22nd DUBAI INTERNATIONAL SPINE CONFERENCE

17,18,19 MAY 2023 GRAND HYATT, DUBAI, UAE

21 PTS CPD POINTS AMA AMERICAN MEDICAL ASSOCIATION

21 PTS CPD POINTS DUBAI HEALTH AUTHORITY

ACCREDITED

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TOPICS

- SPINE DEFORMITY IN ELDERLY: WHEN TO OPERATE? WHAT EXTEND OF SURGERY IS REASONABLE
- ARTIFICIAL INTELLIGENCE IN SPINE: UPDATE
- "NOT SO SIMPLE" COMPLICATIONS IN "SIMPLE" SPINE SURGERY
- REGENERATION MEDICINE - STEM CELLS AND SPINE DISEASE
- PERIPHERAL NERVE SURGERY

+971 4 5730737 / 33 spine@nshdubai.com www.dubaispinecONFERENCES.com

In collaboration with NASSi ADVANCING GLOBAL SPINE CARE RCSI ArabSpine

Organized by: مستشفى الجراحة العصبية والعمود الفقري NEURO SPINAL HOSPITAL

Continuing Medical Education (CME) Credit

This activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education through the joint providership of the North American Spine Society and ArabSpine. The North American Spine Society is accredited by the ACCME to provide continuing medical education for physicians.

The North American Spine Society designates this live activity for a maximum of 21 AMA PRA Category 1 Credits™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

The American Medical Association has determined that physicians not licensed in the US to participate in this CME activity are eligible for AMA PRA Category 1 Credits™.

Message from the President

Dear Colleagues, Friends and Guests ,

On behalf of the Organizing Committee, it is with great honor and pleasure to welcome you all to the 22nd Dubai International Spine Conference (DISC) in collaboration with NASS (North American Spine Society), Royal College of Surgeons in Ireland (RCSI) and ArabSpine.

The educational committee prepared a very rich program covering Spine Deformity in Elderly, Artificial Intellegence in Spine: Update, Not so simple complications in “simple” spine surgery, Regeneration Medicine - stem cells and Spine disease, Peripheral Nerve Surgery in Spine Surgery provided by top international and regional faculty.

We are proud and honored to have the NASS and the RCSI associated to the spine education in the Arabic world through the active participation in ASCD (ArabSpine Course Diploma) and to DISC (Dubai International Spine Conferences) ambition to deliver the advanced and highest standard of teaching for the benefit of patients, healthcare providers, hospitals and communities which is in line with the strategic vision of His Highness Sheikh Mohammed bin Rashid Al Maktoum, UAE Vice President, Prime Minister and Ruler of Dubai to therefore enhance the medical education and practice in UAE and the whole region.

We would like to extend our sincere thanks to Dubai Health Authority (DHA), the Ministry of Health (MOH) of United Arab Emirates, North American Spine Society (NASS) and Royal College of Surgeons in Ireland (RCSI) for their valuable support to Dubai International Spine Conferences and to ASCD, thank you to our esteemed faculty for sharing their knowledge out of their busy schedules, to the attendees who are here, the sponsors and companies who have been our strategic partners since the inception of Dubai International Spine Conference.

Enjoy the opportunity of visiting Dubai, the most sought after destination which represents a mix of living and business environments, a tourist haven offering the widest attractions from luxury urban spots to historic architectural places connected by state-of-the-art infrastructures and transportations.

We welcome you all to Dubai and wishing you the very best and pleasant stay.

Prof. Abdul Karim Msaddi
Chairman of Dubai International Spine Conference

DAY1

SCIENTIFIC PROGRAM

DAY ONE - MAY 17, 2023 (WEDNESDAY)

Morning Sessions

7.30 - 8.45 am	**REGISTRATION AND WELCOME RECEPTION**	
8.45- 8.55 am	Welcome Speech - Abdul Karim Msaddi, Chairman of the Conference	
SESSION 1	**KEYNOTE LECTURES**	
Chairpersons: Mohamed Wafa - Egypt / Saleh Baeesa - KSA		
9.00 - 9.15 am	Antithrombotic Therapies in Spine Surgery	S. Theiss / USA
9.15 - 9:30 am	Assessment of the Incidence and Nature of Adverse Events and their Association with Human error in Neurosurgery. A Prospective Observation	B. Meyer / Germany
9.30 - 9.45 am	Full Endoscopic Spine Surgery: Adoption and Learning Curve	R. Assaker / France
9.45 - 10.00 am	Spinal Cord Injury and Stem Cells: Do We Have a Viable Treatment?	D. Wong / USA
10.00 - 10.15 am	DISCUSSION	
10.15 - 10.30 am	OPENING SPEECH:	
10.30 - 11.00 am	COFFEE BREAK	
SESSION 2	**ADULT SPINE DEFORMITY - I**	
Chairpersons: Antony Michael-UAE / Tanmoy Maiti-UAE		
11.00 - 11.15 am	Preop Optimization of Patients Requiring Adult Deformity Surgery	S. Theiss / USA
11.15 - 11.30 am	Adult spinal Deformity. How Aggressive Should We be in treating the Aged Spine	B. Meyer / Germany
11.30 - 11.45am	What extend of surgery in spine deformity in elderly	C. Lamartina / Italy
11.45 - 12.00pm	Adult scoliosis Surgery: Do We Always Need Long Segment Fusion? Optimizing Patient Specific Management	T. Maiti / UAE
12.00 - 12.15pm	Adult Deformity and Parkinson: Challenging Pathology	R. Assaker / France
12.15 - 12. 30pm	Post Operative Junctional Problems	M. Wafa / Egypt
12.30 - 12.45pm	IOM in Scoliosis Surgery	L. Abukwedar / UAE
12.45 - 1.00pm	DISCUSSION	
1.00 - 2.00pm	LUNCH BREAK	

DAY 1

Afternoon Sessions

SESSION 3A PAIN MANAGEMENT

Chairpersons: Mohamed Al Olama - UAE / Nader Hebela - UAE

2.00 - 2:15pm	SIJ The Hidden and Forgotten Joint	T. Hamdan/ Iraq
2.15 - 2.30pm	Diagnostic Utility of Selective Nerve Root Block	D. S. Cheng / USA
2.30 - 2.45pm	Technical Pitfalls and Complication Avoidance in Radiofrequency Thermocoagulation of Medial Branches	D. S. Cheng / USA
2.45 - 3.00pm	SCS or In the Management of Neuropathic Pain	M. Al Olama / UAE
3.00 - 3.15pm	Cervical Epidural Steroid Injections: Technical Pitfalls and Complications	D. S. Cheng / USA
3.15 - 3.30pm	Multimodal Perioperative Pain Management in Spine & Scoliosis Surgery	N. Hebela / UAE
3.30 - 3.40pm	Midline Posterior Single-Entry Approach for Bilateral Cervical Medial Branch Radiofrequency Ablation. A Description of a New Access Technique	S. Kassis / UAE
3.40 - 3.50pm	DISCUSSION	
3.50 - 4.10pm	COFFEE BREAK	

SESSION 3B COMPLICATIONS– I

Chairpersons: Catalin Majer-UAE / Wael Kasem-Iraq

2.00 - 2:15pm	“Not so Simple” Complications in “Simple” Spine Surgery	M. Szpalski / Belgium
2.15 - 2.30pm	“Not so simple” complications in “simple” L5 isthmic low-grade spondylolisthesis	C. Lamartina / Italy
2.30 - 2.45pm	Decision Making in Complex Cervical Spine Revision Surgery	A Abou Modawi / Egypt
2.45 - 2.55pm	Systematic Review of Vascular Injury During Thoracic And Lumbar Spine Surger	T. Hamdan / Iraq
2.55 - 3.05pm	Managing Complications in Scoliosis Surgery	A Michael / UAE
3.05 - 3.15pm	Neurological Deficit After ACDF	C. Majer / UAE
3.15 - 3.25pm	Spine Infections - Unusual Cases	M. Wafa / Egypt
3.25 - 3.35pm	Thoracic Herniated Spinal Cord: Exceptional Cause of Myelopathy	B. Abdennebi / Algeria
3.35 - 3.45pm	DISCUSSION	
3.45 - 4.10pm	COFFEE BREAK	

Afternoon Sessions

SESSION 4A REGENERATIVE MEDICINE

Chairpersons: Mohamed Halawani- KSA / Kassem Shunnar- UAE

4.10 - 4.25pm	Intra- discal stem cell injections	B. Schneider / USA
4.25 - 4.40pm	Stem Cells in Intervertebral Disc Regeneration	M. Szpalski / Belgium
4.40 - 4.55pm	PRP injections for facet and SIJ pain	B. Schneider / USA
4.55 - 5.10pm	Stem cell applications in degenerative spine conditions	G. Ghiselli / USA
5.10 - 5.25pm	Intra- discal PRP injections	B. Schneider / USA
5.25 - 5.40pm	Intranasal Therapy for Acute Spine Cord Injury	T. Chen / USA
5.40 - 5.55pm	DISCUSSION	

SESSION 4B COMPLICATIONS - II

Chairpersons: Yasser El Banna- Egypt / Thamer Hamdan- Iraq

4.10 - 4.20pm	It's a Simple Lumbar Microdiscectomy: But how do you Avoid Complications and Make the Surgery Better?	D. Wong / USA
4.20 - 4.30pm	Infection post lumbar surgery, does it Change Outcomes	J. France / USA
4.30 - 4.45pm	Management of unintentional durotomies in minimally invasive spine surgery - what works, what doesn't	B.R. Gantwerker / USA
4.45 - 5.00pm	Wrong site surgery in the thoracic spine	J. France / USA
5.00 - 5.10pm	It was a Simple Lumbar Stenosis Decompression Until the CSF and Nerve Roots Appeared: Strategies for Durotomy Prevention and Repair	D. Wong / USA
5.10 - 5.20pm	Complications in Simple Spine Surgery	A Al Mashani / Oman
5.20 - 5.30pm	Redo- Anterior cervical spine surgery , complications/pitfalls	M. Halawani / KSA
5.30 - 5.40pm	Surgical incision and wound related complications in lumbar spine surgery	A Taghikani / UAE
5.40 - 5.50pm	DISCUSSION	
	END OF DAY ONE	

DAY 2

SCIENTIFIC PROGRAM

DAY TWO - MAY 18, 2023 (THURSDAY)

Morning Sessions

SESSION 5 ARTIFICIAL INTELLIGENCE

Chairpersons: David Wong- USA / Ahmed Al Khani- KSA

8.30 - 8.45am	Artificial Intelligence in Spine Care	M. Szpalski / Belgium
8.45 - 9.00am	Artificial Intelligence in Life, Business and Medicine	I Khoury / UAE
9.00 - 9.15am	Augmented reality in spine surgery, overview	M. Halawani / KSA
9.15 - 9.30am	Artificial Intelligence and Robotics in Spine Surgery	D. Hafez / USA
9.30 - 9.45am	Update in Ai application in diagnostic Imaging	A Zerbi / Italy
9.45 - 10.00am	The Use of Artificial Intelligence in Spine Surgery	M. Al Fawareh / Jordan
10.00 - 10.15am	Artificial Intelligence' the next level	C. Bolger / Ireland
10.15 - 10.30am	Artificial intelligence: the patient gains safety, the surgeon loses happiness of the dexterity of his fingers?	B. Abdennebi / Algeria
10.30 - 10.40am	DISCUSSION	
10.40 - 10.50am	COFFEE BREAK	

SESSION 6 SPINE ONCOLOGY

Chairpersons: Abbas Ramadan- Kuwait / Aneela Darbar- UAE

10.50 - 11.05am	State- of- the- art Imaging for Diagnosis of Metastasis and Primary Spine Bone Tumors	A. Zerbi / Italy
11.05 - 11.20am	Spine Oncology: What is available now ??	T. Chen / USA
11.20 - 11.35am	Treatment Options for Primary Malignant Bony Tumors	R. Assaker / France
11.35 - 11.50am	Surgical Treatment of Metastatic Spine	D. Hafez / USA
11.50 - 12.05pm	Radiotherapy and Radiosurgery Bony Spinal Tumors	S. Yanek / UAE
12.05 - 12.20pm	Spine Metastasis: Decision Making Treatment and Prognosis	M. Hamidani / Algeria
12.20 - 12.35pm	Primary Spinal Tumors	S. Hilmani / Morocco
12.35 - 12.50pm	Surgery for Spinal Cord Tumors	A El Azhari / Morocco
12.50 - 1.00pm	DISCUSSION	
1.00 - 2.00pm	LUNCH BREAK	

Afternoon Sessions

DAY 2

SESSION 7A GENERAL SESSION - I

Chairpersons: Sirajeddin Belkhair- Qatar / Mohmed El Gohari- Egypt

2.00 - 2.15 pm	Degenerative Disc Disease: Who should have Surgery?	T. Chen / USA
2.15 - 2.30pm	When Things go wrong in Spine Surgery.	C. Bolger / Ireland
2.30 - 2.45pm	Fusions in the elderly: Open vs MIS approach	D. Hafez / USA
2.45 - 3.00pm	Tandem Stenosis – the dilemma of Simultaneous Cervical and Lumbar Stenosis	D. Wong / USA
3.00 - 3.10pm	Why do it? My decision-making tree in deciding on approach to lumbar degenerative disc disease in the aging population	B.R. Gantwerker / USA
3.10 - 3.20pm	LLIF: When and How?	R. Assaker / France
3.20 - 3.30pm	Kyphoplasty or Corpectomy: When Do you Need to Do More than just put Cement in.	B.R. Gantwerker / USA
3.30 - 3.40pm	Decompression alone versus Decompression and Fusion for elderly patients with two level or more lumbar canal stenosis	S. Belkhair / Qatar
3.40 - 3.50pm	Thoracic Tuberculosis	S. Hilmani / Morocco
3.50 - 4.00pm	DISCUSSION	
4.00 - 4.20pm	COFFEE BREAK	

SESSION 7B ADULT SPINE DEFORMITY - II

Chairpersons: Wael Al Shaya-KSA / Said Hilmani-Morocco

2.00 - 2.15pm	Severe sagittal and Coronal Malalignment	C. Lamartina / Italy
2.15 - 2.30pm	Alar- iliac instrumentation Reduces Caudal Screw Loosening	B. Meyer / Germany
2.30 - 2.45pm	Cervical Deformity Consideration for Degenerative Spinal Conditions	G. Ghiselli / USA
2.45 - 3.00pm	Drop head syndrome: strategy and surgical treatment	R. Assaker / France
3.00 - 3.15pm	Atlantoaxial Osteoarthritis and deformity in elderly: outcome and complication	W. Alshaya / KSA
3.15 - 3.30pm	Surgical Options for Spine Deformity in the Elderly	C. K. Yaltirik / UAE
3.30 - 3.45pm	Post- Fusion Lumbar Flatback Deformity with Sagittal Imbalance does always need Surgery? and Surgical Outcomes	W. Kasem / Iraq
3.45 - 3.55pm	DISCUSSION	
3.55 - 4.20pm	COFFEE BREAK	

DAY 2

Afternoon Sessions

SESSION 8A ENDOSCOPY

Chairpersons: Khaled Al Kuwari-Bahrain / Chanshik Shim-UAE

4.20 - 4.30pm	Endoscopic Spine Surgery	K Al Kuwari / Bahrain
4.30 - 4.40pm	A Modified Endoscopic Access for Lumbar pathologies; "inter-transverse" Endoscopic Approach to Minimize Postoperative Dysesthesia following Transforaminal Approach	F. Musharbash / USA
4.40 - 4.50pm	Full-Endoscopic Soft Tissue Approach for Lumbar Disc Herniation	T.I. Metwally / Egypt
4.50 -5.00pm	Obstacle for the New Technology for Endoscopic Discectomy and How We Can Avoid It	M. Malibary / KSA
5.00 - 5.10pm	Endoscopic Extreme Transforaminal Lumbar Interbody Fusion with Large Spacer: A Technical Note and Preliminary Report.	J.H. Eum / UAE
5.10 - 5.20pm	Outcome of Tubular Endoscopic Surgery for Lumbar Disc Herniation	K. Ullah / Pakistan
5.20 - 5.30pm	DISCUSSION	
	END OF DAY TWO	

SESSION 8B PERIPHERAL NERVE SURGERY

Chairpersons: Abbas Ramadan-Kuwait / Amer Al Shurbaji-Jordan

4.20 - 4.35 pm	Management of peripheral nerve sharp lacerations	B. Addas / KSA
4.35 - 4.50pm	Iatrogenic Peripheral Nerve Injuries – Common Causes and Treatment: Case Series	K. Al Ali / UAE
4.50 - 5.05pm	Surgical Anatomy of Brachial Plexus	B. Addas / KSA
5.05 - 5.20pm	Selective Peripheral Nerves Neurotomy for Handicapping Spasticity	AK Msaddi / UAE
5.20 - 5.30pm	Intracapsular Micro-enucleation of a Painful Superficial Nerve Schwannoma. A Rare Encounter.	A. Ramadan / Kuwait
5.30 - 5.40pm	Clinical Dilemma: Thoracic Outlet, Cervical Radiculopathy or Entrapment Neuropathy	B. Addas / KSA
5.40 - 5.50pm	DISCUSSION	
	END OF DAY TWO	

DAY 3

SCIENTIFIC PROGRAM

DAY THREE - MAY 19, 2023 (FRIDAY)

Morning Sessions

SESSION 9 GENERAL SESSION - III

Chairpersons: Bassam Addas- KSA / Cumhur Kaan Yaltirik - UAE

8.30 - 8.45am	How Do I Do It, Over the Top Surgery for Spinal Stenosis (or decompression for foraminal Stenosis)	C. Bolger / Ireland
8.45 - 9.00am	Limited Surgical Intervention in Adult Spine Deformity Surgery	S. Theiss / USA
9.00 - 9.15am	Minimally invasive treatments for lumbar stenosis in the elderly	D. Hafez / USA
9.15 - 9.30am	Minimally Invasive Tubular Microdiscectomy for Recurrent Lumbar Disc Herniation. Step by Step Technical Description and Retrospective Review	K. Al Ali / UAE
9.30 - 9.40am	Microsurgery of Lumbar Disc Hernia: Some Thoughts After 35 Years of a Technique	A El Azhari/ Morocco
9.40 - 9.50am	Degenerative Spondylolisthesis Accompanying LSS: Do we need Fusion?	S. Samy / Egypt
9.50 - 10.00am	Brucella Spondylodiscitis	A Al Khani / KSA
10.00 - 10.10am	Vascular Interventional Radiology in Spine and Spinal Cord	R.B. Pons / UAE
10.10 - 10.20am	Bariatric Surgery in Obese Patient with CLBP	Amr Arafa / UAE
10.20 - 10.30am	DISCUSSION	
10.30 - 10.50am	COFFEE BREAK	

SESSION 10 EDUCATION / INNOVATION

Chairpersons: Ahmed Al Khani-KSA / Khaled Al Ali-UAE

10.50 - 11.05am	Robotic assisted spine surgery: adoption and learning curve	R. Assaker / France
11.05 - 11.20am	Optimizing outcomes and experience for patients traveling abroad for spine surgery	S. Baeesa / KSA
11.20 - 11.35am	Degenerative Spondylolisthesis - What Constitutes Instability	D. Wong / USA
11.35 - 11.50am	ArabSpine Course Diploma	AK Msaddi / UAE
11.50 - 12.05pm	Neurosurgery Training Program: An Eye to the Future	A Al Khani / KSA
12.05 - 12.20pm	Arab Board in Neurosurgery	B. Abdennebi / Algeria
12.20 - 12.30pm	DISCUSSION	
12.30 - 2.10 pm	LUNCH BREAK & FRIDAY PRAYER	

DAY3

Afternoon Sessions

SESSION 11A GENERAL SESSION - III

Chairpersons: Abdessamad Al Azhari-Morocco / Samer Samy Rezk-Egypt

2.10 - 2.20pm	Electrodiagnostic Testing in Spine Care	D. S. Cheng / USA
2.20 - 2.30pm	Comparative Study Between ALIF and TLIF	Y. El Banna / Egypt
2.30 - 2.40pm	Surgical Management of Lumbar Degenerative Disease in Osteoporotic Patient	A Abdulla / Kuwait
2.40 - 2.50pm	Outcome of Lumbar Interbody Fusion Versus Posterolateral Fusion with pedicle screw fixation	E. H. Abdou El Maaty/ Egypt
2.50 - 3.00pm	Refuse to Fuse in Degenerative Spondylolisthesis: Why and How?	C. Shim / UAE
3.00 - 3.10pm	Coccydynia: Evidence based Approach to Management	A Michael / UAE
3.10 - 3.20pm	Sagittal and Coronal Balance of Spine: Why it is needed?	M. Z. Shakir / Iraq
3.20 - 3.30pm	Arnold Chiari Malformation: Comprehensive Approach	Ahmed Anwar / UAE
3.30 - 3.40pm	DISCUSSION	
3.40 - 4.00 pm	COFFEE BREAK	

SESSION 11B CERVICAL SPINE - IV

Chairpersons: Essam El Gamal-UAE/ Nicandro Figueiredo / UAE

2.10 - 2.25pm	Asymptomatic / Minimally symptomatic cervical stenosis. Surgical indications and review of literature	G. Ghiselli / USA
2.25 - 2.40pm	Hybrid Cervical Surgery: What's the Current Medical Evidence	N. Figueiredo / UAE
2.40 - 2.50pm	Cervical ACDF & ADR in Management of Cervical Disc	A. Abdulla / Kuwait
2.50 - 3.00pm	Comparison Between Cage-Implant and Zero Profile Cage Fusion	M. Zayan / UAE
3.00 - 3.10pm	Rashid Hospital Experience with Stand Alone Cage for Anterior Cervical Discectomy and Fusion	A Al Maazmi / UAE
3.10 - 3.20pm	Post Cervical Foraminotomy: Indication and Complications Avoidance	C. Majer / UAE
3.20 - 3.30pm	Atlantic-Axial Instability in Children with Down Syndrome	E. El Gamal / UAE
3.30 - 3.40pm	DISCUSSION	
3.40 - 4.00pm	COFFEE BREAK	

Afternoon Sessions

SESSION 12	COMPLICATIONS - III	
Chairpersons:	*Ali Al Mashani-Oman / Bennaisa Abdennebi-Algeria*	
4.00 - 4.15pm	Imaging Prediction of failed spine	A. Zerbi / Italy
4.15 - 4.30pm	Low-Grade Infection and Implant Failure Following Spinal Instrumentation: A Prospective Comparative Study	B. Meyer / Germany
4.30 - 4.40pm	It was a Simple Lumbar Fusion until the Patient Woke up With Perioperative Blindness: What are the Prevention Strategies	D. Wong / USA
4.40 - 5.00pm	Serious complications after simple spine surgery (how to avoid).	A Al Shurbaji / Jordan
5.00 - 5.10pm	Major Vascular Injury in Lumbar Disc Surgery Series of Three Cases and Review of Literature	M. El Gohary / Egypt
5.10 - 5.20 pm	DISCUSSION	
	END OF THE PROGRAM	

Full-Endoscopic Soft Tissue Approach for Lumbar Disc Herniation

Author: **Tamer Hassan, MD, PhD**
Country: Egypt

Background Data: Open lumbar microdiscectomy has been considered the gold standard in the management of lumbar disc herniation (LDH) because of its favorable outcomes in long-term follow up. Nowadays, minimally invasive discectomy is gaining recognition due to its advantages. The advantages of endoscopic lumbar discectomy includes clear visualization, less injury to the paraspinal muscle, protection of spinal stiffness and dynamic structure better cosmetic effect, and less postoperative symptoms and open surgery related complications with subsequent earlier return to work.

Purpose: This study was conducted to evaluate the efficacy of transforaminal and interlaminar endoscopic lumbar discectomy in the treatment of lumbar disc prolapse.

Patients and Methods: A prospective descriptive case series study was carried out on 42 patients who had lumbar disc herniation not responding to medical treatment for 6 months. Patients included from those attending the neurosurgical department. All patients underwent either transforaminal or interlaminar endoscopic lumbar discectomy.

Results: All patients had significant improvement in VAS score. According to Mac Nab's criteria; 79% of patients have excellent results and 11% have good results; thus giving about 90% satisfactory outcome. Out of the 25 patients undergone interlaminar approach, 24 (96%) had completed the planned operative procedure. On the other hand, out of the 17 patients who undergone transforaminal approach; only 12 patients (70.6%) had completed the planned operative procedure.

Conclusion: Pure endoscopic discectomy is an effective surgical method for treatment of lumbar disc prolapse.

Endoscopic Extreme Transforaminal Lumbar Interbody Fusion with Large Spacer: A Technical Note and Preliminary Report

Author: **Jin Hwa Eum**
Country

This report describes a novel endoscopic fusion technique to be used with unilateral biportal endoscopy (UBE) called extreme transforaminal lumbar interbody fusion (eXTLIF) with a large spacer. We also present short-term results of this procedure. Previous studies reported that minimally invasive transforaminal lumbar interbody fusion (MIS-TLIF) could produce acceptable fusion rate; therefore, it is often used for treating various degenerative lumbar disease. Moreover, MIS-TLIF can be performed via a unilateral approach, and because of this, it is commonly performed with the UBE technique. The biportal endoscopic TLIF procedure is generally used with a single spacer in the interbody space. It is important to insert the maximum amount of graft material into the prep site via an autologous bone marrow transplant or another substance with spacer insertion. Since MIS-TLIF using UBE is performed in water, it may be insufficient environment for excellent fusion. Therefore, a modified method was used to increase the surface contact area and insert the maximum amount of bone material using a larger spacer. However, using a large-size spacer necessitates a larger spacer orifice. For this purpose, eXTLIF was performed, which inserts the spacer more laterally than current TLIF position, we report the surgical method and short-term results, which have been satisfactory thus far.

Optimizing outcomes and experience for patients traveling abroad for spine surgery

Author: **Saleh S. Baeesa, MD**
Country: Saudi Arabia

Introduction: It is widely accepted that patients with complex medical diagnoses who have the means will travel abroad for specialized medical care. Leading global medical centers have promoted destination medical services to capture international patients, increase revenue, and boost brand visibility abroad. For various reasons, patients from the Gulf countries, including the Kingdom of Saudi Arabia (KSA), have comprised a significant proportion of patients traveling abroad for care. Rarely, however, have local physicians and surgeons been involved at the granular level in these decisions.

Objective: This study aims to understand better the opinions, insights, and suggestions of local spine surgeons in KSA regarding the outbound surgical services provided to their patients. We believe that engaging local physicians will ultimately enhance outcomes and experience for patients needing to travel abroad for specialized spine surgery.
Methods: A cross-sectional study was conducted from April 11 to April 27, 2022. An electronic Qualtrics online survey with 12 items was sent to all spine surgeons (orthopedics and neurosurgeons) from KSA, identified by the local neurosurgery, orthopedics, and spine societies. In addition, recent experiences and opinions on patients traveling abroad for spine care were assessed.

Results: A total of 110 participants were identified, with 86 responses. Most responders (84%) have cared for patients who have traveled abroad or feel knowledgeable about destination services. In that order, the patient's perception of the local system, the complexity of the case, and the opportunity for tourism were selected as the main reasons for patients traveling abroad. The top 3 destinations for spine surgery were Germany (31%), the USA (23%), and Egypt (16%). Hospital and surgeon's reputations were chosen as the most likely factors for patients to select their destination. The quality of care received abroad was considered fair (49%) or good (31%), while the communication between stakeholders and the patient was considered poor by 72% and 52% of the respondents, respectively. Better communication with the patient and colleagues and changes to the local system to improve the patient's perception of the local care was suggested to enhance local clinical care.

Conclusion: This study highlights the need to engage local physicians in the conversation involving destination services. While most Saudi surgeons surveyed consider the care abroad acceptable for their patients, the vast majority have identified a gap in communication among treating physicians, local physicians, and patients. Many have also suggested a need for better education and awareness locally to improve the perception of the local capabilities.

Thoracic Herniated Spinal Cord: Exceptional Cause Of Myelopathy

Author: **Jin Hwa Eum**
Country: Benaissa Abdennebi

Introduction
The more frequent neurosurgical causes of myelopathy are spinal and intraspinal tumors, vascular lesions and degenerative disc diseases. Thoracic herniated spinal cord or displacement of the spinal cord through an anterior dural defect is exceptional affecting one person per million of the population. We report one case in this presentation.

Material and method

This patient is 37 year old woman who complained of a muscle weakness of right lower limb. Despite this symptom, neurological examination remained normal for 18 months. Spine MRI revealed a thoracic herniated spinal cord herniation in T7. A conservative treatment was appropriate during this period. After that, syndrom clinical deterioration showed a monoparesis of the same limb and loss of pain and temperature sensation on the opposite side, signs which are part of the Brown Sequard syndrome.

Before surgery, accurate location of the lesion was done using Xrays. Through a laminectomy, longitudinal incision of the dura and section of the dentate ligaments were performed. Spinal cord appears atrophic and rolled. Microdissection of the arachnoid adhesions allows observing the anterior defect of the dura. Since the carereful reduction of the herniated spinal cord is realized, attention was turned to dural reconstruction which was made with regenerative dural repair patch

Conclusion

Through this case of herniated spinal cord and in the light of literature we focus on the long duration of symptoms, the MRI modality of choice for diagnosis and surgery which is recommend to prevent permanent neurological deficits. The outcome is usually favorable

Intra- discal stem cell injections

Author: **Byron Schneider**
Country: United States of America

Transplantation. 2017 Aug;101(8):1945-1951. doi: 10.1097/TP.0000000000001484.

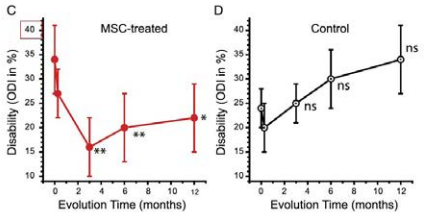
Intervertebral Disc Repair by Allogeneic Mesenchymal Bone Marrow Cells: A Randomized Controlled Trial.

Noriega DC[1], Ardura F, Hernández-Ramajo R, Martín-Ferrero MÁ, Sánchez-Lite I, Toribio B, Alberca M, García V, Moraleda JM, Sánchez A, García-Sancho J.

- Design: RCT 1:1 tx to control
  - MSC vs paravertebral muscular anesthetic
- Allogenic BM MSC (cultured)
- Patient selection: Pfirrmann gr 2-4 and No modic 3
- No discography
- n=24
- 1 or 2 discs injected with 25M MSC vs ctrl IM anesthetic
- Outcome measures: VAS and ODI SF36 QOL at 3,6,12 months

Financial support from the Red de Terapia Celular (RD12/0019/0036, RD12/0019/0001 and RD16/0011/0003), Instituto de Salud Carlos III, Ministerio de Economía y Competitividad, and the Centro en Red de Medicina Regenerativa de Castilla y León is gratefully acknowledged.

ODI



Results of Noriega: Cultured MSC RCT

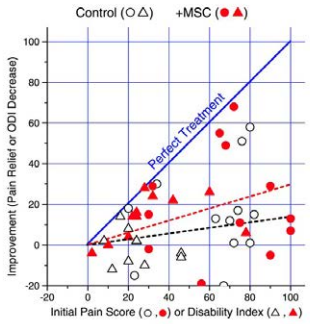
- No statistical significance between groups in VAS or ODI at any time point
- Both groups improved relative to baseline

Mean VAS	MSC (SE)	Control (SE)
Baseline	67 (+/-7)	62 (+/-7)
3 mos	43 (+/-9)	46 (+/-8)
6mo	40 (+/-8)	51 (+/-8)
12mos	47 (+/-10)	47 (+/-8)

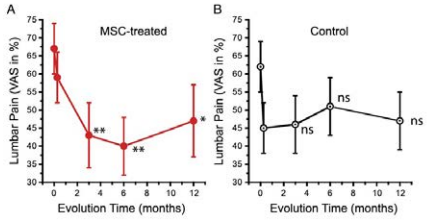
Mean ODI	MSC (SE)	Control (SE)
Baseline	34 (+/-7)	24 (+/-4)
3mos	16 (+/-6)	25 (+/-4)
6mos	20 (+/-7)	30 (+/-6)
12 mos	22 (+/-7)	34 (+/-7)

Responders?

- "This improvement seemed restricted to a group of responders that included 40% of the cohort"
- the cohort seemed to divide into 2 groups:
  - 1 group of 5 patients close to the blue line, with a high relief index (responders) and the remaining patients, which show little improvement (nonresponders).



VAS



Pain Physician 2021; 24:465-477 • ISSN 1533-3159

Randomized Control Trial

Viable Disc Tissue Allograft Supplementation; One- and Two-level Treatment of Degenerated Intervertebral Discs in Patients with Chronic Discogenic Low Back Pain: One Year Results of the VAST Randomized Controlled Trial

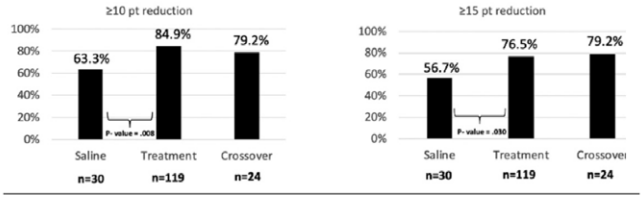
Douglas P. Beall, MD[1], Timothy Davis, MD[2], Michael J. DePalma, MD[3], Kasra Amirdelfan, MD[4], Edward S. Yoon, MD[5], Gregory L. Wilson, DO[6], Randolph Bishop MD[7], William C. Tally, MD[8], Steven L. Gershon, MD[9], Morgan P. Lorio, MD, FACS[10], Hans Joerg Meisel, MD, PhD[11], Meredith Langhorst, MD[12], Corey W. Hunter, MD[13,14], and Timothy Ganey, PhD[15]

Disclaimer: VIVEX Biologics, Inc. (Miami, FL) sponsored this study and contributed to study design, data monitoring, statistical analysis, and reporting of results and paid for independent data collection, core laboratory, and EDC services.

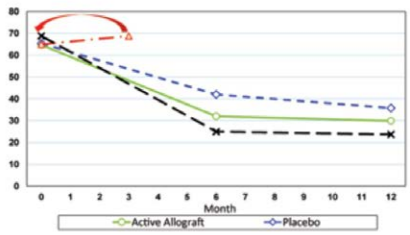
Methods

- Prospective RCT
- Patients randomized to 1.75 ml Intradiscal injection of saline (n=39) vs "viable disc allograft" (n=140) into 1 or 2 discs
  - Small "nonsurgical management" arm with early cross over
- Inclusion criteria included "identification of painful discs" via "MRI imaging, physical examination and discography"
- Excluded instability, spondyloarthropathy, prior lumbar surgery, modic 3 findings, "greater than mild facet joint arthritis", or spinal stenosis

ODI as reported



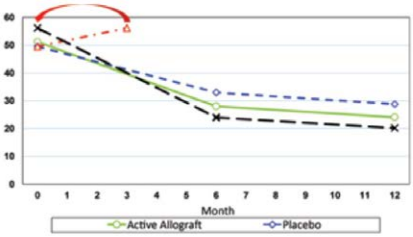
VAS Results



Responder Analysis

- Giving the benefit of the doubt with respect to loss to follow up patients
- VAS 50% reduction in pain:
  - Saline 16/30 53% (95% CI 34-72%)
  - Allograft 75/120 62% (95%CI 53-71%)
- ODI 15 pts reduction:
  - Saline 17/30 57% (95% CI 37-75%)
  - Allograft 91/119 76.5% (95% CI 68-84%)

ODI Results



Complications

- In the active allograft arm:
  - 2 cases of osteomyelitis
  - 3 cases "infections and infestations"
  - 1 case of bacteremia
  - 2 cases of "back pain"
- No complications in saline or conservative care group

> Spine J. 2021 Feb;21(2):212-230. doi: 10.1016/j.spinee.2020.10.004. Epub 2020 Oct 9.

Allogeneic mesenchymal precursor cells treatment for chronic low back pain associated with degenerative disc disease: a prospective randomized, placebo-controlled 36-month study of safety and efficacy

Kasra Amirdelfan [1], Hyun Bae [2], Tory McJunkin [3], Michael DePalma [4], Kee Kim [5], William J Beckworth [6], Gary Ghiselli [7], James Scott Bainbridge [7], Randall Dryer [8], Timothy R Deer [9], Roger D Brown [10]

Affiliations + expand

PMID: 33045417 DOI: 10.1016/j.spinee.2020.10.004

Results: Efficacy (VAS)

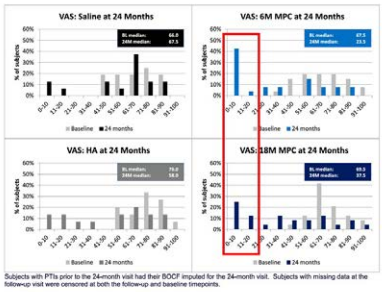
Lower back pain VAS scores (mm)—LS mean and mean change from baseline

Visit statistic	Control				MPCs			
	Saline N=20		HA N=20		6 million N=30		18 million N=30	
	Prospected	PTI-corrected	Prospected	PTI-corrected	Prospected	PTI-corrected	Prospected	PTI-corrected
Screening – n	20		20		30		30	
LS Mean (95% CI)	66.90 (55.66, 78.14)		71.85 (60.61, 83.09)		69.67 (60.49, 78.85)		71.47 (62.29, 80.65)	
30 days visit – n	20	20	20	20	29	29	30	30
LS Mean (95% CI)	44.75 (34.17, 55.33)	44.75 (33.51, 55.99)	50.40 (39.82, 60.98)	50.40 (39.16, 61.64)	40.93 (32.15, 49.71)	40.93 (31.59, 50.27)	40.97 (32.33, 49.60)	40.97 (31.79, 50.15)
LS Mean Change (95% CI)	−23.53 (−34.42, −12.64)	−23.21 (−34.63, −11.80)	−20.14 (−31.03, −9.25)	−20.48 (−31.89, −9.07)	−28.14 (−37.17, −19.10)	−28.05 (−37.52, −18.57)	−29.40 (−38.29, −20.51)	−29.69 (−39.01, −20.37)
3 months visit – n	20	20	19	19	29	29	27	27
LS Mean (95% CI)	37.70 (27.12, 48.28)	39.10 (27.86, 50.34)	49.20 (38.41, 60.11)	51.68 (40.15, 63.22)	30.28* (21.49, 39.06)	30.28* (20.94, 39.61)	35.26 (26.16, 44.36)	35.26* (25.58, 44.94)
LS Mean Change (95% CI)	−30.58 (−41.47, −19.69)	−28.86 (−40.28, −17.45)	−21.20 (−32.35, −10.05)	−19.10 (−30.81, −7.39)	−38.79 † (−47.83, −29.75)	−38.70 † (−48.18, −29.23)	−35.10 (−44.47, −25.73)	−35.38 † (−45.20, −25.56)
6 months visit – n	18	18	19	19	28	28	30	30
LS Mean (95% CI)	29.28 (18.13, 40.43)	33.67 (21.82, 47.52)	41.63 (30.78, 52.48)	42.20 (30.73, 53.80)	25.93 † (16.95, 34.87)	25.93 † (16.63, 35.43)	34.60 (25.96, 43.24)	34.60 (25.42, 43.78)
LS Mean Change (95% CI)	−38.95 (−50.42, −27.47)	−32.22 (−44.26, −20.19)	−28.83 (−40.00, −17.66)	−28.52 (−40.23, −16.81)	−42.07 (−52.07, −33.67)	−42.70 (−52.55, −33.06)	−35.77 (−44.66, −26.88)	−36.05 (−45.37, −26.73)
12 months visit – n	16	16	18	18	27	27	27	27
LS Mean (95% CI)	29.75 (27.93, 51.57)	50.63 (38.05, 63.20)	44.88 (33.41, 56.35)	46.56 (34.70, 58.41)	30.58 (21.30, 39.85)	31.48* (21.81, 41.16)	35.00 (20.72, 39.28)	32.57* (22.69, 42.05)
LS Mean Change (95% CI)	−28.49 (−40.66, −16.32)	−17.29 (−30.05, −4.53)	−25.67 (−37.48, −13.87)	−24.18 (−36.21, −12.15)	−30.05 (−47.60, −28.50)	−36.65 † (−46.47, −26.82)	−39.87 (−49.42, −30.33)	−38.16 † (−47.98, −28.34)
24 months visit – n	16	16	15	15	26	26	24	24
LS Mean (95% CI)	44.63 (32.08, 56.45)	55.88 (43.30, 68.45)	37.53 (25.32, 49.75)	47.93 (34.95, 60.92)	24.80* (15.34, 34.26)	33.00* (23.14, 42.86)	35.17 (25.31, 45.04)	37.63* (27.36, 47.89)
LS Mean Change (95% CI)	−23.02 (−35.79, −11.44)	−12.04 (−24.80, 0.72)	−33.81 (−46.39, −21.23)	−23.98 (−37.17, −10.79)	−43.56* (−53.30, −33.82)	−34.79* (−44.81, −24.78)	−34.48 (−44.63, −24.34)	−32.71* (−43.12, −22.29)
36 months visit – n	16	16	14	14	26	26	21	21
LS Mean (95% CI)	40.19 (28.36, 52.01)	51.88 (39.30, 64.45)	27.36 (14.72, 40.00)	42.14 (28.70, 55.58)	27.30 (17.44, 37.17)	35.60* (25.83, 45.55)	24.95 (14.37, 35.53)	28.24* (17.27, 39.21)
LS Mean Change (95% CI)	−28.05 (−40.23, −15.88)	−16.04 (−28.80, −3.28)	−44.26 (−57.29, −31.24)	−30.13 (−43.79, −16.48)	−41.02 (51.18, −30.87)	−32.10 (−42.12, −22.09)	−44.70* (−55.58, −33.82)	−42.17* (−53.30, −31.03)

Study Design

- 100 subjects with chronic low back pain associated with moderate DDD (modified Pfirrmann score of 3–6) at one level (+/- discography)
- Randomized to receive 6 million MPCs with HA, 18 million MPCs with HA, HA vehicle control, or saline control (2mL total)
- Allogeneic, immunoselected MPCs from cell fraction of BMA (iliac crest) of a single young healthy donor.
- After isolation, the cells were expanded ex vivo.
- Study was industry funded

Pain Nomograms



Subjects with PTIs prior to the 24-month visit had their BOCF imputed for the 24-month visit. Subjects with missing data at the follow-up visit were censored at both the follow-up and baseline timepoints.

Results

Visit statistic	Control				MPCs			
	Saline N=20		HA N=20		6 million N=30		18 million N=30	
	Prospected	PTI-corrected	Prospected	PTI-corrected	Prospected	PTI-corrected	Prospected	PTI-corrected
Screening – n	20		20		30		30	
LS Mean (95% CI)	66.90 (55.66, 78.14)		71.85 (60.61, 83.09)		69.67 (60.49, 78.85)		71.47 (62.29, 80.65)	
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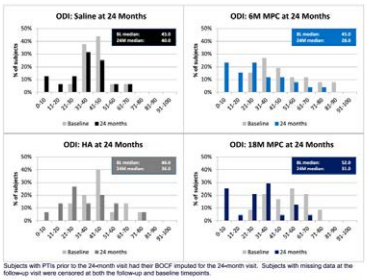
24 months visit – n	16	16	15	15	26	26	24	24
LS Mean (95% CI)	44.63 (32.08, 56.45)	55.88 (43.30, 68.45)	37.53 (25.32, 49.75)	47.93 (34.95, 60.92)	24.80* (15.34, 34.26)	33.00* (23.14, 42.86)	35.17 (25.31, 45.04)	37.63* (27.36, 47.89)
LS Mean Change (95% CI)	−23.02 (−35.79, −11.44)	−12.04 (−24.80, 0.72)	−33.81 (−46.39, −21.23)	−23.98 (−37.17, −10.79)	−43.56* (−53.30, −33.82)	−34.79* (−44.81, −24.78)	−34.48 (−44.63, −24.34)	−32.71* (−43.12, −22.29)
36 months visit – n	16	16	14	14	26	26	21	21
LS Mean (95% CI)	40.19 (28.36, 52.01)	51.88 (39.30, 64.45)	27.36 (14.72, 40.00)	42.14 (28.70, 55.58)	27.30 (17.44, 37.17)	35.60* (25.83, 45.55)	24.95 (14.37, 35.53)	28.24* (17.27, 39.21)
LS Mean Change (95% CI)	−28.05 (−40.23, −15.88)	−16.04 (−28.80, −3.28)	−44.26 (−57.29, −31.24)	−30.13 (−43.79, −16.48)	−41.02 (51.18, −30.87)	−32.10 (−42.12, −22.09)	−44.70* (−55.58, −33.82)	−42.17* (−53.30, −31.03)

ODI nomograms



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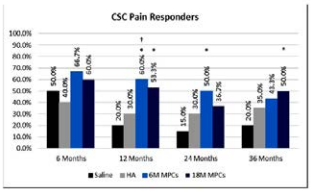
Results



- 50% relief response

Transplantation. 2011 Oct 15;92(7):822-8. doi: 10.1097/TP.0b013e3182298a15.

Intervertebral disc repair by autologous mesenchymal bone marrow cells: a pilot study.

Orozco L[1], Soler R, Morera C, Alberca M, Sánchez A, García-Sancho J.

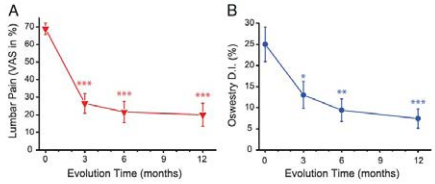
- **Observational trial** n=10
- Chronic LBP
- "Positive discography"
  - "lumbar disc degeneration and intact annulus fibrosus"
- Intradiscal injection autologous **cultured** 20M MSC
  - 28 days, viability and flow cytometric immunophenotypic profile

Authors conclusions

- intradiscal injection of MPCs appears to be safe
- May be an effective and durable minimally invasive therapy for subjects who have CLBP associated with moderate DDD
- Complication of 1/30 or 1/60 may actually be quite significant
- Agree there may be a subgroup of responders (~50%) that may be beyond placebo effects

Results

- Mean pain improved from 6.9 to 2.1 and 2.0 at 6 and 12 mo
- Similar improvement in ODI

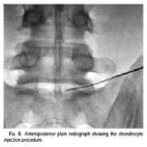


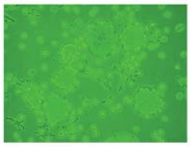
Observational Stem Cell

- Autologous Culture Expanded
  - Orozco
- Culture Expanded adipose Derived
  - Kumar
- Allogeneic Chondrocytes
  - Coric
- Autologous non cultured (BMAC)
  - Wolff
  - Pettine

Prospective study of disc repair with allogeneic chondrocytes Coric Pettine Sumich and Boltes

- 15 patients enrolled as part of IND study
- Single level pfirmann grade III or IV disc degeneration with discography done to confirm annular integrity
- Allogeneic chondrocytes from cadaver cultured and then confirmed to be viable





J Neurosurg Spine 18:83–95, 2013
©AANS, 2013

Coric Results

- ODI baseline 53.3 -> 27.6, 27.1, 26.9, 20.3 at 1,3,6,12 months
  - 13/15 with at least 30% improvement on ODI
- NRS 5.7 -> 3.9, 3.5, 3.8, 3.1 at 1, 3, 6, 12 mo

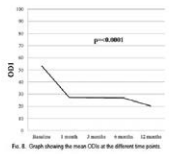


Fig. 8. Graph showing the mean ODIs at the different time points.

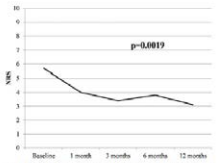


Fig. 9. Graph showing the mean NRS scores at the different time points.

Int Orthop. 2017 Oct;41(10):2097-2103. doi: 10.1007/s00264-017-3560-9. Epub 2017 Jul 26.

Autologous bone marrow concentrate intradiscal injection for the treatment of degenerative disc disease with three-year follow-up.

Pettine KA[1], Suzuki RK[2], Sand TT[2], Murphy MB[3,4].

- Prospective **observational** trial n=26 13 pts 1 level, 13 pts at 2 levels
- Patient selection: disc height ≥70%, no modic type 3, mod Pfirrman 4-7
- Discogenic pain determination clinical and radiologic, 7 had discography

Procedure

- 2-3 ml of BMAC (non-cultured) into disc
  - patients offered repeat injection at 6 mo if <25% improvement, n=2

Stem Cell Res Ther. 2017 Nov 15;8(1):262. doi: 10.1186/s13287-017-0710-3.

Safety and tolerability of intradiscal implantation of combined autologous adipose-derived mesenchymal stem cells and hyaluronic acid in patients with chronic discogenic low back pain: 1-year follow-up of a phase I study.

Kumar H[1], Ha DH[2], Lee EJ[3], Park JH[4], Shim JH[4], Ahn TK[5], Kim KT[6], Ropper AE[7], Sohn S[1], Kim CH[8], Thakor DK[9], Lee SH[10], Han IB[11].

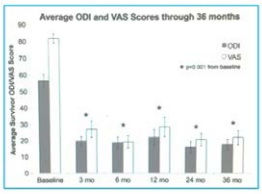
- Prospective cohort
- 10 patients with CLB (unclear how many screened)
  - Pfirrmann grade III or IV
  - Discography "low pressure by hand" with **concordant pain**
- Adipose derived MSC (2 or 4 million cells) plus hyaluronic acid
  - Abdominal source, cells processed and cultured , characterized, suspended
  - 4.5 – 5.5 million cells per vial
- All 10 injected at L4-5, 1 also at L5-S1

International Orthopaedics (SICOT) (2016) 40:135–140

Results: Pettine et al.

- >50% VAS improvement
  - 6 months 19/26 (73.1% 95%CI: 56%–90%)
  - 12 months 16/26 (61% 95%CI 41-80%)
- >30% improvement in ODI
  - 6 months 21/26 (80.8%, 95% CI: 65.6%–95.9%)
  - 12 months 19/26 (73.1%, 95% CI: 56.0%–90.1%)
- Mean VAS of 79 to 33 at 1 yr
- Mean ODI 56 to 25 at 1 yr
- Largely sustained and 2 and 3 year

Progression to surgery: 2 patients by 1 yr, 5 patients by 2 yrs, 6 patients by 3 yrs



Results – mean change

Table 3 Comparison of patients' outcomes according to time points

	VAS			ODI		
	Mean	*P* value_WSR	*P* value_paired *t*	Mean	*P* value_WSR	*P* value_paired *t*
Baseline–1 week	0.5	0.4766	0.5212	-10.6	0.0977	0.00489
Baseline–1 month	1.9	0.0098	0.0044	11.6	0.002	0.0014
Baseline–3 months	2.15	0.0156	0.014	11.09	0.0117	0.006
Baseline–6 months	3.3	0.0039	0.0008	21.52	0.002	0.0016
Baseline–9 months	3.4	0.0039	0.0012	22.72	0.002	0.0002
Baseline–12 months	3.6	0.002	0.0003	26.02	0.002	0.0004
Baseline–mean of each visit	2.475	0.0039	0.001	13.725	0.002	0.0018

VAS visual analogue scale, *ODI* Oswestry Disability Index, *WSR* Wilcoxon signed-rank test

- 6/10 with 50% improvement in VAS and 30% in ODI at 12 months

Injections of concentrated bone marrow aspirate as treatment for Discogenic pain: a retrospective analysis

Wolff et al. BMC Musculoskeletal Disorders (2020) 21:135
https://doi.org/10.1186/s12891-020-3126-7

Michael Wolff[1*], Jon Mark Shillington[1], Christopher Rathbone[2], Shawn K. Piasecki[3] and Brian Barnes[3]

- Retrospective **observational** cohort n=33 8 pts 1 level, 16 pts at 2 levels, 9 pts 3 levels
- Patient selection MRI disc desiccation, disc bulge or small contained protrusion (> 6 mm), and/or posterior annular tear
- Positive provocative discography in all patients (negative screens not listed)
  - SIS standard guidelines
- Procedure
  - 3 ml or less of BMAC (non-cultured) into disc

Wolff et al results

- At least 50% improvement in NRS (n=33):
  - 11/24 45.8% at 6 weeks
  - 7/17 41.1 % at 12 weeks
  - 4/17 23.5% at 24 weeks
  - 7/18 38.9% at 52 weeks

Stem Cell Aggregate Analysis

- As reported in the original papers:
- >50% reduction in NRS :
  - 23/43 (53.5%, 95% CI: 38.6-68.4%) at 6 months
  - 23/44 (52.3%, 95% CI: 37.5-67.0%) at 12 months.
- Using worst-case analysis
  - 23/59 (39% 95% CI: 27-51 %) at 6 months
  - 23/59 (39% 95% CI: 27-51 %) at 12 months.

Worst Case Analysis

- At least 50% improvement in NRS (n=33):
  - 11/33 33% at 6 weeks
  - 7/33 21% at 12 weeks
  - 4/33 12% at 24 weeks
  - 7/33 38.9% at 52 weeks

ODI Aggregate Analysis

- As reported in the original manuscripts: >30% reduction in ODI was achieved:
  - 26/35 (74.3%, 95% CI: 59.8-88.7%) at 6 months
  - 25/39 (64.1%, 95% CI: 49.0-79.2%) at 12 months.
- Using worst-case analysis,
  - 26/59 (44.1%, 95% CI: 28.1-53.2%) at 6 months
  - 25/59 (42.4%, 95% CI: 29.8-55.0%) at 12 months.

ODI

- At least 30% ODI (n=33):
  - 4/15 26% (95% CI 4-49%) at 6 weeks
  - 4/11 36 % (95% CI 8-64%) at 12 weeks
  - 5/9 55% (95% CI 23-88%) at 24 weeks
  - 4/13 31% (95% CI 6-56%) at 52 weeks

Stem Cell Grade

- There is very low-quality evidence that cultured allogeneic bone marrow derived MSCs are **ineffective** compared to sham treatment.
  - The sole RCT reviewed was found to have an overall high risk of bias due to insufficient blinding and concerns pertaining to statistical analysis and selection of the reported results.
- For other types of intradiscal SC treatments reviewed:
  - very low-quality evidence for effectiveness in reducing pain and disability.
    - Downgraded from an initial rating or "high quality" to "very low quality"
      - risk of bias, imprecision, and indirectness relating to patient selection and outcome measurement.
  - No study included more than 33 participants in any group and reported within group success rates were associated with wide ranging confidence intervals with upper and lower ends substantially overlapping clinically important thresholds.

PRP injections for facet and SIJ pain

Author: **Byron Schneider**
Country: United States of America

Regenerative Injection Treatment in the Spine: Review and Case Series with Platelet Rich Plasma

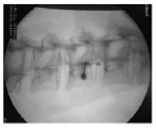
- Case series of 5 patients, all receiving series of 3 PRP facet injections into "cervical, thoracic, or lumbar spine" with follow up 6-12 months
- Case 1: 100% better at 6 months
- Case 2: VAS 1/10 at 9 months
- Case 3: VAS 2/10 at 12 months
- Case 4: 70% symptom improvement "following 3rd injection"
- Case 5: 65-70% symptom improvement at 6 months

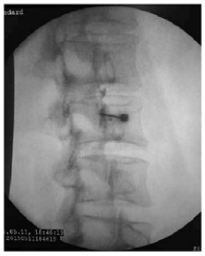
Pain Physician. 2016 Nov-Dec;19(8):617-625.

A New Technique for the Treatment of Lumbar Facet Joint Syndrome Using Intra-articular Injection with Autologous Platelet Rich Plasma.

Wu J[1], Du Z[1], Lv Y[1], Zhang J[1], Xiong W[1], Wang R[1], Liu R[1], Zhang G[1], Liu Q[1].

- Prospective cohort of 19 patients with IA autologous PRP





2015 AAPM Abstract: Pain, Functional, and Behavioral Outcomes in Patients Undergoing Platelet Rich Plasma (PRP) Injection for Cervical and Lumbar Facet Arthropathy by Palmieri et al

- Retrospective review of 24 patients who had "PRP to treat facet arthropathy"
- NRS scores decrease in months 1 and 3 compared to baseline ($p \leq 0.01$), but return to baseline levels in months 6 and 12.
- ODI and RMDQ disability scores decreased in the first month (both $p < 0.01$), but returned to baseline afterwards

Inclusion criteria

- Continuous or intermittent low back pain;
- Local or paraspinal pain with or without radiation to the buttock, groin, or thigh;
- Increase of pain on flexion, rotation, or lateral bending, and with local excessive stress;
- Fracture like feelings when bending down;
- Experience of hard physical labor or sedentariness;
- Absence of neurological deficit;
- Lumbosacral x-rays showing findings of lumbar facet joint degenerative changes

ORIGINAL ARTICLE

Year : 2016 | Volume : 7 | Issue : 4 | Page : 250-256

Intradiscal and intra articular facet infiltrations with plasma rich in growth factors reduce pain in patients with chronic low back pain

Fernando Kirchner[1], Eduardo Anitua[2]

[1] Barcelona Traumatology Institute, Mataró, Spain

[2] Eduardo Anitua Foundation for Biomedical Research; BTI-Biotechnology Institute, Vitoria, Spain

- Intradiscal, epidural, and IA PRP
- No useful data

Pain Physician. 2016 Nov-Dec;19(8):617-625.

A New Technique for the Treatment of Lumbar Facet Joint Syndrome Using Intra-articular Injection with Autologous Platelet Rich Plasma.

Wu J[1], Du Z[1], Lv Y[1], Zhang J[1], Xiong W[1], Wang R[1], Liu R[1], Zhang G[1], Liu Q[1].

- Prospective cohort of 19 patients with IA autologous PRP
- Injection of 0.1 - 0.2 contrast and 0.5 ml autologous PRP
  - Ranging from 2- 6 joints
- 3 month follow up

VAS

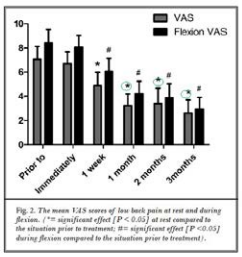


Fig. 2. *The mean VAS scores of low back pain at rest and during flexion. (*= significant effect [P < 0.05] at rest compared to the situation prior to treatment; #= significant effect [P <0.05] during flexion compared to the situation prior to treatment).*

- Baseline VAS: 7/10 vs 3 month VAS 2.63/10
- "The paired t-test was used for comparing the difference in VAS, RMQ, and ODI before and after treatment"
- "The 95% confidence intervals were determined and a P value of less than 0.05 was considered statistically significant"

Pain Pract. 2017 Sep;17(7):914-924. doi: 10.1111/papr.12544. Epub 2017 Feb 22.

A Prospective Study Comparing Platelet-Rich Plasma and Local Anesthetic (LA)/Corticosteroid in Intra-Articular Injection for the Treatment of Lumbar Facet Joint Syndrome.

Wu J[1], Zhou J[2], Liu C[1], Zhang J[1], Xiong W[1], Lv Y[1], Liu R[1], Wang B[1], Du Z[1], Zhang G[1], Liu Q[1].

- 93 patients identified
  - Inclusion criteria same as prior
- 70 patients enrolled, received 1 month of conservative care
- If <50% relief, receive diagnostic IA block with 0.5% lidocaine
  - Those with "negative block" excluded
- 23 each randomized to autologous PRP (group A) vs betamethasone (group B)

RMQ

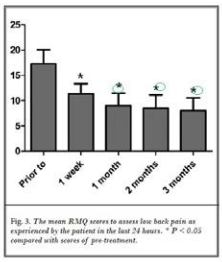
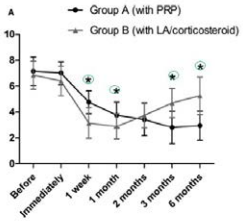


Fig. 3. *The mean RMQ scores to assess low back pain as experienced by the patient in the last 24 hours. * P < 0.05 compared with scores of pre-treatment.*

- As shown in Fig. 3, RMQ scores were significantly reduced after lumbar facet joint injections. The mean scores of RMQ were reduced gradually in a time-dependent manner after treatment. Moreover, there was significant difference in the RMQ scores between pre-treatment and post-treatment

VAS



ODI

	Prior to	After			
		1 week	1 month	2 months	3 months
Means ± SDs	54.32 ± 13.94%	39.47 ± 7.77%	27.79 ± 6.63%	24.63 ± 8.19%	26.32 ± 5.67%
Minimal disability	0 (0%)	0 (0%)	4 (21.05%)	8 (42.11%)	4 (21.05%)
Moderate disability	2 (10.53%)	12 (63.16%)	15 (78.95%)	10(52.63%)	15 (78.95%)
Severe disability	10 (52.63%)	7 (36.84%)	0 (0%)	1 (5.26%)	0 (0%)
Crippled	6 (31.58%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Bed-bound or exaggerating symptoms	1 (5.26%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)

- 17/19 (89%, 95% CI 75-100%) severe disability or worse at baseline compared to 0/19 (0% 95% CI 0-21%)

VAS

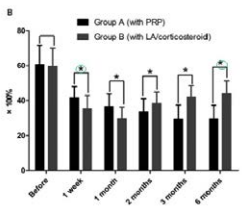
Table 4. Results of Objective Success Rate and Total Usage Rate of Post-Treatment Drugs Between Groups Over Time

Group	Immediately after	1 week	1 month	2 months	3 months	6 months
Objective success rate with over 50% pain relief at rest						
A	0 (0.00%)	4 (19.05%)	13 (61.90%)	15 (71.43%)	17 (80.95%)	17 (80.95%)
B	0 (0.00%)	17 (85.00%)	17 (85.00%)	12 (60.00%)	2 (15.00%)	4 (20.00%)
P		< 0.001	0.095	0.440	< 0.001	< 0.001

- >50% improvement in pain at 6 months:
- Group A (PRP) 17/23 (74%, 95% CI 53.0-95%)

  Vs
- Group B (steroid) 4/23 (17%, 95% CI 0-54.5%)

ODI



- Data not presented in full
- Same general trend favoring PRP as time progresses

Cervical facet joint platelet-rich plasma in people with chronic whiplash-associated disorders: A prospective case series of short-term outcomes

- *Prospective case series*
- *44 people with at least 3 months of chronic whiplash-associated neck pain and*
- *Further diagnosed as having cervical facet joint mediated pain via single medial branch block 3 month follow up*
  - *Pain (0-10 NRS)*
  - *Disability (NDI)*

Interventional Pain Medicine 1 (2022) 100078

Medications and General Satisfaction

Total usage rate of acetaminophen after treatment

A	3 (14.29%)	5 (23.81%)	5 (23.81%)	5 (23.81%)	5 (23.81%)
B	3 (15.00%)	3 (15.00%)	3 (15.00%)	3 (15.00%)	8 (40.00%)
P	1.000*	0.751*	0.751*	0.751*	1.000*	0.265

Table 3. Comparisons Between Groups for Subjective Satisfaction: Modified MacNab Criteria

Group	Excellent	Good	Fair	Poor	*P*
Immediately after					
A	2 (9.52%)	8 (38.10%)	4 (19.05%)	7 (33.33%)	0.636
B	3 (15.00%)	8 (40.00%)	4 (20.00%)	5 (25.00%)	
1 week					
A	4 (19.05%)	8 (38.10%)	6 (28.57%)	3 (14.29%)	0.228
B	10 (50.00%)	5 (25.00%)	3 (15.00%)	2 (10.00%)	
1 month					
A	6 (28.57%)	7 (33.33%)	6 (28.57%)	2 (9.52%)	0.203
B	12 (60.00%)	4 (20.00%)	2 (10.00%)	2 (10.00%)	
2 months					
A	9 (42.86%)	6 (28.57%)	4 (19.05%)	2 (9.52%)	0.658
B	6 (30.00%)	7 (35.00%)	5 (25.00%)	2 (10.00%)	
3 months					
A	11 (52.38%)	5 (23.10%)	3 (14.29%)	2 (9.52%)	0.153
B	5 (25.00%)	6 (30.00%)	6 (30.00%)	3 (15.00%)	
6 months					
A	11 (52.38%)	6 (28.57%)	2 (9.52%)	2 (9.52%)	0.037
B	4 (20.00%)	6 (30.00%)	6 (30.00%)	4 (20.00%)	

Study Methods

- *+MBB defined as 80% relief or 50% + improved ADLs*
- *PRP preparation*
  - *platelets 4.2X;neutrophils 1.0X; lymphocytes/monocytes 1.8X* concentrate whole blood
  - *1 cc IA and 1cc peri-capsular*
- *1 level injected (6), 2 levels (14), 3 levels (13) and 4 levels (11)*
  - *50% also with thoracic and lumbar prp injections*
- *24 subjects with bilateral injections*
- *Most common level was C5-6*

PRP

- Extremely limited data

BUT

- What is available is promising

ADDITIONAL RESEARCH IS NEEDED

Results

- 41% of patient with >50% reduction in pain
- 29% additional with 15%-49% reduction in pain
- 80% with 10% reduction in NDI
- Mean data:

	Pre-PRP (95%CI)	3-months Post-PRP (95%CI)
NPRS (/10)	5.8 (5.2, 6.4)	3.7 (3.0, 4.4)
NDI (%)	45.2% (40.9%, 49.5%)	30.7% (26.2%, 35.2%)

Interpretation

Methods

- *Diagnosis of SIJ pain made clinically*
  - *Pain below L5*
  - *3 + exam maneuvers*
- *1.5 mL of methylprednisolone (40 mg/mL) 1.5 mL of 2% lidocaine with 0.5 mL of saline (4cc)*
- *3 mL of leukocyte-free PRP with 0.5 mL of calcium chloride*
- *Unilateral Injection done with US guidance*

SIJ

Results

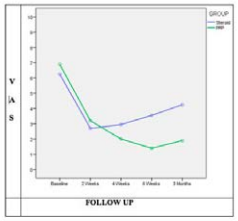


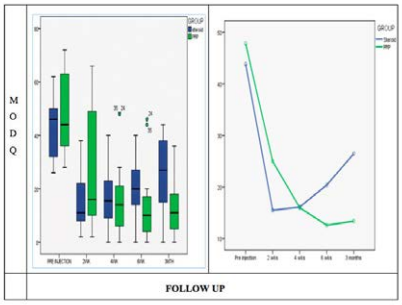
Table 3. Patients with Reduction of Visual Analog Scale Scores ≥50% at Different Time Frames

Time	Reduction of VAS ≥ 50% Group P	Group S	*P*	Unadjusted OR	95% CI for Unadjusted OR	
2 weeks	12 (60%)	15 (75%)	0.311	—	—	—
4 weeks	15 (75%)	14 (70%)	0.723	—	—	—
6 weeks	18 (90%)	9 (45%)	0.002	11.0	1.99	60.57
3 months	18 (90%)	5 (25%)	0.001	27.0	4.56	159.66

Steroid vs. Platelet-Rich Plasma in Ultrasound-Guided Sacroiliac Joint Injection for Chronic Low Back Pain

- Prospective RCT
- 40 patients with “low back pain”
- Steroid vs PRP
- 3 month follow up
- *Pain (VAS), Function (modified ODI), Short Form (SF-12)*

Results



Intra-Articular Platelet Rich Plasma vs Corticosteroid Injections for Sacroiliac Joint Pain: A Double-Blinded, Randomized Clinical Trial

- Double Blind RCT
- 26 patients
- Steroid (n=11) vs PRP (n=15)
- 6 month follow up
- Pain (NRS) and Function (ODI)

Pain Medicine, 23(7), 2022, 1266–1271
doi: 10.1093/pm/pnab332

Results

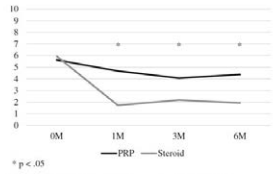


Figure 2. Mean NPRS scores by study visit. *$P < 0.05$.

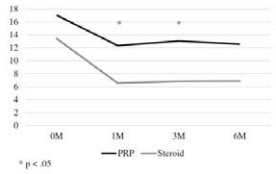


Figure 3. Mean ODI scores by study visit. *$P < 0.05$.

Methods

- Patients selected 3 positive exam maneuvers to undergo diagnostic SIJ injection
- 30/64 diagnostic injections resulted in >80% pain relief (4 declined to enroll)
- Injections done under fluoroscopy and with contrast
- *1mL of betamethasone and acetate suspension and 1mL of 2% lidocaine*
- *2mL PRP*
  - *EmCyte PurePRPVR II*

SIJ conclusion

Results

- 2 lost to follow up at 3 months, but 8 LTFU at 6 months
- >50% reduction in pain:
  - *1 Month: PRP 3 (21.4%) vs Steroid 8 (80.0%) P<0.011*
  - *3 Month: PRP 3 (21.4%) vs Steroid 7 (70.0%) P<0.035*
  - *6 Month PRP 3 (25.0%) vs Steroid 4 (66.7%) P<0.141*

THANK YOU

Byron J. Schneider MD
Dept. of PM&R
Vanderbilt University Medical Center
byron.j.schneider@vanderbilt.edu

Intra- discal PRP injections

Author: **Byron Schneider**
Country: United States of America

PM R. 2016 Jan;8(1):1-10; quiz 10. doi: 10.1016/j.pmrj.2015.08.010. Epub 2015 Aug 24.

Lumbar Intradiskal Platelet-Rich Plasma (PRP) Injections: A Prospective, Double-Blind, Randomized Controlled Study.

Tuakli-Wosornu YA[1], Terry A[2], Boachie-Adjei K[3], Harrison JR[4], Gribbin CK[5], LaSalle EE[6], Nguyen JT[7], Solomon JL[8], Lutz GE[9].

Prospective double-blind RCT 2:1 Tx : ctrl (explanatoy)

Disclosures:

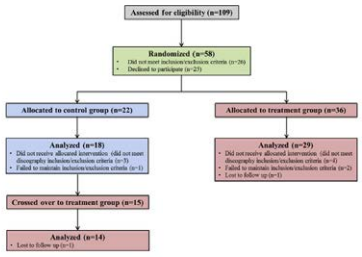
- Internal funding from HSS physiatry research and education fund
- PRP kits and centrifuge donated by Harvest (Plymouth, MA)
- Grant, Harvest Technologies unrestricted research grant (funds to institution)

- Single Intradiscal PRP injection at time of "discography"
  - 50% disc height, grade III or IV annular tear, concordant pain, less than 5 mm protrusion
- NRS, Funct Rating Index (FRI), SF36 (pain and function sections), NASS outcome questionnaire completed at **1week, 4 weeks, 8 weeks (then unblinded and crossover), 6 mo's , 1 year**
  - 15/18 participants in the control arm crossed over to the treatment group at 8 weeks

PRP Tuakli-Wosornu et al. PM&R 2016 [45]

- Results: n=47 (29 in PRP group and 18 in control group) Between group difference PRP vs control
  - Statistically sig difference: FRI (p=0.03), NRS best pain (p= 0.02)
  - Not statistically significant: NRS current, NRS worst, SF-36 pain and function at 8 weeks
  - Best Pain: PRP NRS 2.8 -> 2.0 vs control 2.1 -> 2.7
- Only Categorical outcome measure: NASS Outcome: "were satisfied with or would under go the same treatment" 56% (95% CI 37% – 75%) in PRP group vs 18% (95% CI 0%– 36%) Odds Ratio: 5.83 (95% CI 1.2-37.5), p=0.01
-

Patient flow



- Only 7/58 had negative discography criteria: 88% positive discography

Long term outcomes – Observational Data

Outcome	Time	N	Mean	SD	P Value*
Current Pain	Baseline	29	4.74	2.21	Ref
	1 wk	29	4.21	1.99	.436
	4 wk	29	4.00	2.21	.215
	8 wk	29	3.09	2.59	.001
	6 mo	28	3.60	2.49	.091
	1 y	21	3.15	2.38	.063
	P value over time†		<.001		
Worst Pain	Baseline	29	7.98	1.56	Ref
	1 wk	29	6.86	1.94	.001
	4 wk	28	6.41	1.85	<.001
	8 wk	29	5.82	2.33	<.001
	6 mo	28	6.32	2.12	<.001
	1 y	21	5.86	2.20	.002
	P value over time†		<.001		

- 28 and 21 of the the 32 that met discography criteria at 6 and 12 mo respectively
- Reports statistically significant improvements over time for SF-36 and FRI at 1 year as well

Results

Table 3
Results of patient-reported outcome scores between control and PRP groups over time

Outcome	Time	Control Mean	SD	PRP Mean	SD	P Value*
FRI	Baseline	45.37	15.61	51.47	15.62	.027
	1 wk	45.99	15.74	49.83	15.72	
	4 wk	44.17	17.14	43.25	16.68	
	8 wk	44.45	19.60	37.99	19.60	
SF-36 Pain	Baseline	47.92	21.13	43.28	21.11	.079
	1 wk	47.22	21.76	40.52	21.76	
	4 wk	47.22	19.98	55.17	19.98	
	8 wk	52.78	22.19	61.29	22.19	
SF-36 Physical Function	Baseline	56.11	18.54	56.40	18.52	.435
	1 wk	51.28	20.04	51.63	20.46	
	4 wk	60.97	21.43	58.43	21.17	
	8 wk	57.08	22.91	61.70	22.89	
Current Pain	Baseline	4.61	2.21	4.74	2.21	.157
	1 wk	4.78	1.99	4.21	1.99	
	4 wk	4.61	2.21	4.00	2.21	
	8 wk	4.39	2.59	3.09	2.59	
Best Pain	Baseline	2.08	1.74	2.81	1.78	.015
	1 wk	2.44	1.82	2.88	1.83	
	4 wk	2.28	1.82	2.53	1.83	
	8 wk	2.72	2.12	2.00	2.06	
Worst Pain	Baseline	7.72	1.53	7.98	1.56	.086
	1 wk	7.39	1.95	6.86	1.94	
	4 wk	7.11	1.80	6.41	1.88	
	8 wk	6.83	2.33	5.82	2.33	

PRP = platelet-rich plasma; SD = standard deviation; FRI = Functional Rating Index; SF-36 = 36-Item Short Form Health Survey.
* P value indicates significance of interaction effect of treatment over time.

Safety and Efficacy of Platelet Rich Plasma for Treatment of Lumbar Discogenic Pain: A Prospective, Multicenter, Randomized, Double-blind Study

Margaret Anne Zielinski, BA[1], Natalie Eleanor Evans, BA[1], Hyun Bae, MD[2], Evish Kamrava, MD[2], Aaron Calodney, MD[2], Kent Remley, MD[2,5], Ramsin Benyamin, MD[6], Daniel Franc, MD, PhD[7], Matthew R. Peterson, MD[8], Jessica Lovine, BA[1], Hannah R. Barrows, BA[1], Kennedy Mahdavi, BA[1], and Taylor P. Kuhn, PhD[9], and Sheldon Jordan, MD[1,10]

Pain Physician 2022; 25:29-34 • ISSN 1533-3159

Design

- Prospective, single blind, randomized controlled trial (5 sites)
- Patients with suspected discogenic pain "considered for discography" recruited
- Discography: at least 1 negative level and from 1 to 4 positive levels
- MRI Pfirrmann grading 4 or less at each treatment level
- Missing CONSORT DIAGRAM

Author Conclusions

- "These findings are markedly different than the highly promising results of the 2016 PRP study. "
- "This study posits necessary caution for researchers who wish to administer PRP for therapeutic benefit and may ultimately point to necessary redirection of interventional research for discogenic pain populations"

Design

- 2:1 enrollment PRP (18 patients) vs saline (8 patients)
- EmCyte's high-yield PRP and BioRich Medical ProPlaz Protein Plasma Concentrator
- Primary outcome 30% reduction in NRS and ODI at 8 weeks
- Injections with contrast but not antibiotics, total 2 cc
- Authors without stated COI
- Kits donated in kind

Effectiveness of intradiscal platelet rich plasma for discogenic low back pain without Modic changes: A randomized controlled trial

M.O. Schepers, D. Groot*, E.M. Kleinjan, M.M. Pol, H. Mylenbusch, A.H.J. Klopper-Kes

Rugvoll Tweens, De Rhen 3, 7491HP, Delden, the Netherlands

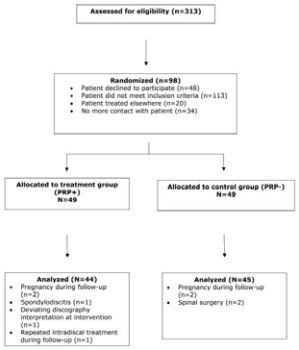
Interventional Pain Medicine 1 (2022) 100011

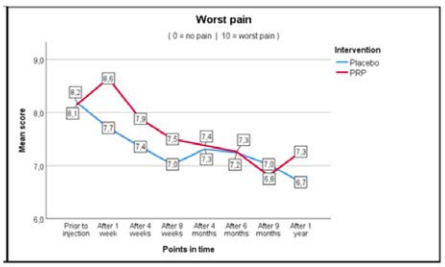
Data – 8 weeks

- 30% reduction NRS: 22% PRP vs 38% saline
- 30% reduction ODI: 38% PRP vs 39% saline
- 30% reduction in both NRS and ODI: 17% PRP vs 13% saline
- 1 patient in PRP with "clinically significant decline"
- No other reported complications

Design

- Prospective, single blind, randomized controlled trial 98 subjects with low back pain, absence of modic changes on MRI, and positive discography by SIS criteria randomized
- Intra-discal injection (without contrast) of PRP (Smart PReP 2) vs Intra-discal saline
- PRP neg group with intra-discal antibiotics
- Primary endpoint is NRS and RMDQ
- 1 year follow up
- Non-industry funded



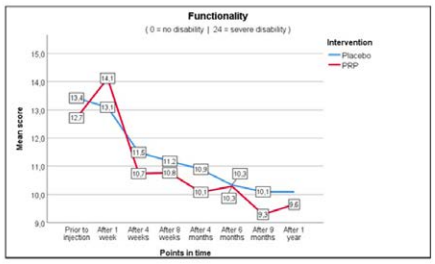


Results

Table 3
Primary and secondary outcomes; the number of patients achieving a minimum two points change in NRS for pain and the number of patients achieving a minimum 3 points change in RMDQ for disability.

	Intervention PRP+ (n = 44)	Control PRP− (n = 45)	p-value
Primary outcome			
Average Pain[a]	21	16	0.244
Worst pain[a]	16	18	0.724
RMDQ[b]	22	24	0.753

No difference in any secondary outcomes either



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No difference in any secondary outcomes either

Safety

- 1 case of discitis-osteomyelitis in the PRP+ group

Authors Conclusions

- "In this single-blind, statistically powered RCT, participants who received intradiscal PRP showed no significant improvement compared to the control group at 1 year follow up."

Intradiscal Injection of Autologous Platelet-Rich Plasma Releasate to Treat Discogenic Low Back Pain: A Preliminary Clinical Trial

Koji Akeda,[1] Kohshi Ohishi,[2] Koichi Masuda,[3] Won C. Bae,[4] Norihiko Takegami,[1] Junichi Yamada,[1] Tomoki Nakamura,[1] Toshihiko Sakakibara,[5] Yuichi Kasai,[5] and Akihiro Sudo[1]

Asian Spine J. 2017 Jun; 11(3): 380–389.

- Design: Prospective trial n=14 (out of 27 discography patients over 3 years) (Observational)
- **Single Intradiscal** 2ml of autologous PRP releasate
- **Patients selected by discography and disc block**
- **concordant pain followed by relief with lidocaine**
- 4 - 48 week f/u VAS and Roland Morris

Pain Med. 2016 Jun;17(6):1010-22. doi: 10.1093/pm/pnv053. Epub 2015 Dec 26.

Intradiscal Platelet-Rich Plasma Injection for Chronic Discogenic Low Back Pain: Preliminary Results from a Prospective Trial.

Levi D[1], Horn S[2], Tyszko S[2], Levin J[3], Hecht-Leavitt C[4], Walko E[2].

Design: Prospective trial n=22 (Obersvational)

Single Intradiscal 1.5ml of autologous PRP.

- Presumed discogenic pain based upon:
  - Positive discography
    OR
  - Clinical findings suggestive of discogenic: midline location, pain arising from sitting, peripheralization/centralization
  - MRI findings suggestive of discogenic: HIZ, protrusion, decreased T2 signal, type 1 or 2 Modic
  - Other anatomic source of pain: Z-joint and or SIJ mediated pain ruled out by diagnostic injection as indicated.

Results Akeda et al. Asian Spine J 2017 [46]

- n=14, beyond 6 months had significant dropout
- At 1 month: 10/14 (70%) had >50% relief
- At 6 months 7/14 (50%,CI 95% 24-76%) had > 50% relief
- Report statistically significant change in mean VAS and RM at all time periods

Results

- ≥50% pain relief on NRS was reported:
  - 1 month - 7/22 (32%, 95% CI: 12%–51%),
  - 2 month - 10/22 (45%, 95% CI: 25%–66%),
  - 6 month - 10/22 (45%, 95% CI: 25%–66%)
- ≥30% improvement in ODI was achieved
  - 1 month - 4/22 (18%, 95% CI: 2%–34%)
  - 2 month - 10/22 (45%, 95% CI: 25%–66%)
  - 6 month - 10/22 (45%, 95% CI: 25%–66%)

Platelet-rich plasma injections for lumbar discogenic pain: A preliminary assessment of structural and functional changes

Annu Navani, MD[a,b,], Alexandra Hames[c]*

- Case series (observational) of 6 patients with chronic low back and leg pain who received autologous intra-discal PRP
- 2 ccs, maximum 3 discs
- 6/6 (100%, 95% CI: 54-100%) reported >50% pain relief at 6 months

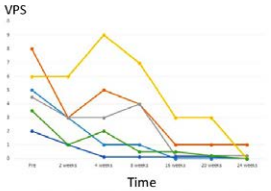


Fig. 7 – Graph demonstrating change in verbal pain scores (VPS) over 24 weeks.

Aggregate Analysis

- 23/42 (54.8%, 95% CI: 40-70%) participants achieved >50% relief of LBP following intradiscal injection of PRP with a minimum follow-up of six months.
- No other aggregate analysis was possible due to heterogeneity in outcomes reported.

Case Reports

- Early a case report of confirmed infection with Cutibacterium acnes (C acnes)
  - Two failed PRP inj, then BMC injection at L4-5 and L5-S1
  - Beatty NR, Lutz C, Boachie-Adjei K, Laynes TA, Lutz C, Lutz G. Spondylodiscitis due to *Cutibacterium acnes* following lumbosacral intradiscal biologic therapy: a case report. Regenerative Medicine. 2019 Sep;14(9):823–9.
- Two presumed cases of discitis without pathogen confirmation.
  - L4-5 and L5-S1 intra-discal BMC and facet BMC
    - Hospitalized day 19, + labs and imaging no bx
  - L3-4 and L4-5 intra-discal BMC
    - Presented day 7, + labs and imaging no bx

Int J Spine Surg published online 21 April 2021
http://ijssurgery.com/content/early/2021/04/20/8053

GRADE

- **Very low-quality evidence that PRP effectively reduces pain and disability in patients with discogenic LBP.**
  - Initially rated "high" and downgraded to "very low quality" due to:
    - risk of bias, Imprecision, and indirectness relating to patient selection and intervention.
- The sole RCT reviewed has overall high risk of bias
  - randomization process and missing outcome data in ≥20% of participants.
- No study included more than 30 participants in any group and within-group success rates were associated with wide-ranging confidence intervals with upper and lower ends substantially overlapping clinically important thresholds.
- All comparative studies were underpowered to detect significant differences between groups.
- Reviewed data came from studies with heterogeneous selection criteria, and the composition of injectate may have varied substantially.

INFECTIONS

- Two weeks after an intra-discal injection of adipose cells, bone marrow aspirate and plasma into his L3-L4 and L5-S1 lumbar disc, presented with discitis osteomyelitis
- A 32-year-old man developed lumbar discitis and osteomyelitis 10 days after receiving a "cell-based injection for the treatment of degenerative disc disease"

Spine J. 2012 Nov;12(11):e1-4. doi: 10.1016/j.spinee.2012.10.004.

JBJS Case Connector: July-September 2020 - Volume 10 - Issue 3 - p e19.00636
doi: 10.2106/JBJS.CC.19.00636

Safety?

- None of the studies in the systematic review report major complications
- As a group this is still only approximately 300 patients overall
- More recently:
  - One "implant site" infection in the new stem cell RCT (6 million cells group)
  - One patient in recent PRP RCT with discitis osteomyelitis
  - 2 cases of osteomyelitis in the VAST study

Spinal Cord Injury and Stem Cells: Do We Have a Viable Treatment?

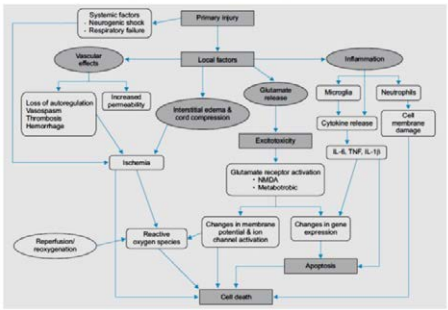
Author: **David Wong, MD**
Country: United States of America

Spinal Cord Injury (SCI)
and Stem Cells: An Update
Do we have a viable treatment?

David A. Wong MD, MSc, FRCS(C)
Past President North American Spine Society (NASS)
Director Advanced Center for Spinal Microsurgery
Presbyterian St. Luke's Medical Center, Denver CO USA
Former Staff Surgeon Craig Hospital Denver

SCI Pathopysiology of Events

Acute Phase



SCI Rehabilitation Hospital Craig Hospital Denver

- Regional Center
  - 30,000+ patients since 1956
  - 500 inpt /1600 outpt/ year
    - 55% ASIA incomplete
  - Average age 38
    - 75% male
  - Etiology
    - 50% MVA
    - 17% falls
    - 10% sports

SCI Research Focus Areas

- ***Neuroprotection*** — protecting surviving nerve cells from further damage - **Medications**
- ***Regeneration*** — stimulate regrowth of axons and target appropriate connections–**Macrophage/Stem Cell**
- ***Cell replacement*** — replace damaged nerve/glial cells – **Stem Cells**
- ***Retraining CNS circuits*** and plasticity to restore body functions

Craig Hospital SCI Research $3.8 M/yr

- SCI Clinical Outcomes
- Exoskeleton
- Macrophage/Stem Cell Injection
  - ISCOS 2012 London
    - Dan Lammertse Craig Med Dir
      - Enroll pts in Israeli RCT
    - Symposium report 2 RCT's
      - Zurich / Israel
      - Results poor

SCI Research FDA Phase II Trials

- Medications
  - **Riluzole**
  - Minocycline
  - Rho Protein Antagonist
  - Mag Chlor/Polyeth Glycol
  - Fibroblast Growth Factor
- Stem Cells
  - Inject injury site
    - Human Embryonic Progenitor Cell

Rationale, design and critical end points for the Riluzole in Acute Spinal Cord Injury Study (RISCIS): a randomized, double-blinded, placebo-controlled parallel multi-center trial

MG Fehlings[1], H Nakashima[1,2], N Nagoshi[1,3], DSL Chow[4], RG Grossman[5] and B Kopjar[6]

Spinal Cord 2016; 54:8-15

Riluzole - Neuralprotection

- Sodium channel blocker
- Tx ALS–Lou Gehrig's Disease
  - Amyotrophic Lateral Sclerosis
- SCI- ? **Neuroprotective** ?
  - 100 mg BID 1st 24h/50 mg BID X 13d
    - C4-8 ASIA A,B,C vs. Placebo
  - Phase I trial complete
    - Safety
    - Pharmacokinetic data-neuroprotect

Spinal Cord (2012) 50, 661–671

www.nature.com/sc

ORIGINAL ARTICLE

Autologous incubated macrophage therapy in acute, complete spinal cord injury: results of the phase 2 randomized controlled multicenter trial

DP Lammertse[1,2], LAT Jones[3], SB Charlifue[1], SC Kirshblum[4,5], DF Apple[6], KT Ragnarsson[7], SP Falci[8], RF Heary[9], TF Choudhri[10], AL Jenkins[10], RR Betz[11], D Poonian[12], JP Cuthbert[1], A Jha[1,2], DA Snyder[13] and N Knoller[14]

- RCT 2:1 Tx vs Control
- 43 pts – 26 Tx/ 17 Control
- ASIA A-B 7 Tx/10 Control
- ASIA A-C 2 Tx/ 2 Control
- Trend improve Control-**NSD**

Macrophages are required for adult salamander limb regeneration

James W. Godwin[a,1], Alexander R. Pinto[a], and Nadia A. Rosenthal[a,b]

[a]Australian Regenerative Medicine Institute, Monash University, Clayton, VIC 3800, Australia; and [b]National Heart and Lung Institute, Imperial College London, London W12 0NN, United Kingdom

PNAS 2013;110:9417

- Modulation immune cell signaling during limb **regeneration**
- Time defined requirement for macrophage infiltration in regen
- Deplete macrophages 1st 24 hrs post amputation
  - = wound heal, fibrosis, dysregulation extracellular component gene express
- Restore macrophages/re amputate
  - = full limb regeneration

Early Reports Adult Stem Cells for SCI Regeneration in Humans

2006 Dr. Carlos Lima in Portugal reported on transplant of nasal stem cells into 7 **patients** with spinal cord injury. Patients regained some motor function and sensation, and 2 patients showed bladder control improvement. Lima C *et al.*, Olfactory mucosa autografts in human spinal cord injury: A pilot clinical study, *Journal of Spinal Cord Medicine* 29, 191-203, June 2006.

2008 Australian scientists published results of a 3-year clinical trial, showing adult nasal cells were safe and produced some improvement for spinal cord injury **patients**. Mackay-Sim A *et al.*, Autologous olfactory ensheathing cell transplantation in human paraplegia: a 3-year clinical trial, *Brain* 131, 2376 - 2386, September 2008.

2008 Researchers reported that bone marrow adult stem cells improved function in eight spinal cord injury **patients**. Geffner LF *et al.*, Administration of autologous bone marrow stem cells into spinal cord injury patients via multiple routes is safe and improves their quality of life: Comprehensive case studies, *Cell Transplantation* 17, 1277-1293, 2008.

J Neurosurg Spine 3:173–181, 2005

Clinical experience using incubated autologous macrophages as a treatment for complete spinal cord injury: Phase I study results

NACHSHON KNOLLER, M.D., GUSTAVO AUERBACH, D.M.D., VALENTIN FULGA, M.D., GABRIEL ZELIG, M.D., JOSEF ATTIAS, PH.D., RONIT BAKIMER, PH.D., JONATHAN B. MARDER, PH.D., ETI YOLES PH.D., MICHAEL BELKIN, M.D., MICHAL SCHWARTZ, PH.D., AND MOSHE HADANI, M.D.

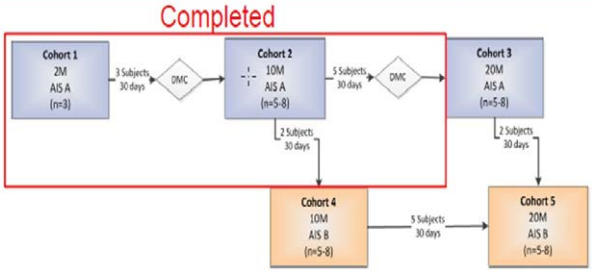
- Pilot - 8 patients age 19-41
- 7 M /1 F
- 7 thoracic / 1 C5
- All ASIA A/complete
- Injection 9-14 days
- 12 mo f/u 3/8 ASIA C
  - 5/8 remain ASIA A

12 MONTH SAFETY AND EFFICACY RESULTS OF THE SCIStar Study

PI Rick Fessler

RUSH

AST-OPC1 Current Study Design



Currently recruiting patients for both Cohorts 3 & 4

JNS SPINE

CLINICAL ARTICLE

J Neurosurg Spine 37:321–330, 2022

Ten-year safety of pluripotent stem cell transplantation in acute thoracic spinal cord injury

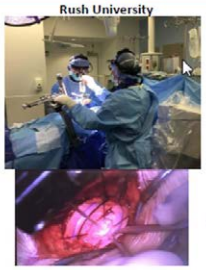
*Stephen L. McKenna, MD,[1,2] Reza Ehsanian, MD, PhD,[3] Charles Y. Liu, PhD, MD,[4–6] Gary K. Steinberg, MD, PhD,[7] Linda Jones, PT, PhD,[7] Jane S. Lebkowski, PhD,[8,9] Edward Wirth III, MD, PhD,[8,10] and Richard G. Fessler, MD, PhD[11]

- Open-label, unblinded, nonrandom non-placebo-controlled stude
- Estab safety of intraparenchymal injection of LCTOPC1 cells
- 5 pts acute thoracic ASIA A
- 2x10⁶ cells caudal to epicenter
- q yr exam/MR → telephone>10 yr
- No mass/neuro progression/syrinx etc.

AST-OPC1 Injection Procedure

Shepherd Center

Rush University



- Injections performed using a table-mounted syringe positioning device (SPD)
- Direct intra-parenchymal injection into the spinal cord lesion
- Single 50µL injection for both the 2M & 10M doses
- No intraoperative complications to date

JNS SPINE

CLINICAL ARTICLE

J Neurosurg Spine 2022; 37: 1-9

A phase 1/2a dose-escalation study of oligodendrocyte progenitor cells in individuals with subacute cervical spinal cord injury

*Richard G. Fessler, MD, PhD,[1] Reza Ehsanian, MD, PhD,[2] Charles Y. Liu, PhD, MD,[3–5] Gary K. Steinberg, MD, PhD,[6] Linda Jones, PT, PhD,[7] Jane S. Lebkowski, PhD,[8,9] Edward D. Wirth III, MD, PhD,[8,10] and Stephen L. McKenna, MD[8,11]

- 25 pts ASIA A/B subacute 21-42d
- Single 1x10⁶/1x10⁷/2x10⁷cells
- Intraparenchymal @ site
- Low dose Tacrolimus x 60 days
- All 25 at least 1 A/E
  - 534 A/E (32 study/502non study)
  - 2 serious A/E
    - CSF leak/resolve minor mental status ↓
    - Infecion 30d post inj resolve with ABX

Nistor GI, Totoiu MO, Haque N, Carpenter MK, Keirstead HS. Human embryonic stem cells differentiate into oligodendrocytes in high purity and myelinate after spinal cord transplantation. Glia. 2005;49(3):385-396.

- Oligodendrocyte Progenitor Cells (LCTOPC1)
- Derived from human embryonic pluripotent stem cells
- Mechanistic properties support survival & repair key cellular components & architecture at SCI
- Rat contusion model=cells survive
  - Remyelinate denuded axons
  - Improve locomotor function

JNS SPINE

CLINICAL ARTICLE

J Neurosurg Spine 2022; 37: 1-9

A phase 1/2a dose-escalation study of oligodendrocyte progenitor cells in individuals with subacute cervical spinal cord injury

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- @ 1 yr F/U
- No enlarging mass/syrinx

- 21/22 (96%) recover one level at least 1side
- 7/22 (32%) recover two level at least 1 side

SCI Research Focus Areas

- ***Neuroprotection*** — protecting surviving nerve cells from further damage - **Medications**
- ***Regeneration*** — stimulate regrowth of axons and target appropriate connections–**Macrophage/Stem Cell**
- ***Cell replacement*** — replace damaged nerve/glial cells – **Stem Cells**
- ***Retraining CNS circuits*** and plasticity to restore body functions

Bibliography

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- Fessler R et al. A phase 1/2a dose-escalation study of oligodendrocyte progenitor cells in individuals with subacute cervical spinal cord injury. J Neurosurg Spine 2022; 37: 1-9
- Lammertse DP et al. Autologous incubated macrophage therapy in acute, complete spinal cord injury: results of the phase 2 randomized controlled multicenter trial. Spinal Cord. 2012;50(9):661-671.
- Pollack A. Geron is shutting down its stem cell clinical trial. The New York Times. November 15, 2011. Accessed February 16, 2022. https://www.nytimes.com/2011/11/15/business/ geron-is-shutting-down-its-stem-cell-clinical-trial.html

Stem Cells for Spinal Cord Injury-SCI

Do we have a viable treatment ?

- Non-SCI Adjunct to healing
  - yes
- Regeneration/Repair
  - Possible – SCIStar - promising
- New Cell Replacement
    - Disc Degeneration
    - Spinal Cord Injury (SCI)
  - Not so far

Future of Spine & Stem Cells
NASS Presidential Address 2014

- J Craig Venter PhD
  - Principal Investigator Human Genome Proj
    - Find/synthesize RNA messenger
    - Identify Alleles for each cell develop
- Open Issues
  - 25 yrs complete Human Genome
    - ? Time frame for RNA Messenger/ID alleles
  - Nutrition
    - Nanotechnology (Nature 6/08)
  - Concentrate start process
    - How does one stop tissue production
      - Prevent Stem Cell from becoming Cancer Cell

It's a Simple Lumbar Microdiscectomy: But how do you Avoid Complications and Make the Surgery Better?

Author: **David Wong, MD**
Country: United States of America

It's a Simple Lumbar Microdiscectomy:

But how do you avoid complications and make the surgery better?

David A. Wong, MD, MSc, FRCS(C)
Past President, North American Spine Society
Director Advanced Center for Spinal Microsurgery
Presbyterian St. Luke's Medical Center, Denver, Colorado

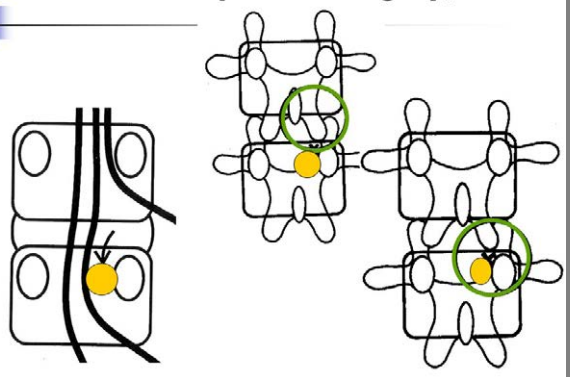
Ian Macnab John McCulloch

Techniques for Optimizing Outcome and Safety in *"MIS" Discectomy*

- Optimal Outcome
  - Analysis of pathology
  - Adequate decompression
    - Principal Anatomic Landmarks
      - PAL's
- Safety
  - High speed burr
  - 3-0 curette
  - Ligamentum Flavum Anatomy
  - Wrong Site Surgery (WSS)
  - Radiation

Localization of Pathology

- Critical Concept Microsurgery/MISS



Lumbar Herniated Nucleus Pulposis

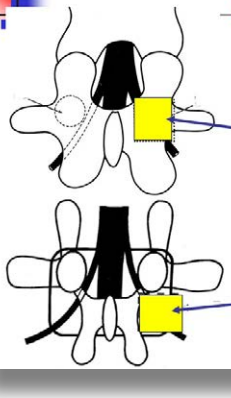
HNP

- Incidence Primary HNP
  - 1% Pop/yr(McCulloch 1996)
    - 10K/M pop/yr (3M USA/yr)
  - 2-4% Sx (Davis 1994)
    - 60-120,000 USA/yr
- Incidence in UAE
  - 5M population
    - =50,000 HNP/yr
    - =1,000 – 4,000 surgeries/yr

Patho-Anatomy – Medial to Lateral

Macnab HIDDEN ZONES

Macnab I. Negative Disc Exploration. JBJS-A. 1971; 53(5): 891- 903

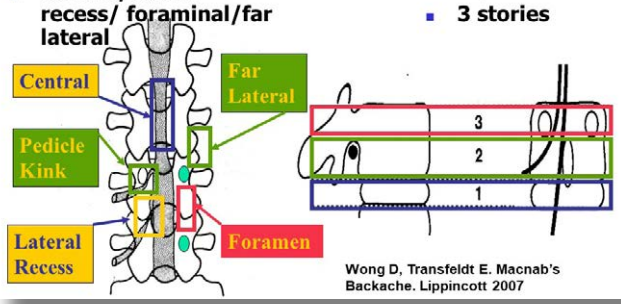


- Hidden Zone
  - Lateral recess stenosis
  - Foraminal stenosis
- Hidden Zone
  - Far lateral HNP

Critical Concepts in Spine Anatomy/Pathology

Ian Macnab
- Medial – lateral
- Central/lateral recess/ foraminal/far lateral

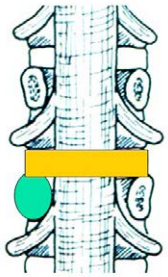
John McCulloch
- Inferior – superior
- 3 stories



Wong D, Transfeldt E. Macnab's Backache. Lippincott 2007

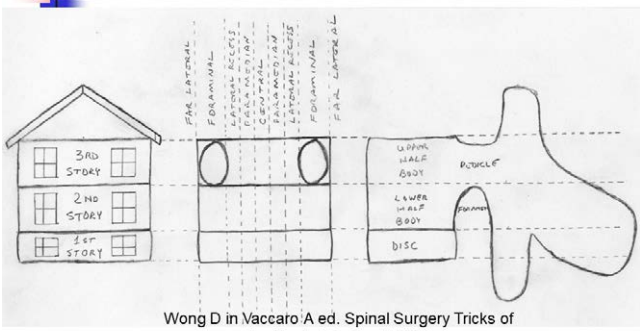
"PALs" for Windows Medial Laminotomy

- External
  - Facet
  - Pars Interarticularis
  - Superior edge inferior lamina
- Canal
  - Pedicle
  - Disc



Wong D, Transfeldt E. Macnab's Backache. Lipponcott 2007

Grid Orientation to Spinal Pathology



Wong D in Vaccaro A ed. Spinal Surgery Tricks of the Trade. Lippincott 2008

Key Technical Points

- Ligamentum Flavum
  - Attach superior
    - Undersurface of lamina
  - Attach inferior
    - Abut leading edge lamina
- Dural tears
  - Epid fat/ligamentum attenuate
  - Dura adhere to bone
- High speed burr
  - Side cutting AM-8
  - Align 90° to dura
- Ligamentum Flavum
  - Protect Dura

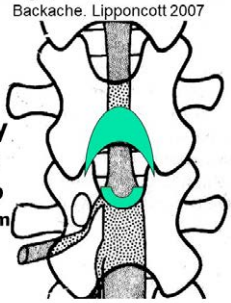
Read Axial Images CT/MRI

- Anterior
  - Disc density
  - Bone density
- Middle
  - Foramen – hole
  - Pedicle - bone
- Anterior
  - Disc = 1st story
  - Bone = 2nd/3rd story
- Middle
  - Foramen = 2nd story
  - Pedicle = 3rd story

Wong Personal Collection

Micro-Discectomy

Wong D, Transfeldt E. Macnab's Backache. Lipponcott 2007



- Ligamentum Flavum Anatomy
  - Attach-Sup Undersurf/Inf Abut
  - Hypertrophied – Mushroom Cap
    - Separate hypertrophied layers from inferior
      - Resect
      - Keep last layer for dural protect
- Burr Sup Lamina 1st
  - Protect dura
  - Keep Ligamentum tension
    - Release upper first
    - Curette under to release point

Discectomy Safety

- Canal Entry – Medial
  - Fat/trefoil – safer zone
- Identify
  - Pedicle - 3rd Story below
  - Root adjacent to pedicle
  - Disc – 1st Story
  - Lateral border of dura
  - Pars – don't coagulate neurovasc bundle
- LOF Root flat over large HNP
  - ID Root every time! – PAL = Pedicle
- Annulus incision – Slit/Oblique
  - Rate recurrent HNP
  - Anular Repair

Wong D, Transfeldt E. Macnab's Backache. Lippincott 2007

MISS Decompression Endoscopic

- Tony Yeung
- Tom Hoogland
- Questions
  - Methylene blue
    - reliability
  - Bony stenosis
  - Indications
  - Complications
    - ?Laser?

Tubular Diskectomy vs Conventional Microdiskectomy for Sciatica

A Randomized Controlled Trial

Mark P. Arts, MD
Ronald Brand, PhD
M. Elske van den Akker, PhD
Bart W. Koes, PhD
Ronald H. M. A. Bartels, MD, PhD
Wilco C. Peul, MD, PhD
for the Leiden-The Hague Spine Intervention Prognostic Study Group (SIPS)

Context Conventional microdiskectomy is the most frequently performed surgery for patients with sciatica due to lumbar disk herniation. Transmuscular tubular diskectomy has been introduced to increase the rate of recovery, although evidence is lacking of its efficacy.

Objective To determine outcomes and time to recovery in patients treated with tubular diskectomy compared with conventional microdiskectomy.

Design, Setting, and Patients The Sciatica Micro-Endoscopic Diskectomy randomized controlled trial was conducted among 328 patients aged 18 to 70 years who had persistent leg pain (>8 weeks) due to lumbar disk herniations at 7 general hospitals in the Netherlands from January 2005 to October 2006. Patients and observers were blinded during the follow-up, which ended 1 year after final enrollment.

JAMA 2009; 302:149-158

- 328 patients
  - tube 167/ micro 161
- Wrong site surgeries
  - Tube – 1
  - Micro – 5

Advantages Endoscopic Discectomy

- ? Less invasive
- Easily outpatient procedure

MISS Decompression Endoscopic

- Concept
  - Percutaneous decompression
- Questions
  - Approach limitations
    - Identify anatomy
      - No cavity
      - Mark herniated disc
    - Indirect disc decompression
  - Visualization
    - 2-D

Disadvantages Endoscopic Discectomy

- Disc Sx not root Sx
  - Metrx excepted
- No RCT's
- 2D unless Metrx
- Equip cost
  - 1 anatomic area
  - Limited procedure
- Scar around ganglion
- Tech difficult
  - Soft tiss / cavity ratio
- Non expansile
  - Trouble convert open
- Indications difficult to determ
  - MRI wk protrusion vs extrusion
- Difficult to learn / teach
- Labour intensive
- No broad support

Spine (Phila Pa 1976). 2011 Feb 1;36(3):255-60.
Radiation exposure to the surgeon during open lumbar microdiscectomy and minimally invasive microdiscectomy: a prospective, controlled trial.
Mariscalco MW, Yamashita T, Steinmetz MP, Krishnaney AA, Lieberman IH, Mroz TE.

- **MIS exposure**
  - **Higher than microdisc**
    - **Thyroid/Eye**
    - **Chest**
    - **Hand**
  - **Statistically significant**

It was a Simple Lumbar Stenosis Decompression Until the CSF and Nerve Roots Appeared: Strategies for Durotomy Prevention and Repair

Author: **David Wong, MD**
Country: United States of America

It was a simple
Lumbar Stenosis Decompression
UNTIL the CSF and Nerve Roots appeared:
Strategies for Durotomy
Prevention and Treatment.

David A. Wong, MD, MSc, FRCS(C)
Past President, North American Spine Society
Director Advanced Center Spinal Microsurgery
Presbyterian St Luke's Medical Center, Denver

J Neurosurg Spine. 2011 May ; 14(5): 647–653. doi:10.3171/2011.1.SPINE10426.

Outcomes after incidental durotomy during first-time lumbar discectomy

Neurosurgery. 2011 July ; 69(1): 38–44. doi:10.1227/NEU.0b013e3182134171.

SPORT: Does incidental durotomy affect long-term outcomes in cases of Spinal Stenosis?

Atman Desai, M.D.[1], Perry A. Ball, M.D.[1], Kimon Bekelis, M.D.[1], Jon Lurie, M.D., M.S.[2], Sohail K. Mirza, M.D., M.P.H.[3], Tor D. Tosteson, Sc.D.[2], and James N. Weinstein, D.O., M.S.

Spine (Phila Pa 1976). 2012 March 1; 37(5): 406–413. doi:10.1097/BRS.0b013e3182349bc5.

Surgery for lumbar degenerative spondylolisthesis in SPORT: Does incidental durotomy affect outcome?

- Discectomy – 25/799pts = 3.1%
- Spinal Stenosis - 37/409pts = 9%
- SS + Spondylo - 40/389pts = 10.5%

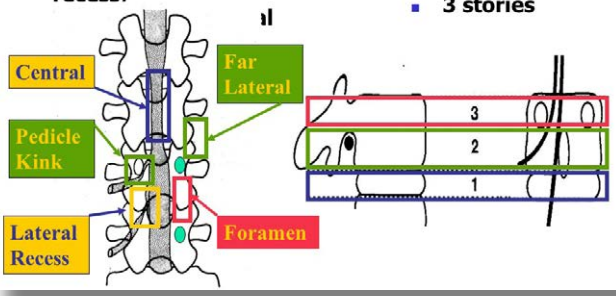
Outline
Incidental Durotomies

- Setting the Stage –
  - Incidence of Durotomies
  - Clinical Outcomes Tx
  - Prevention = Adherence
- Treatment
  - Timing
  - Suture
    - Neuralon/Teflon
  - Fibrin glue
  - Mobilization
  - CSF Drains

Concepts in Spine Anatomy/Pathology

Ian Macnab
- Medial – lateral
- Central/lateral recess/

John McCulloch
- Inferior – superior
- 3 stories



Durotomy
Incidence & Clinical Outcomes

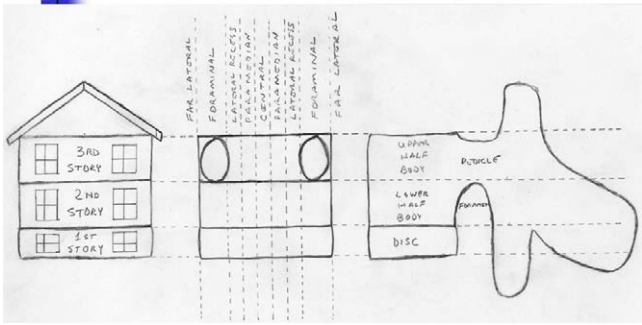
Spine 1989;14:443

Long-Term Results of Lumbar Spine Surgery Complicated by Unintended Incidental Durotomy

A. ALEXANDER M. JONES, MD,* J. L. STAMBOUGH, MD,†
R. A. BALDERSTON, MD,‡ R. H. ROTHMAN, MD,‡ and R. E. BOOTH, Jr, MD‡

- 450pts/17duotomy/4%
  - All primary repair
  - Av 25 mo F/U
  - Matched controls
  - No diff morbidity/outcome

Grid Orientation to Spinal Pathology



Understand: Pathoanatomy of Dural Adhesion

- **Spinal Stenosis is a *First Story* disease.**
  - **John A. McCulloch**
- **= understand risk**
- **Strategize prevention of complications**
  - **e.g. durotomy**
  - **Separate tissue planes**
  - **LOF Vinculae**

Surgical Tips Facet Cyst

- Resect sufficient Bone
- Work from normal dura each end/ midline
- Adhesions/thin dura
  - 3-0 curette/nerve hook
  - Look out for Burst
- Remove facet capsule
- Synovectomy
  - Long McCulloch Hook

Dural Adhesion

- **Dural Adhesions**
  - **Inflammatory**
    - **Carefully separate ligamentum-dura plane 3-O curette**
  - **Vinculae**
    - **Fibrous attachments ligamentum to Dura**

Durotomy Treatment

- ↓Inspiratory pressure/volume
- ?Suture every durotomy?
  - Neuralon/Teflon
- Timing
  - Immediate suture
    - Reduce blood into CSF by pulsation
    - =Arachnoiditis post Pantopaque
  - Fibrin glue –Tisseal- vol ↑ 10-20%
  - Close deadspace-muscular suture
- Flat x 12-24hrs
  - foley

Synovial Cyst

- **Inflammatory/adherent**
  - **Incorporated with ligamentum**
- **Sufficient exposure key**
  - **Superior**
  - **Inferior**
  - **Medial**
- **Separate from dura**
  - **3-0 curette**
  - **Small McCulloch hook**
  - ***Patience!***

Durotomy Treatment

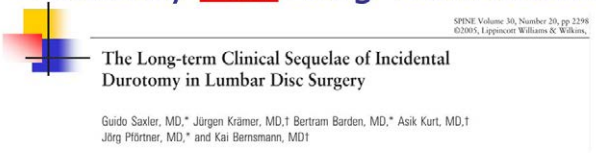
Eur Spine J (2014) 23:904–908
DOI 10.1007/s00586-013-3159-9
ORIGINAL ARTICLE

Dural tears in primary decompressive lumbar surgery. Is primary repair necessary for a good outcome?

Sean Grannum · Mohammed Shakil Patel · Fahad Attar · Martyn Newey
Leichester UK

- 19/200 durotomy =9.5%
  - 1 suture
  - 2 "punctate/small" – no tx
  - <5mm "cover" fat/surgicel/ Duragen
  - (NO GELFOAM-FDA Pt Safety Alert)
    - https://www.accessdata.fda.gov/cdrh_docs/pdf18/N18286S012c.pdf
- Mean bedrest 2.6d (2-4d)
- Av hospital 4.2d (2-7d)
- F/U 4.9yr match controls
  - No sig diff ODI/SF36/VAL/VAB

Durotomy Poor Long Term Result


SPINE Volume 30, Number 20, pp 2298
©2005, Lippincott Williams & Wilkins,

The Long-term Clinical Sequelae of Incidental Durotomy in Lumbar Disc Surgery

Guido Saxler, MD,* Jürgen Krämer, MD,† Bertram Barden, MD,* Asik Kurt, MD,†
Jörg Pförtner, MD,* and Kai Bernsmann, MD†

- 41/1280pts = 3.2%
- 35 sutured
- No bedrest
- Vs matched controls
- F/U 10.2 yrs
- Tegner-daily activity/Hanover Function
- ↑reop/time off work/LBP/Function Limits

Intradural Drain Complications

- Flat 24hrs
- Spinal headache
  - Clear wound drainage
- Intradural drain
- 5-20cc/hr
- Wound drainage stop
- Rapid Response Call
  - Faster CSF drainage
  - Cerebellar tonsil Herniation
- Spinal Headache
  - Severe/postural
  - Fluids/Caffeine
    - Mountain Dew/Red Bull

Herniated Tonsils

- Cushing's triad
  - Hypertension
  - Bradycardia
  - Irregular respiration
- Coma/↓BP/Apnea

Incidental Durotomy Post Op Tx Spinal Headache

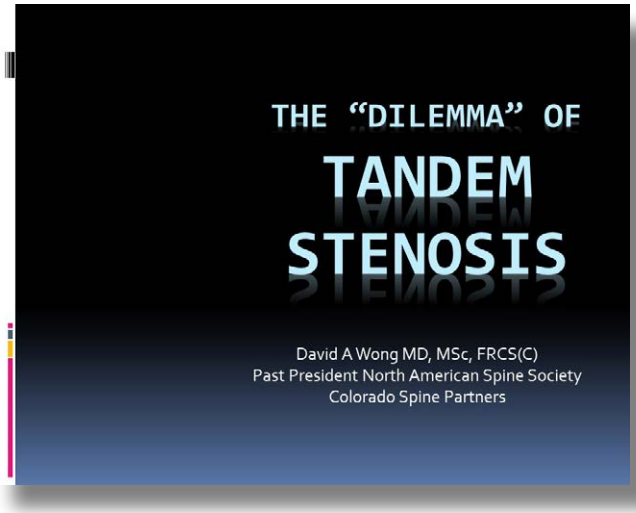
- Blood Patch
- Intradural drain
  - CSF produce
  - Drain 15-20cc/hr
  - CSF pres<12mmHg
  - 120-360cc/d x 3-5d 90% success rate close leak
    - Chaudhry S. Tech in Ortho2012;27:265

Intradural Drain Complications

- 69 yr businessman
  - Prev college football player
  - Runner/marathons/Iron Man
- Severe Critical Stenosis<5mm L4-5, L3-4
- Mult ESI's – some particulate
- Micro laminotomy/laminaplasty
  - Thin dura – abrasion
  - Steroid plaques
- Durotomy/5mm/sutured

Tandem Stenosis - the dilemma of Simultaneous Cervical and Lumbar Stenosis

Author: **David Wong, MD**
Country: United States of America



Tandem Stenosis

- Symptomatic (or Asymptomatic?) Spinal Stenosis Occuring **Concurrently in the Cervical and Lumbar Spine**
- Primary Manifestations:
  - Complex, Progressive Gait Disturbance
  - Mixed Upper (Myelopathic) and Lower (Polyradicular) Motor Neuron Findings
  - Neurogenic Cluadication
- Typically Insidious
- Signs and Symptoms of one sometimes **"unmasked"** by surgery for the other

Evidence

- Mostly Level 2 Evidence

Historical Perspective

- Teng and Papatheodorou **1st to describe** "Combined Cervical and Lumbar Spondylosis"
  - **1964, Archives of Neurology**
- Dagi et al.
  - Coined the term **"Tandem Stenosis"**
  - **1987**, Journal of Neurosurgery
- Body of Literature is Limited
- All Studies are Retrospective/Case Series
  - Prevalence difficult to define, but low
    - Symptomatic vs. Asymptomatic

Objectives

- What Is Tandem Stenosis?
- Historical Perspective
- Treatment Approaches
- Evidence Base
- Cases
- Summary
- Discussion

? Prevalence/Clinical ?

- Classically Reported as **5-25% (of those with stenosis)**
  - Epstein et al., 1984, 5% of 24 hospitalized with stenosis had tandem stenosis
  - Laroche et al., 1992, 19% of 47 hospitalized with stenosis had tandem stenosis
  - Dagi et al., 1987, 19% of 100 hospitalized with stenosis had tandem stenosis
  - Hsieh et al., 1998, 7.6% of 158 who underwent surgery for stenosis had tandem stenosis
  - Aydogan et al., 2007, 3.4% of 230 who underwent surgery for stenosis had tandem stenosis

? Prevalence ?

- Cadaveric Studies
  - Lee et al., 2007, Cervical Stenosis in up to 20%
  - Jenis and An, 2000, Lumbar Stenosis in up to 11%
  - Lee et al., 2008, 440 cadavers, Tandem Stenosis (mid-sag. canal <12mm) up to **5.4%**
    - Presence of stenosis in one region, **PPV for Tandem Stenosis = 15-32%**
- LeBan and Green, 2004, retrospective review of 461K Hospital admissions, Tandem Stenosis **0.12%**

Treatment Options

- Several reviews on the subject
  - Rowland, 1992, *Neurology*, "Surgical treatment for cervical spondylotic meylopathy: time for a controlled trial"
  - Matz, 2006, *The Spine Journal*, "Does nonoperative management play a role in the treatment of cervical spondylotic myelopathy?"
- Both Question the Conventional Wisdom
  - Non-operative measures may arrest/reverse progression of early disease
  - Once myelopathy is present, progression may occur despite the best of treatments (surgical or nonsurgical)

Demographics

- Sex… **Predominantly Male**
  - Teng and Papatheodorou, 1964, **11/12** Male
  - Epstein et al., 1984, 12/24 Male
  - Dagi et al., 1987, 15/19 Male
  - Leban and Green, 2004, **36/54** Male
- Age… As Expected, **Predominantly >50-year-olds**
  - Teng and Papatheodorou, 1964, 11/12 > 50
  - Epstein et al., 1984, 22/24 > 50
  - Dagi et al., 1987, 19/19 >57 (avg. age 68)
  - Leban and Green, 2004, 51/54 > 51

Treatment Options

Table 4
Comparison of operative and nonoperative management of cervical spondylotic myelopathy

Author	Number of patients	Outcome measure	Therapy	Result
Bednarik et al. [15]	49	Modified JOA and EP monitoring	Conservative therapy (n=27, cervical collar, NSAID, rest) Surgery (n=22)	No difference in modified JOA scores or aggregate EP potentials at 6 and 24 months
Sampath et al. [16]	62	Neurologic Outcome Score, Functional Status Measure, ADL scale	Conservative therapy (n=31 included rest, exercise, cervical collar) Surgery (n=31)	Only 69% follow-up at mean of 11 months. Functional improvement seen with both treatments but significant in social and work categories with surgery compared with conservative therapy. Neurological improvement seen with surgery but not significant compared with conservative.
Kadanka et al. [18]	68	Modified JOA and 10-meter walk times, Video evaluation of ADL (self and observer)	Conservative therapy (n=35, cervical collar, rest, NSAID) Surgery (n=33)	Modified JOA remained 14.6–14.7 and 10-meter walk remained 7.4–7.5 s with conservative therapy at 3 years. With surgery, JOA remained 13.8 to 14.1 but 10-meter walk worsened from 7.9 to 9.4 s ($P<.05$ difference compared with conservative). Surgery improved with respect to self-evaluation at 6 months while conservative did better with observed ADL at 6 months. No differences in ADL at 3 years.

JOA = Japanese Orthopedic Association grading scale; EP = electrophysiological; NSAID = nonsteroidal anti-inflammatory drugs; ADL = activities of daily living.

Treatment Options

- Is There A Role For Conservative Treatment
  - Intuitively, we know that there is
  - Certainly an evidence base supporting surgery for lumbar stenosis… Stenosis Arm of SPORT study
  - Evidence base for surgery for cervical myelopathy less convincing
- Common Argument : Structural Problem Requires Structural Solution
  - What About A "Functional" or "Dynamic" Component
    - White and Panjabi, 1988, *Spine*, argued contribution of both "Static" and "Dynamic" pathophsyiology

Treatment Options

- Surgical Treatment Widely Considered The Mainstay Of Treatment For Spinal Stenosis
- Surgical Dilemma For Tandem Stenosis…

Which Level To Do First?

- Do you treat the predominant imaging findings or the predominant clinical syndrome first?
- Is there a "critical level" of cervical narrowing (or cord signal changes) which "trumps" the clinical syndrome in decision making

Treatment Outcomes

- Teng and Papatheodorou, 1964, *Archives of Neurology*
- 12 cases
- AP canal diameter 4-9 mm by myelogram
- Treatment presumably dictated by dominant clinical syndrome
- 6/12 Cervical Decompression Alone
- 1/12 Lumbar Decompression Alone
- 3/12 Cervical & Lumbar (Cervical First)
- 7/10 Surgical Patients "Satisfactory Relief"

Treatment Outcomes

- Hsieh et al., 1998, *Changgeng Yi Xue Za Zhi*
  - 12 patients
  - Treatment dictated by clinical signs:
    - Cervical decompression first if UMN or UE signs
  - 8 had initial cervical decompression
    - 4 required later lumbar decompression
  - 4 had initial lumbar decompression
    - None required later cervical decompression
- 66.7% Good-Excellent Outcome

Treatment Outcomes

- Epstein et al., 1984, *Neurosurgery*
  - 24 patients
  - Treatment Dictated By:
    - Sagittal diameter of the cervical canal (<10mm)
    - Predominant clinical symptoms if canal 11-13 mm
  - 11 Initial Cervical Decompression
    - 8 required later lumbar decompression
  - 13 Initial Lumbar Decompression
    - 4 required later cervical decompression (also much longer duration to second surgery)
  - "Significant Improvement" in 90% overall

Treatment Outcomes -Trends

- 65 Total Surgical Patients
- 40 had initial cervical surgery
  - 23/40 later required lumbar decompression (58%)
- 22 had initial lumbar surgery
  - 7/22 later required cervical decompression (32%)
- 3 had concurrent cervical/lumbar decompression
- Outcomes ranged from 47-90% success
  - Best outcomes reported by Epstein et al. where treatment was dictated by:
    1st: Cervical Canal <10 mm
    2nd: Predominant Syndrome

Treatment Outcomes

- Dagi et al., 1987, *Journal of Neurosurgery*
  - 19 patients
  - Most symptomatic level "usually treated first"
  - 12 Initial Cervical Decompression
    - 8 required later lumbar decompression
  - 4 Initial Lumbar Decompression
    - 3 required later cervical decompression
  - 3 Concurrent Cervical/Lumbar Decompression
  - Poorer Outcome, Only 47% Good-Excellent

Back to Case #2

- Lumbar Stenosis: Symptomatic
- Cervical Stenosis: Mildly Symptomatic
- What Would You Recommend?

Cervical Only?

Lumbar Only?

Both?

- Same Case… Symptomatic Lumbar Stenosis, Mildly Symptomatic Cervical Stenosis But Now + Cord Signal Changes

Cervical Only?

Lumbar Only?

Both?

- Anybody Change Their Mind?

Tandem Stenosis Summary

- Clinical vs. Radiologic Diagnosis
- Prevalence is Low
  - Radiologically, Around 5%
  - Clinically, Much Lower (<1%)
- Male > Female
- Disease of Aging
- Classic Triad…
  - Complex Gait Disturbance
  - Mixed Upper/Lower Motor Neuron Findings
  - Neurogenic Claudication
- Some Controversy as to Order of Treatment
- More Studies Needed

Disclosure Index

Assaker, Richard: Speaking and/or Teaching Arrangements: AOSpine (B, Paid directly to institution/employer).

Bolger, Ciaran: Board of Directors: Intellect Medical Ltd (Nonfinancial); Consulting: SpineGuard (B); Royalties: Alphatec Spine (B); SpineGuard (D); Scientific Advisory Board: SpineGuard (B); Stock Ownership: SpineVision (60,000 Shares, 1%).

Chen, Thomas C.: Board of Directors: Cognos (1,200,000 Shares, 10%, Chief Neuro-oncology); Consulting: ERC (25,000,000 Shares, 5%, Chief Medical Officer); Scientific Advisory Board: ERC (establishing board); Stock Ownership: NeOnc Technologies (None, 2,800,000 Shares, 30%, CEO, chairman).

Cheng, David S.: Other: American Academy of Physical Medicine and Rehabilitation (Nonfinancial, Medical Education Committee - Digital Learning Committee Chair, Pain Management and Opioid Taskforce), Spine Intervention Society (Nonfinancial); Speaking and/or Teaching Arrangements: SI-BONE (B).

France, John C.: Board of Directors: AONA (B); Speaking and/or Teaching Arrangements: DePuy Synthes (Travel Expense Reimbursement).

Gantwerker, Brian R.: Consulting: Brainlab (B); Other: DePuy Synthes (B); Private Investments: Eyedaptic (B), Raydiant Oximetry (D).

Ghiselli, Gary: Board of Directors: Colorado Orthopedic Society (Nonfinancial); Consulting: Johnson & Johnson (C); Device or Biologic Distribution Group (Physician-Owned Distributorship): Impulse Neuromonitoring, Neurointerpretive Services (E), New Era Orthopedics (B).

Kim, Jin-Sung L.: Board of Directors: ISESS (Nonfinancial, Board of Director), SMISS AP (Nonfinancial, Co-president), SMISS Asia Pacific (Nonfinancial); Consulting: Elliquence (B), RIWO Spine (B); Grants: AOSpine (A); Other: Global Spine Journal (Nonfinancial, Deputy Editor); Scientific Advisory Board: Amplify Surgical (None).

Meyer, Bernhard: Consulting: Brainlab (B), Icotec (C), Medacta (B); Fellowship Support: EANS, AO SPINE (B, Paid directly to institution/employer); Grants: Ulrich Medical, Brainlab, Zeiss, Medtronic, Icotec (F, Outside 24-Month Requirement, Paid directly to institution/employer), Relievant (C, Outside 24-Month Requirement, Paid directly to institution/employer); Royalties: Spineart (E); Scientific Advisory Board: ZEISS (B).

Schneider, Byron J.: Consulting: AIM Specialty (B, hourly consulting), State Farm (D, hourly consulting); Grants: SIS (D, Paid directly to institution/employer); Trips/Travel: NASS (Travel Expense Reimbursement).

Szpalski, Marek: Trips/Travel: Integra (B, Outside 24 Month Requirement).

Theiss, Steven M.: Fellowship Support: AOSpine North America (E, Paid directly to institution/employer); Other Office: AOA (Nonfinancial, Committee Chair, Executive Committee).

Wong, David A.: Other: Presbyterian St Lukes Medical Center (B); Research Support (Staff and/or materials): Mesoblast (B, Paid directly to institution/employer); Royalties: Lippincott Williams And Wilkins (A); Scientific Advisory Board: United Healthcare (B); Stock Ownership: Denver Integrated Imaging (5%), Denver Spine Real Estate Investments LLC (33%), Huron Shores LLC (50%), Impulse LLC (5 Shares), Neuro Interpretive Services LLC (5 Shares), OCC Imaging (2%), PRO GC LLC (33%), Verus LLC (80%).

The following participants have nothing to disclose:

Abdennebi, Benaissa
Abdou El Moaty, Emad H.
Abdulla, A.
Abou Modawi, A.
Abukwedar, Loay
Addas, Bassam
Al Azhari, Abdusamad
Al Maazmi, A.
Al Mashani, Ali
Al Olama
Al Shurbaji, Amer A.
Alfawareh, Mohammad D.
Alkhani, Ahmed M.
Alkuwari, Khaled
Alshaya, Wael
Anwar, Ahmed
Baeesa, Saleh Salem
Belkair, Sirajeddin
El Gamal
El Gohary, Mohamed
Elbanna, Yasser
Eum, J. H.
Figueiredo, Nicandro
Hafez, Daniel
Halawani, Mohammad M.
Hamdan, Thamer A.
Hamidani, A.
Hebela, Nader M.
K. Al Ali
Kasem, W.
Kassis, Sebouh
Khoury, Issam S.
Lamartina, Claudio
Maiti, Tanmoy
Majer, Catalin
Malibary, M.
Michael, A.
Msaddi, Abdul Karim
Musharbash, Farah
Pons, R. B.
Samy, S.
Shakir, M. Z.
Taghikani, A.
Ullah, Kaleem
Wafa, Mohamed
Yaltirik, C. K.
Yanek, Salam Ali
Zayan, Mohammed
Zerbi, Alberto

Degenerative Spondylolisthesis - What Constitutes Instability

Author: **David Wong, MD**
Country: United States of America

Degenerative Spondylolisthesis: What Constitutes Instability?

David A. Wong, MD, MSc, FRCS(C)
Past President, North American Spine Society
Director Advanced Center for Spinal Microsurgery
Presbyterian St Luke's Medical Center Denver Colorado USA
Past Chairman NASS and AAOS Clinical Guidelines Committees

Instability/Spondylolisthesis Macnab 1950

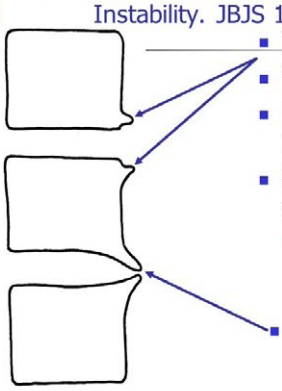
- Macnab I. Spondylolisthesis with an intact neural arch— the so-called pseudospondylolisthesis JBJS 1950;32B:325-333.
- = degenerative spondylolisthesis

Fellowship: Spinal Surgery Dr. Ian Macnab

- Conceptual thinking
  - Pathoanatomy
    - Natural history
    - instability
  - Classification
    - Spondylolisthesis
      - Degenerate 1950
      - Traction Spur 1971
      - Wiltse et al 1976

Dr. Ian Macnab 1971

The Traction Spur: An Indicator of Segmental Instability. JBJS 1971; 53A:663



- Traction Spur
- "Macnab Spur"
- Early segmental instability
- Start 1 – 2 mm off end plate
  - Annulus not insert cartilaginous epiphyseal plate
- Claw Osteophyte
  - Late Osteoarthritis

Harry Farfan

- 3 Joint Complex
  - Disc
  - 2 Facets
- Lumbo Sacral Stability
  - Seating L5 in Pelvis
  - Strength Ligaments
    - Level Degen Spondylo

Wiltse LL, Newman PH, Macnab I. Classification of spondylolysis and spondylolisthesis. *Clin Orthop. 1976;117:23–29.*

Type I	Dysplastic		
Type II	Isthmic	a. Lytic	Slip associated with a displaced pars articularis
		b. Elongation	Repeated pars stress fractures have healed with elongation and attenuation. A defect may not be present
		c. Acute fracture	Rare
Type III	Degenerative		
Type IV	Traumatic		
Type V	Pathological		

Spondylolisthesis
Meyerding Classification

- Meyerding HW. Spondylolisthesis. Surg Gynecol Obstet 1932;54:371-7.
  - Grade I – 0-25% offset
  - Grade II – 25-%-50% offset
  - Grade III- 50-75%
  - Grade IV- 75- 100%
  - Grade V – 100%+ (spondyloptosis)

Background Context
Slip Progression

- **Normal pre-op align**
  - **Midline laminectomy**
  - **31% slip**
- **Pre-Op Degenerative Spondylo Grade I**
  - **Midline laminectomy**
  - **73% slip progression**

Mardjetko SM, Connolly PJ, Shott S. Degenerative lumbar spondylosis: A meta-analysis of the literature 1970–93. *Spine* 1994;19:2256S–65S.

Instability
Biomechanical Definition

- ISSLS 1982
- Pope and Punjabi
  - Loss of stiffness in spine
  - "stiffness" = amount of motion within a system relative to a load applied to the structure
  - Horizontal translation >4mm
  - Angular motion >12°

Spondylolisthesis
Progression with Laminectomy

- 45 patients
  - 25 stenosis no slip
  - 20 Gr I Spondylo
- Progressive Spondylo
  - 5/25 stenosis -=25%
  - 13/20 Gr I slip = 65%
- Outcome
  - 7/13 good

Johnsson KE et al. Postoperative instability after decompression for lumbar spinal stenosis. *Spine 1986;11:107–10.*

Instability
NASS Lumbar Stenosis/Spondylo Guideline

- Comprehensive Literature Review
- Hours of debate
- Definition
  - ≥4mm horizontal translation
    - Standing Flexion / Extension X-Rays

Stability with
MIS Decompression

- Finite element analysis remove posterior elements
  - Laminectomy
  - MIS
- Extension vs intact
  - Lam 4X/MIS 2X
- Flexion
  - Lam 3.6X/MIS

Bresnahan L, Fessler R et al. A Biomechanical Evaluation of Graded Posterior Element Removal for Treatment of Lumbar Stenosis. Spine 2008;34:17-23.

?Bilateral Decompression via Unilateral Laminotomy?

- **John McCulloch**
- **Paul Young**
  - **PAWS (Practical Anatomy WorkShop)**
    - **St Louis MO**
    - **1st AAOS cadaver**
  - **Co-authors**

McCulloch JA, Young PH. Essentials of Spinal Microsurgery. Lippincott-Raven. Philadelphia 1998

Classic Reading
Instability/Spondylolisthesis

- Macnab I. Spondylolisthesis with an intact neural arch— the so-called pseudospondylolisthesis JBJS 1950;32B:325-333.
- Macnab I. The Traction Spur: An Indicator of Segmental Instability. JBJS 1971; 53A:663
- Macnab I. Negative Disc Exploration. JBJS 1971;53A:891
- Wiltse LL, Newman PH, Macnab I. Classification of spondylolysis and spondylolisthesis. *Clin Orthop. 1976;117:23–29.*
- Offierski C, Macnab I. Hip-Spine Syndrome. Spine 1983; 8:316
- Fraser R. The Formation of ISSLS and its Influence on Lumbar Spine Research. Spine 2004; 29:1059

Stability with MIS Decompression

- McCulloch/Young approach
- 57 pts 27m/30f av age 69.6
- F/U 5 yr min/mean 6 yrs (5-8)
- 27 SS/20 spondylo/10 scoli
- Slip progression
  - 1.2% +/- 3.1% SS
  - 2.4% +/- 4.7% Spondylo
  - 0.0% +/- 0.0% Scoli
- Clinical outcome NSD

Toyoda H et al. Clinical Outcome of Microsurgical Bilateral Decompression via Unilateral Approach for Lumbar Canal Stenosis. Spine 2011;36:410-415.

Instability
Biomechanical Definition
Classic Reading

- Pope MH, Panjabi M. Biomechanical definitions of spinal instability. Spine (Phila Pa 1976) 1985;10: 255–6.
- Panjabi MM. The stabilizing system of the spine. Part I. Function, dysfunction, adaptation, and enhancement. J Spinal Disord 1992;5: 383–9.
- Panjabi MM. The stabilizing system of the spine. Part II. Neutral zone and instability hypothesis. J Spinal Disord 1992;5:390-6.

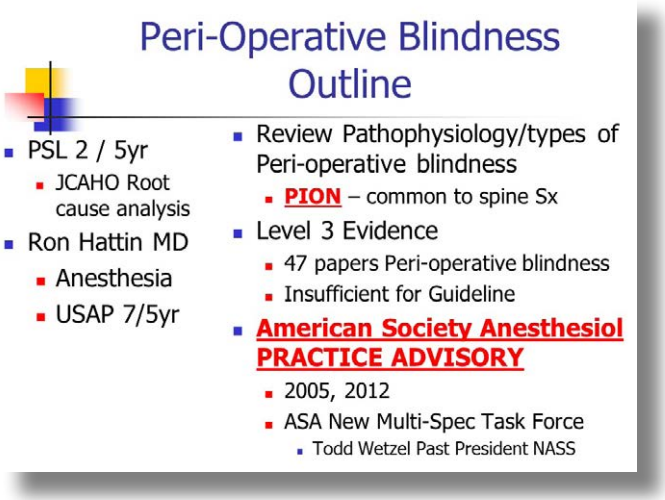
Background Context
Clinical Outcome - SPORT

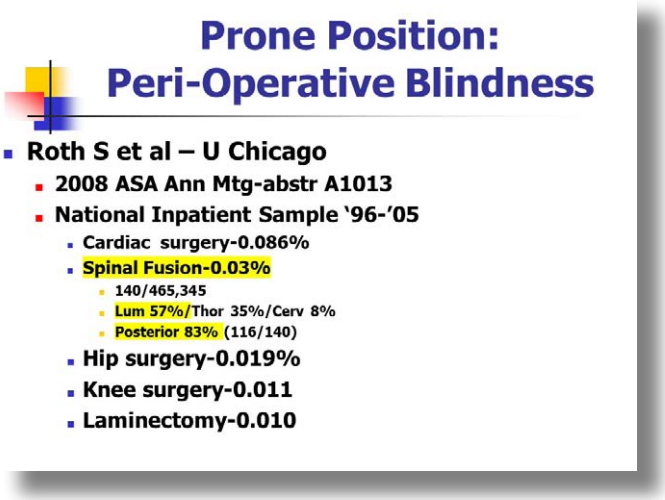
- SS+Spondy 601 pt/369 (61%) Sx
  - Sx incl fusion 347/94% (78% metal)
- SS 634 pt/394 (62%) Sx
  - Sx incl fusion 43/11% (53% metal)
- Baseline same exc spondy more Female
- Both groups better with Sx vs non Sx
- Spondylo outcome better vs SS

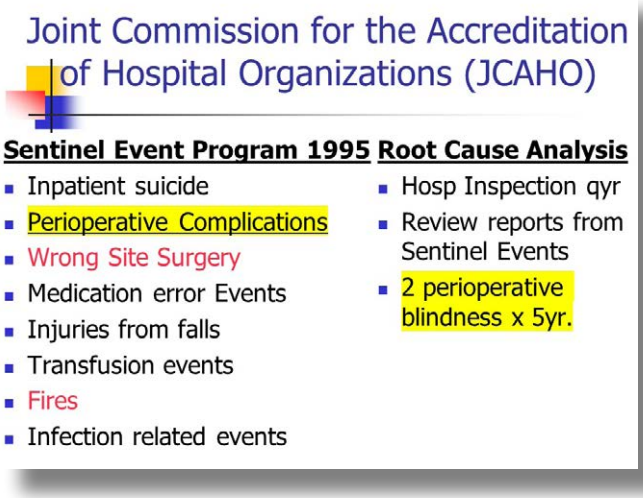
Pearson A et al. Degenerative Spondylolisthesis Versus stenosis. Does a Slip Matter? Comparison of Baseline Characteristics and Outcomes (SPORT). Spine 2010; 35:298-305.

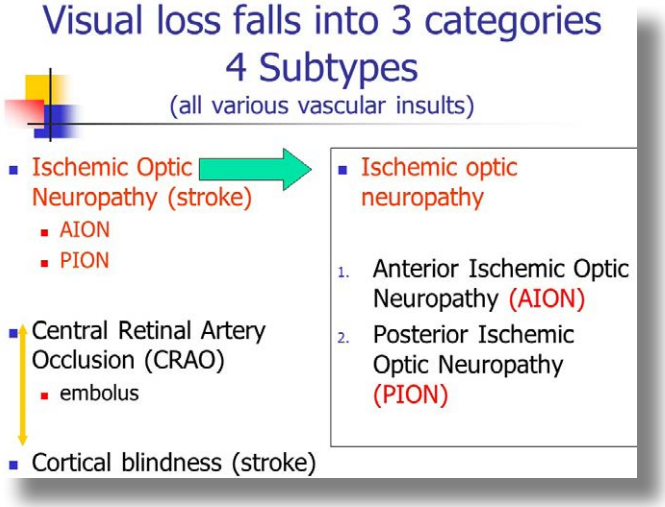
It was a Simple Lumbar Fusion until the Patient Woke up With Perioperative Blindness: What are the Prevention Strategies

Author: **David Wong, MD**
Country: United States of America









Peri-Operative Visual Loss
Pathophysiology/Classification

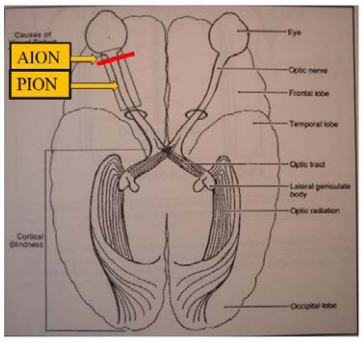
		Prone	Etiology	Mono/ Bilat	Recover
Ischemic Optic Neuropathy	Anterior AION		**Common**:Spontaneous 1/10k adults Microemboli watershed post ciliarry artery Hypotension esp CABG	mono	50% recover normal
*	Posterior POIN	Yes 50% spine	Infarct optic nerve **posterior** to lamina cribrosa **Risk:Obese, Prone, >6hrs**	Bilat 85% complete	no
Central Retinal Artery Occlusion			Embolic esp CABG, carotid **Direct pressure (obstruct venous return)**	Mono field defect	no
Cortical Blindness		No	Cortical **hypoxia**/embolism/ infarct. Esp children (56x)	uni	part

PION-Posterior Ischemic Optic Neuropathy
Hallmarks:

- >85% is **BILATERAL** (unilateral CB, CRAO, AION)
- RARELY REVERSABLE
- **COMPLETE BLINDNESS** in >50% of cases
- Fundoscopic exam is Normal at first @ 3 months pale retina
- nearly 50% of all blindness reported in prolonged spine surgery patients!!!!!
- ?? Etiology??

ISCHEMIC OPTIC NEUROPATHIES
Ant/Post-Location vs Lamina Cribrosa (bottom of Optic Cup)

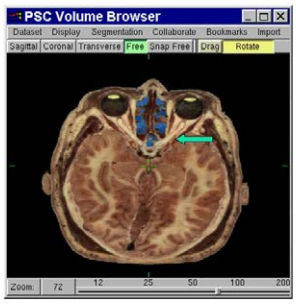
- "Stroke" Optic N
- ANTERIOR ISCHEMIC OPTIC NEUROPATHY
  - **AION**
- POSTERIOR ISCHEMIC OPTIC NEUOPATHY
  - **PION**



Central Retinal Artery Occlusion (CRAO)

- Can occur spontaneously
- Higher occur embolic events.(CABG, CEA)
- Presents painless MONOCULAR vision loss
- Nearly 100% permanent
  - can be a partial limited field defect that improves with time if in only a small branch of retinal artery
- Can occur from direct pressure on globe
  - Obstruction of venous drainage
- Abnormal fundoscopic exam

Posterior Ischemic Optic Neuropathy (PION)



Prevention Strategies CRAO
↓ Pressure-Prone Headrests

- No studies to prove which is better in preventing CRAO
- Prone View *may* reduce facial edema in prolonged cases
- "No know mechanism whereas *facial edema* can cause cause CRAO or other blindness"

Prone Position Cardiac Index ↓ 24%

- Tx Intra-op Hypotension
  - Anesthesia Options ↓BP
    - Phenylephrine/Volume
      - Vasoconstriction + Fluid
        - No effect stroke volume
        - Constrict peripheral circulation
        - **Acidosis → coagulopathy**
        - **Fluid Overload → CHF**
    - Ephedrine /Dopamine=**Best**
      - Cardiac stimulant
      - Less fluid

Anesthesia in the Prone Position. Edgecombe K. et al Br J Anesth 2008;100:165

2nd Patient Safety Challenge Safe Surgery Saves Lives World Health Organization Geneva

- **Checklist Work Group Chair**
  - **Atul Gawande - Harvard**
- **Surgical Checklist**
  - **Reduce medical errors**
  - **Promote team communication**
- **Sign In / Pre-op Briefing**
  - **Prior to Induction Anesthesia**
- **Time Out**
  - **Prior to Skin Incision**
- **Sign Out / Debrief**
  - **Prior to Drape Removal**

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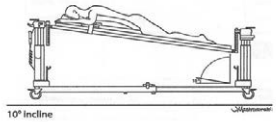
Clinical Study

Effect of the degree of reverse Trendelenburg position on intraocular pressure during prone spine surgery: a randomized controlled trial

Timothy W. Carey, DO, CPT, MC, K. Aaron Shaw, DO, CPT, MC, Marissa L. Weber, MD, CPT, MC, John G. DeVine, MD, COL, MC

- Mean intra-ocular pressures were:
  - **58% higher** with Trendelenberg of 10 deg.
- 10 deg . ***Reverse*** Trendelenberg ameliorated the pressure increase of prone position by 50%!



Bibliography

Hollenhorst RW, Svien HJ, Benoit CF. Unilateral blindness occurring during anesthesia for neurosurgical operations. *AMA Arch Ophthalmol* 1954;52: 819–30.

Williams EL, Hart WM Jr, Tempelhoff R. Postoperative ischemic optic neuropathy. *Anesth Analg* 1995;80:1018–29.

Hoski JJ, Eismont FJ, Green BA. Blindness as a complication of intraoperative positioning. A case report. *J Bone Joint Surg Am* 1993;75:1231–2.

Myers MA, Hamilton SR, Bogosian AJ, et al. Visual loss as a complication of spine surgery. A review of 37 cases. *Spine* 1997;22:1325–9.

Stevens WR, Glazer PA, Kelley SD, et al. Ophthalmic complications after spinal surgery. *Spine* 1997;22:1319–24.

Peri-Operative Blindness Addressing Risk Factors- ASA Practice Advisory 2012

Surgical Planning

- >6 hrs surgical time
  - Staged Procedures
- >45% blood loss
  - Arterial Line
  - Cell saver
  - Anti-fibrinolytics
    - Tranaxemic Acid

Time Out/Briefing

- Prone Position-CRAO
  - Headrest
  - Rev Trendel 10°
- BP 24% baseline
  - 84mm systolic min
  - HCT>28/Hb>9.4
    - Ephedrine/dopamine
      - No phenylephrine

Bibliography

- Shen Y, Drum M, Roth S. The prevalence of perioperative visual loss in the United States: a 10-year study from 1996 to 2005 of spinal, orthopedic, cardiac and general surgery. Anesth Analg 2009;109:1534-1345.
- Nandyala S et al. Incidence and risk factors for perioperative visual loss after spinal fusion. Spine J 2014; 14:1866-1872.
- *American Society of Anesthesiologists Practice Advisory on Perioperative Vision Loss Associated with Spinal Surgery 2012; www.**asa**hq.org/.../**ASA**HQ/.../**practice-advisory-for-perioperative-visual-loss**-associated-with-spine-surgery.pdf*
- Carey T et al. Effect of the degree of reverse Trendelenburg position on intraocular pressure during prone spine surgery: a randomized controlled trial. Spine J 2014:14:2118-2136

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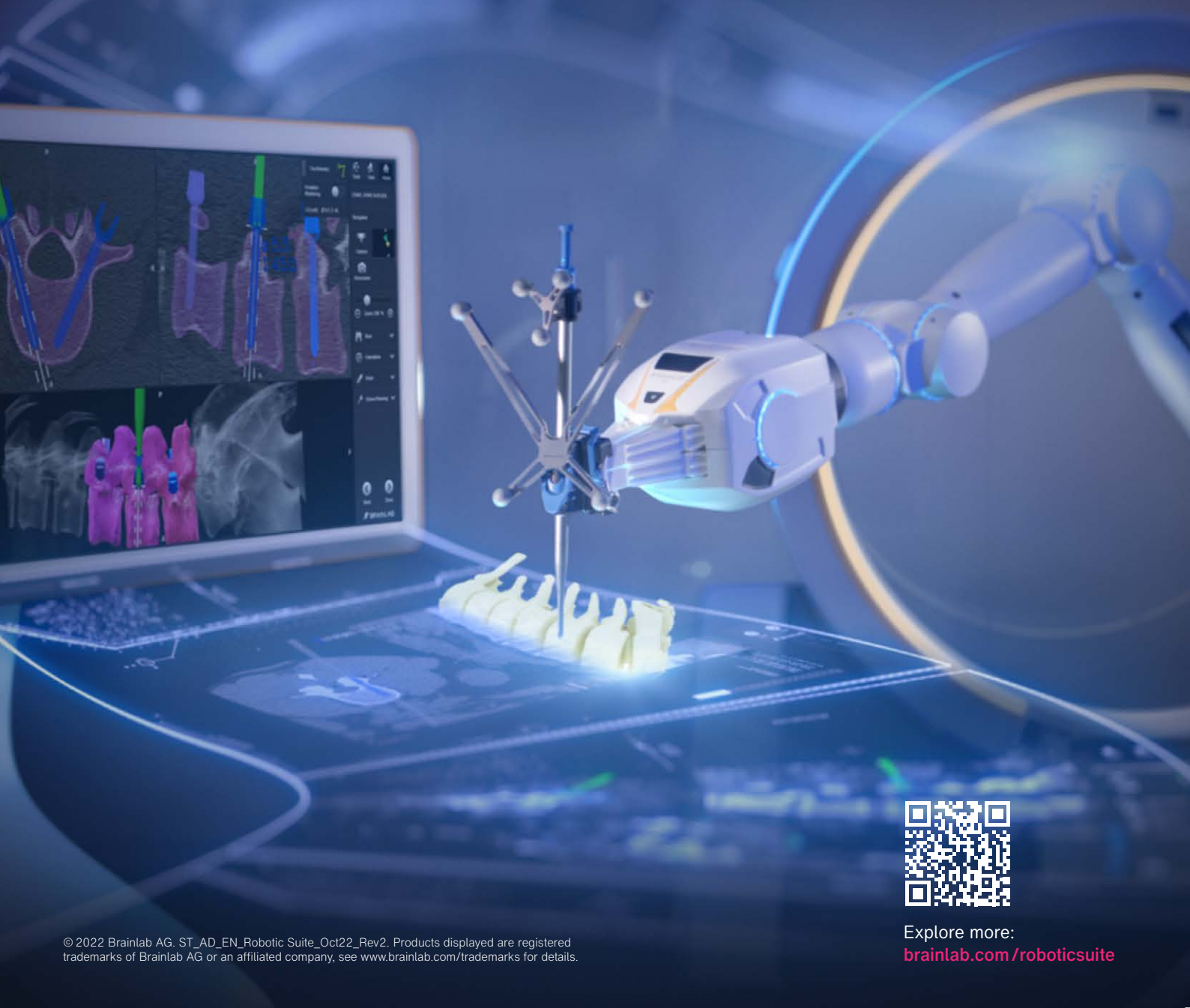

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- Lumbar Disc Herniation and Sciatica
- Lumbar Canal Stenosis
- Spondylolisthesis
- Axial Pain/ Sacroiliac Joint Pain
- Facet Joint Pain. Evidence, Outcome & Clinical Pearls

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- Mini TLIF
- Spine Microsurgery
- Pain Management:
  - Percutaneous Injection technique

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- Deformity:
  - Normal Growth
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  - Degenerative Scoliosis
  - Neuromuscular Scoliosis
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- Cervical Spine:
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14-16 - **SRS Spine Deformity Solutions: A Hands-On Course** | Nijmegen, the Netherlands

September 2023

6-9 - **SRS 58th Annual Meeting** | Seattle, WA, USA
9-13 - **Congress of Neurological Surgeons (CNS) Annual Meeting** | Washington, D.C., USA
24-28 - **EANS Annual Meeting** | Barcelona, Spain

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4-6 - **EUROSPINE Annual Meeting** | Frankfurt, Germany
18-21 - **NASS 38th Annual Meeting** | Los Angeles Convention Center, CA

November / December 2023

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November 3-4 **- 11th Annual UCSF Techniques in Complex Spine Surgery Program**
November 9-10 - **1st National Guard Complex Spine Surgery Course & 7th ArabSpine Annual Meeting** | Riyadh
November 29-December 2 - **Cervical Spine Research Society (CSRS) Annual Meeting** | Cosmopolitan of Las Vegas, NV, USA
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December 14-16 - **ArabSpine Course Diploma Module 1 and Module 4 |** Dubai, UAE

April 2024

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11-14 - **SRS Annual Meeting** | Barcelona
25-28 - **NASS Annual Meeting** | Chicago

October 2024

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