surgery and Neurosurgery, University of Minnesota, Minneapolis, MN [2]Indiana Interventional Pain, Indiana Surgery Center East, Indianapolis, IN [3]Department of Orthopaedics and Rehabilitation, Yale University School of Medicine, New Haven CT [4]Integrated Spine Care, Wauwatosa, WI [5]Medical University of South Carolina, Charleston, SC [6]Aurora BayCare Orthopedic & Sports Medicine Center, Green Bay, WI [7]SI-BONE, Inc., San Jose, CA [8]Department of Orthopaedic Surgery, University of Minnesota, Minneapolis, MN

VAS Pain



ODI



Polly – *Int J Spine Surg* 2016

2-year RCT:
SI Joint Fusion vs. NSM

		SI Joint Fusion % subjects	NSM % subjects
Primary Endpoint *	Success @ 6 mo	82%	26%
Patient Satisfaction	Very or somewhat satisfied	90% (6 mo) 88% (2 yr)	61% (6 mo)
Clinical Improvement (Minimum Clinically Important Difference)	VAS improvement ≥ 20pt	83% (2 yr)	10% (2 yr)
	ODI improvement ≥ 15pt	68% (2 yr)	7.5% (2 yr)
Opioid Use	% change in number of subjects taking opioids	30% ↓ (baseline to 2 yr)	7.5% ↑ (baseline to 6 mo)

* Binary success/failure composite measure. Success if all criteria met: VAS SI joint pain reduction ≥ 20 points, no device-related SAEs, no neurological worsening, and no surgical re-intervention for SI joint pain.

Polly – *Int J Spine Surg* 2016

iMIA 2-year RCT Results: LBP and ODI

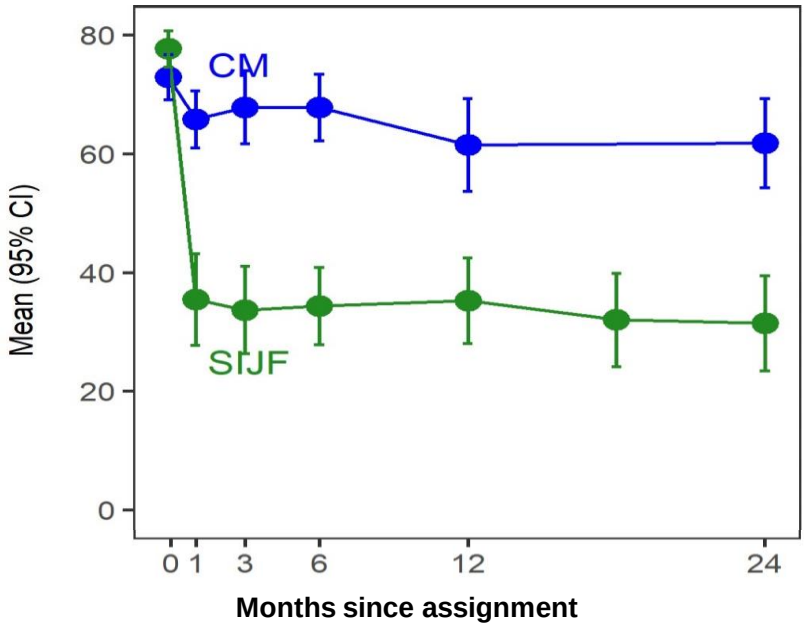
Improves more after TTIs than CM

J Bone Joint Surg Am. 2019 Mar 6;101(5):400-411. doi: 10.2106/JBJS.18.00022.

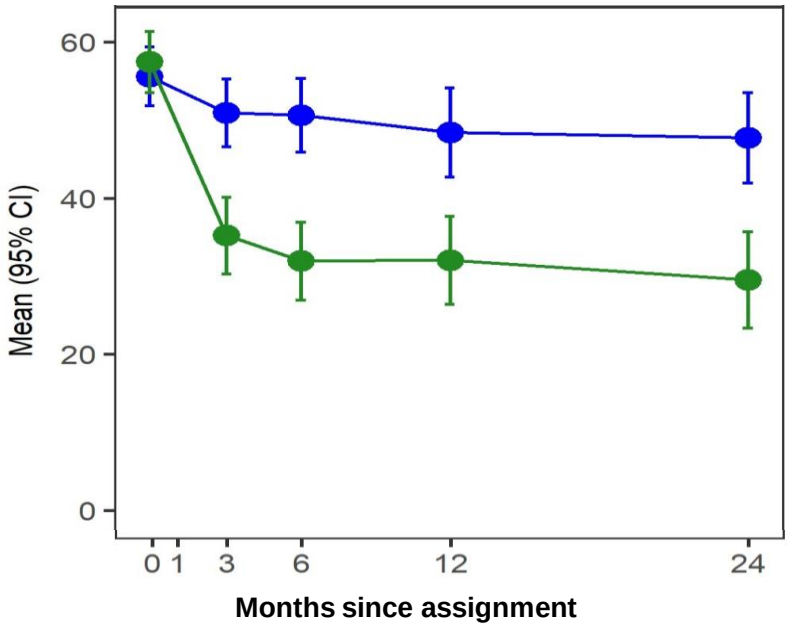
Randomized Trial of Sacroiliac Joint Arthrodesis Compared with Conservative Management for Chronic Low Back Pain Attributed to the Sacroiliac Joint.

Dengler J[1,2,3], Kools D[4], Pflugmacher R[5], Gasbarrini A[6], Prestamburgo D[7], Gaetani P[8], Cher D[9], Van Eeckhoven E[10], Annertz M[11], Sturesson B[12].

VAS LBP



ODI

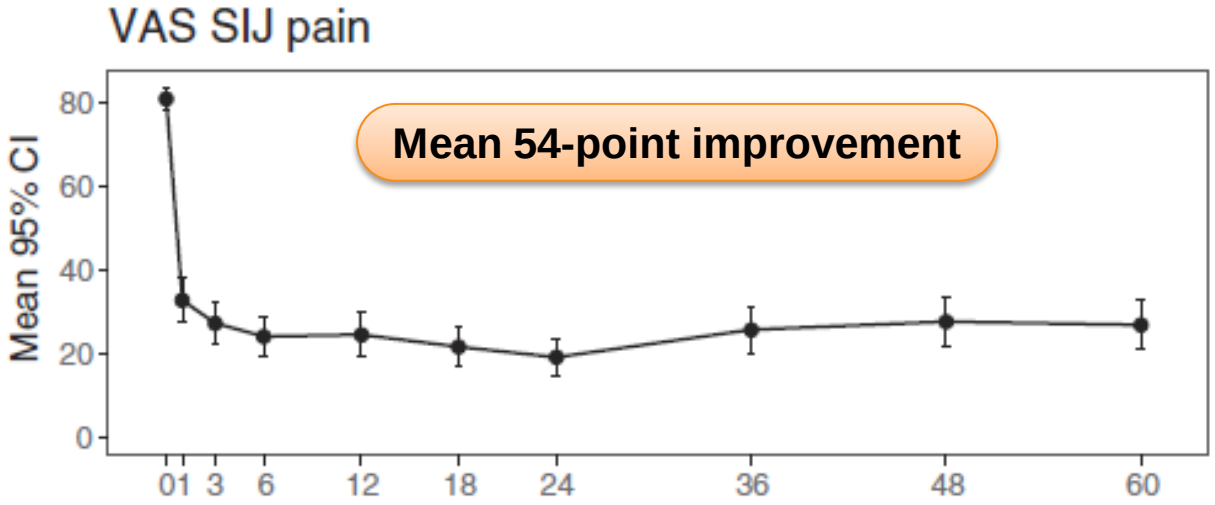


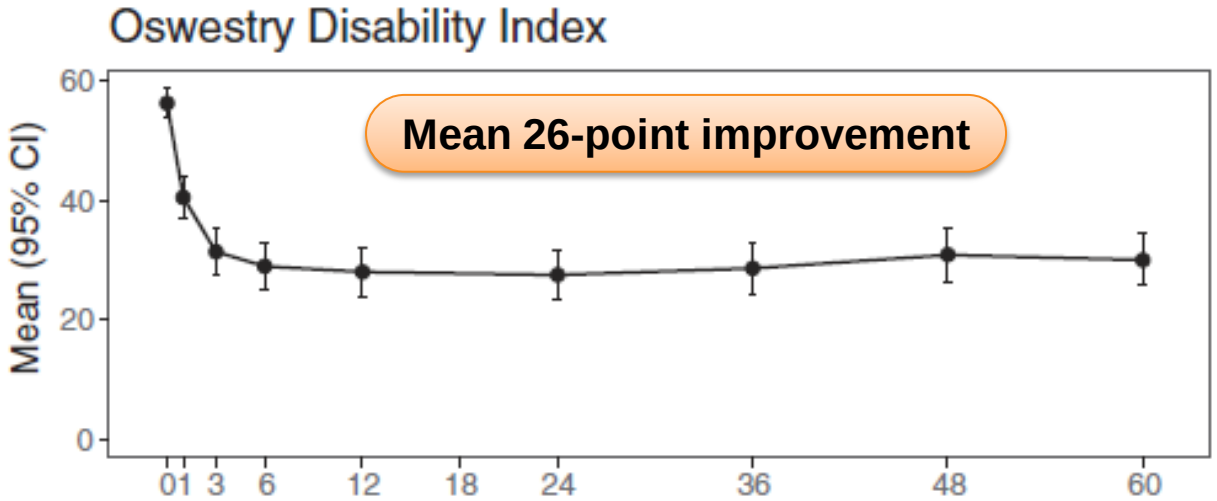
Mean change from baseline to 2 years	VAS LBP	ODI
TTI	- 45	- 26
CM	- 11	- 8

Dengler – *J Bone Joint Surg Am* 2019 (2yr results)

5-Year Prospective Follow-up

Published September 2019





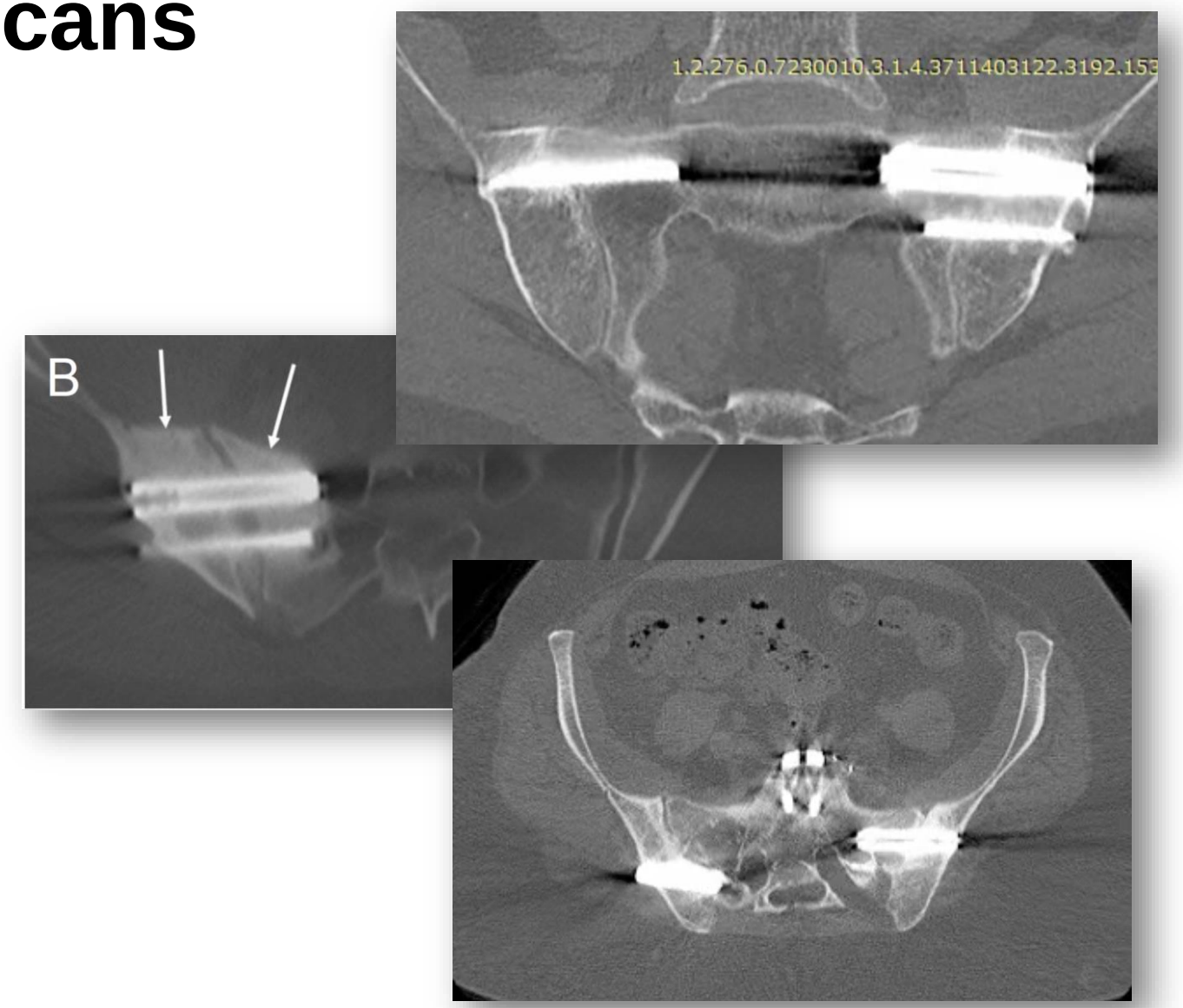
Medical Devices: Evidence and Research
Dovepress
open access to scientific and medical research
Open Access Full Text Article
CLINICAL TRIAL REPORT

Long-Term Prospective Clinical And Radiographic Outcomes After Minimally Invasive Lateral Transiliac Sacroiliac Joint Fusion Using Triangular Titanium Implants

Whang – *Med Devices Evid Res* 2019 (LOIS 5yr)

5-year Follow-up CT Scans

- High percentage of patients (88%) had bridging bone
- No new implant loosening
- Positive bone remodeling (increased bone density)



Whang – *Med Devices Evid Res* 2019 (LOIS 5yr)

Araghi – *Open Orthop* 2017

- Minimally invasive SIJ fusion with decortication and bone grafting
- Prospective
- 50 patients
- 6-month follow-up

1440 *The Open Orthopaedics Journal*, 2017, *11*, 1440-1448

BENTHAM OPEN

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The Open Orthopaedics Journal

Content list available at: www.benthamopen.com/TOORTHJ/

DOI: 10.2174/1874325001711011440

CASE REPORT

Pain and Opioid use Outcomes Following Minimally Invasive Sacroiliac Joint Fusion with Decortication and Bone Grafting: The Evolusion Clinical Trial

Ali Araghi[1], Robert Woodruff[2], Kyle Colle[3], Christopher Boone[4], Lisa Ingham[5], Antoine Tomeh[6] and Louis C Fielding[7,*]

	Baseline to 6mo
VAS Pain Reduction (mean)	41.4 points
ODI Reduction (mean)	20 points

Rappoport – *World Neurosurgery* 2017

- MIS SIJ fusion with hydroxyapatite-coated screw
- Prospective
- 32 patients
- 12-month follow-up

ORIGINAL ARTICLE

CrossMark

Minimally Invasive Sacroiliac Joint Fusion Using a Novel Hydroxyapatite-Coated Screw: Preliminary 1-Year Clinical and Radiographic Results of a 2-Year Prospective Study

Louis H. Rappoport[1], Ingrid Y. Luna[2], Gita Joshua[2]

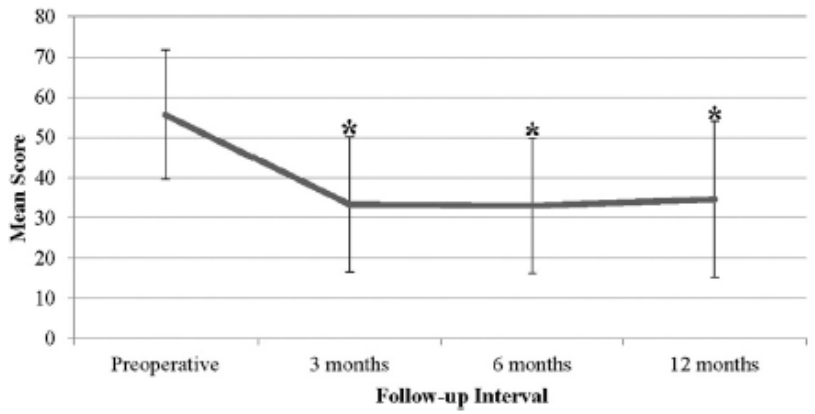


Figure 4. Line graph comparing Oswestry Disability Index (ODI) scores over 12-month postoperative follow-up (mean ± standard deviation) for all patients. *Statistically significant differences from preoperative scores ($P < 0.05$).

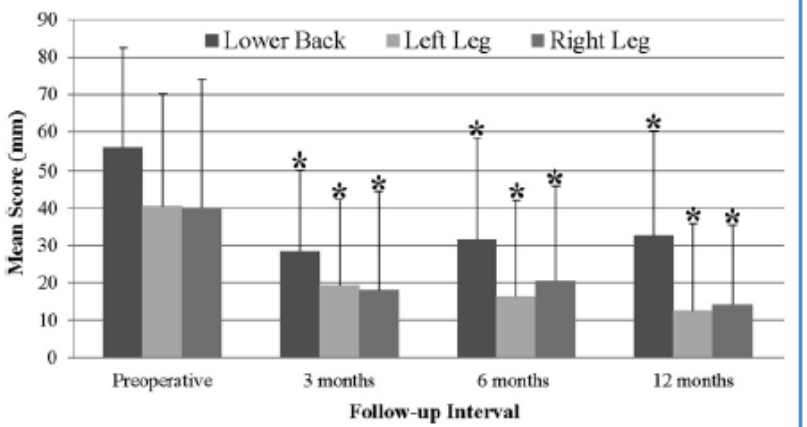
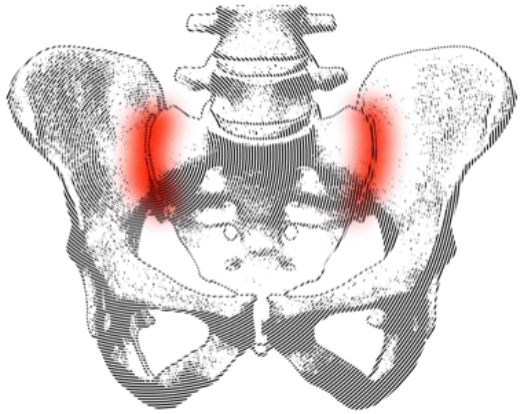


Figure 3. Bar graph of visual analog scale (VAS) scores for all patients from preoperative assessment to 12-month postoperative follow-up (bar height indicates mean value and error bars ± 1 standard deviation). *Statistically significant differences from preoperative scores ($P < 0.05$).



Reimbursement

Reimbursement Review

SI Joint Pain: Highly Burdensome

Medical Devices: Evidence and Research

Dovepress

ORIGINAL RESEARCH

Sacroiliac joint pain: burden of disease(1)

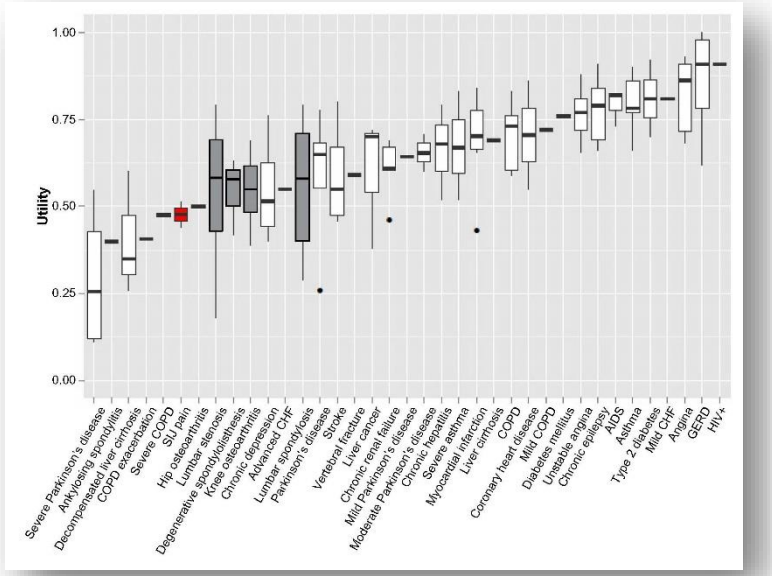
This article was published in the following Dove Press journal:
Medical Devices: Evidence and Research
12 April 2014
Number of times this article has been viewed

Daniel Cher[1]
David Polly[2]
Sigurd Berven[3]

[1]SI-BONE, Inc., San Jose, CA, USA; [2]Department of Orthopedic Surgery, University of Minnesota, Minneapolis, MN, USA; [3]Department of Orthopedic Surgery, University of California San Francisco, San Francisco, CA, USA

Objectives: The sacroiliac joint (SIJ) is an important and significant cause of low back pain. We sought to quantify the burden of disease attributable to the SIJ.

Methods: The authors compared EuroQol 5D (EQ-5D) and Short Form (SF)-36-based health state utility values derived from the preoperative evaluation of patients with chronic SIJ pain participating in two prospective clinical trials of minimally invasive SIJ fusion versus patients participating in a nationally representative USA cross-sectional survey (National Health Measurement Study [NHMS]). Comparative analyses controlled for age, sex, and oversampling in NHMS. A utility percentile for each SIJ subject was calculated using NHMS as a reference cohort. Finally, SIJ health state utilities were compared with utilities for common medical conditions



Cher – *Med Device Evid Res* 2014

Prevalence of Work-Related SIJ Patients

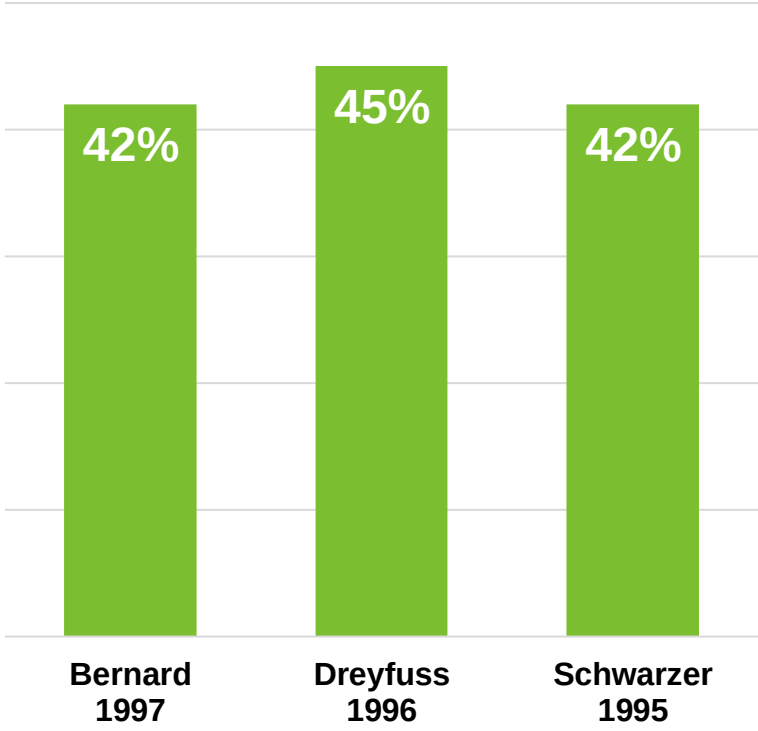
42% Bernard 1997

Compensable Injury = Worker's Comp

45% Dreyfuss 1996

38 of 85 patients

42% Schwarzer 1995



1. *Bernard - The Adult Spine: Principles and Practice, Second Edition, 1997.*
2. *Dreyfuss - Spine. 1996.*
3. *Schwarzer - Spine.1995*

Professional Society Guidelines

Coverage for **MIS SI joint fusion is recommended** for appropriately selected patients by the professional medical societies listed below. Patient selection criteria and recommendations for insurance coverage, can be accessed via the links below.

North American Spine Society (NASS)

The coverage recommendation outlines 8 criteria specifically intended to ensure patients are appropriately selected for the procedure. (June 2015)

https://si-bone.com/uploads/documents/PercutaneousSacroiliacJointFusion.pdf

International Society for the Advancement of Spine Surgery (ISASS)

ISASS has concluded that minimally invasive SI joint fusion is now the standard of care for a select subset of patients. ISASS concludes that minimally invasive SI joint fusion is a safe and effective procedure for patients with unremitting pain due to SI joint disorders. (Updated July 2016)

http://www.isass.org/public-policy/isass-policy-statement-minimally-invasive-sacroiliac-joint-fusion-july-2016/

Medical Necessity Documentation 1 of 2

1. Comprehensive history

- Date of onset
- Mechanism of onset
- Aggravating/relieving actions
- Location, type, of pain

<u>Functional limitations</u>

- Walking, standing, sitting, stairs, lifting, etc.

<u>Relevant history</u>

- Prior lumbar fusion, trauma, LBP with pregnancy, inflammatory arthropathy, scoliosis, leg length inequality, etc

2. Treatment to date (include details)

- Treating physicians (duration, type, results)
- Non-surgical treatments
  - Medications, Physical Therapy, Chiropractic, etc.

- Injections/Procedures – amount and duration of relief
  - Therapeutic Injections
  - RF Ablation
  - other

Medical Necessity Documentation 1 of 2

3. Diagnostic imaging and studies (Spine, pelvis, hip, etc.)

- Study performed (*e.g.*, CT Pelvis), date performed
  - Radiographic interpretation, key points, include report
  - Personal review / interpretation, describe SI joint findings
- EMG/NCV reports

4. Physical examination

Spine: inspection, palpation, ROM, neurologic exam

Pelvis: inspection, palpation (piriformis, trochanter, symphysis, etc.)

SI Joint: inspection, palpation, provocative maneuvers

Hip: inspection, palpation, ROM

5. Diagnostic Injection (date, dictated report, images, results)

- Percentage of relief with injection
- Duration of relief with injection

History of SI Joint Fusion

Fusion History

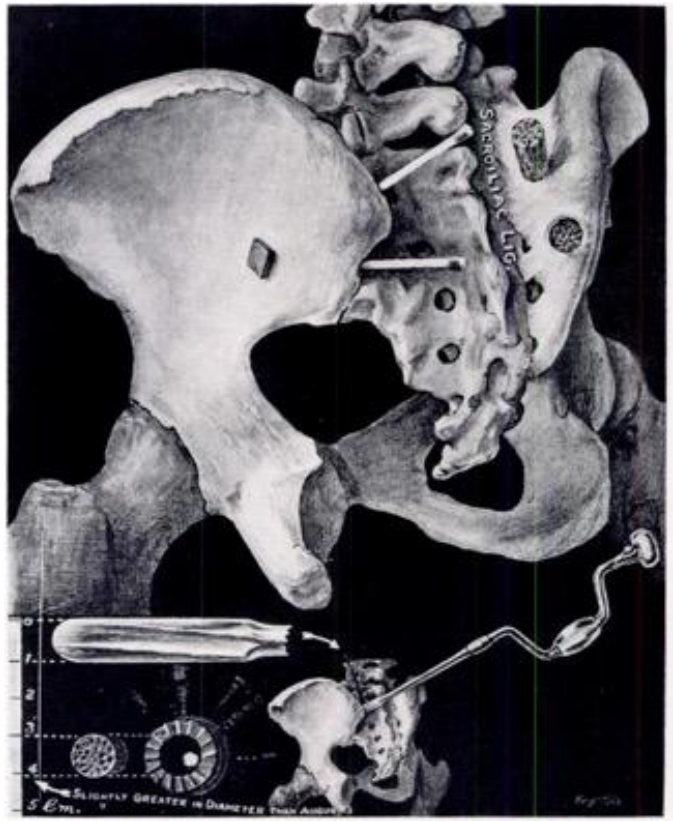
SI Joint Fusion

- First published case
  - 1908 Painter
- Surgical approaches
  - Posterior – 1908
  - Lateral – 1921 Smith-Peterson
  - Anterior – 1941 Rand
- MIS techniques – 1990s

Lumbar Fusion

- First published case
  - 1911 Albee and Hibbs
- Surgical Approaches
  - Posterior – 1911
  - Lateral – 1970s
  - Anterior – 1970s, O’Brien
- MIS Techniques – 1990s

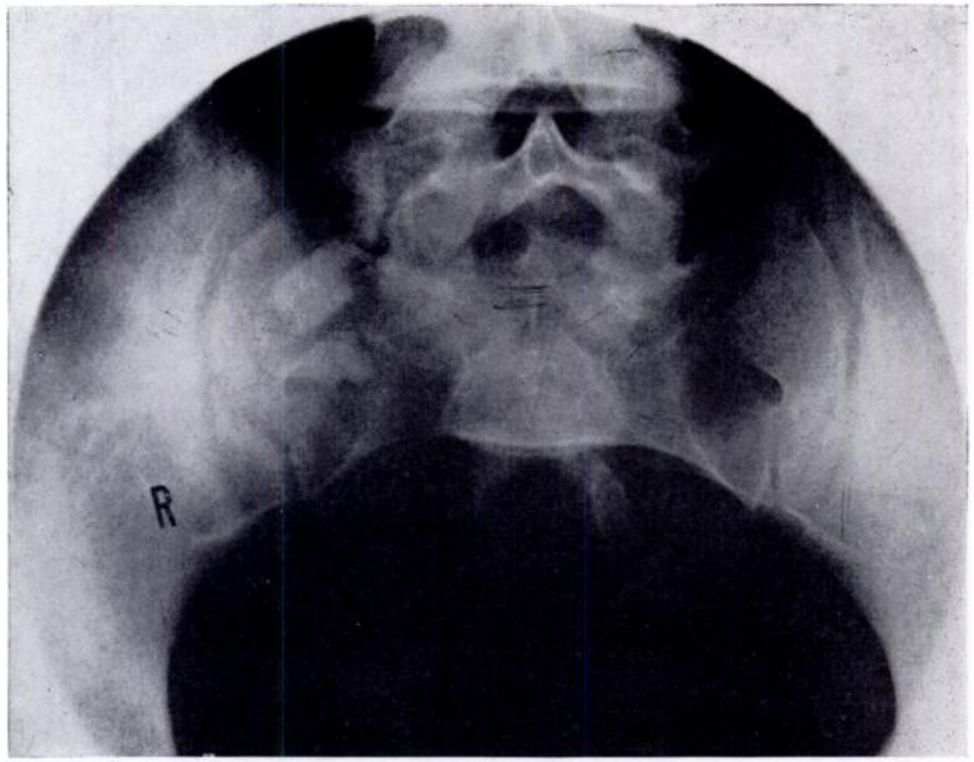
MIS SIJ Fusion 1916



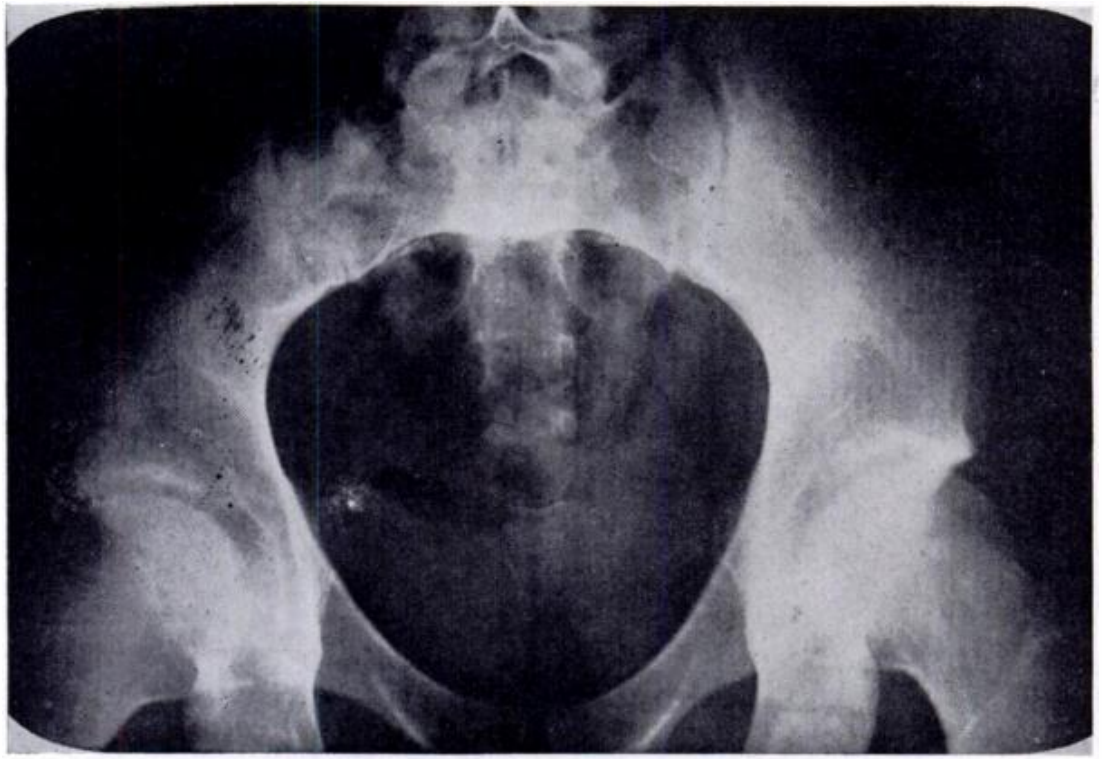
- TB Right SIJ
- 9 mm holes med to lat
- Tibial autograft inserted
- Holes not parallel
- Cast for two months
  - Belt
  - Crutches
- Healed, served in WWI
- Laferte, 1928 JBJS

MIS SIJ Fusion 1916

Two months post operative



Eight years post operative



Complications of SIJ Fusion (Historical)

- Related to surgery
  - Sequelae of underlying condition (TB)
  - Surgical shock (hypovolemia)
  - Wound infection 5-15% (Spica Cast)
  - Failure of fusion (25% or more)
    - Beef bone screws, Auto graft (iliac crest, tibia)
- Specific to surgical approach
- Generally good clinical results
- Moderate morbidity

Thank you

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