

SUBSPECIALTY PROCEDURES

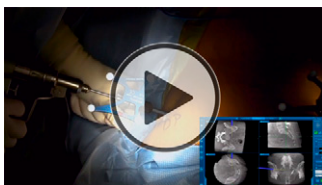
MINIMALLY INVASIVE SACROILIAC
JOINT FUSIONA Lateral Approach Using Triangular Titanium Implants and
Navigation

David W. Polly Jr., MD, Kenneth J. Holton, MD

Published outcomes of this procedure can be found at: *Int J Spine Surg.* 2016 Aug 23;10:28, *Pain Physician.* 2017 Sep;20(6): 537-50, and *Med Devices (Auckl).* 2019 Sep 26;12:411-22.

Investigation performed at the Department of Orthopedic Surgery, University of Minnesota, Minneapolis, Minnesota

COPYRIGHT © 2020 THE AUTHORS. PUBLISHED BY THE JOURNAL OF BONE AND JOINT SURGERY, INCORPORATED. ALL RIGHTS RESERVED



Click the arrow above or go to surgicaltechniques.jbjs.org to view the video article described in this summary.

Abstract

Background: Minimally invasive sacroiliac (SI) joint fusion is indicated for low back pain from the SI joint that is due to degenerative sacroiliitis and/or sacroiliac joint disruption. This technique is safe and effective in relieving pain uncontrolled by nonoperative management¹⁻⁴. There is some controversy, but there continues to be increasing evidence of effectiveness.

Description: This procedure is performed, with the patient under general anesthesia and in the prone position, using fluoroscopy or 3-dimensional (3D) navigation such as cone-beam computed tomographic (CT) imaging. After navigation setup, a navigated probe is used to approximate the desired location of each implant and trajectory. These positions are marked on the skin, and the skin is incised. A 3 to 5-cm lateral incision is made. The gluteal fascia is bluntly dissected to the outer table of the ilium. A guide pin is passed across the SI joint and into the center of the sacrum lateral to the neural foramina, which is confirmed with imaging. This is then drilled and broached. Triangular titanium rods are placed. Typically, 3 implants are placed, 2 in S1 and 1 in S2. Multiplanar postplacement imaging of the pelvis is obtained. The wound is irrigated and closed in layers.

Alternatives: Nonsurgical alternatives have been reported to include pharmacological therapies, such as nonsteroidal anti-inflammatory drugs, therapeutic SI joint blocks⁵, and physical therapy, such as core stabilization, orthotics (SI belts), and radiofrequency ablation^{1,2,6-8}. The surgical alternative is an open anterior or posterior approach with SI joint arthrodesis. The anterior

Disclosure: The authors indicated that no external funding was received for any aspect of this work. On the **Disclosure of Potential Conflicts of Interest** forms, which are provided with the online version of the article, one or more of the authors checked "yes" to indicate that the author had a relevant financial relationship in the biomedical arena outside the submitted work (<http://links.lww.com/JBSEST/A305>).

Copyright © 2020 The Authors. Published by The Journal of Bone and Joint Surgery, Incorporated. All rights reserved. This is an open-access article distributed under the terms of the [Creative Commons Attribution-Non Commercial-No Derivatives License 4.0](https://creativecommons.org/licenses/by-nc-nd/4.0/) (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

approach differs by the resection of the SI joint cartilage, the use of a plate or screws across the joint for stabilization, and the packing of bone graft to facilitate fusion⁹. These are more morbid and have a much longer recovery.

Rationale: Conservative management for SI joint pain is inadequate for all patients. Having 3 of 5 positive physical examination maneuvers⁷, having confirmatory diagnostic block(s)¹⁰, and ruling out the hip or spine as the pain generator provide a success rate of >80%. These patients have early and sustained clinically important and significantly improved outcomes across varying measures compared with conservative treatment^{1-4,11,12}.

Expected Outcomes: Patients can expect to experience decreased pain, reduced disability, increased daily function, and improved quality of life soon after the procedure is performed. These patients typically have an improvement of $\geq 50\%$ in the Oswestry Disability Index score and a clinically significant decrease in visual analog pain scores¹³. The procedure appears durable through at least 5 years¹⁴. Complete pain relief is rare, but clinically important improvement is typical.

Important Tips:

- Proper setup of the navigation system or fluoroscopy is needed to ensure accurate starting points.
- For 3D navigation, use a reference pin in the contralateral posterior superior iliac spine.
- Although navigation is used, radiographic images are made periodically to confirm proper placement of guide pins and implants. Images provide the greatest benefit when establishing navigation, after guide-pin placement when an outlet view allows for evaluation of pin depth, and after implant placement to confirm proper placement.
- Blood loss is generally low, but care should be taken to avoid vascular injury. Although rare, improper placement has led to injury of the superior gluteal artery¹⁵ and iliac artery¹⁶. This can be avoided by staying in bone.
- Proper placement of the implant is imperative in this procedure. There is the potential for nerve injury with improper placement of the implant: an L5 nerve injury if the implant is too ventral or an S1 or S2 nerve injury if the implant is too deep and into the foramen. Revision surgery is commonly due to nerve root impingement and/or malpositioning.
- Preoperative 3D imaging is indicated when it is necessary to rule out differential diagnoses that mimic SI joint pain. This enables the surgeon to rule out intrapelvic pathology, assess sacral bone density¹⁷, and identify dysmorphic sacra or transitional vertebrae.

David W. Polly Jr., MD¹

Kenneth J. Holton, MD¹

¹Department of Orthopedic Surgery, University of Minnesota, Minneapolis, Minnesota

Email address for D.W. Polly Jr.: pollydw@umn.edu

ORCID iD for D.W. Polly Jr.: [0000-0001-7572-6584](https://orcid.org/0000-0001-7572-6584)

ORCID iD for K.J. Holton: [0000-0002-1267-2387](https://orcid.org/0000-0002-1267-2387)

References

1. Polly DW, Swofford J, Whang PG, Frank CJ, Glaser JA, Limoni RP, Cher DJ, Wine KD, Sembrano JN; INSITE Study Group. Two-year outcomes from a randomized controlled trial of minimally invasive sacroiliac joint fusion vs. non-surgical management for sacroiliac joint dysfunction. *Int J Spine Surg*. 2016 Aug 23;10:28.
2. Dengler JD, Kools D, Pflugmacher R, Gasbarrini A, Prestamburgo D, Gaetani P, van Eeckhoven E, Cher D, Stuesson B. 1-year results of a randomized controlled trial of conservative management vs. minimally invasive surgical treatment for sacroiliac joint pain. *Pain Physician*. 2017 Sep;20(6):537-50.
3. Dengler J, Duhon B, Whang P, Frank C, Glaser J, Stuesson B, Garfin S, Cher D, Rendahl A, Polly D; INSITE, iMIA, SIFI Study Groups. Predictors of outcome in conservative and minimally invasive surgical management of pain originating from the sacroiliac joint: a pooled analysis. *Spine (Phila Pa 1976)*. 2017 Nov 1;42(21):1664-73.

4. Dengler J, Kools D, Pflugmacher R, Gasbarrini A, Prestamburgo D, Gaetani P, Cher D, Van Eeckhoven E, Annertz M, Stuesson B. Randomized trial of sacroiliac joint arthrodesis compared with conservative management for chronic low back pain attributed to the sacroiliac joint. *J Bone Joint Surg Am.* 2019 Mar 6; 101(5):400-11.
5. Kennedy DJ, Engel A, Kreiner DS, Nampiaparampil D, Duszynski B, MacVicar J. Fluoroscopically guided diagnostic and therapeutic intra-articular sacroiliac joint injections: a systematic review. *Pain Med.* 2015 Aug;16(8):1500-18. Epub 2015 Jul 14.
6. Prather H, Hunt D. Conservative management of low back pain, part I. Sacroiliac joint pain. *Dis Mon.* 2004 Dec;50(12):670-83.
7. Polly DW Jr. The sacroiliac joint. *Neurosurg Clin N Am.* 2017 Jul;28(3):301-12.
8. Cross WW, Tavanaiepour K, Paschel EE, Gerszten PC. Percutaneous sacroiliac joint fusion: indications and technique. *Oper Tech Orthop.* 2017 Dec;27(4): 236-41.
9. Ledonio CGT, Polly DW Jr, Swiontkowski MF. Minimally invasive versus open sacroiliac joint fusion: are they similarly safe and effective? *Clin Orthop Relat Res.* 2014 Jun;472(6):1831-8.
10. Polly D, Cher D, Whang PG, Frank C, Sembrano J; INSITE Study Group. Does level of response to SI joint block predict response to SI joint fusion? *Int J Spine Surg.* 2016 Jan 21;10:4.
11. Stuesson B, Kools D, Pflugmacher R, Gasbarrini A, Prestamburgo D, Dengler J. Six-month outcomes from a randomized controlled trial of minimally invasive SI joint fusion with triangular titanium implants vs conservative management. *Eur Spine J.* 2017 Mar;26(3):708-19. Epub 2016 May 14.
12. Rudolf L. Sacroiliac joint arthrodesis-MIS technique with titanium implants: report of the first 50 patients and outcomes. *Open Orthop J.* 2012;6: 495-502. Epub 2012 Nov 30.
13. Whang P, Cher D, Polly D, Frank C, Lockstadt H, Glaser J, Limoni R, Sembrano J. Sacroiliac joint fusion using triangular titanium implants vs. non-surgical management: six-month outcomes from a prospective randomized controlled trial. *Int J Spine Surg.* 2015 Mar 5;9:6.
14. Whang PG, Darr E, Meyer SC, Kovalsky D, Frank C, Lockstadt H, Limoni R, Redmond AJ, Ploska P, Oh M, Chowdhary A, Cher D, Hillen T. Long-term prospective clinical and radiographic outcomes after minimally invasive lateral transiliac sacroiliac joint fusion using triangular titanium implants. *Med Devices (Auckl).* 2019 Sep 26;12:411-22.
15. Duhon BS, Cher DJ, Wine KD, Kovalsky DA, Lockstadt H; SIFI Study Group. Triangular titanium implants for minimally invasive sacroiliac joint fusion: a prospective study. *Global Spine J.* 2016 May;6(3):257-69. Epub 2015 Aug 11.
16. Palmiere C, Augsburg M, Del Mar Lesta M, Grabherr S, Borens O. Fatal hemorrhage following sacroiliac joint fusion surgery: a case report. *Leg Med (Tokyo).* 2017 May;26:102-5. Epub 2015 Jun 23.
17. Hoel RJ, Ledonio CG, Takahashi T, Polly DW Jr. Sacral bone mineral density (BMD) assessment using opportunistic CT scans. *J Orthop Res.* 2017 Jan;35(1): 160-6. Epub 2016 Aug 26.