ICSJS 2016

2nd International Conference on Sacroiliac Joint Surgery

Sept. 16th - 17th 2016
Hamburg/Germany

Medical Association for Research into Diseases of the Sacroiliac Joints and their Treatment

M.E.G.
Sacroiliac Medical Expert Group e.V.

PROGRAM + ABSTRACTS

Conference language: ENGLISH

DEAR COLLEAGUES, MEMBERS AND SPONSORING PARTNERS

thanks for joining our 2nd International conference on SIJ-treatment (ICSJS) in Hamburg, Germany.

To avoid wrong diagnosis and operations and to find out the most optimal indication related surgical technique and treatment we performed our „1st International Congress on Sacroiliac Joint Surgery“ in 2015.

For those who were not able to attend that meeting we can assure, that this was a true update on sacroiliac joint surgery, treatment, research and medical device developments. Speakers and attendants appreciated our decision to set up an unbiased conference – not dictated by commercial interest – and confirmed the need of a specialized sacroiliac association. We keep up this unbiased attitude, which is also appreciated and backed up by the exhibiting companies.

Due to the fact that more and more companies introduce new surgical techniques and medical devices for treating the SIJ there is a great risk that too many patients with SIJ problems will be operated for no reason.

Although implant systems are FDA and CE certified, can spinal implant test protocols be applied at all? Shouldn't special protocols be developed for these systems and how can we compare them clinically? These simple questions show that the quest for the 'gold standard' has just started.

We are proud to welcome 24 internationally well acknowledged experts to guide us through this convention. And please allow us to express our thanks that they all share their lectures without demanding a speakers fee!

Dedicated to serious research all discussions – though controversial – aim to find a consensus for the most important questions: pain generators, indication, clinical studies, patient work up, postoperative treatment, healing challenges.

There is still a long and bumpy road ahead until a level of understanding has been reached which provides certainty in diagnosis and treatment. We need your expertise, your engagement and your support to define and develop the needed scientific projects and studies.

We feel this is only the beginning of true research into the surgical aspects of sacroiliac joint pain treatment. You are invited to be a part of it.

We are looking forward to a successful meeting!

M.E.G.
Sacroiliac Medical Expert Group e.V.

Thomas J. Kibsgard, President
Volker Fuchs, Vice President
Michael Dierks, Secretary

The conference is awarded with 20 CME credits by the Medical Association (Ärztekammer) Hamburg

FRIDAY, SEPT. 16TH

08:00 h - Registration

09:00 h – Session 1

Welcome address (Fuchs/Dierks)

1. What do we know/not know about the SIJ? (Kibsgard) 15“
2. Update on anatomy and histology of the SIJ - and are there obstacles we have to think of before operating ? (Kibsgard) 15“
3. Lumbosacral transition and SIJ – anatomic demonstrations (Rauschning) 20“
4. Statistical shape modelling of the SIJ (Patel) 10“
5. Update on biomechanics of the SIJ (Kibsgard) 20“

› **Discussion**

10:30 h Coffee Break

10:50 h – Session 2

6. Does the sagittal profile influence the Sacroiliac Joint function? (LeHuec – video conference to Italy) 20“
7. Ligamentous influence in pelvic load distribution (Hammer) 20“
8. Update on imaging procedures of degenerative arthritis and axial spondyloarthritis of the SIJ - X-ray, MRI, CT, SPECT-CT, PET-CT (Stark) 25“
9. Update on correct diagnosis of SIJ pathologies (Donner) 25“

› **Discussion**

12:30 h - Lunch-Workshops

Industrial sponsors present the latest SIJ-medical devices

14:00 h - Session 3

10. Scoring systems for SIJ related pain (Kurosawa) 15“
11. Pelvic belts do help – myth or reality? (Hammer) 15“
12. Role of opioids and other drugs in the treatment of SIJ related pain - how much is enough? (Dengler) 15“
13. Update Peri- and intraarticular SIJ injection – the best way to do it! (Kurosawa) 25“
14. Does level of response to SIJ block really guide us which patient we should fuse? (Whang) 15“
15. Update on denervation of the SIJ – is it really working and will it last? (Loh) 25“

› **Discussion**

16:00 h Coffee Break

16:20 h - Session 4

16. Peripheral nerve stimulation of the SIJ – a possible option to treat chronic SIJ related pain? (Guentchev) 15“
17. What is the underlying lesion in the painful SIJ? Don´t we need to know before we start operating? (Stark) 20“
18. Are there special tricks to accomplish healing of the operated SIJ? What do we do if bone quality is compromised? (Maus) 20“
19. When is the right point to recommend surgery - how much conservatism is enough or might be not enough? (Freeman) 15“
20. Protocol for a conservative treatment arm in SJI fusion studies (Dengler) 15“

› **Discussion and Summary**

18:00 h End of Day One - 19:00 h Dinner (Dorint Hotel)

SATURDAY, SEPT. 17TH

08:30 h – Session 5

21. Is there a deformity in the degenerative SIJ? Does it need to be corrected? (Stark) 15“
22. Leg pain – is it really SIJ related? (Murakami) 15“
23. Does lumbar or lumbosacral fusion really increase the incidence of SIJ pain - what do we tell our lumbar patients about the possibility of SIJ failure? (Unoki) 15“
24. Different revision techniques after a failed SIJ fusion - How do we accomplish fusion in case of a pseudoarthrosis and when do we switch one method for another? (Patel) 15“

› **Discussion**

09:45 h Coffee Break

10:00 h - Session 6

25. What is or could be the downside to a successful fusion of the SIJ - can we compare it with the lumbar spine? (Whang) 15“
26. Osteitis condensans – a good idea to fuse the SIJ? (Ayoub) 15“
27. SIJ fusion – a must-have tool for spine surgeons? Yes (Donner) or No (Meyer)? 30“

› **Discussion**

11:20 h - Session 7

28. SIJ Fusion Devices: Introductional talk (Fuchs/Kibsgård) 15“

Questions:

- What are the advantages/disadvantages and limitations of the existing SIJ Implant Systems – is there room for improvement?
- In case of a revision: What do you do?
- Actual results and personal experience of the existing SIJ Implants – have the initial expectations been fulfilled?

29. Many years of experience with open compression arthrodesis of the SIJ (Harms) 15“

a) Anterior approach (times include discussion):

30. Anterior plate (Murakami/Kurosawa) 15“
31. Anterior plate ./. iFuse (Kibsgård) 10“

12:20 h Short Lunch

13:00 h - Session 7 continued

b) posterior based systems (times include discussion):

32. iFuse ./. DIANA (Westberg) 15“
33. DIANA (Stark; Freeman) 30“
34. SI-Desis (Donner) 15“

c) lateral based systems (times include discussion):

35. SILEX (Bull) 15“
36. SI-Lok (Hassel) 15“
37. iFuse (Whang; Kools; Patel) 45“

15:15 h - Final discussion, take home message

15:30 h - Hands on Workshops: Injection Techniques (Kurosawa)

16:30 h End

FACULTY AND ABSTRACT INDEX

ABSTRACTS

The abstracts are listed in alphabetical order of the Speakers

Bull, Tim, MBBS FRCS FRCS(ORTHO), Royal Free Hospital Chase Farm , London, UK

Royal National Orthopaedic Hospital: registrar training; program and Cambridge orthopaedic senior registrar training program, before obtaining the prestigious BOA national fellowship in spinal surgery at the Centre for the Study and Surgery of the Spine, Nottingham. Consultant orthopaedic and spinal surgeon for 18 years. I have recently stepped down as Service Line Lead for Orthopaedics for the Royal Free Hospitals NHS Trust, after 5 years in that role. I am an examiner in adult and paediatric trauma for the Intercollegiate examination board of the four Royal Colleges of Surgeons. I have also lectured widely at regional, national and international meetings. I am a member of the AO Spine, British Association of Spine Surgeons and the European Spine Society.

#35: Lateral Based Systems (SILEX)

This presentation will concentrate on indications, patient assessment and selection as well as the surgical technique for sacro-iliac jointfusion using the Silex screw system. There will be some case studies and questions if time allows.

Dengler, Julius, M.D., PD, Clinic for Neurosurgery, Medical University Charité, Berlin, Germany

Charité, Berlin, Germany

Medical Degree: 2000 - 2006 – Technical University of Munich, Germany

Residency Program: 2006 – 2012, Dept. of Neurosurgery, Charité, Berlin

Fellowship Training: since 2012, Dept. of Neurosurgery, Charité, Berlin

Scientific Focus: Giant intracranial aneurysms, subarachnoid hemorrhage, traumatic brain injury, sacroiliac joint

#12 Role of opioids and other drugs in the treatment of SIJ related pain - how much is enough?

Long-term opioid treatment of low back pain (LBP) is one of the main drivers of opioid dependency and abuse, which have recently evolved into a national epidemic in the U.S. As evidence on the efficacy of opioids in the treatment of LBP is lacking, we used data from the ongoing randomized controlled iFuse Implant System Minimally Invasive Arthrodesis (iMIA) trial to study associations between opioid use and treatment outcome after conservative management (CM) or minimally invasive surgical management (MISM) of LBP originating from the sacroiliac joint. Outcome was measured using visual analogue scale (VAS), Oswestry disability index (ODI), EuroQuol score (EQ-5D-3L) and the Zung depression scale. Patients were included at 9 study centers between June 2013 and May 2015 and randomized either to CM (n=49) or MISM (n=52). At 6 months of follow-up, we found no association between opioid use and good treatment outcome (odds ratio (OR) 1.22, P=0.47) and observed higher degrees of disability in patients with daily opioid use after MISM (ODI 44.0% (interqartile range 36.0-54.0)) than in patients without any opioid use after MISM (ODI 24.0% (8.0-34.0); P<0.01). Opioid users were also more likely to incur serious adverse events (OR 2.58, P<0.01) and displayed higher Zung depression scores both after CM and MISM. Opioid use had no effect on the quality of life. Our results support the view that the efficacy of long-term opioid use in the treatment of LBP may be limited and that its side effects should be carefully discussed with the patient.

#20 Protocol for a conservative treatment arm in SJI fusion studies

No high quality evidence and no specific guidelines exist on how to conduct conservative treatment of pain originating from the sacroiliac joint (SIJ). This lack in evidence is a relevant challenge for randomized controlled trials seeking to compare interventional treatment of SIJ pain to conservative management. The currently ongoing randomized controlled iFuse Implant System Minimally Invasive Arthrodesis (iMIA) trial decided to use previously published European guidelines on the treatment of pelvic girdle pain as a basis for designing treatment algorithms for its conservative management cohort. All patients in the conservative management cohort of the iMIA trial are allowed to use pain medication without specific regulation by the study protocol. During the first 2 months patients undergo mandatory physical therapy with at least 2 treatment sessions per week. Care is taken that each patient's physical therapy program is individualized and focuses on muscle control and stabilization exercises to support the muscles relevant to the pelvic girdle. After these mandatory 2 months, physical therapy may be continued, if the patient wishes to do so. After 6 months, minimally invasive local interventions are allowed as part of conservative management. These include local injections into the SIJ as well as radio-frequency ablation techniques. Also after 6 months, patients that are not satisfied with the outcome of their conservative management are allowed to cross over to the surgical treatment cohort of the iMIA trial. In summary, conservative treatment is taken very seriously by the iMIA study protocol. Medical treatment is supported by mandatory physical therapy and, at later stages, optional local injection treatment of the SIJ. The conservative management algorithm in the iMIA trial seeks to optimize conservative treatment for each patient individually.

Donner, Jeff, MD, Colorado Spine Institute, Loveland, Colorado, USA

Dr Donner is an American Board of Orthopedic Surgeons & American Board of Spinal Surgery certified orthopedic spinal surgeon who has over 20 years experience diagnosing and surgically treating patients with SI joint pain and dysfunction and has presented scientific papers at multiple international meetings on SI joint related topics during his career including the outcomes of SI joint fusion surgeries.

Dr Donner completed his orthopedic surgery training at Temple University Hospital and a spinal surgery fellowship at the Hospital of the University of Pennsylvania, Temple University Hospital and Shriner's Hospital in Philadelphia Pennsylvania, USA and is a member of multiple medical societies including the American Academy of Orthopedic Surgeons, North American Spine Society , International Spinal Intervention Society. Dr Donner recently authored a chapter in the book, Surgery for the Painful, Dysfunctional Sacroiliac Joint, focusing on the minimally invasive, posterior inferior approach.

#9 Update on the Correct Diagnosis of SIJ Pathologies

The diagnosis of back, buttock and leg pain can often be elusive and one must consider multiple potential anatomic pain generators including structures in the lumbar spine, hip joint and SI joint, as well as from the regional viscera. The sacroiliac joint itself may have multiple pathologic processes causing the pain which usually leads to different treatment options. An accurate diagnosis is critical to assure the best treatment outcome.

#27 SIJ Fusion is a must-have tool for Spine Surgeons

A rational approach to accepting the fact that the sacroiliac joint is a potential pain generator which is best addressed by surgical fusion, will be presented.

#34 SI-Desis

A fusion method, instrumentation and implants were developed to address the painful SI joint based on experience and sound orthopedic principles. The process of developing the product from inception to commercialization will be presented.

Freeman, Thomas, MD, Professor, Medical Director Department of Neurosurgery and Brain Repair, University of South Florida, USA

#19: When is the right point to recommend surgery - How much conservatism is enough or might be not enough?

Authors: Kelsey R. Duncana, BSN; Barbara B. Mancheca, MD; Ryan D. Murtaghb, MD; Cesar V. Borlonganc, PhD; Debbie E. Scottb, BS; Frances I. Bernardoa, MS; William D. Monahana, MS; Thomas B. Freemanb,c,, MD.*

**Communicating author; tfreeman@health.usf.edu*

Affiliations:

a: University of South Florida Morsani College of Medicine, 12901 Bruce B. Downs Blvd., Tampa, FL, 33612, United States of America

b: University of South Florida Department of Neurosurgery and Brain Repair, 2 Tampa General Circle, Tampa, FL, 33606, United States of America

c: Center of Excellence for Aging and Brain Repair, 12901 Bruce B. Downs Blvd., MDC 78, Tampa, FL, 33612, United States of America

When is the right point to recommend surgery – How much conservatism is enough or might be not enough?

Introduction

SIJ pain constitutes an epidemiologically large healthcare issue due to both the number of patients suffering with this problem as well as the burden of the disease. Current non-interventional therapies consist of oral and topical medications, physical therapy, stabilization of the SIJ with an orthotic, chiropractic or osteopathic manipulation, and correction of leg length discrepancies with an orthotic for the shoe (when indicated), among others. Interventional treatment modalities include intra-articular or intra-capsular injections of anesthetic, and median branch blocks as well as radiofrequency dorsal rhizotomies of L5, S1, S2, and S3. Surgical fusion and/or arthrodesis of the SIJ is considered when other therapies are inadequate and pain is intolerable. We report the safety and efficacy of sacroiliac joint (SIJ) arthrodesis using a novel distraction-interference device 2 years post-operatively.

Methods

In this retrospective study, 38 consecutive patients with severe SIJ pain underwent arthrodesis by a single surgeon using a distraction-interference cage with bone bank bone graft and BMP. All of these patients had severe SIJ pain following failure of conservative therapy. All patients had a baseline pain score of 7.0 or greater (on a 10-point VAS) in the region of the SIJ following

completion of all conservative therapies and SIJ pain that persisted for 6 months or longer. Additionally, all patients had a positive Fortin finger test, Patrick's test, and sitting intolerance. They also had three or more of the following findings referable to SIJ pain: positive line drawing, reproduction of pain with pressure on the posterior superior iliac spine with thigh immobilization, as well as a positive Faber or Gaenslen's test for SIJ pain.

Records were evaluated at baseline and 2 years postoperatively for change in self-reported pain scores related to the SIJ. Our primary endpoint was improvement of SIJ pain as assessed using a 10-point VAS in all non-osteoporotic patients. A Bonferroni statistical correction for subgroups was utilized.

Results

Severe adverse events included 4 failed fusions, 2 of which required revision. There were no neurovascular or device-related adverse events.

SIJ pain scores in non-osteoporotic patients (n=35) improved from 9.43 preoperatively to 2.64 two years post-operatively ($p<0.0001$). Similar improvement was noted in all patient subgroups without osteoporosis, including those with: 1) isolated SIJ pain (n=13; $p<0.0001$) 2) previous or concomitant laminectomy (n=8; p=0.0036) 3) previous or concomitant short segment instrumentation (n=11; p=0.0008) and 4) previous long segment fusion (n=3; p=0.20). Patient-reported global improvement averaged 79% (n=29). 90% (26/29) said they would have the surgery again and recommend it to others. Sitting tolerance improved from 30 to 110 minutes. Osteoporotic patients experienced less but still meaningful improvement in SIJ pain (8.67-4.33; n=3; p=0.0495).

Conclusions

Our results demonstrate that SIJ arthrodesis using this novel device is safe, effective, and provides sustained alleviation of SIJ pain. This study is limited by subgroup sample size and a retrospective design.

We strongly disagree with some aspects of the National Association of Spine Surgeons (NASS) recommendations and Medicare guidelines for diagnostic criteria for sacroiliitis requiring surgery. We believe that it is unnecessary and inappropriate to exclude a patient from having a beneficial operation based on a radiologic workup that reveals adequate surgical anatomy but no SIJ pathology, an ineffective or partially effective injection, or an inflammatory arthropathy, provided that they meet all other clinical criteria for surgery.

Over-operating may pose a threat to the field if conservative therapy is under-utilized, particularly in the case of patients with mild pain or moderate pain that may benefit from non-interventional modalities.

#33 Clinical Experience: DIANA®

Introduction

We report the safety and efficacy of sacroiliac joint (SIJ) arthrodesis using a novel distraction-interference device 2 years post-operatively.

Methods

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Conclusions

Our results demonstrate that SIJ arthrodesis using this novel device is safe, effective, and provides sustained alleviation of SIJ pain. This study is limited by subgroup sample size and a retrospective design.

Fuchs, Volker, MD, Orthopedic Department, AMEOS Clinic St. Salvator, Halberstadt, Germany

#26 Refractory Osteitis Condensans Ilii: Is It a Good Idea to Fuse the SIJ ??

Osteitis condensans ilii (OCI) is an orthopaedic mystery until now and the refractory type poses a great challenge in its management. Conservative treatment always fails to manage this type and surgical resection or sacroiliac joint arthrodesis are major procedures with no guarantee of success for an unknown disease entity with a normal sacroiliac joint.

Guentchev, M., MD, PD, Neurosurgical Clinic, Klinikum Idar-Oberstein GmbH, Idar-Oberstein, Germany

PD Dr. Guentchev received 1997 his M.D. from the University of Vienna, Austria ,where he later completed his residency in Neurosurgery. From 2001 to 2004 he went on to become a Visiting Fellow at National Institute for Neurological Disorders and Stroke, National Institutes of Health, Bethesda, MD. Since 2011 he is Head of Unit at the Dept of Neurosurgery, Klinikum Idar-Oberstein, Germany. Since 2015 Dr. Marin Guentchev is Privat Dozent at the Medial faculty of Mannheim, Karl-Ruprechts University of Heidelberg. Dr. Guentchev's main research interests are focused on the molecular biology of primary brain tumours and the treatment of therapy resistant low back pain.

For his research Dr. Guentchev has received several scientific awards:

2014 DGNC Posterpreis Neuromodulation,

2002 Pfizer Österreich ZNS Preis,

2000 Pfizer Österreich ZNS Preis,

1999 Erste Bank Preis der Österreichischen Ärztekammer,

1998 EFNS Meeting, Poster Prise.

#16 Long-term reduction of sacroiliac joint pain with peripheral nerve stimulation

Marin Guentchev, M.D. [1,2], Christian Preuss, M.D. [1], Rainer Rink, M.D. 1, Levente Peter, M.D. [1], Martin H. M. Sailer, M.D. [3], and Jochen Tuettenberg, M.D. [1]

[1] Department of Neurosurgery, Klinikum Idar- Oberstein, D-55743 Idar-Oberstein, Germany

[2] Spine Center, Zaichar St. 117, BG-1309 Sofia, Bulgaria

[3] Department of Neurosurgery and Spine Surgery, Schulthess Klinik, Lengghalde 2, CH-8008, Zurich, Switzerland

Background:

We recently demonstrated an 85.7% success rate among patients with severe conservative therapy-refractory sacroiliac joint (SIJ) pain after one year of treatment with peripheral nerve stimulation.

Objective:

In this study, we aimed to investigate the effect of this novel treatment method over follow-up period of up to 48 months.

Methods:

Sixteen consecutive patients with therapy-refractory SIJ pain were treated with peripheral nerve stimulation and followed for 48 months in 3 patients, 36 months in 6 patients, and 24 months in 1 patients. Patient satisfaction, pain, and quality of life were evaluated by means of the International Patient Satisfaction Index (IPSI), Visual Analog Scale (VAS), and Oswestry Disability Index 2.0 (ODI), respectively. For stimulation, we placed an 8-pole peripheral nerve electrode parallel to the SIJ.

Results:

Patients reported an average reduction in VAS from 8.8 to 1.6 at one year ($p < 0.0001$, as compared to preoperative baseline), and 13 of 14 patients (92.9%)

rated the therapy as effective (IPSI score ≤ 2). At 24 months, average VAS score was 1.9 ($p < 0.0001$), and 9 of 10 patients (90.0%) considered the treatment a success. At 36 months, 8 of 9 patients (88.9%) were satisfied with the treatment results, reporting an average VAS of 2.0 ($p < 0.005$). At 48 months, 2 of 3 patients were satisfied with the treatment results.

Conclusion:

We have shown for the first time that peripheral nerve stimulation is an effective long-term treatment for therapy-refractory SIJ pain.

The abstracts are listed in alphabetical order of the Speakers

Hammer, Niels. MD, Professor (Assoc.), Department of Anatomy, University of Otago, Dunedin, New Zealand

Mr. Hammer is an anatomist from the University of Otago, New Zealand. He trained and specialized in Leipzig, Germany, with a background in surgery, paramedics and pain therapy. His Clinical Anatomy Research Group in Otago is focused on the functional anatomy and biomechanics of the pelvis and lower extremity, with particular interest of the soft tissues' role in sacroiliac joint biomechanics.

#7 Ligamentous influence in pelvic load distribution (Hammer)

The ligaments of the posterior pelvic ring are known to be involved in pelvic stability, guiding nutation movements in a minute range. The extent of stabilization provided by the respective ligaments has yet to be quantified. The given combined morphological and biomechanical study aimed at describing this role specifically.

Morphometric data of the iliolumbar, anterior, interosseous and posterior sacroiliac ligaments as well as the sacrospinous and –tuberous ligaments were obtained, using computed tomography, 7 T magnetic resonance imaging, thin-slice plastination and freeze-sectioning of 55 cadaveric pelvises. The resulting data was used to build a computer model of the pelvis using the finite elements method. Pelvic motion related to altered ligament and cartilage stiffness was determined in a range of 50% to 200%. Ligament strain was investigated in the standing and sitting position.

Age-, gender- and side-dependent differences were found for the SIJ ligaments in the dissections. In the numerical model, tensile and compressive stresses were observed at the sacroiliac and pubic symphysis joint. The centre of sacral motion was determined in the region of the second sacral vertebra. At the acetabula and the pubic symphysis joint, higher ligament and cartilage stiffness decreased pelvic motion. Similar effects were found for the sacrum. However, increased sacrospinous' and -tuberous' stiffness increased sacral motion. Compared with standing, total ligament strain was reduced to 90%.

It can be concluded that the posterior pelvic ring ligaments strongly contribute to pelvic stability, with region- and stiffness-dependent effects. While sitting, peak loads occur at the iliolumbar, interosseous and posterior sacroiliac joint ligaments, underlining these ligaments' role as generators of low back pain. Age-related changes in ligament morphometry furthermore give evidence that the SIJ ligaments are capable of compensating degenerative bone morphology.

#11 Pelvic belts do help – myth or reality? (Hammer)

The sacroiliac joint (SIJ) may be considered as one of the causes of low back pain. There is a broad range of treatment options for SIJ pain, including pelvic belts. However, data on their effectiveness is missing to date. The given study investigated pelvic belt effects in patients with SIJ-related pain and healthy age-matched controls. 3 T magnetic resonance imaging, electromyography of pelvic and lower extremity muscles, gait analyses were utilized in static and dynamic scenarios under different belt tensions. Patients were followed up for six weeks on their pain (NRS) and pain-related quality of life (SF-36) under belt application.

Pelvic morphometry, muscle activation patterns and pain perceptions (NRS) were minutely decreased in the static one-leg standing scenario. Changes in pelvic morphometry were minute due to belt application. However, when walking, patients and controls exhibited significantly increased cadence and gait velocity. Muscle activity of the rectus femoris was significantly decreased in patients when walking. Moreover, the long-term application of pelvic belts was accompanied by significantly improved health-related quality of life, surveyed by the SF-36, especially in the physical functioning and physical pain subscores.

It can be concluded that chronic belt application leads to significantly improved pain-related quality of life. Belt effects become more evident in dynamic scenarios, including postural stability. The given lack of visible alterations on pelvic morphometry by belts gives evidence that the exerted compressions are minute in a therapeutic range. These findings indicate that pelvic belt effects might likewise be due to altered neuromuscular loops.

Harms, Jürgen, Prof. Dr. med., Spinal Surgery, Ethianum Klinik, Heidelberg, Germany

Curriculum Vitae

1944	*Born in Darmstadt, Germany*
1963 - 1968	*Studied medicine in Frankfurt/M. and Saarbrücken, Germany*
1968 - 1973	*General and trauma surgery and training in Neuburg/Donau and Ludwigshafen, Germany*
1973 - 1980	*Training in orthopedics- and trauma surgery at University hospital Homburg/Saar*
1978	*Professor of Orthopedics and Trauma surgery*

1980 to 2011 Head of Spine Surgery SRH Klinikum Karlsbad-Langensteinbach,

Development of new surgical techniques and implant systems in spine, which became state-of-the-art in spine surgery until today

Since 2012 Ethianum Klinik Heidelberg , Consultant spine surgeon Heidelberg / Esslingen / Hanover / Achern

Main emphasis on spinal surgery : Deformity; Degenerative diseases; Cervical spine surgery incl. transoral (> 300 cases), Fractures; Tumor

Close scientific relationship with spine surgeon communities in: Europe, America, Asia, Africa, Australia

Chairman and lecturer of international congresses

Advisor on research projects

Publications on advanced techniques in spinal surgery

Honorary Member of SRS (Scoliosis Research Society)

Kibsgård, Thomas, PHD, Oslo University Hospital, Oslo, Norway

Medical Degree: 2002 – University of Oslo, Norway

PhD 2014: Radiostereometric analysis of sacroiliac joint movement and outcomes of pelvic joint fusion

Current position: Consultant and head of Section of spinal deformities, Oslo University Hospital and Associate Professor at University of Oslo

#2 Update on anatomy and histology of the SIJ – and are there obstacles we have to think of before operating?

Much can be said about the anatomy of the SIJ but in this lecture I will focus on two questions:

Does the pain come from inside the SIJ and are there anatomical obstacles I have to be afraid of?

The innervation of the SIJ has been reported in many studies, but there is no agreement regarding the exact innervation of the SIJ (Cohen 2005, Vleeming et al. 2013). In two systematic reviews (Cohen 2005, Vleeming et al. 2013), the innervation of the dorsal part of the joint was suggested to arise primarily from the lateral branches of L4-S3, although different authors have suggested that different levels are involved. The anterior part is assumed to be innervated by the ventral rami, varying from L2 to S4. Further immunohistochemical analyses have been performed on the ventral capsule, interosseous ligaments, cartilage and bone, and there has been evidence of sensory nerves in all of these structures (Szadek et al. 2008, Szadek et al. 2010). The presence of calcitonin gene-related peptide and substance P immunoreactive fibers has been believed to provide morphological and physiological bases for pain signals originating from these structures (Szadek et al. 2008, Szadek et al. 2010), which could be why SIJ injections have effects and might also be why fusion to the joint can be effective for alleviating SIJ pain.

Referred pain has been reported to coexist with SIJ pain, and in a study of 25 patients with SIJ pain, verified by positive SIJ injections, as many as 60% had either thigh or leg pain (Laplante et al. 2012). In another study of 50 patients, the authors found buttock pain in 94% of the patients and referred pain to the leg in more than 50% of the cases but with 18 different pain distributions (Slipman et al. 2000). Before the herniated disc was discovered, the SIJ was regarded as an important etiology of sciatica, and it has been questioned whether nerves can be affected by disturbances in the SIJ (Fortin et al. 1994). Degenerative changes in the SIJ can probably affect the lumbosacral nerves directly. Using arthrography, extravasation of contrast agent has been observed in many subjects, and different pathways between the SIJ and neural structures have been identified. Fortin et al. (Fortin et al. 1994) reported 61% SIJ extravasation in 76 injections, and these cases followed 5 patterns; ventral (16%), dorsal to the first sacral foramen (8%), dorsal sub-ligamentous (24%), superior (3%) and inferior (12%) to the sacral ala. Ventral extravasation of inflammatory agent could theoretically affect the lumbosacral plexus and S1 foramen all the way up to the L5 foramen. The neurotransmitter substance P has been identified as

The abstracts are listed in alphabetical order of the Speakers

a possible cause of "neurogenic inflammation". The SIJ is innervated and can therefore be a pain generator. Different referred pain patterns have been observed and can be explained by individual variations in innervation, direct nerve involvement or different sclerotomes (Slipman et al. 2000).

Sacral anatomy in relation to sacroiliac fusion

During the last 5-6 years minimal invasive SIJ fusion has become the standard approach to treat SIJ pain surgically. Percutane lateral screw fixation has been used in the treatment for posterior pelvic fractures much longer, and one of the complications with this method is screw displacement. The term "sacral dysmorphism" has been used to describe all the different variation in morphology, and these changes increase the probability for complication (Gardner et al. 2010, Goetzen et al. 2016). Sacral dysmorphism is relatively common and have been reported to occur in 30-40% of adults. The posterior pelvic anatomy is variable and knowledge about this can probably reduce surgical complication when we perform SIJ fusions, especially with the lateral based technique. With the help from a pre operative CT scan and the knowledge about sacral dysmorphism, many of these complications can be avoided.

#5 Update on biomechanics of the SIJ

Several attempts have been undertaken to establish movement in the SIJ, both in healthy subjects and in patients with SIJ pain. Many different techniques have been used, such as cadaver studies, studies using different markers (skin markers, palpation of the bony landmarks and k-wires) and radiological studies (x-ray, CT, RadioStereometric Analysis - RSA) (Hungerford et al. 2004, Hungerford et al. 2007, Jacob and Kissling 1995, Lavignolle et al. 1983, Smidt et al. 1995, Smidt et al. 1997, Sturesson 1999, Brunner et al. 1991, Vleeming et al. 1992a, Sturesson et al. 1989, Sturesson et al. 1999, Sturesson et al. 2000b, Sturesson et al. 2000a). All of these techniques have obvious advantages and disadvantages. The cadaver studies lacked muscular influence on stabilization, and the sample tended to come from an older population. The different experimental settings have different levels of precision and accuracy, and it seems that the methods with the best precision have the lowest measured SIJ motion (Goode et al. 2008). Although the literature regarding analysis of movement has reported various results, there are some points on which these reports have generally agreed.

1. Most of the movement in the SIJ is rotational, occurring around all 3 axes but predominantly in the sagittal plane (Brunner et al. 1991, Goode et al. 2008, Mens et al. 1999, Sturesson et al. 1989, Walker 1992).
2. The movements in the SIJ are small, and the total rotation has varied in different studies but has seldom exceeded a mean value of 2 (Egund et al. 1978, Goode et al. 2008, Jacob and Kissling 1995, Vleeming et al. 1992a, Vleeming et al. 2012). This movement has seemed to be greater in an unloaded pelvis than in a loaded pelvis (Goode et al. 2008, Sturesson et al. 1989, Sturesson et al. 2000b, Sturesson et al. 2000a).
3. There do not seem to be differences in movement between symptomatic and asymptomatic SIJs (Sturesson et al. 1989, Kibsgård et al. 2014).
4. There is evidence that women tend to have greater mobility than men. In healthy volunteers, Jacobs (1990) did not find any differences in SIJ movement with regard to age, sex or parturition. Other studies have reported less movement in men than in women (Brunner et al. 1991, Bussey et al. 2009, Sturesson et al. 1989). It also seems that multiparous women have greater movement of the pelvic joints than nulliparous and men (Garras et al. 2008, Mens et al. 2009).

To measure SIJ movement accurately, the RSA technique has been applied to the SIJ. One-millimeter markers were implanted in patients, and with a specialized x-ray set-up and a computer program, the in vivo movement could be measured with high precision (Kibsgård et al. 2012). These markers were attached to a segment in each ilium and to one in the sacrum, and the movement between these segments was then measured.

We used RSA to measure movements in the SIJ during the single-leg stance test and the active straight leg raise (ASLR). Chamberlain described a method for indirectly measuring SIJ movement by measuring the movement in the pubic symphysis on anterior-posterior (A-P) x-rays. This procedure was performed in the single-leg stance, and Chamberlain attempted to correlate the pubic movement with SIJ pain. However, there have been different reports regarding this relationship, which have made it difficult for clinicians to use the results of the Chamberlain test in the diagnosis of SIJ pain, particularly when normal variations in the movement of the pubic symphysis have also proven to be large. We used RSA to measure the movement in the SIJ in the single-leg stance in 11 patients, and the movements were small and almost undetectable using the method. We measured a mean rotation of 0.5 on both the standing- and hanging-leg SIJs, and no translation was detected. There were no differences in total movement between the standing- and hanging-leg SIJs. From the results of this study, we consider the Chamberlain examination to likely be inadequate for evaluation of SIJ movement in patients with SIJ pain.

We also did the RSA during the ASLR. ASLR is a functional test used in the assessment of pelvic girdle pain/SIJ pain, and has shown to have good validity, reliability and responsiveness. The ASLR is considered to examine the patients' ability to transfer load through the pelvis. It has been hypothesized that patients with pelvic girdle pain/SIJ pain lack the ability to stabilize the pelvic girdle, probably due to instability or increased movement of the sacroiliac joint. Also in this study only small movements were detected. There was larger movement of the sacroiliac joint of the rested leg's sacroiliac joint compared to the lifted leg's side. A backward rotation of mean 0.8 degree and a 0.3 degree inward tilt were seen in the rested leg's sacroiliac joint. Our findings contradict an earlier understanding that a forward rotation of the lifted leg's innominate occur while performing the ASLR.

#31 SIJ fusion with anterior plate

To my knowledge only two papers describe the outcome after anterior plating when the indication for surgery was SIJ pain. In 1985 Rand described complete relief in one patient and we reported the outcome of 8 patients (Kibsgård et al. 2012). The open access fusion of the pelvic joints in patients with severe SIJ pain is a controversial and insufficiently studied subject. The aims of our study were to evaluate physical function and pain after sacroiliac (SIJ) fusion. A single-subject research design study with repeated measurements was conducted; pre-operatively and 3, 6 and 12 months post-operatively. The outcome measures considered were the Oswestry disability index (ODI), visual analogue scale (VAS), and SF-36. Eight patients with severe PGP received open-accessed anterior SIJ fusion and concomitant fusion of the pubic symphysis. Seven patients reported positive results from the surgery. At 1 year post-operation, significant ($p<0.001$) reductions in ODI (54 to 37) and VAS (82 to 57) were reported. The physical functioning, bodily pain, and social functioning scores in the SF-36 were also improved. Positive and significant changes in disability and pain at 1 year after SIJ fusion were observed. Despite these positive results, open accessed anterior fusion of the SIJ was associated with adverse events and complications.

Kools, Djaya, MD, Neurosurgeon, Onze Lieve Vrouw Hospital, Aalst, Belgium

Dkaya is a neurosurgeon working in the Onze-Lieve-Vrouw Hospital in Aalst, Belgium.

He did his medical school at the University of Antwerp, Belgium, and was board certified as a neurosurgeon in 2008.

For the first three years of his career he worked in the Sint-Maarten hospital in Mechelen. He build up experience in general spinal surgery by attending a lot of courses and congresses. Besides that, he started to perform injections in the spine.

From the fourth year he worked in the (for Belgian people renowned) Onze-Lieve-Vrouw Hospital in Aalst. This hospital is called "the royal hospital" because the former Belgian king had his lumbar disc herniation and his heart operated there.

He developed special interest in the surgical treatment of chronic low back pain, applying the principles of obtaining a good bony fusion and good sagittal balance in the spine. Then he got interested in the sacro-iliac joint because this was a forgotten and neglected cause of chronic low back and leg pain, which sometimes can explain the bad results after good lumbar surgery. He became consultant and teacher for SI-Bone in 2014.

On the cranial field he has special interest in endoscopic pituitary surgery.

#37 Lateral based SIJ fusion systems: iFuse

This lecture is about my personal, unbiased experience in performing sacroiliac joint fusions with the iFuse implant (SI-Bone) by the minimally invasive lateral approach. I performed 67 iFuse operations in 51 patients, 33 females (65%) and 18 males (35%).

Diagnosing sacroiliac joint pain was the first difficulty. Especially the intra-articular diagnositic block is not an easy procedure . Any technical problem to get the local anesthetic into the joint may result in false-negative results.

After a while, I saw some new clinical signs which may help us to diagnose sacroiliac joint pain clinically: 1) false-positive passive straight leg raising test, 2)antalgic paresis of the iliopsoas and quadriceps muscles and 3) diminished active straight leg raising test range. I noticed the severity of sacroiliac joint pain is inversely related to the ASLR test range. The validity of these tests is not proven yet, but the ASLR test range may be very interesting because it allows us to express the severity of sacroiliac joint pain by a number (of degrees) for future comparison.

The operative technique is straightforward and not very difficult if you have a good preoperative CT pelvis and you are familiar to the different fluoroscopy views.

Because I was surprised by the good results of this operative technique I also started to operate the sacroiliac joint in patients who may also suffer of pain of lumbar origin, as long as the diagnostic block could prove that the main pain generator was the sacroiliac joint. The clinical results of these "mixed pain" patients is included in this presentation.

Overall, I saw good clinical results in 46%, moderate results in 21% and poor results in 33%.

We saw 3 factors which were associated with worse clinical outcome: 1) improvement after diagnostic block was later than 1 hour after the block, 2) preoperative ASLR test range was >45° and 3) bilateral pain.

The abstracts are listed in alphabetical order of the Speakers

Poor results can be explained by wrong diagnosis or persisting/recurrent sacroiliac joint pain. The iFuse implant system only provides stabilization of the joint, making pseudarthrosis one of the major risks which can lead to persistent or recurrent sacroiliac joint pain. Clinically we can suspect pseudarthrosis if patients were better initially after the operation and over time pain recurs. In patients who never had any benefit from the operation probably the major pain source was not the sacroiliac joint.

Diagnosis of pseudarthrosis is challenging however because of the metallic scattering on CT. CT only showed only minor lucency around the implants in some patients, which is best visualized on the sagittal images. A clear correlation was seen between these minor lucencies and the clinical results. In patients with good clinical results no lucencies were seen. In patients with moderate results no lucencies were seen, indicating a mixed origin of their pain with partial relief after treating their sacroiliac pain component and persisting pain from somewhere else. In the 22 patients with poor clinical results, lucencies were seen in 9 (41%, 13% of all patients) and no lucencies were seen in 13 (59%, 19% of all patients). Typically all patients (except one) with lucencies around their implants had temporary benefit from the operation and all patients without lucencies never had any benefit from the operation. We conclude therefore, that the iFuse system leads to symptomatic pseudarthrosis in 13% of our patients, which is an acceptable failure rate to me. The rest of the failures are probably due to improper diagnosis and mixed pain.

Kurosawa, Daisuke, MD, Department of Orthopedic surgery, Low back pain and Sacroiliac joint Center, JCHO Hospital, Sendai, Japan

Daisuke Kurosawa, M.D. 2004: Graduated from Yamagata University School of Medicine. 2009–Present: JCHO Sendai Hospital Dept. of Orthopaedic Surgery/ Low Back Pain and Sacroiliac Joint Center. Board member of the Japanese Sacroiliac Joint Research Association. License: Japanese Board of Orthopedic Surgery. Instructor of Japanese Medical Society of Arthrokinematic approach.

#10 A diagnostic scoring system for SIJ-related pain

Introduction:

About 20 years ago, when Dr. Murakami released several findings on sacroiliac joint (SIJ) dysfunction and related pain for the first time, most of the orthopaedic surgeons denied the existence of SIJ pain itself. However, he believed the patient's complains and understood that they were different from those of patients with lumbar disorders. An intra-articular SIJ injection was somewhat difficult to perform successfully and the diagnostic rate using this injection was not high. Therefore most spine surgeons were not able to understand SIJ pain.

Physical signs related to SIJ dysfunction: In 2007, Dr. Murakami established a peri-articular SIJ injection technique to diagnose SIJ dysfunction1. Murakami's peri-articular SIJ injection is much easier and more effective than an intra-articular SIJ injection for pain in the SIJ region. His injection technique came to be widely used in Japan. Based on diagnosis by using peri-articuar SIJ injections, he identified the characteristic physical signs of patients with SIJ dysfunction. The "one-finger test" is useful to detect an accurate pain area2. When patients pointed to the posterosuperior iliac spine (PSIS) or within 2cm of it as the main site of pain by using their index finger, SIJ pain should be considered as the origin of the lower back and buttock pain3. Groin pain is one of the significant SIJ-related symptoms4. It's hard for patients with SIJ problems to sit on the chair without backrest, however they are often able to sit Japanese style or "Seiza"5. The SIJ shear test is the most useful provocation test. Among the nine tenderness points in a pelvic girdle area, four tenderness points in particular: the posterosuperior iliac spine (PSIS), the long posterior sacroiliac ligament (LPSL), the sacrotuberous ligament (STL), and the iliac muscle were significantly useful in detecting patents with SIJ dysfunction6.

Developing a scoring system: It was Dr. Murakami's goal to eventually develop a diagnostic scoring system which is able to help spine surgeons and physicians distinguish between patients with SIJ dysfunction and related pain from those with lumbar disorders such as a lumbar disc herniation (LDH) and a lumbar spinal canal stenosis (LSS). The Japanese Sacroiliac Joint Research Association, which was founded by Dr. Murakami in 2010, developed a scoring system7. Two pain areas (PSIS and groin), pain while sitting on a chair, the SIJ shear test, and two tenderness points (PSIS and STL) were included as factors in the scoring system. An integer score derived from the regression coefficient and clinical experience was assigned to each identified risk factor (Table). The sum of the risk score for each patient ranged from 0–9. This scoring system had a sensitivity of 90.3% and a specificity of 86.4% for a positivity cutoff point of 4. The scoring system can help distinguish between patients with SIJ dysfunction and related pain from those with LDH and LSS.

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#13 An update on the peri- and intra-articular SIJ injections. The best way to do it!

A review of ICSJS 2015: The sacroiliac joint (SIJ) consists of the articular and posterior ligamentous compartments, with either compartment being a potential source of SIJ pain. However, in 2007, Dr. Murakami discovered the fact that peri-articular SIJ injections were more effective for pain relief in the SIJ area than intra-articular SIJ injections1. It means that the posterior ligamentous region is more often responsible for SIJ pain. In ICSJS 2015, we concluded that we are able to diagnose more patients with SIJ pain using peri-articular SIJ injections.

An update on the injection method:

1. Peri-articular SIJ injections: Dr. Murakami established peri-articular SIJ injections method in 2007. The patient lies in a prone oblique position with the involved side down on a fluoroscopic table. The posterior area of SIJ is divided into four sections and a 23-gauge needle is inserted into each section. A mixture of 2% lidocaine and a contrast medium (mixture ratio 1:1) is injected into the sections. We should ensure that the solution does not spread outside of the posterior ligamentous region1-3.
2. Intra-articular SIJ injections: Many modified techniques including Dussault's method4 have been developed because intra-articular SIJ injections are somewhat difficult to perform successfully in clinical settings. We developed a technique via the middle portion of the joint (Figure 1-3) because the conventional caudal approach has limitations concerning access into the joint cavity for anatomical reasons. Although our new technique via the middle portion has also limitations, it may be able to improve the chances for success.

Conclusions:

We should start with peri-articlar SIJ injections first because it is more effective and easier than intra-articular SIJ injections. Subsequently, intra-articular SIJ injections should be attempted using Dussault's technique via the caudal or using our technique via the middle depending on the anatomical condition of each patient. When making a decision about SIJ arthrodesis for patients with severe SIJ pain, both peri- and intra-articular SIJ injections should be performed at the same time. Pain and numbness relief immediately after both injections can be expected to have the maximum effect after SIJ arthrodesis.

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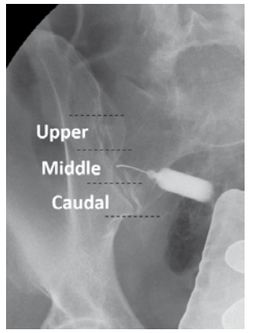


Figure 1.

Posteroanterior view with the patient lying prone-oblique.

A needle is inserted into the point where the joint line intersects with the parallel lines consisting of the inferior border of the posterior superior iliac spine (PSIS) and the border of the lateral sacral crest.

Figure 2. Caudal angulation of the fluoroscopic tube.

A) After needle insertion, the fluoroscopy tube is angled caudally 25-30 °.

B) The image clearly shows the recess between the ilium and sacrum. The needle direction and depth are also clearly shown.

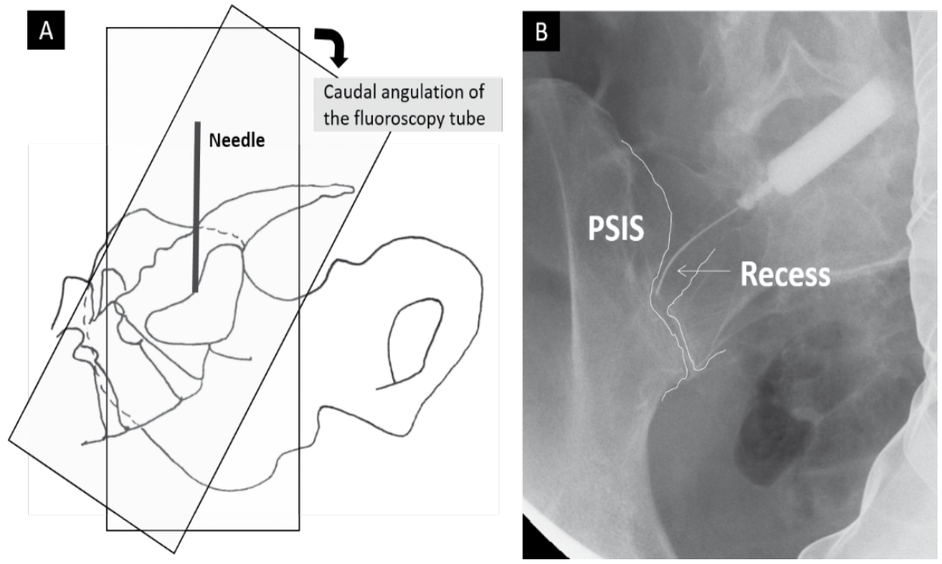
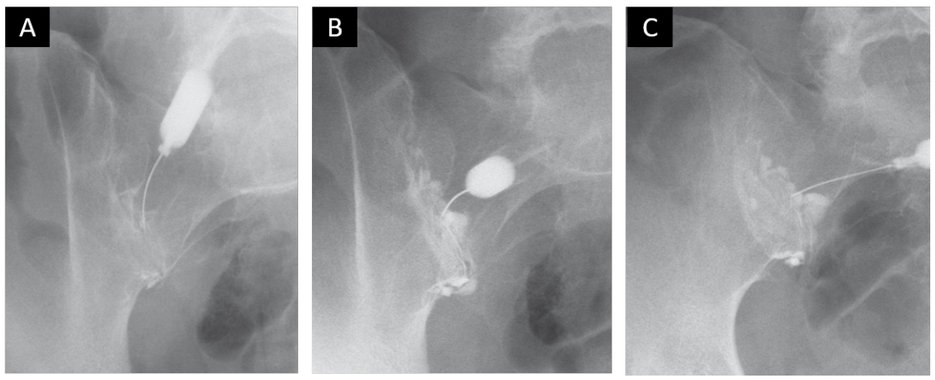


Figure 3. Injection of contrast medium to outline the joint.



A) Injection of contrast medium with the fluoroscopic tube angled caudally at 25-30°. The contrast medium outlines the joint.

B) Posteroanterior view after contrast medium injection.

C) Contra-oblique view. The needle is inserted into the joint via the middle portion.

#30 Our SIJ anterior arthrodesis

Why we chose anterior approach?

Initially, we performed the posterior arthrodesis using three screws and bone graft in three patients. Preoperative pain was relieved shortly after the surgery, however, considerable pain remained in all patients and they could not return to their former works. We considered this approach was not suitable for treating patients with severe SIJ pain and we changed to the anterior approach.

Why we changed to para-rectal anterior approach?

In the earlier period, we used an anterior approach by separating the iliac muscle from the iliac bone to expose the SIJ. Then, the SIJ was fixed with the plate made for SIJ in Japan and screws, at least one of which was inserted from sacrum to iliac bone to unite the joint directly. However, we recognized problems of this approach later on. Separating the iliac muscle from the iliac bone leads to pain and inability to flex the hip after the surgery. In addition, inserting a screw from the sacrum to the iliac bone required medial retraction of the iliac muscle firmly, followed by a high risk of cluneal nerve injury. Therefore, we changed to the current para-rectal anterior approach.

Current para-rectal anterior approach.

Through para-rectal approach using a longitudinal incision along the lateral border of the rectus abdominal muscle, we expose the anterior surface of SIJ between psoas major muscle and iliac muscle extra-peritoneally. The joint space is curetted and grafted with cancellous bone, followed by fixation with a plate and five screws. Most patients were confirmed union of the joint by CT examination and their sitting time and walking time were much improved postoperatively.

Advantage of our anterior arthrodesis.

No need to detach the iliac muscle from the iliac bone. Preserving direct-view enables easier curettage and bone grafting. Strong fixation leads to good bony union.

Disadvantage of our anterior arthrodesis.

Our arthrodesis is a relatively more invasive with a long recovery time after the surgery. Screw dislocation and injury of the lateral cutaneous nerve are considerable complications. Additional posterior arthrodesis may be necessary using two or three screws when pain relief was not sufficient after the first anterior arthrodesis procedure.

Why SIJ arthrodesis is less prevalent in Japan?

Among over 4000 patients with SIJ pain treating in our hospital, only 45 patients underwent the anterior SIJ arthrodesis from 2001 to 2015. The number of SIJ arthrodesis is relatively low compared with that in USA and Europe.

The main reason could be conservative managements such as peri- articular SIJ injection and arthrokinematic approach (AKA)-Hakata method, which have generally been used in Japan. A peri-articular SIJ injection is technically much easier than an intra-articular SIJ injection. AKA-Hakata method is a physical therapy developed in Japan to recover the movement of SIJ. Combination of them could be effective for patients with relatively early stage of the SIJ disorder and prevent from developing severe pain.

The abstracts are listed in alphabetical order of the Speakers

Loh, Eldon, MD, FRCPC, Dept. of Physical Medicine and Rehabilitation, Western University, London, Canada

Dr. Eldon Loh, MD, FRCPC

eldon.loh@sjhc.london.on.ca

Twitter: @LohEldon

QUALIFICATIONS

July 2011	*CSCN Diplomate (EMG)*
July 2010	*Fellow, Royal College of Physicians of Canada (FRCPC)*
	Specialist: Physical Medicine and Rehabilitation
June 2006	*Licentiate, Medical Council of Canada*
May 2005	*Doctor of Medicine, University of Western Ontario*

CURRENT ACADEMIC POSITIONS

July 2011 – pres. Assistant Professor, Physical Medicine and Rehabilitation, University of Western Ontario, London, Ontario

Aug. 2011- pres. Allied Scientist, Lawson Health Research Institute, London, Ontario.

#15 Update on Ultrasound-Guided Denervation of the SIJ – Is It Working and Will It Last?

Eldon Loh MD FRCPC[1], Shannon Roberts BA[2], Robert Burnham MD FRCPC[3], Anne Agur PhD[2,4]

[1]Western University, Dept. of Physical Medicine and Rehabilitation, Parkwood Institute

[2]University of Toronto, Division of Anatomy

[3]University of Alberta, Division of Physical Medicine and Rehabilitation, Central Alberta Pain and Rehabilitation Institute

[4]University of Toronto, Division of Physical Medicine and Rehabilitation

Introduction:

An ultrasound (US) guided technique for diagnostic block/radiofrequency ablation (RFA) of the sacroiliac joint (SIJ) has recently been proposed by our group, based on an analysis of posterior SIJ innervation in cadaveric studies. The posterior sacral network (PSN), a fine plexus of nerves that received contributions from the lateral branches of the posterior rami of S1-S3 ± L5/S4, innervated the SIJ posteriorly. The PSN consistently coursed over the lateral sacral crest between the first and third transverse sacral tubercles (TSTs).

Hypotheses:

(1) US-guided block of the PSN with local anesthetic along the lateral sacral crest will provide similar pain relief to fluoroscopically (FL) guided block. (2) An RFA strip lesion along the lateral sacral crest from the first to third TSTs will reduce pain intensity and improve function.

Methods:

Thirty-three participants were recruited in this clinical pre-post study. Subjects were identified from the investigators' (RB and EL) interventional pain practices and were deemed appropriate candidates for SIJ RFA after successful FL-guided diagnostic lateral branch block. Repeat block was performed under US, and participants were asked to complete a pain diary. US-guided SIJ RFA was then performed. Participants completed the Pain Disability Quality of Life Questionnaire–Spine (PDQQ-S) and Numeric Rating Scale (NRS) pre-procedure, and at 2 and 6 months post-RFA.

Results:

Mean pain relief after diagnostic block showed no statistically significant difference between FL and US-guided approaches. Correlation was strong ($r=0.7$, $p<0.05$). NRS scores were significantly lower at 2 months and 6 months post-RFA compared to pre-RFA ($F=19.3$; $p<.05$). At 2 and 6 months post-RFA, a majority of subjects had experienced 50% pain relief. Similar significant reductions of PDQQ-S scores occurred ($F=19.1$; $p<.05$)

Conclusion:

Preliminary data suggest that US-guided RFA of the posterior SIJ provides clinically significant reductions in pain intensity and improvements in function at 2 and 6 months post-RFA. Data collection is ongoing, with follow-up to a maximum of 2 years.

Acknowledgements:

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Maus, Uwe, Priv.-Doz. Dr. med. habil. MHBA, Orthopedic and Traumatologic University Hospital, Oldenburg, Germany

Carl-von-Ossietzky University Oldenburg, Georgstrasse 12, 26121 Oldenburg, Germany

Education

RWTH Aachen, School of Medicine (1995-2001), Aachen, Germany

Graduation

Medical doctor, RWTH Aachen, Aachen, Germany, June 2002; Postdoctoral lecture qualification and Ass. Prof., RWTH Aachen, Aachen, Germany, January 2009; Master of Health Business Administration, FAU Nürnberg, Nürnberg, Germany, November 2015; Professor, CvO Oldenburg, Germany, July 2016

#18 (Are there special tricks to accomplish healing of the operated SIJ? What do we do if bone quality is compromised?

Complaints of the SIJ are an demanding situation for patients and clinicans. The SIJ is thought to cause at least 15% of low back pain. It is more common in the presence of trauma, pregnancy, or in certain athletes. Therapy options reach from conservative to surgical treatment as last resort. Especially in elderly people healing of the SIJ after surgical treatment is influenced by reduced bone remodelling and osteoporosis.

The prevalence of osteoporosis has continously increased over the past decades and it is set to increase substantially as life expectancy rises steadily. Fragility or osteoporotic fractures of the pelvis often occur after low energy falls e.g. from standing, however, some patients present with assumed insuffiency fractures from the pelvis without a trauma. Osteoporotic fractures impose a tremendous economic burden and these fractures deserve attention as they lead to a decrease in mobility with an increase in dependency and are associated with a high rate of mortality. Potential risk factors for fragility fractures of the pelvis are Osteoporosis, hypertension, diabetes, vitamin D deficiency, hypocalcaemia and nicotine abuse.

The risk for insufficency fractures and impaired healing is evident for both diagnoses.

In the last decades several treatment options with antiosteoporotic drugs were primaily introduced to reduce the risk for osteoporotic fractures and to enhance bone mineral density in the second line. One interesting side effect of these drugs, for example bisphosphonates, strontium ranelate or teriparatide, is their influence on frature healing. All these drugs influence fracture healing by reducing or increasing callus dimension and callus strength and have effects on mechanical stability.

However, the evaluation of risk factors is crucial to identify possible causes for reduced bone mineral density and reduced bone quality. In germany the guideline for diagnosis and therapy of postmenopausal osteoporosis is helpful to check the relevant risk factors.

Vitamin D level, for example, should be analysed and equalized for starting a treatment with antiosteoporotic drugs.

In conclusion antiosteoporotic drugs might be an beneficial additional therapy after surgery of the sacroilical joint, especially when bone quality is reduced. Possible secondary causes for osteoporosis and reduced bone quality should be detected and treated, if possible.

Meyer, Bernhard, MD, Professor, Direkcor Neurosurgical Clinic, Techn. University, Klinikum rechts der Isar, Munich/Germany

#27 (no abstract) SIJ fusion – a must-have tool for spine surgeons?

Training (excerpt)

1982-83 - Medical School, University of Padova Italy:; 11-1989 - Medical Doctor`s Degree (Doctoral Thesis at the Department of Human Genetics, University of Erlangen, Germany)

Neurosurgical Training (excerpt)

1989-90 - Internship: Department of Neurosurgery, University of Tübingen, Germany (Prof Dr EH Grote); 1992 - Residency: Department of Neurosurgery, City Hospital of Duisburg, Germany (Prof Dr WE Hassler); Visiting Resident Department of Neurosurgery, University of Zürich, Switzerland (Prof Dr MG Yasargil);

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Visiting Resident Department of Neurosurgery, BNI, Phoenix, AZ (Prof R Spetzler); 08-1995 -Residency: Department of Neurosurgery, University of Bonn, Germany (Prof Dr J Schramm); Board Examination as Certified Neurosurgeon, by the Regional Chamber of Physicians of Northrhine-Westfalia, Düsseldorf Germany

Appointments (excerpt)

01-1999 - Assistant Professor of Neurosurgery; 09-2002 - Associate Professor of Neurosurgery (tenure track); 03-2006 - Full Professor of Neurosurgery and Chairman , Technical University of Munich

Murakami, Eiichi, MD, Department of Orthopedic surgery, LBP and SIJ center, JCHO Sendai hospital, Sendai, Japan

Chief of Low Back Pain and Sacroiliac Joint Center in JCHO Sendai Hospital. Representative Director of the Japanese Sacroiliac Joint Research Association.

#22 Leg pain - is it really SIJ related?

Leg symptoms from ligaments are not rare: It is generally considered that leg symptoms such as pain and numbness develop mainly from damage to the lumbar nerve roots. However, leg symptoms from damage to ligaments are not rare as had been previously indicated by Hackett1. In most cases, SIJ related pain is also considered to stem from posterior sacroiliac ligaments rather than from the joint cavity. This conclusion comes from our study indicating that the peri-articular injection was more effective than the intra-articular injection in patients with pain in the SIJ area2.

Leg symptoms of SIJ disorder: We evaluated 100 patients with SIJ disorder using conservative therapy (group A) and 20 patients using joint arthrodesis (group B)3. In group A: Ninety-four patients reported pain at or around the posterior-superior iliac spine (PSIS). Leg symptoms of SIJ disorder were comprised of pain and numbness/tingling sensation, and ≥60% of the patients had these symptoms. Pain was mainly detected in the gluteal, groin, and thigh areas, while numbness/tingling was mainly detected in the lateral to posterior thigh and back of the calf, not in the gluteal or groin area. In group B: Pain was detected at or around PSIS in all 20 patients. Some patients also experienced in their groin, greater trochanter, Ischial tuberosity, knee, ankle and perineal area. Numbness was detected in gluteal and lateral or medial thigh, leg, ankle and foot, and the whole leg below the knee in a few patients. Pain and numbness originating from SIJ disorder did not usually correspond to the dermatome of lumbar roots.

Pain at PSIS and Groin area is useful in differentiating patients with SIJ disorder from those with LDH and LSS: We evaluated 62 patients with SIJ disorder originating from the posterior ligament and 28 patients with LDH and 31 patients with LSS. The frequency of pain at or around PSIS detected by the one-finger test and groin pain was significantly higher in patients with SIJ disorder than those with LDH and LCS4.

Pain in the lateral thigh shows a difference between pain from lumbar roots and that from SIJ: In another study, we compared pain in the lateral thigh from damaged lumbar nerve roots with that from SIJ. Pain areas of 32 nerve roots that included L2, L3, L4, L5, S1 nerve root were examined using the nerve stimulator. The pain area of L2, L3, and L4 nerve root was inclined to spread into groin or medial thigh and the pain area of L5 and S1 nerve root was detected from gluteal to posterior thigh and leg. Pain in the lateral thigh from the greater trochanter to lateral of the knee was not found in the stimulated lumbar nerve roots. On the other hand, five of 10 patients with SIJ disorder had pain at the lateral thigh. Therefore, pain in the lateral thigh from the greater trochanter to the lateral area of knee usually develops not from impairment of lumbar nerve roots, but often from SIJ disorder5.

Conclusion: SIJ related pain can be usually distinguished from impairment of lumbar nerve roots based on the knowledge of the characteristic features of SIJ disorder.

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#30 Our SIJ anterior arthrodesis

Why we chose anterior approach?

Initially, we performed the posterior arthrodesis using three screws and bone graft in three patients. Preoperative pain was relieved shortly after the surgery, however, considerable pain remained in all patients and they could not return to their former works. We considered this approach was not suitable for treating patients with severe SIJ pain and we changed to the anterior approach.

Why we changed to para-rectal anterior approach?

In the earlier period, we used an anterior approach by separating the iliac muscle from the iliac bone to expose the SIJ. Then, the SIJ was fixed with the plate made for SIJ in Japan and screws, at least one of which was inserted from sacrum to iliac bone to unite the joint directly. However, we recognized problems of this approach later on. Separating the iliac muscle from the iliac bone leads to pain and inability to flex the hip after the surgery. In addition, inserting a screw from the sacrum to the iliac bone required medial retraction of the iliac muscle firmly, followed by a high risk of cluneal nerve injury. Therefore, we changed to the current para-rectal anterior approach.

Current para-rectal anterior approach.

Through para-rectal approach using a longitudinal incision along the lateral border of the rectus abdominal muscle, we expose the anterior surface of SIJ between psoas major muscle and iliac muscle extra-peritoneally. The joint space is curetted and grafted with cancellous bone, followed by fixation with a plate and five screws. Most patients were confirmed union of the joint by CT examination and their sitting time and walking time were much improved postoperatively.

Advantage of our anterior arthrodesis.

No need to detach the iliac muscle from the iliac bone. Preserving direct-view enables easier curettage and bone grafting. Strong fixation leads to good bony union.

Disadvantage of our anterior arthrodesis.

Our arthrodesis is a relatively more invasive with a long recovery time after the surgery. Screw dislocation and injury of the lateral cutaneous nerve are considerable complications. Additional posterior arthrodesis may be necessary using two or three screws when pain relief was not sufficient after the first anterior arthrodesis procedure.

Why SIJ arthrodesis is less prevalent in Japan?

Among over 4000 patients with SIJ pain treating in our hospital, only 45 patients underwent the anterior SIJ arthrodesis from 2001 to 2015. The number of SIJ arthrodesis is relatively low compared with that in USA and Europe.

The main reason could be conservative managements such as peri- articular SIJ injection and arthrokinematic approach (AKA)-Hakata method, which have generally been used in Japan. A peri-articular SIJ injection is technically much easier than an intra-articular SIJ injection. AKA-Hakata method is a physical therapy developed in Japan to recover the movement of SIJ. Combination of them could be effective for patients with relatively early stage of the SIJ disorder and prevent from developing severe pain.

Patel, Vikas, MD, MA, BSME, Professor, Chief of Orthopedic Spine Surgery, University of Colorado, Denver CO, USA

Sacroiliac Joint Specific CV

Personal history or biographical sketch

Education

The Spine Institute at St. John's Hospital, Santa Monica, California

- *Spine Surgery Fellowship, Rick Delamarter, Hyun Bae, Ed Dawson Aug. 2003-July 2004*
- *University of California, San Francisco Department of Orthopaedic Surgery*
- *Internship, General Surgery 1997-1998*
- *Residency, Orthopaedic Surgery 1998-2003*
- *Washington University School of Medicine, St. Louis Missouri*
- *Masters in Biomedical Sciences 1997*
- *Doctor of Medicine 1992-1997*

- *University of Illinois, Champaign-Urbana Illinois*
- *Bachelor of Science, Mechanical Engineering 1987-1991*
- *Technical University of Munich, Munich, Germany*
- *Engineering 1989-1990*

Academic appointments

Professor, Chief of Orthopaedic Spine Surgery, Department of Orthopaedic Surgery,

July 2014 to present

Associate Professor, Chief of Orthopaedic Spine Surgery, Department of Orthopaedic Surgery, June 2009 to July 2014

Assistant Professor, Orthopaedic Spine Surgery, Department of Orthopaedic Surgery, September 2004 to May 2009

Graduate Faculty, University of Colorado Denver, Bioengineering, March 2014 to present

Faculty: AO North America, 2008 to present

Invited extramural lectures, presentations and visiting professorships

Low Back Pain's Missing Piece – Diagnosing the Sacroiliac Joint, Jan. 24, 2011

Sacroiliac Joint Surgery Society, 1st annual meeting, 2/2012: Pre-operative protocol with discussion.

Sacroiliac Joint Surgery Intraoperative Navigation, University of Colorado 2/28/2012 and 5/16/2012

SI Bone National Training Course, Minimally-Invasive Sacroiliac Fusion with the iFuse Implant System, lecture and live surgery, February 7, 2014

The Winter Clinics for Cranial and Spinal Surgery, Experience with the Minimally Invasive Sacroiliac Fusion from a Lateral Approach, February 25, 2014

Non-Peer Reviewed Grants

Investigation of Sacroiliac Fusion Treatment – INSITE - CT, PI, SI Bone, Industry, 12/4/2012 to 12/3/2016, 3% effort, $54,904

Validation of a New Sacroiliac-Joint Specific Disability Questionnaire, CO-I, SI Bone, Industry, 3/4/2012 to 3/3/2015, 1% effort, $48,834

Clinical Trials

Investigation of Sacroiliac Fusion Treatment – INSITE - CT, PI, SI Bone, 12/4/2012 to 12/3/2015

Validation of a New Sacroiliac-Joint Specific Disability Questionnaire, CO-I, SI Bone, 3/4/2012 to 3/3/2015

#4 Statistical Shape Modeling of the SI-Joint

Statistical shape modeling (SSM) techniques were used to quantify the 3 dimensional anatomic variations of the sacrum and sacroiliac joint surface in the general population. 25 pelvises were segmented from a from database 223 patients who had CT

studies performed for evaluation of abdominal pain at the University of Colorado Hospital. Surface STL meshes were created using Simpleware ScanIP. The statistical shape model was created using the Coherent Point drift (CPD) algorithm for registration and correspondence. SSM analysis and ordination was performed utilizing Procrustes analysis and principal component analysis(PCA). PCA provides dimensionality reduction of the data for visualization and interpretation of shape features. We found variation in the sacroiliac joint morphology could be quantitatively described using our CPD-SSM technique. We also found the first, second and third PCA modes describe changes in the sacroiliac joint shape. Preliminary analysis of SI joint pain patients with normal controls utilizing visual shape parameters yielded statistical correlation with surface area and pain, and, in women, shape with pain. Further work is underway to correlate statistical shape models with symptomatic joints in patients.

STL: Surface Tesselation Language

#24 Strategies for SI Joint Revision Fusion Surgery

Sacroiliac joint fusion has increased in prevalence over the last 10 years, partly due to the availability of new minimally invasive surgical techniques. Along with increased utilization, the need for treatment of failed surgery has subsequently increased significantly. Treatment of the failed SI joint surgery should start with verifying the diagnosis, as the first source of failure could be an incorrect diagnosis of the source of pain. Once the SI joint is verified as the source by repeat injections, imaging, or both, the cause of failure should be analyzed: nicotine use, osteoporosis, vitamin D deficiency, poor restrictions/compliance, inadequate technique, inadequate fixation, etc. With the source of failure rectified, surgical intervention might include simple to more complex approaches: adding minimally invasive implants, bone grafting of the joint, sacral pedicle and iliac screw fixation with rods, and possibly pubic symphysis plating. These are based on the amount of stability required and the quality of the bone for fixation. With appropriate management, SI Joint stability can be achieved.

Rauschning, Wolfgang, MD, PhD, Professor of Clinical Applied Anatomy at the Academic University Hospital in Uppsala

Wolfgang Rauschning is an orthopaedic surgeon by training and has mainly been involved in the development of knee arthroscopic surgery and reconstruction techniques. His medical studies were in Kiel, Germany, and he has been practicing in Sweden since 1967.

After predominantly clinical research in a wide variety if fields, Prof. Rauschning developed an anatomical technique for cryosectioning of fresh-frozen, nondecalcified specimens. This technique renders anatomical images of unprecedented precision and colour rendition. This technique has been predominantly employed to studies of the anatomy and pathology of the spine, ranging from normal anatomy and its variations, to a wide variety of pathologies such as trauma, degenerative conditions, tumours and metastases. In addition, a large number of specimens were processed that stem from deceased who had had spinal surgery.

Prof. Rauschning has published over 200 original peer reviewed journal articles, written over 100 textbook chapters, developed numerous electronic teaching programmes, and also received numerous honours, prices and awards, among them the Volvo Award in clinical sciences. Currently he is teaching on many international spine courses, symposia and educational meetings, he also is member of most spine societies and several task forces and study groups.

#3 LUMBOSACRAL TRANSITION AND SI JOINT – AnatomicalDemonstrations

Wolfgang Rauschning, MD, PhD, Department of Orthopaedic Surgery,

Academic University Hospital, S-751 85 UPPSALA, Sweden

Employing the author's Uppsala Cryoplaning Technique over 400 human spine specimens have been studied in considerable detail during a 25-year period of time. Typically portions of the spine (craniocervical, cervical, thoracic, and lumbosacral) were harvested during the course of clinical-pathological or forensic routine autopsies, freezing the specimens in situ before removal. The specimens were radiographed and CT-scanned before they were sectioned on a heavy-duty sledge cryomicrotome to facilitate exceptionally accurate radiographic-anatomical correlations.

Section sequences were obtained in the orthogonal planes (axial, coronal and sagittal), and also oblique planes, when warranted.

High-resolution slides were obtained from the surface of the specimen during the cryoplaning process, typically at submillimeter intervals and in perfect pin-registration. In addition to a vast variety of normal spines, virtually all types of pathological conditions were studied, including tumours and metastases. More than 50 spines from former patients who had had spinal surgery performed, were also studied in great detail.

The transitional lumbosacral region is portrayed in considerable detail, focusing on the stabilising structures, iliolumbar and corporotransverse ligaments, the coarse lumbosacral fascia and the intertwining osseoligamentous structures, also addressing functional anatomical aspects.

In addition to multiplanar views of the SI joint and relevant neurovascular structures endangered in surgical approaches, the anatomy of the upper sacrum is also shown. In addition to normal surgical issues, also degenerative and osteoporotic specimens will be demonstrated.

Stark, John Gregory , MD, Orthopedic Surgeon, Backpain Clinic, Minneapolis, MN, USA

Dr. Stark attended both medical school and orthopedic residency at the University of Minnesota. He has held academic positions at the University of Minnesota and was a Clinical Instructor of Orthopedic Surgery at the Shriner's Hospital in Minneapolis. He then became an Assistant Professor of Orthopedic Surgery at the Level One Trauma Center, Regions Hospital, in St. Paul. His career has included joint reconstruction, complex pediatric foot deformity, spine and trauma. His current passion is the sacroiliac joint and its surgical reconstruction-arthrodesis. Dr. Stark performed his first sacroiliac joint fusion surgery in 1996 and has over the course of his career developed multiple inventions and obtained several patents, many of which involve the safe surgical approach to sacroiliac disease and deformity. In 2009 he founded the company Ilion Medical, Inc which commercialized his patented approach to treating sacroiliac joint pain.

In treating sacroiliac pain patients, Dr. Stark advocates for:

-the cautious evaluation by physical examination in every low back pain patient,

-the use of CT imaging in the plane of the SIJ (as this is the most effective imaging for the great majority of symptomatic SIJ problems), and

-an osteoarthritis model which explains the majority of SIJ pain.

He believes that deformity in this complex and vulnerable area of the body can result in neurologic symptoms and that correction of the SIJ deformity during arthrodesis is fundamental to addressing the mechanical and neurovascular elements of SIJ disease.

The abstracts are listed in alphabetical order of the Speakers

#8 Update on imaging procedures of degenerative arthritis and axial spondyloarthritis of the SIJ - X-ray, MRI, CT, SPECT-CT, PET-CT

The sacroiliac joint is a true synovial joint, with a basic structure that includes supportive subchondral bone, articular cartilage, articular space and constraining ligaments. It is unique in that it is constrained by congruent articular surfaces which allow only a small amount of motion. The SIJ is not oriented to the axis of gravity, but to the oblique convergence of the weight-bearing forces as they are distributed up to the spine, or the divergence of bodily forces as they are distributed downwards to the limbs. Each SIJ is deep, inaccessible, and oriented obliquely to the typical planes of imaging.

To optimize an understanding of the individual joint, any imaging must be aligned to the plane of the joint and to the plane of oblique joint forces, not to gravity. The clinician must have an idea of the lesions that are expected, and those within the differential diagnoses, which must include metabolic disease, tumor, and inflammatory disease.

The pathology of SIJ pain starts with a deep understanding of the possible pain generators, is directed by a careful physical examination, and a knowledge of the sensitivity and specificity of available imaging.

- A survey of alignment and general health can be assessed using plain films.
- Osteoarthritis is a disease of joint, manifested in visible changes of the bone, making CT most useful.
- Nerve encroachment, inflammation and soft tissue changes are reflected by the MRI
- Invasive testing, by injection has changed little, but remains
- Catheterization are sometimes necessary, for pelvic congestion and May-Thurner syndrome.
- The most important image of all is the clinician's internal "image" of the whole patient which includes the specifics of the hip spine axis, as well as general health, age and the physical examination.

#17 Is there a deformity in the degenerative SIJ? Does it need to be corrected? "

The anatomic position of the SIJ and the complex relationship to neurovascular anatomy create deep challenges for our understanding of the less intuitive manifestations of SIJ disease.

The SIJ is part of the pelvic wall. It is an element in a three-part universal joint, but also must remain inconspicuous to the passing vessels, the abdominal contents and the functions of birth and delivery. Its motion is constrained to less than few degrees, or a few millimeters. Therefore, deformity in the SIJ may be subtle and its effects may be difficult to see, or suggestive of other more familiar lesions.

Multiple forms of SIJ deformity exist (e.g. degenerative, posttraumatic, iatrogenic, developmental), and the surgical approach to pain, must be aware, and responsive to deformity. Furthermore, it is a principle in orthopedics to not only address the deformity, but to avoid new deformity, preserve bone stock, and provide for revision. Intervention cannot proceed without a deep understanding of the requirements and limitations of the surgical target, which in the case of the SIJ are extreme, treacherous and unyielding.

#21 What is the underlying lesion in the painful SIJ? Don´t we need to know before we start operating?

The science of the surgical treatment of the SIJ is done a disservice by allowing its disease to be lumped in with low back pain, which is not a diagnosis, but a syndrome.

Painful disease of the SIJ is a diagnosable lesion. If outliers or lack of understanding remain, it is a noble challenge to create a model that includes all possible elements, whether degenerative, inflammatory or neoplastic.

It is the clinician's responsibility to rule out the worrisome competing diagnoses of the pelvis and hip-spine axis and to identify the manifestations of common degenerative processes.

The great majority of the painful processes of the SIJ are "degenerative", but this term requires definition. Extreme joint reaction force with the associated microfracture, reactive sclerosis, and reactive hypertrophy all leave marks and evidence as to their basis, which parallels the disease processes of other joints.

Effective surgical intervention will require a full understanding of the pathophysiology. Does the surgery address the pathologic lesion? Does it ablate it? circumvent it? realign it? Answering these questions requires a concrete understanding of the underlying disease, its anatomic manifestations and surgical realities. To attempt intervention in the absence of such understanding is a violation of the scientific approach to lesion, and a violation to the highest level of care of the patient.

Unoki, Eiki, MD, Department of Orthopedic Surgery, Akita Kousei Medical Center, Akita, Japan

Graduated from Akita University School of Medicine, Japan (1989).

Doctor of Medicine, Department of Orthopedic Surgery, Akita University Graduate School of Medicine, Japan (1994).

Experience: 2008-2015: Akita Kousei Medical Center Dept. of Orthopedic Surgery.

Licence: Japanese Board of Orthopedic Surgery.

#23 Does Lumbar/lumbosacral fusion really increase the incidence of SIJ pain-what do we tell our lumbar patients about the possibility of SIJ failure?

Introduction

In recent years, lumbar fusion has become common in the treatment of various lumbar disorders. However, we often experience that low back pain(LBP) persists postoperatively or develops newly, and treating this pain can be difficult. Recently, the sacroiliac joint (SIJ) has gained increased attention as a source of pain after lumbar or lumbosacral fusion. We examined the factors related to the development of SIJ pain after lumbar or lumbosacral fusion

Objectives and Findings.

1. What is the risk factor of SIJ pain after fusion surgery?

We performed a retrospective analysis of 262 patients who underwent lumbar or lumbosacral fusion from June 2006 to June 2009. Of these, 28 newly developed SIJ pain. Our investigation are as follows; Is there difference of incidence of SIJ pain between floating fusion (sacrum not fused) and fixed fusion (sacrum fused)? Does incidence of SIJ pain change according to the number of fused segments? As a result, the incidence of SIJ pain was higher with fixed fusion (13.1%) than with floating fusion (10.0%). With regard to the number of fused segments, the incidence of SIJ pain was 5.8% for 1 fused segment, 10.0% for 2 segments, 20.0% for 3 segments, 22.5% for ≥4 segments. Thus, the incidence was significantly higher when ≥3 segments were fused. Logistic regression analysis was performed to determine if the development of SIJ pain was related to the presence of fusion involving the sacrum or the number of fused segments. The analysis revealed that the number of fused segments was significantly associated with the development of SIJ pain1.

2. If the patients undergo multiple segments fusion (≥3) with fixed fusion (sacrum fused), will the incidence of SIJ pain become more high rate?

We investigated the same series, the incidence of SIJ pain was higher with fixed fusion (30.0%) than with floating fusion (17.8%), although this difference was not significant. But, interestingly, the mean onset of SIJ pain was 9.5 (2–19) months after surgery in the floating fusion and 2.7 (1–6) months after surgery in the fixed fusion, indicating that incidence occurred significantly earlier in the fixed fusion.

3. If the patients undergo sacropelvic fixation in addition to multiple lumbar fusion, would SIJ pain develop?

We performed a retrospective analysis of 77 patients who underwent lumbar or lumbosacral fusion (≥3 segments) including sacropelvic fixation cases from 2009 to 2012. All Sacropelvic fixation were used S2-iliac screws. Of these, 12 newly developed SIJ pain. We investigated the difference of incidence of SIJ pain between L5 group (the lower end of the fusion is L5), S group (the lower end of the fusion is Sacrum) and P group (sacropelvic fixation). As a result, the incidence of SIJ pain was 16.7%(5/30) for L5 group, 26.1%(6/23) for S group, 4.2%(1/24) for P group. The incidence was significantly lower in P group. In sacropelvic fixation group, only one patient complained right SIJ pain. It was a case that S2-iliac screw was failed to put into right SIJ.

Conclusions

SIJ pain is a potential cause of low back pain after lumbar or lumbosacral fusion. Our study indicated that fusion of multiple segments (≥3) can increase the incidence of SIJ pain after lumbar or lumbosacral fusion1.

Recently, there has been an increase in the number of patients with osteoporotic kyphosis and adult spinal deformity. We believe that with improvement in the surgical skills of spine surgeons, spinal fusion techniques for multiple segments using instrumentation will increase considerably. When performing such surgery, in addition to adjacent segment disease (ASD), SIJ pain should be kept in mind as a potential cause of LBP following lumbar fusion. Similar to ASD, we think that SIJ pain cannot be completely prevented. Furthermore, In the case of multiple fusion, we believe that it is dangerous when combined with fixation to sacrum. This is because

The abstracts are listed in alphabetical order of the Speakers

two risk factors occur at the same time of which the fusion of multiple segments is the stronger participant. If possible, one should extend fixation to the pelvis. An article by Ohtori et al. found that development of SIJ pain was not seen in the case of pelvic fixation.2 Our data also indicate that fixation to pelvis could decrease the incidence of SIJ pain after lumbar / lumbosacral fusion. I think that movement of SIJ could be limited in this case.

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Westberg Andreas, MD orthopaedic surgeons Capio S:t Görans Sjukhus Stockholm Sweden

Medical degree at the Karolinska institute	*1993*
License to practice medicine	*1995*
Orthopedic specialist	*2001*
Consultant Spine surgery at Capio S:t Göran	*2008*
Head of spine surgery at Capio S:t Göran Hospital	*2009*

#32 EARLY RESULTS OF SI-JOINT SURGERY WITH TWO NEW MINIMALLY INAVASIVE METHODS

Westberg A., Adler T., MD orthopaedic surgeons Capio S:t Görans Sjukhus Stockholm Sweden.

Introduction

It is well known that up to 25% of patients undergoing surgery for chronic low back pain with or without concomitant leg pain may not achieve significant improvement. Moreover, many patients with back or leg pain are not considered suitable for back surgery. Some of these patients may suffer from pain actually arising from the sacroiliac joints. There is however no general consensus on how pain from the sacroiliac joints should be diagnosed nor treated.

Surgical arthrodesis of the sacroiliac joints has been carried out at least since 1920, however with widely varying results. In recent years, several less invasive methods for arthrodesis of the sacroiliac joint have been introduced.

Purpose/Aim

In this pilot study we have evaluated two less invasive methods to achieve arthrodesis of the sacroiliac joint. We studied surgical technique, complications and results. In this particular study we focus on clinical results using PROM (patient reported outcome measurements) after one year.

Relevance

Several less invasive methods for fusing the SI-joint have been introduced in recent years. To our knowledge there are no studies so far that compare results between these different methods.

Materials and Methods

All patients referred for "low back pain" to the Capio S:t Görans hospital during 2012 to 2015 and eventually diagnosed with SI-joint triggered pain using a diagnostic algorithm (see below), and with enough disability and pain to possibly benefit from surgery, were offered mini invasive si-joint fusion according to the description below.

The patients who underwent surgery were registered and followed prospectively in the Swedish spine surgery registry (Swespine).

A total of 39 fusion procedures were performed on 37 patients using the "DIANA"-technique (December 2012-january2014), and a total of 80 fusion procedures were performed on 68 patients using the "iFuse" –technique (February 2014 - May 2015), hence possible to evaluate one year results in June 2016. We have control of reoperation risk in all but one patient in the DIANA group. In the iFuse group we have 100% control of reoperations.

One year patient reported result (PROM) was successfully obtained from 25/37 DIANA patients (67%). In the iFuse group the corresponding figures were PROM from 58/68 patients (85%). All operations were performed by two experienced spine surgeons.

Inclusion criteria:

Patients without prior back surgery where MRI showed no findings that could explain the patient's back or pelvic symptoms and/or possible radiating leg pain, or patients with previous spinal surgery where MRI and CT of the lumbar spine did not indicate complication of previous spine surgery, or other changes in the lumbar region that could explain the patient's back or pelvic pain and/or radiating pain.

• The patient must have a history compatible with SI-joint induced pain.

• The patient must have at least two clinical findings of SI-joint induced pain. In accordance with the „European Guidelines for the Diagnosis and Treatment of pelvic girdle pain"

• The patient must have at least one diagnostic Si-joint block giving significant pain relief in the short term.

If patients did not meet all these criteria above but we still strongly suspected SI-joint pain we have done a temporary diagnostic fixation of the SI-joint with a screw. If good pain relief was achieved, the patient has been included for si-joint fixation. If temporary fixation did not result in pain relief the screw was removed.

Results

1. Global assessment.

In the DIANA group, after one year 48 % reported to be much better/better, while 20 % were worse, none were completely recovered.

In the iFuse group, 17% stated that they were completely pain free, 52% much better/better, while 17% were worse.

2. Pain VAS:

In the DIANA group, the mean VAS score went from 71 preop to 55 one year postop.

In the iFuse group the mean VAS score went from 70,5 preop to 37,5 one year postop.

3. Reoperations:

In the DIANA group 19 patients have eventually been reoperated because of continuous pain due to possible pseudarthrosis. In these patients, the DIANA implants were removed and "refusion" was performed using iFuse. Nine of these patients were operated during our iFuse inclusion period, and are included in this study. They have similar results as the overall iFuse group after their iFuse operation, but of course unsatisfactory results after their initial DIANA procedure. This also means that most DIANA reoperations have been done later than one year postop.

The iFuse group have so far been followed only one year.

In the iFuse group 6 patients have been reoperated, 2 because of misplaced implants, and in 4 cases we added additional implants to achieve full stability.

Discussion

This study has definite limitations. First of all it is not randomized. The inclusion criteria though have been similar over time, and so have the groups in respect of age, gender and frequency of former spine surgery etc.

Learning curve affects both methods. Some lessons learned in the "DIANA group" may benefit the iFuse-group, even though the surgical techniques are very different. The DIANA technique may feel more "natural" in the hands of a spine surgeon to begin with, while the iFuse technique might come more "natural" to an experienced pelvic fracture surgeon. Both techniques seem to be comparable regarding operation time bleeding etc. after "learning curve", though we did not study that in this study.

Conclusion(s)

The "Diana-procedure" had fewer direct complications but a large proportion of pseudarthrosis resulting in later reoperations. The clinical results at one year were also not in line with our expectations.

The iFuse method also carried several reoperations, but our impression is that they are more dependent on "learning curve". They have come early, and we have so far only seen and reoperated one late "pseudarthroses" (outside this study)

The clinical result, at least in our hands, favour iFuse.

Keywords

Si-joint fusion, DIANA, iFuse.

The abstracts are listed in alphabetical order of the Speakers

Whang, Peter, MD, Dpmt. of Orthopaedics and Rehabilitation, Yale University School of Medicine, New Haven CT, USA

Dr. Peter Whang, MD, FACS attended Harvard University (Cambridge, MA) where he graduated with a degree in biochemistry and subsequently received his medical degree from the Duke University School of Medicine (Durham, NC). He completed his residency in orthopaedic surgery at the University of California, Los Angeles (Los Angeles, CA) and underwent specialized fellowship training in orthopaedic and neurologic spine surgery at the Rothman Institute at Thomas Jefferson University (Philadelphia, PA). He is currently an Associate Professor in the Department of Orthopaedics and Rehabilitation in the Yale University School of Medicine. Dr. Whang is actively involved in clinical and basic science research, focusing on the biology of spinal fusion and bone healing, bone grafting substitutes, minimally invasive surgical techniques, and evidence-based medicine; he has also served as an investigator for various clinical trials including a prospective randomized controlled study comparing fusion to nonoperative care as a treatment for SI joint dysfunction (INSITE, SI-BONE).

#14 Does Level of Response to SIJ Block Really Guide Us as to Which Patient We Should Fuse?"

The optimal degree of pain relief following a diagnostic sacroiliac joint (SIJ) block that may reliably establish the presence of SIJ dysfunction remains a matter of some debate and there is currently no validated "gold standard" threshold. In an attempt to determine whether there is a specific percentage of pain relief that is predictive of clinical outcomes following definitive treatment, we performed a subgroup analysis of 320 subjects enrolled in two separate prospective multicenter trials who underwent minimally invasive fusion for SIJ dysfunction diagnosed by history, physical examination, and standardized SIJ block.

As part of this investigation, a 50% reduction in pain at 30 or 60 minutes following SIJ block was considered to be confirmatory of the diagnosis. The absolute and percentage improvements in Visual Analog Scale (VAS) SIJ pain and Oswestry Disability Index (ODI) scores at 6 and 12 months after SIJ fusion were correlated with the average acute improvement in SIJ pain following SIJ block.

The average pain reduction during the first hour after SIJ block was 79.3%. At 6 months after fusion, the overall mean reductions in VAS SIJ pain and ODI scores were 50.9 points (0-100 scale) and 24.6 points, respectively; these values were not significantly different at the 12 month time point (50.8 and 25.8). Reductions at 12 months after SIJF were similar. Thus, the improvements in SIJ pain and ODI scores observed at 6 and 12 months after surgery did not appear to correlate with the responses to SIJ blocks.

In this study, the use of a threshold of at least a 50% decrease in pain following SIJB block with this patient population gave rise to excellent clinical outcomes at 6 and 12 months after SIJ fusion, suggesting that adherence to overly stringent selection criteria (i.e. 75% reduction) for this procedure is not warranted and could serve to withhold a potentially beneficial therapeutic option from a substantial proportion of individuals with debilitating pain and/or disability resulting from SIJ dysfunction.

#25 What is or Could be the Downside to a Successful Fusion of the SIJ – Can We Compare it to the Lumbar Spine?

As minimally invasive sacroiliac joint (SIJ) fusion becomes a more well-accepted treatment for patients with SIJ dysfunction, it is expected that these procedures will continue to be increasingly performed over time. However, the biomechanical effects of SIJ stabilization on other anatomic structures have not been well characterized. In the spine, the principle of adjacent segment degeneration refers to the progressive spondylosis which often develops at the levels contiguous with an arthrodesis. Whether these changes arise as a direct result of the surgical intervention or simply represent the natural history of spinal disease remains somewhat controversial. Nevertheless, there is ample evidence derived from various biomechanical and clinical investigations suggesting that these adjoining spinal segments are subjected to pathologic forces following a fusion, thereby predisposing them to premature degeneration (although to what extent that are symptomatic may be uncertain) which has served as the rationale for motion-sparing techniques such as disc arthroplasty. It is possible that these constructs may not only affect the rest of the spine but also the SIJ; in fact, the incidence of SIJ-mediated pain has been shown to be higher in individuals who have previously undergone a lumbar arthrodesis.

Given the frequency with which patients develop contralateral symptoms following fusion of one of the SIJ, it certainly is conceivable that this procedure could alter the biomechanical profile of the pelvis and transmit greater forces across these joint surfaces and bring about worsening dysfunction; in theory, stabilization of the SIJ could also affect the spine or hip and hasten their degeneration as well. Although the SIJ is a true synovial joint which allows for movement in multiple planes, it does not have nearly the same range of motion as the spine or hip so it seems less likely that minimally invasive SIJ fusion would result in any deleterious effects on these other joints. Regardless, additional biomechanical and clinical studies are clearly needed in order to better elucidate the consequences of SIJ fusion on the rest of the axial and appendicular skeleton.

INDUSTRIAL WORKSHOPS AND EXHIBITION

1. Bauerfeind AG, 07937 Zeulenroda-Triebes/GER - www.bauerfeind.com
2. Diros Technology Inc., Markham, Ontario, Canada- www.dirostech.com
3. German Institute for Cell and Tissue Replacement, a not-for profit Inc., 12555 Berlin/GER, www.dizg.de
4. Globus Medical, Inc., Audubon, PA 19403, USA www.globusmedical.com
5. Ilion Medical, Inc., Minneapolis, MN 55402/USA - www.ilionmedical.com
6. Orthofix International N.V., 3451 Plano Parkway Lewisville, TX 75056 - www.orthofix.com
7. SI-BONE SRL - European Headquarters, 21013 Gallarate (VA), Italy, www.si-bone.com
8. SIGNUS Medizintechnik GmbH, 63755 Alzenau/ Germany, www.signus.com
9. SI-Technology, LLC, 80524 Fort Collins, Co, USA, www.si-technology.co
10. St. Jude Medical GmbH, 66760 Eschborn, www.sjm.com
11. XTANT Medical - www. xtantmedical.com
    X-spine Systems, Miamisburg, Ohio 45342, USA
    Bacterin International, Belgrade, MT 59714, USA

ORGANIZING HOST

Sacroiliac Medical Expert Group e.V.
www.si-meg.com
T +49 2196 709013
F +49 2196 732 536
info@si-meg.com
www.si-meg.com

Organizing committee:

- Volker Fuchs, MD, Vice President
- Michael Dierks, Secretary
- Thomas Kibsgård, MD, President

SIMEG is a „Medical Experts Association for Research into Diseases of the Sacroiliac Joints and their Treatment" of casualty surgeons, orthopaedic surgeons, neurosurgeons, neurologists, physiotherapists together with scientists and other persons, who work surgically and conservatively in the treatment of the sacroiliac joints and of the pelvic girdle in hospital, practice and research. The association is independant. Registered at the Federal Court of Cologne VR 18315. Tax no./AZ 230/5724/3251 KöZst, FA Leverkusen/Germany, acknowledged as non profit organization acc. to §60a Abs. 1 AO

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Time Table

	Thursday	Friday	Saturday
8:00		Registration	08:00 h Registration
8:30			08:30 h - Session 5
9:00		09:00 h - Session 1	***Challenges:*** *Pain source, bone healing and fusion, revision options*
9:45			09:45 h - 10:00 hBreak
10:00		*Introduction and Updates: Anatomy and Biomechanis*	**10:00 h - Session 6** ***Fusion surgery:*** *Pro/Con*
10:30		10:30 h - Break	
11:00		10:50 h - Session 2	
11:20		***SIJ Basics:*** *Biomechanics, Diagnostic Imaging; Innervation; SIJ pathologies*	11:20 h - Session 7
11:30			**Fusion Devices 1 anterior approach:** *Open surgery, Anterior plates*
12:20			12:20 h - Lunch
12:30		12:30 h - Lunch-Workshops	
13:00			**13:00 h - Fusion Devices 2** ***posterior approach:*** *iFuse ./.DIANA; DIANA; Si-Desis*
14:00		14:00 h - Session 3	**14:00 h - Fusion Devices 3** ***lateral approach:*** *SILEX ; SI-Lok; iFuse*
15:00			15:15 h - Final Discussion
15:30		***Non surgical:*** *Pain scores; Denervation*	**15:30 h - Hands on: Clinical Examination and Injection Techniques**
16:00		16:00 h - Break	16:00 h - End of Conference
16:20		16:20 h - Session 4	
16:30		***Indication:*** *Indication techniques; Decision making*	
17:30		17:40 h -Discussion and Summary	
19:00 - 20:30	**Members' Meeting**	19:00 h - Dinner	

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