Case Presentation - 1
- 52 yo Male Police Detective
- Hx of Prior Lumbar Fusion at L5-S1
- Chief Complaint
  - Right Buttock Pain
- PMR – SI injection with some relief of pain

Case Presentation - 2
- 44 y/o Female
- 5 year history of low back pain
- Left sided L5 Radicular symptoms
- Total Disc Replacement
- 30% pain relief
Background – SI Dysfunction

- Back Pain
  - 2nd Most Common – clinician visits behind the common cold
  - 95% incidence rate
- Economic Cost
  - 60 to 200 Billion annually
- 1905 – Goldwaith and Osgood
  - Relaxation in pregnancy – Increased Vascularity of the sacroiliac joint

Background – SI joint Dysfunction

- 1921 – Smith Petersen
  - SI joint dysfunction suspected of causing low back pain
- 1934 – Mixter and Barr
  - Lumbar Intervertebral disc herniations
- 1987 – Waisbrod, Krainick, Gerbershagen
  - SI joint pain Reemerged
Back Pain – SI Dysfunction
- Low Back Pain – SI joint Dysfunction
- Bernard and Kirkaldy
  - Range – 13% to 32%
  - Largest Series – 1300 patients – 23%
- Hansen – 2007
  - Double Block Paradigm
    - 10-27%
    - False Positive Rate of 20% to 22% after one SI joint injection.

SI joint pain – Lumbar Fusion
- 2003 – Katz
  - s/p lumbar fusion
  - 34 patients
  - 32% patients – SI joint pain
  - Dx with injection of the SI joint
- Spine 2008 – Ha
  - 37 patients – lumbar fusion
  - CT scan – preop, 1 years, 5 years
  - Fusion group – 75% degeneration
  - Nonfusion group – 38%

SI Joint Pain – Lumbar Fusion
- Spine – Ivanov 2009
  - Finite Element Model
  - Simulated L4-5, L4-S1, L5-S1 Fusion
  - Increased motions of the SI joint
  - Increase Stress
- Pain Medicine - Liliang 2011
  - 130 patients – lumbar fusion
  - 52 patients - 40% - 3 positive provocative tests
    - 21/52 (40%) – diagnostic blocks
Sacroiliac Joint - Anatomy
- True Diarthrodial Joint
  - Anterior – synovial joint
  - Posterior – syndesmosis
- Joint space – 1-2 mm wide
- C shaped joint – 2 lever arms interlock at the 2nd sacral vertebrae
- Main function
  - Stability and some motion
  - Less than 1 degree of motion
- Stability – Ridges and Large Ligaments

SI Joint Anatomy
- Blood Supply
  - Posterior Divisions of Internal Iliac Artery
    - Iliolumbar
    - Lateral Sacral
    - Superior Gluteal Arteries
- Innervation
  - Superior Gluteal Nerve
  - Ventral Rami L4,L5
  - Lateral Branches of the dorsal rami – S1 and S2

Sacroiliac Ligaments
- Posterior Ligaments – Long and Short
  - Restraint – Sacral Extension
  - Nociceptors – Substance P
- Anterior Sacroiliac Ligament
- Interosseous Ligaments - important
  - Restraint – Sacral Flexion and Axial Rotation
  - Resist Separation
  - Mechanoreceptors/nociceptors – sub p and cgrp
- Sacrotuberous/Sacrospinous
  - Restraint – Sacral Flexion
  - No nerve fibers
- Iliolumbar
  - Ventral and Dorsal – forward flexion and side bending
  - Nociceptors
Biomechanics – SI Joint

- 2008 - Three-Dimensional Movements of the Sacroiliac Joint: A Systematic Review of the Literature and Assessment of Clinical Utility

- Rotation
  - X axis: -1.1 to 2.2 degrees
  - Y axis: -0.8 to 4 degrees
  - Z axis: -0.5 to 8 degrees

- Translation
  - X: -0.3 to 8 degrees
  - Y: -0.2 to 7.0 degrees
  - Z: -0.3 to 6 degrees

**MOTION VS NO MOTION?**

**HOW DO WE DIAGNOSE THESE PATIENTS?**
Diagnosis – SI Joint Dysfunction

- **Differential Diagnosis**
  - Inflammatory arthritis
  - Postpartum syndrome
  - Adjacent osteoarthritis
  - Paget’s Disease
  - Trauma
  - Adjacent segment Degeneration – lumbar fusion

- **Complaints**
  - Low Back Pain (72%)
  - Gluteal pain (94%)
  - Groin Pain (14%)
  - Radicular Symptoms (50%)

Diagnostic Imaging – SI joint

- Xrays
- CT Scan
- MRI

Diagnosis – SI Joint Dysfunction

- **Physical Exam**
  - Tenderness
  - Distraction
  - Thigh Thrust
  - Compression
  - FABER
  - Gaenslen
  - Gillet Test

- **Diagnostic Joint Injections**
  - Gold Standard
  - Results – transient improvement in symptoms
Sacroiliac Provocation Tests

- Distraction
- Thigh Thrust

- FABER
- Compression

- Gaenslen’s Maneuver

Types of Treatment – SI joint dysfunction

- **Conservative Treatments**
  - Physical Therapy – First Line
  - Anti Inflammatory medications
  - Sacral Belt
  - Sacroiliac Joint injections
  - Radiofrequency Ablation

- **Surgical Treatments**
  - Open Dorsal SI Fusion
  - Minimally Invasive Posterior SI Fusion
  - Minimally Invasive Lateral SI Fusion

Treatment Options: Surgical

- Smith-Petersen 1926
- Campbell 1927
- Gaenslen 1927
- Bloom 1937
- iFuse 2008
Surgical Approaches – SI joint

3 approaches
- Open Dorsal Approach
- Minimally Invasive Dorsal Approach
- Minimally Invasive Lateral Approach

OPEN VS MIS Sacroiliac Fusion

- 2013 – Smith
- 263 patients

Results
- MIS - decreased
  - Operative time
  - Blood loss
  - Hospital stay
  - Complications
  - VAS

Minimally Invasive – SI Fusion
Techniques – Medtronic Rialto

- Dorsal Approach
- Cannulated Fenestrated Screws
- Dorsal Incision – 3cm inferior to the L5/S1 joint – at the PSIS

Guidewire through the ilium – across the joint
Depth: 4-5cm

- Selecting Screw length
  - 1cm short of anterior sacral cortex
- Drill Depth
  - Selected implant size
  - Confirm drill position with fluoroscopy
- Tapping
  - Over guidewire
  - Set depth stop
  - Advance until contact with ilium
  - Remove Guidewire after tapping
- **Screw Implant**
  - Insert until flush or 5mm countersunk into the ilium

- **Multiple Screw**
  - As needed
  - 8-10mm spacing
**Technique - SIBONE**

- Lateral Approach
- Titanium
- Triangular
  - Minimize rotation/micromotion
- Stronger than Screws
- >38,000 implants placed
  - No breakage

**Technique SIBONE**

- Pin
- Drill
- Broach
- Implant

- Prone Position
- Rolls under chest and waist
Complications
- Pain or discomfort due to the presence of the implant
- Migration, loosening or fracture of the implant
- Muscle pain – altered biomechanics
- Implant rejection
- Pseudoarthrosis
- Increased pain at treated or adjacent levels

Results
- Patient Satisfaction
  - 89% Average
SI Joint Fusion - Results

April 2016 – IJSS – Duhon and Bitan
- Triangular Titanium Implants for Minimally Invasive Sacroiliac Joint Fusion: 2-Year Follow-Up from a Prospective Multicenter Trial
- 172 patients, 149 (2yr) – 26 US sites
- Triangular Titanium Implants
- 1,3,6,12,18,24 assessments
- VAS, ODI, SF-36, EQ-5D

SI Joint Fusion - Results

- VAS
  - 79.8 to 26 – 24 months
- ODI
  - 55.2 to 30.9 – 24 months
- Quality of Life
  - Improvements with SF-36 and EQ-5D
  - 24 months
- Opioid Use
  - 76.2% to 55% - 24 months

SI Joint Fusion - Results

- 26 procedure related adverse events

Device Related
- Buttock pain (3)
- SI pain after fall, inadequate device placement (1)
- Hip pain periosteal bone growth around the implant (1)

Procedure Related
- Buttock pain (3)
- Foot weakness (1)
- Nerve impingement (3)
- Neurovascular bundle (3)
- SI joint pain (prosthetic stabilization (4.9%) (3)
- Urinary Retention (1)
- Vascular Injury (1)
- Wound drainage/infection (3.5%) (6)
- Wound numbness (1)
Case Presentation - 1

- Diagnostic Injection
  - May 2012
- Clinic Visit – July 2012
  - 100% relief for 1 week
- SI fusion – Sept 2012

Case Presentation - 2

- Diagnostic Injection
  - 85% relief with one injection with marcaine
    - Without steroids
- Refused Radiofrequency Ablation
- SI fusion performed
- Post Op
  - VAS: 8.7 to 2
  - ODI: 58 to 20
Conclusion

- Thorough H/P
- Think Outside the box
- Controversial
23. Laslett M. *Evidence-Based Diagnosis and Treatment of the Painful Sacroiliac Joint.* J Man & Manip. Ther. 2008;16:142-152.


Five-Year Clinical and Radiographic Outcomes After Minimally Invasive Sacroiliac Joint Fusion Using Triangular Implants

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doi: 10.1179/106698108790818639
PMCID: PMC2565072

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Open versus minimally invasive sacroiliac joint fusion: a multi-center comparison of perioperative measures and clinical outcomes

Arnold Graham Smith,1 Robyn Capobianco,corresponding author2 Daniel Cher2 Leonard Rudolf,3 Donald Sachs,4 Mukund Gundanna,5 Jeffrey Kleiner,6 Milan G Mody,7 and A Nick Shamie8

ARTHRODESIS OF THE SACROILIAC JOINT. A NEW METHOD OF APPROACH

M. N. SMITH-PETERSEN

http://dx.doi.org/

Sacroiliac joint arthrodesis for chronic lower back pain.
Waisbrod H, Krainick JU, Gerbershagen HU.

The sacroiliac joint: a potential cause of pain after lumbar fusion to the sacrum.
Katz V, Schofferman J, Reynolds J.


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- 5 year history LBP
- L5 radicular symptoms
- Tx TDR L5-S1
- 30% pain relief