



Final Program

49th Annual Meeting
December 1-4, 2021

26th Instructional Course
November 29 – December 1, 2021

Atlanta Marriott Marquis
Atlanta, GA



John M. Rhee, MD • President

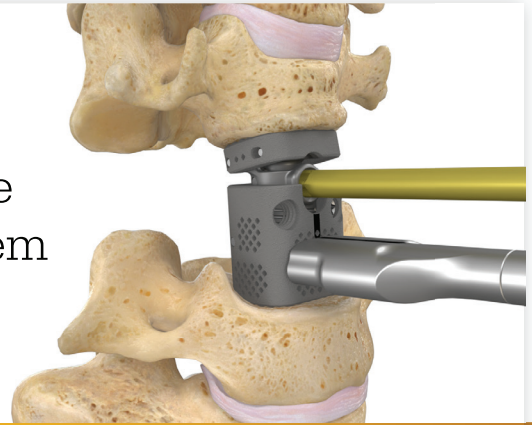
Samuel K. Cho, MD • Steven C. Ludwig, MD • Annual Meeting Program Co-Chairs

Brian K. Kwon, MD, PhD, FRCSC • Neill M. Wright, MD • Instructional Course Program Co-Chairs

www.csrs.org

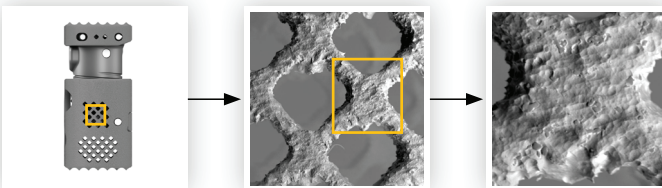
Capri®

Cervical 3D Expandable Corpectomy Cage System

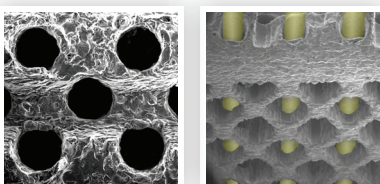


This system provides an innovative, 3D-printed solution for stabilization in cases of vertebral body resections caused by tumor, fracture, or osteomyelitis, or for reconstruction following corpectomy performed to achieve decompression of the spinal cord and neural tissues in cervical degenerative disorders.

Featuring Lamellar 3D Titanium Technology



3-5 μm surface roughness to allow for direct bony ongrowth^{1,2}

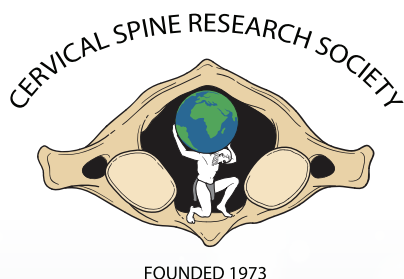


**Visit us at the
Exhibit Hall,
Atrium BC**

1. Test Report TR-1220
2. Loh OL and Choong C. "Three-dimensional scaffolds for tissue-engineering applications: Role of porosity and pore size." Tissue Engineering Part B 19 (2013): 485-502.

Table of Contents

Meeting Schedule.....	2
CSRS Meeting Space and WiFi.....	4
Welcome	5
About CSRS	6
Instructional Course Final Program	9
2021 Corporate Supporters.....	16
2021 Exhibit Companies.....	17
Annual Meeting Final Program	23
Annual Meeting Industry Lunch Workshops	31
12 th Annual Henry H. Bohlman Presidential Guest Lecture.....	33
Lifetime Achievement Award.....	42
Additional Resources.....	54
CME Resources.....	54
Henry H. Bohlman Educational Fund Donors	58
Legacy Donors.....	59
Research Grant Award Winners.....	64



Cervical Spine Research Society
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 Milwaukee, WI 53202
 Phone: 414-918-9834
www.csrs.org
 Email: info@csrs.org

No electronic devices of any kind may be used to record any portion of the Instructional Course, Annual Meeting Scientific Program, E-Posters or Technical Exhibits.

Meeting Schedule

Pre-Conference Annual Meeting Schedule

Monday, November 29

8:00am-9:00am Session I: CSRS Asia Pacific



Tuesday, November 30

8:00am-9:00am Session II: CSRS Europe



26th Instructional Course Schedule

Monday, November 29

7:00pm-9:30pm Scientific Program – Instructional Course



Tuesday, November 30

7:00pm-9:30pm Scientific Program – Instructional Course



Wednesday, December 1

5:00pm-7:30pm Scientific Program – Instructional Course



All times are listed in Eastern Time (ET).
Sessions marked with a icon are available on-demand December 6, 2021 – January 31, 2022.
Sessions marked with a icon are available virtual-live on date and time listed in the session title.

49th Annual Meeting Schedule

Wednesday, December 1

2:00pm-8:30pm	Registration Open	Atrium Lobby
3:00pm-4:30pm	Resident and Fellow Pre-Conference Session	A601
7:30pm-8:30pm	Welcome Reception for Attendees	Atrium Lobby

Thursday, December 2

6:30am-8:30am	Breakfast	Atrium Lobby
6:30am-6:30pm	Registration Open	Atrium Lobby
7:00am-5:00pm	Scientific Program – Annual Meeting	Atrium A
9:00am-11:00am	Guest Breakfast	Pulse Loft
9:15am-6:30pm	Exhibit Hall Open	Atrium BC
9:24am-9:54am	Coffee Break in Exhibit Hall	Atrium BC
11:30am-1:00pm	Industry Lunch Workshops <i>*see page 31 for rooms</i>	
3:10pm-3:40pm	Coffee Break in Exhibit Hall	Atrium BC
5:00pm-6:30pm	Reception in Exhibit Hall for All Attendees	Atrium BC
7:00pm-9:00pm	Industry Dinner sponsored by NuVasive	

Friday, December 3


6:30am-8:30am	Breakfast	Atrium Lobby
6:30am-5:30pm	Registration Open	Atrium Lobby
7:00am-5:00pm	Scientific Program – Annual Meeting	Atrium A
9:00am-11:00am	Guest Breakfast	Pulse Loft
9:30am-1:30pm	Exhibit Hall Open	Atrium BC
9:41am-10:11am	Coffee Break in Exhibit Hall	Atrium BC
12:10pm-1:20pm	Members' Business Meeting & Lunch	A602
12:10pm-1:20pm	Lunch for Non-Members in Exhibit Hall	Atrium BC
3:28pm-3:52pm	Coffee Break	Atrium Lobby

Saturday, December 4

7:00am-9:00am	Breakfast	Atrium Lobby
7:00am-10:00am	Registration Open	Atrium Lobby
8:00am-12:55pm	Scientific Program – Annual Meeting	Atrium A
9:00am-11:00am	Guest Breakfast	Pulse Loft
9:41am-9:56am	Coffee Break	Atrium Lobby
12:47pm-12:55pm	Close of Meeting	Atrium A

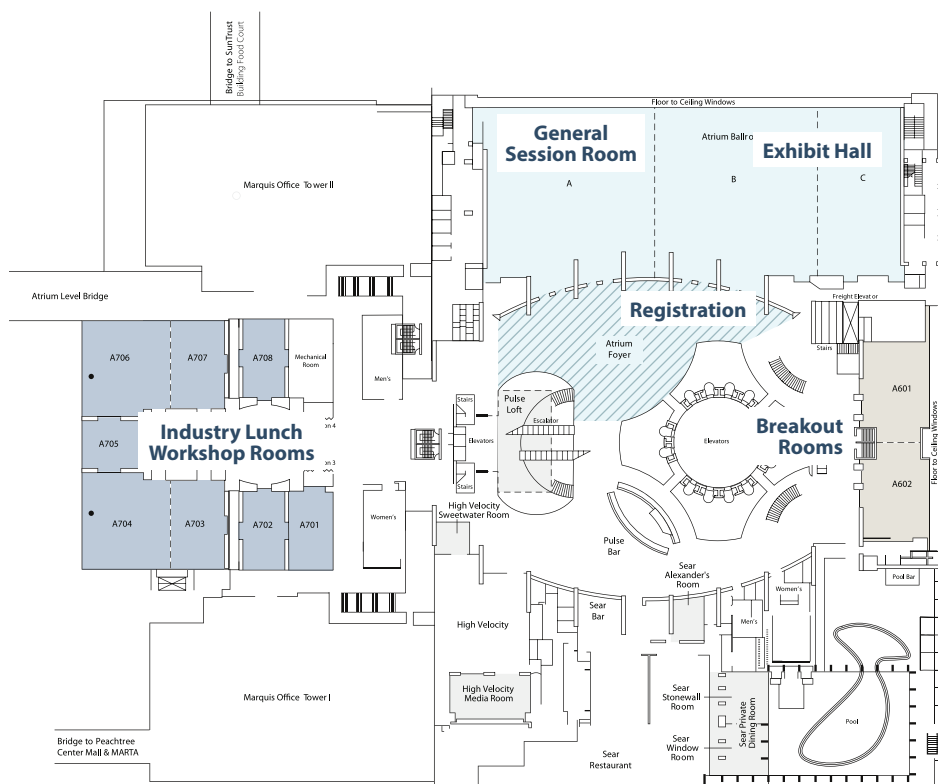
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Sessions marked with a  (LIVE) icon are available virtual-live on date and time listed in the session title.

CSRS Meeting Space and WiFi

Atrium Level, Atlanta Marriott Marquis



WiFi

Network: CSRSWIFI
 Password: AM21_csrs

Welcome to the CSRS 26th Instructional Course and 49th Annual Meeting



Welcome to the 2021 Annual Meeting and Instructional Course. I know that we have all been looking forward to an in-person meeting after wrestling with the pandemic over the past (almost) two years. Our program committees have organized two absolutely tremendous meetings. I am looking forward to seeing all of you and engaging in the interactive, high-level discussions for which the CSRS is known!

We will kick off the in-person portion of our meeting with a live Instructional Course on Wednesday evening, Dec. 1, in Atlanta. You will have ample travel time Wednesday morning to arrive in time for the live Instructional Course in the evening. A special thank you to the Instructional Course Co-Chairs, Neill Wright and

Brian Kwon, as well as to their committee, for putting together a phenomenal program.

The 49th Annual Meeting will then continue in-person from Thursday, Dec. 2 through Saturday, Dec. 4. The Annual Meeting Co-Chairs, Sam Cho and Steve Ludwig, have organized an outstanding program. In addition to 84 abstract presentations of the highest quality, featured sessions include the following symposia:

- "Pearls of Wisdom for a Successful Research Study"
- "Deformity Considerations for Everyday Cervical Degenerative Conditions"
- "Digital Transformation During the Pandemic: How Did COVID-19 Change the Practice of Cervical Spine Surgery?"
- Two master debates with world-renowned faculty

In addition, this year's Presidential Guest Lecture will feature the legendary comedian, actor, author and Atlanta native Jeff Foxworthy. This event is not to be missed!

I so much look forward to seeing all of you, interacting in-person again, and together enjoying all that our meeting has to offer!

Sincerely,



John M. Rhee, MD
CSRS President

About CSRS



FOUNDED 1973

Origins of the Society

The Cervical Spine Research Society is an organization of individuals interested in clinical and research problems of the cervical spine. Its purpose is the exchange and development of ideas and philosophy regarding the diagnosis and treatment of cervical spine injury and disease.

The concept of a sub-specialty group devoted to the cervical spine was first considered in 1966. As interest in this area grew, a preliminary meeting

to consider the formation of such an organization was held in Las Vegas, Nevada, in February, 1973, during the annual meeting of the American Academy of Orthopaedic Surgeons.

Present at the meeting were Edward H. Simmons and Ian McNab of Toronto; Richard Rothman and Henry H. Sherk of Philadelphia; Lee H. Riley, Jr. of Baltimore; Alice L. Garrett of West Haverstraw, New York; and Bernard Jacobs and J. William Fielding of New York City.

The name "Cervical Spine Research Society" was agreed upon and annual meetings were planned. The first such meeting was held in New York City in November, 1973. Since that time, yearly meetings have taken place at various locations within the North American continent.

Since the primary purpose of the organization is to carry out research and develop and exchange information on the cervical spine, international participation has been encouraged.

To provide a wide range of interest, it was felt that the composition of the membership should reflect the varying specialties and disciplines dealing with the cervical spine; biomechanical engineering, neurology, neurosurgery, radiology, orthopaedic surgery, and others. Qualifications for membership were to include demonstration of continued interest in the cervical spine and its related structures.

The organization has developed projects and has continued to grow. Current members are encouraged to seek out individuals, with appropriate interests, for membership to ensure the Society's future.

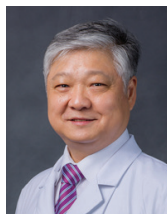
J. William Fielding, MD

Mission Statement

The Cervical Spine Research Society is a multidisciplinary organization that provides a forum for the exchange of ideas and promotes clinical and basic science research of the cervical spine. The organization values collegial interaction and strong scientific principles.

About CSRS

CSRS Asia Pacific



President: Yu Sun, MD

11th Annual Meeting

March 25-27, 2022

Seoul, Korea

<https://csrs-ap-section.org/>

CSRS Europe



President: Heiko Koller, MD, PhD

37th Annual Meeting

June 15-17, 2022

Barcelona, Spain

<https://csrs-europe.org/>

Future Meetings

Hands On Surgical Techniques Course

July 21-23, 2022

Indiana Spine Group, Carmel, Indiana

Future Instructional Courses

Nov. 16, 2022

Manchester Grand Hyatt, San Diego, CA

Nov. 30, 2023

The Cosmopolitan of Las Vegas, NV

Future Annual Meetings

Nov. 17-19, 2022

Manchester Grand Hyatt, San Diego, CA

Dec 1-3, 2023

The Cosmopolitan of Las Vegas, NV



NuVasive lunch workshop

Seeing is knowing: How visualization is advancing anterior cervical surgery

Simplify
Cervical Disc
for cTDR

Thursday, December 2 from 11:30am-1:00pm

Marriott Marquis, room A706

265 Peachtree Center Ave., Atlanta, Georgia 30303

Come see the Simplify Cervical Disc, NuVasive ACP system and our porous interbody offering at booth 101.

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[nuvasive.com](https://www.nuvasive.com)



26TH**Twenty-Sixth Instructional Course**

of the



FOUNDED 1973

Live-Virtual: November 29-30, 2021**In-Person: December 1, 2021****Atlanta Marriott Marquis, Atlanta, GA**

On-demand recordings of scientific sessions, December 6, 2021 - January 31, 2022

President John M. Rhee, MD**Instructional Course Program Co-Chairs** Brian K. Kwon, MD, PhD, FRCSC • Neill Wright, MD**Instructional Course Sub-committee:** Paul M. Arnold, MD, FAANS, FACS • Jesse E. Bible, MD

Charles H. Crawford, III, MD • Michael C. Gerling, MD • Brian K. Kwon, MD, PhD, FRCSC

Sang Hun Lee, MD • Thomas E. Mroz, MD • Themistocles S. Protopsaltis, MD

Jefferson Wilson; MD

Course Objectives

- Review appropriate anatomy of the cervical spine.
- Compare the methods for diagnosis of neck disorders.
- Evaluate operative and non-operative treatment options for cervical spine disorders.
- Recognize and respond to complications of surgical treatment.
- Exchange information on cervical spine research, diagnosis and treatment with both US and international surgeons.

No electronic devices of any kind may be used to record any portion of the Instructional Course, Annual Meeting Scientific Program, E-Posters, Industry Workshops, or Technical Exhibits.

Monday

11/29/2021

7:00pm-8:10pm  **LIVE** **Degenerative Pt. I***Moderator(s): Charles Crawford, MD; Paul Arnold, MD*

7:00pm-7:05pm

CSRS Welcome*John Rhee, MD; Brian Kwon, MD, PhD, FRCSC*

7:05pm-7:07pm

Introduction*Charles Crawford, MD; Paul Arnold, MD*

7:07pm-7:15pm

**Surgical Decision Making for Single-Root Radiculopathy
In the Setting of Multi-Level Spondylosis: Choosing Levels,
Approaches, and Techniques***John Rhee, MD*

7:15pm-7:21pm

Discussion

7:21pm-7:29pm

**Master Class Video: Posterior Foraminotomy for Cervical
Radiculopathy***Thomas Mroz, MD*

7:29pm-7:37pm

**Master Class Video: Posterior Endoscopic Techniques for
Cervical Radiculopathy***Sang Hun Lee, MD*

7:37pm-7:45pm

Discussion

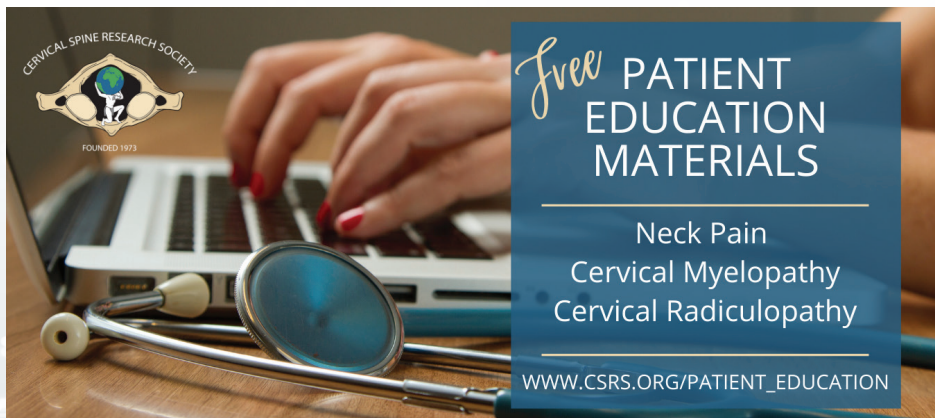
7:45pm-7:53pm


DEBATE - Mildly Symptomatic Myelopathy: Wait and Watch*Samuel Cho, MD*

7:53pm-8:01pm

DEBATE - Mildly Symptomatic Myelopathy: Operate*Jason Savage, MD*

8:01pm-8:10pm

Discussion





FOUNDED 1973

Free **PATIENT
EDUCATION
MATERIALS**

Neck Pain
Cervical Myelopathy
Cervical Radiculopathy

WWW.CSRS.ORG/PATIENT_EDUCATION

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Monday
11/29/2021

8:20pm-9:30pm  **LIVE** 

Deformity for “Bread & Butter” Cervical Spine Surgeons

Moderator(s): Thomas Mroz, MD; Themistocles Protopsaltis, MD

8:20pm-8:21pm

Introduction

Thomas Mroz, MD; Themistocles Protopsaltis, MD

8:21pm-8:31pm

When is my Degenerative Case Really a Deformity? What Parameters Should I be Aware Of?

Themistocles Protopsaltis, MD

8:31pm-8:41pm

Preoperative Optimization of the Cervical Deformity Patient

Michael Steinmetz, MD

8:41pm-8:51pm

Discussion

8:51pm-9:01pm

Deformity Plus Myelopathy: Double Jeopardy

Jeffrey Wang, MD

9:01pm-9:11pm

Master Class Video: Deformity Technique

Christopher Ames, MD

9:11pm-9:30pm

Discussion

LESS INVASIVE FEWER STEPS

COALITION MIS™

Pre-Loaded Anchors

- Eliminate *in situ* assembly
- Reduce procedural steps

Low-Profile Holder


- Minimizes surgical corridor for less soft tissue retraction
- Reduces interference with surrounding anatomical structures



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Tuesday

11/30/2021

7:00pm-8:12pm  **LIVE** **Tumor and Infection Pt. I***Moderator(s): Michael Gerling, MD; Sang Hun Lee, MD*

7:00pm-7:03pm

CSRS Welcome*John Rhee, MD; Neill Wright, MD*

7:03pm-7:05pm

Introduction*Michael Gerling, MD; Sang Hun Lee, MD*

7:05pm-7:15pm

Tumor: Prognostication, Surgery (Or Not) for Advanced Cervical Metastasis*Langston Holly, MD*

7:15pm-7:25pm

Tumor: Surgical Options for Cervical Metastasis (Fusion or Not, Fixation Methods, Mis, Innovative Options Navigation, Robotics, etc.)*Jean-Paul Wolinsky, MD*

7:25pm-7:30pm

Discussion

7:30pm-7:40pm

Tumor: Radiation Treatment Update on Cervical Metastasis*Kristin Redmond, MD*


7:40pm-7:50pm

Infection: Update on The Primary Cervical Infection (Discitis, Epidural Infection), Surgical Options (Fixation, Graft Material), Perioperative Management*Jesse Bible, MD*

7:50pm-8:00pm

Infection: Post-Surgical Infection of the Cervical Spine, Update and New Technologies*Peter Passias, MD*

8:00pm-8:12pm

Discussion*All times are listed in Eastern Time (ET).*Sessions marked with a  icon are available on-demand December 6, 2021 – January 31, 2022.Sessions marked with a  **LIVE** icon are available virtual-live on date and time listed in the session title.

Tuesday

11/30/2021

8:20pm-9:30pm  **LIVE** **Cervical Trauma Pt. I***Moderator(s): Jefferson Wilson, MD; Jesse Bible, MD***Introduction***Jefferson Wilson, MD; Jesse Bible, MD***Management of The Octa- Or Nonagenarian in Nursing Home with Odontoid Fracture. What are my Treatment Considerations?***Chris Kepler, MD***Discussion****Role and Timing of Surgery in Acute Central Cord Syndrome Patient with a Stable Spine***Alpesh Patel, MD, MBA***Discussion****Hemodynamic Management of Cervical Spinal Cord Injury Patients: What Should We be Targeting?***Brian Kwon, MD, PhD, FRCSC***Discussion****Neuroprotective and Regenerative Options for Spinal Cord Injury In 2021 and 2031***Michael G. Fehlings, MD, PhD, FRCSC, FACS***Discussion**

8:20pm-8:21pm

8:21pm-8:31pm

8:31pm-8:36pm

8:36pm-8:46pm

8:46pm-8:51pm

8:51pm-9:01pm

9:01pm-9:06pm

9:06pm-9:16pm

9:16pm-9:30pm


**Visit the
CSRS VIDEO ARCHIVE**

- Lectures
- Debates
- Symposia


www.csrs.org/video_archive/


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Wednesday

12/1/2021

5:00pm-5:37pm **Atrium A****Cervical Trauma Pt. II***Moderator(s): Jefferson Wilson, MD; Jesse Bible, MD*

5:00pm-5:05pm

CSRS Welcome*Neill Wright, MD; Brian Kwon, MD, PhD, FRCSC*

5:05pm-5:07pm

Introduction*Jefferson Wilson, MD; Jesse Bible, MD*

5:07pm-5:12pm

Cervical Facet Dislocation: Closed Reduction Tips and Tricks*Steven Ludwig, MD*

5:12pm-5:20pm

DEBATE - Bilateral Cervical Facet Dislocation: Anterior Fixation is Best*Brandon Lawrence, MD*

5:20pm-5:28pm

DEBATE - Bilateral Cervical Facet Dislocation: Posterior Fixation is Best*James Harrop, MD, FAANS*

5:28pm-5:37pm

Discussion**5:37pm-6:12pm** **Atrium A****Tumor and Infection Pt. II***Moderator(s): Michael Gerling, MD; Sang Hun Lee, MD*


5:37pm-5:49pm

Management of Recurrent Metastatic Cervical Tumors After Surgery/Radiation Therapy*Daniel Sciubba, MD*

5:49pm-6:01pm

Management & Avoidance of Surgical Complications (Anterior/Posterior Wound Complication, Mechanical Complication Etc.)*Ziya Gokaslan, MD*

6:01pm-6:12pm

Discussion*All times are listed in Eastern Time (ET).*Sessions marked with a  icon are available on-demand December 6, 2021 – January 31, 2022.Sessions marked with a  (LIVE) icon are available virtual-live on date and time listed in the session title.

Wednesday

12/1/2021

6:12pm-6:47pm **Atrium A****Basic Principles of Cervical Deformity, Pearls and Pitfalls***Moderator(s): Themistocles Protopsaltis, MD; Thomas Mroz, MD*

6:12pm-6:20pm

Importance of Global Alignment: Which Measurements are Key?*Jason Savage, MD*

6:20pm-6:28pm

DEBATE (Battle of CSRS Presidents) - Managing Subaxial Cervical Kyphosis: Anterior Osteotomies with A/P Approach is Best*K. Daniel Riew, MD*

6:28pm-6:36pm

DEBATE (Battle of CSRS Presidents) - Managing Subaxial Cervical Kyphosis: Posterior Only Osteotomies are Best; Why Go in the Front at All?*Darrel Brodke, MD*

6:36pm-6:47pm

Discussion**6:47pm-7:22pm** **Atrium A****Degenerative Pt. II***Moderator(s): Charles Crawford, MD; Paul Arnold, MD*


6:47pm-6:58pm

DEBATE - Multi-Level Cervical Myelopathy: Laminoplasty is the Preferred Approach*Zoher Ghogawala, MD, FACS*

6:58pm-7:09pm

DEBATE - Multi-Level Cervical Myelopathy: Laminectomy and Fusion is the Preferred Approach*Steven Ludwig, MD*

7:09pm-7:22pm

Discussion**7:30pm-8:30pm****Atrium Lobby****Welcome Reception for Attendees***All times are listed in Eastern Time (ET).*Sessions marked with a  icon are available on-demand December 6, 2021 – January 31, 2022.Sessions marked with a  (LIVE) icon are available virtual-live on date and time listed in the session title.

The Cervical Spine Research Society gratefully acknowledges

2021 Corporate Supporters

The continued success and increased impact of the Cervical Spine Research Society's research and education effort is dependent upon industry support.

Diamond Level (\$100,000+)

Medtronic

Gold Level (\$50,000-\$74,999)



Silver Level (\$30,000-\$49,999)



Bronze Level (\$15,000-\$29,999)



In-Kind Media Sponsor




2021 Exhibit Companies

Visit the Annual Meeting Exhibit Hall in Atrium BC.

Hours: Thursday, Dec. 2, 9:30-6:30pm & Friday, Dec. 3, 9:30-1:30pm

Exhibitors are listed alphabetically.

Company	Booth	Company Description
Additive Implants	500	Additive Implants is focused on providing innovative solutions to unmet surgeons needs. We offer titanium spacers in 7, 10 and 14 degree angles and footprints that are 14, 16, 18, 20 mm wide allowing surgeons to optimize lordosis and minimize subsidence.
 atec INFORMED BY EOS	302	ATEC is an Organic Innovation Machine™ Revolutionizing the Approach to Spine Surgery. We are committed to creating clinical distinction by developing new approaches that integrate seamlessly with the Alpha InformatiX™ System to achieve the goals of spine surgery. Our ultimate vision is to be The Standard Bearer in Spine.
Bone Foam	200	Bone Foam is the unequivocal leader in perioperative patient positioning by innovating the highest quality solutions that optimize safety, efficiency, cost, and clinical experience. Bone Foam positioners are utilized in hospitals, clinics, and surgery centers around the world and are designed to be mutually beneficial to surgeons, medical staff, and patients.
Camber Spine Technologies	208	Camber Spine is dedicated to creating surgeon-designed solutions in MIS and minimally disruptive access for the treatment of complex spinal pathology. Incorporating state-of-the-art manufacturing, 3-D printing, and an acute sensitivity to patient anatomy, we are making quantum leaps in the spinal fusion market.
Centinel Spine	202	Centinel Spine is the largest privately-held spine company focused on anterior column reconstruction. The company offers a continuum of trusted, brand-name, solutions backed by over 30 years of clinical success—providing the most robust and clinically-proven technology platforms in the world for total disc replacement (prodisc®) and Integrated Interbody™ fusion (STALIF®).
Cerapedics	408	Cerapedics is an advanced orthobiologics company with i-FACTOR® Peptide Enhanced Bone Graft (P-15/ABM) which is only the second FDA PMA approved bone graft on the market, and has shown to be statistically superior to local autograft through an IDE trial on single-level ACDFs in overall clinical success at one year and maintained at two years.
Curiteva	213	Curiteva is a privately held technology and manufacturing company dedicated to improving clinical outcomes by partnering with providers and suppliers to deliver innovative and intuitive implant systems to the market.


2021 Exhibit Companies

Company	Booth	Company Description
 DePuy Synthes <small>THE ORTHOPAEDICS COMPANY OF Johnson & Johnson</small>	104	DePuy Synthes, the Orthopaedics Company of Johnson & Johnson, provides one of the most comprehensive orthopaedics portfolios that helps heal and restore movement for the millions of patients we serve. Specialties including joint reconstruction, trauma, craniomaxillofacial, spinal surgery and sports medicine, in addition to the VELYS™ Digital Surgery portfolio.
Eminent Spine	406	Forged in solid biomechanics and the best-known biomaterials, Eminent Spine emerged as an industry leader in the evolution of spinal implants/instrumentation. Since 2008, full transformation, including rebranding, administration changes, and new FDA clearances has occurred. Eminent Spine furthers market research by developing products that push the industry into the future.
 GLOBUS MEDICAL	105	Globus Medical is driving significant technological advancements across a complete suite of products ranging from musculoskeletal solutions to enabling technologies. For more information visit globusmedical.com .
Immertec	212	Immertec is a software company that provides an immersive, peer-to-peer collaboration platform for physicians to observe cases remotely.
Innovasis	402	Innovasis is a privately held, rapidly growing company that has been engaged in the research, development, manufacturing, and marketing of spinal implant devices and related products for 14 years. Innovasis offers a product line with implants and instruments that address the major pathologies and focus areas of traditional spinal surgery.
Kuros Biosciences	206	Spine-related pain is taking a huge toll on our society: more bed days, more days off work, and at a greater financial cost to westernized healthcare than any other condition. We're on a mission to ease this burden through superior biologics for better spinal fusions.
Life Instruments	300	Life Instruments is dedicated to serving surgeons with the highest quality surgical instruments. Handcrafted from the finest materials, Life Instruments are an extension of the surgeons hands. We customize and modify instruments to fit individual needs in addition to providing ongoing development of new products with surgeons and healthcare professionals.
Medtronic	100	We lead global healthcare technology. Our Mission — to alleviate pain, restore health, and extend life — unites a global team of 90,000+ people. Transforming the lives of two people every second, every hour, every day. Expect more from us. Medtronic. Engineering the extraordinary.

2021 Exhibit Companies

Company	Booth	Company Description
MiRus	207	MiRus is Creating A Better Future For Patients Living With Cardiovascular And Orthopaedic Diseases. Inspired by the pioneering material science of NASA for rocket engines, MiRus has created Rhenium based medical alloys that are transforming medicine by making surgeries less invasive and implants safer and more durable.
 NUVASIVE	101	NuVasive is the leader in spine technology innovation, with a mission to transform surgery, advance care, and change lives. The Company's less-invasive, procedurally integrated surgical solutions are designed to deliver reproducible and clinically proven outcomes.
Orthofix	409	Orthofix Medical Inc. is a global medical device company with a spine and orthopedics focus. The Company's mission is to deliver innovative, quality-driven solutions as we partner with health care professionals to improve patient mobility. Visit www.Orthofix.com to learn more.
Piezosurgery	413	Piezosurgery Incorporated is based in Columbus, OH and is the U.S. operations for Mectron S.p.A. in Carasco (GE) Italy. Piezosurgery® is known worldwide as the market leader in ultrasonic bone surgery, with over 20 years of research and continuous innovation.
Providence Medical Technology	209	Our Mission is to establish Circumferential Cervical Fusion (CCF) as the standard of care for high-risk patients. Our Purpose is to improve clinical outcomes for high-risk patients and prevent surgical failures of the cervical spine. Because high-risk cervical fusion patients deserve more.
SeaSpine	401	SeaSpine® is a global medical technology company focused on the design, development and commercialization of surgical solutions for the treatment of patients suffering from spinal disorders. SeaSpine has a comprehensive portfolio of orthobiologics, spinal implants, and surgical navigation system solutions. Please visit www.seaspine.com for more information.
Spine Wave	303	Spine Wave is a proven spine industry innovation leader; now offering a comprehensive portfolio of solutions for spine surgeons and their patients. Our solutions address real clinical needs in posterior, anterior, lateral, thoracolumbar fixation and cervical spinal procedures and are offered with industry leading clinical service and responsiveness
SpineCraft	301	
SpineGuard	403	SpineGuard provides devices equipped with Dynamic Surgical Guidance technology, a powerful radiation-free sensing technology platform. Our devices give real-time audio and visual feedback to secure and streamline skeletal implant placement.

2021 Exhibit Companies

Company	Booth	Company Description
stryker	203	A leader of complex spine and minimally invasive solutions. Our spine business unit offers one of the most comprehensive and diverse product portfolios, including 3D-printed technologies, enabling surgeons to provide patients with treatment options. Our products include implants, instruments, and biologic solutions for the cervical, thoracic and lumbar spine.
Surgalign Spine Technologies	501	
Surgeons Capital Management	407	Surgeons Capital Management (SCM) is a wealth management firm dedicated to and working with surgeons around the country. We specialize in creditor and asset protection, tax-advantaged distribution, and wealth and estate strategies for high net worth individuals. Please visit our website to learn more - www.surgeonscapitalmanagement.com
Terumo BCT	400	Terumo Blood and Cell Technologies is a medical technology company. Our products, software and services enable customers to collect and prepare blood and cells to help treat challenging diseases and conditions. Our employees believe in the potential of blood and cells to do more for patients than they do today.
 ZIMMER BIOMET	201	Zimmer Biomet Spine is a leader in restoring mobility, alleviating pain, and improving the quality of life for patients around the world by delivering surgeons a comprehensive portfolio of quality spine technologies and procedural innovation, best-in-class training, and unparalleled service via a network of responsive team members and sales professionals.

Medtronic

Infinity™ OCT System— FDA-cleared in the U.S. for use with UNiD™ Rods.

Partnering with you to bring your surgical plan to life with patient-specific rods for the cervical spine.



Clearance of devices named and shown applies to planning, enabling, and providing immobilization and stabilization of spinal segments in fusion and non-fusion procedures for various acute and chronic instabilities of the craniocervical junction, the cervical spine (C1 to C7), and the thoracic spine from T1-T3 and where bony voids or gaps of the skeletal system exist.

Visit us at booth #100 or visit [medtronic.com/infinity](https://www.medtronic.com/infinity) to learn more.



50th Annual Meeting & 27th Instructional Course

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San Diego

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Call for Abstracts March 1 - April 18, 2022 *Visit* www.csr.org

49TH

Forty-Ninth Annual Meeting

of the



FOUNDED 1973

Live-Virtual: November 29-30, 2021**In-Person: December 1-4, 2021****On-Demand: December 6, 2021 – January 31, 2022****President** John M. Rhee, MD**Scientific Program Co-Chairs:** Samuel K. Cho, MD • Steven C. Ludwig, MD

Abstract Review Committee: Alexander C. Ching, MD • Matthew W. Colman, MD
 Clinton J. Devin, MD • Ben J. Garrido, MD • Regis W. Haid, MD, FAANS • Craig A. Kuhns, MD
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 Jason W. Savage, MD • Arjun S. Sebastian, MD, MSc • Brian W. Su, MD
 Barrett I. Woods, MD • Elizabeth M. Yu, MD • John M. Rhee, MD

Scientific Meeting Objectives

- Present the results of current cervical spine research data.
- Promote discussion of new developments and techniques.
- Foster research concerning the diagnosis and treatment of cervical spine injury and disease.

No electronic devices of any kind may be used to record any portion of the Instructional Course, Annual Meeting Scientific Program, E-Posters, Industry Workshops, or Technical Exhibits.

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Monday
11/29/2021

8:00am-9:00am   

Session I: CSRS Asia Pacific - Cervical Deformity, Uncommon but Challenging Cases

Moderator(s): Yu Sun, MD

8:00am-8:02am

CSRS Welcome
John Rhee, MD

8:02am-8:05am

Introduction
Yu Sun, MD

8:05am-8:15am

Post-infectious Deformity
Shanmuganathan Rajasekaran, PhD

8:15am-8:25am

Neuromuscular Deformity
Kyung-Soo Suk, MD

8:25am-8:35am

Congenital Cervical Deformity
Feifei Zhou, MD

8:35am-8:45am

Dropped Head Syndrome
Hiroshi Miyamoto, MD

8:45am-9:00am

Discussion





CSRS HANDS-ON SURGICAL TECHNIQUES COURSE
MARK YOUR CALENDAR July 21-23, 2022
Indiana Spine Group, Medical Academic Center
Carmel, Indiana



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Sessions marked with a   icon are available virtual-live on date and time listed in the session title.

Tuesday

11/30/2021

8:00am-9:00am  **LIVE** **Session II: CSRS Europe - A Great Case Due to the Right Decision***Moderator(s): Heiko Koller, MD, PhD*

8:00am-8:02am

CSRS Welcome*John Rhee, MD*

8:02am-8:05am

Introduction*Heiko Koller, MD, PhD*

8:05am-8:12am

Case Presentation I*Tobias Pitzen, MD*

8:12am-8:15am

Discussion

8:15am-8:25am

Case Presentation II*Petr Vachata, MD*

8:25am-8:26am

Discussion

8:26am-8:33am

Case Presentation III*Jorg Klekamp, MD*

8:33am-8:37am

Discussion

8:37am-8:44am

Case Presentation IV*Deszoe Jeszensky, MD*

8:44am-8:48am

Discussion



8:48am-8:55am

Case Presentation V*Luis Carelli, MD*

8:55am-9:00am

Discussion**Wednesday**

12/1/2021

2:00pm-8:30pm**Atrium Lobby****Registration Open****3:00pm-4:30pm****A601****Resident & Fellow Pre-Conference Session***By invitation only.***7:30pm-8:30pm****Atrium Lobby****Welcome Reception for Attendees***See Instructional Course Final Program for Wednesday ICL Sessions**All times are listed in Eastern Time (ET).**Sessions marked with a  icon are available on-demand December 6, 2021 – January 31, 2022.**Sessions marked with a  **LIVE** icon are available virtual-live on date and time listed in the session title.*

Thursday
12/2/2021

6:30am-8:30am

Atrium Lobby

Breakfast

6:30am-6:30pm

Atrium Lobby

Registration Open

7:00am-8:24am

Atrium A


Session 1: Abstracts - Outcomes Pt. I

Moderator(s): S. Tim Yoon, MD, PhD; Ra'Kerry Rahman, MD

7:00am-7:10am	CSRS Welcome <i>Program Co-Chairs, Samuel K. Cho, MD; Steven C. Ludwig, MD</i>
7:10am-7:11am	Introduction <i>S. Tim Yoon, MD, PhD; Ra'Kerry Rahman, MD</i>
7:11am-7:16am	PRESENTATION #1 Impact of Depression Severity on Patient Reported Outcomes Following Multilevel Anterior Cervical Discectomy and Fusion <i>Elliot DK. Cha, MS</i>
7:16am-7:21am	PRESENTATION #2 No Difference in Clinical Outcomes When Instrumenting Across the Cervicothoracic Junction in Multilevel Posterior Cervical Fusion <i>Gregory R. Toci, BS</i>
7:21am-7:26am	PRESENTATION #54 Evaluating the paradigm shift from anterior cervical decompression and fusion to posterior muscle-preserving selective laminectomy - a single center study of degenerative cervical myelopathy <i>Eddie de Dios, MD</i>
7:26am-7:31am	PRESENTATION #4 Is it better to stop at C2 or C3/4 in elective posterior cervical decompression and fusion? <i>Scott L. Zuckerman, MD</i>
7:31am-7:36am	PRESENTATION #58 Surgical Apgar Score and Controlling Nutritional Status Score are significant predictors of major complications after cervical spine surgery <i>Kousei Miura, MD, PhD</i>
7:36am-7:47am	Discussion

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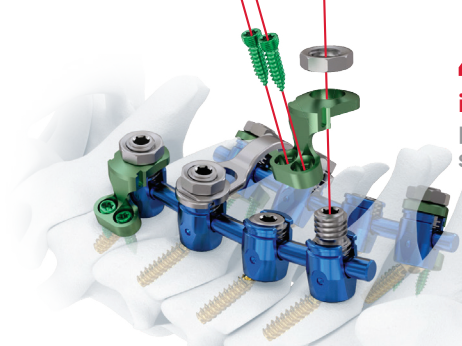
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Thursday, continued

- 7:47am-7:52am **PRESENTATION #6**
Which traditional functional outcome measures and their specific components are most affected by proper re-alignment and clinical improvement in Adult Cervical Deformity Surgery?
Peter G. Passias, MD
- 7:52am-7:57am **PRESENTATION #55**
Does diabetes affect the surgical outcomes in cases with cervical ossification of the posterior longitudinal ligament?
Momotaro Kawai, MD
- 7:57am-8:02am **PRESENTATION #8**
Prediction of complications after anterior cervical spinal fusion: a machine learning-driven approach
Akash A. Shah, MD
- 8:02am-8:07am **PRESENTATION #9**
Social Media Posts pertaining to Anterior Cervical Discectomy and Fusion (ACDF) Surgery: A Cross-Sectional Analysis of Patient and Surgeon Perceptions
Peter Swiatek, MD
- 8:07am-8:12am **PRESENTATION #10**
Comparison of Clinical and Radiographic Outcomes After C3 Laminoplasty versus C3 Laminectomy
Lee A. Tan, MD
- 8:12am-8:24am **Discussion**

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*Lateral Mass with MULTIPOINT SECURE™ 2 Screw Fixation as compared to a SYMPHONY Lateral Mass Screw alone
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The SYMPHONY™ OCT System is contraindicated for osteoporosis and relatively contraindicated for osteopenia.
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Thursday
12/2/2021

8:24am-9:24am 

Atrium A

Symposia 1: Digital Transformation During the Pandemic: How Did COVID-19 Change the Practice of Cervical Spine Surgery?

Moderator(s): Neill Wright, MD; Alpesh Patel, MD, MBA

8:24am-8:25am	Introduction <i>Neill Wright, MD; Alpesh Patel, MD, MBA</i>
8:25am-8:30am	Global Perspectives - United States <i>Rick Sasso, MD</i>
8:30am-8:35am	Global Perspectives - Europe <i>Heiko Koller, MD, PhD</i>
8:35am-8:40am	Global Perspectives - Asia Pacific <i>Yoon Ha, MD, PhD</i>
8:40am-8:47am	Discussion
8:47am-8:53am	DEBATE - Is Telemedicine Here to Stay? Yes, It's Awesome <i>W. Ryan Spiker, MD</i>
8:53am-8:59am	DEBATE - Is Telemedicine Here to Stay? No, It's Worthless <i>Andrew Hecht, MD</i>
8:59am-9:05am	Discussion
9:05am-9:11am	Using the Telemedicine Platform - How to Perform a Virtual Cervical Physical Examination <i>Gregory Schroeder, MD</i>
9:11am-9:17am	Using the Telemedicine Platform - How Telemedicine Improved My Ability to Care for Cervical Spine Patients <i>Sheeraz Qureshi, MD, MBA</i>
9:17am-9:24am	Discussion

9:15am-6:30pm

Atrium BC

Exhibit Hall Open


9:24am-9:54am

Atrium BC

Coffee Break

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Thursday
12/2/2021

9:54am-11:18am 

Atrium A

Session 2: Abstracts - Top Reviewed "Sweet Sixteen" Pt. I

Moderator(s): Louis Amorosa, MD; Daniel Sciubba, MD

9:54am-9:55am

Introduction

Louis Amorosa, MD; Daniel Sciubba, MD

9:55am-10:00am

PRESENTATION #11

Cervical Disc Replacement for Radiculopathy versus Myeloradiculopathy. An MCID Analysis.

Ram K. Alluri, MD

10:00am-10:05am

FIRST PLACE RESIDENT/FELLOW RESEARCH AWARD PRESENTATION #12

The influence of timing of surgical decompression for acute spinal cord injury: a pooled analysis of individual patient data in 1,548 cases

Jetan H. Badhiwala, MD, PhD

10:05am-10:10am

THIRD PLACE RESIDENT/FELLOW RESEARCH AWARD PRESENTATION #13

Comparison of Clinical Guidelines for Reimbursement for Intra-Operative Neuromonitoring During Spine Surgery in the United States

Daniel Berman, MD

10:10am-10:15am

FIRST PLACE BASIC SCIENCE AWARD PRESENTATION #14

Posterior Cervical Spinal Fusion Assemblies Intended to Cross the Cervicothoracic Junction: A Mechanical Analysis

David B. Bumpass, MD

10:15am-10:20am

PRESENTATION #15

Comparative effectiveness of surgical approaches for cervical myelopathy: quality of life assessments from the CSM-S trial

Zoher Ghogawala, MD, FACS

10:20am-10:34am

Discussion


10:34am-10:39am


THIRD PLACE BASIC SCIENCE AWARD PRESENTATION #16

Cervical Total Disc Replacement: Available Implant Size Matters

Richard D. Guyer, MD

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Thursday, continued

- 10:39am-10:44am  **SECOND PLACE RESIDENT/FELLOW RESEARCH AWARD PRESENTATION #17**
 Simulated Bundled Payments for Four Common Surgical Approaches to Treat Cervical Spondylotic Myelopathy: A Consideration to Break the Clinical Equipose
Nikhil Jain, MD
- 10:44am-10:49am  **SECOND PLACE BASIC SCIENCE AWARD PRESENTATION #18**
 Do Inflammatory Cytokines Affect Patient Outcomes after ACDF?
Brian A. Karamian, MD
- 10:49am-10:54am **PRESENTATION #19**
 Discharge to Rehabilitation Predicts Greater Morbidity in Patients Undergoing Posterior Cervical Decompression and Fusion
Austen D. Katz, MD
- 10:54am-11:05am **PRESENTATION #20**
 Cervical Laminectomy with Instrumented Fusion is Associated with a Higher Incidence of Postoperative C5 Palsy Compared to Cervical Laminoplasty with Reconstruction: Single Surgeon and National Inpatient
Jinseong Kim, BS
- 11:05am-11:18am **Discussion**

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Thursday
12/2/2021

11:30am-1:00pm


Industry Lunch Workshops

**Lunch workshops are limited to 40 attendees per room.*

ATEC	Complex Cervical Decision Making <i>Dan Cavanaugh, MD; Alpesh Patel, MD; Tim Yoon, MD</i>	A701
DePuy Synthes	Innovations in Lateral Mass Fixation to Address Complex Cervical Deformity Featuring: DePuy Synthes Spine SYMPHONY™ OCT System & MULTIPOINT SECURE <i>Christopher Ames, MD</i>	A707
Kuros Biosciences	The first investigational drug-biologic candidate to be evaluated for spinal fusion (Fibrin-PTH) and an evidence-based review of bone grafts <i>Cesar Silva, MD, Clinical Study Director, Kuros Biosciences; Katherine Sage, MD, Director of Scientific Affairs, Kuros Biosciences</i>	A702
Medtronic	Intelligence-based medicine: how big data, analytics and patient-specific implants are changing cervical spine surgery <i>Lee Tan, MD; Peter Passias, MD; Christopher Kleck, MD</i>	A704
NuVasive	Seeing is knowing: How visualization is advancing anterior cervical surgery <i>Rick Sasso, MD; Charles Crawford, MD; Jack Zigler, MD, FACS</i>	A706
Stryker	360 View of the Cervical Spine <i>Griffin Baum, MD; Erica Bisson, MD; Scott Parker, MD</i>	A705
Zimmer Biomet	Minimizing Complications in Cervical Arthroplasty Procedures <i>Neill Wright, MD</i>	A703

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Thursday
12/2/2021

1:05pm-2:05pm 

Atrium A

Symposia 2: Pearls of Wisdom for a Successful Research Study

Moderator(s): Zoher Ghogawala, MD, FACS; Wellington Hsu, MD

- | | |
|---------------|--|
| 1:05pm-1:07pm | Introduction
Zoher Ghogawala, MD, FACS; Wellington Hsu, MD |
| 1:07pm-1:14pm | Designing Research Questions - Study Considerations Leading to Success or Failure
Wellington Hsu, MD |
| 1:14pm-1:21pm | Knowing How and When to Pivot in a Research Project
Zoher Ghogawala, MD, FACS |
| 1:21pm-1:28pm | Clinical Trials - Organization and Getting the Message Out to the Right People
Michael G. Fehlings, MD, PhD, FRCSC, FACS |
| 1:28pm-1:33pm | Lessons Learned from Past and Current CSRS-Funded Studies - C12 Fusion vs. Bracing
Christopher Kepler, MD |
| 1:33pm-1:38pm | Lessons Learned from Past and Current CSRS-Funded Studies - 5-yr ASD Incidence After TDA Study
Pierce Nunley, MD |
| 1:38pm-1:43pm | Lessons Learned from Past and Current CSRS-Funded Studies - Steroids for Dysphagia
Sanford Emery, MD, MBA |
| 1:43pm-2:05pm | Discussion |

The most clinically effective cervical total disc replacement (cTDR)



Simplify Cervical Disc is the cTDR with the highest overall success rate at one and two levels.*

Learn more at **booth 101**.


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Thursday
12/2/2021

2:05pm-3:10pm

This event will not be recorded.

Atrium A

12th Annual Henry H. Bohlman Presidential Guest Lecture - Jeff Foxworthy, Comedian



Laugh along with comedy-genius Jeff Foxworthy as he shares life advice and rip-roaring stories at the CSRS 49th Annual Meeting.

Jeff Foxworthy is one of the most respected and successful comedians in the country. He is the largest selling comedy-recording artist in history, a multiple Grammy Award nominee and best selling author of more than 26 books. In 2014, he was inducted into the Georgia Music Hall of Fame. Widely known for his redneck jokes, his act goes well beyond that to explore the humor in everyday family interactions and human nature, a style that has been compared to Mark Twain's.

Jeff is currently on his new comedy tour "The Good Old Days," which features all new material. This unforgettable night of comedy kicks off in Bowler, WI and includes a stop in his hometown at The Fox Theater in Atlanta where he will film a comedy special. We are excited to welcome him for the CSRS 49th Annual Meeting in his hometown!

Henry H. Bohlman, MD



Henry H. Bohlman, MD was a pioneer of modern cervical spine surgery and a founding member of CSRS. He served as President in 1989.

In addition to being a leader, he was a teacher and a mentor to more than 120 Fellows and Residents, many of whom have established their own Fellowships as well as significant academic careers. He trained more CSRS Presidents than anyone in the history of the Society.


Given his influence on our organization, CSRS leadership established a guest lectureship in his name in 2010.


3:10pm-3:40pm

Atrium BC

Coffee Break

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Thursday
12/2/2021

3:40pm-4:56pm

Atrium A

Session 3: Abstracts - Deformity; Diagnostics and Imaging; Biologics and Bone Graft

Moderator(s): Elizabeth Yu, MD; Barrett Woods, MD

3:40pm-3:41pm

Introduction

Elizabeth Yu, MD; Barrett Woods, MD

3:41pm-3:46pm

PRESENTATION #21

Understanding the Effects of Three-Column Osteotomies on Regional and Global Alignment in patients with Moderate to Severe Cervical Deformity

Rushikesh S. Joshi, BS

3:46pm-3:51pm

PRESENTATION #22

Proximal and Distal Reciprocal Changes Following Cervical Deformity Malalignment Correction

Renaud Lafage, MS

3:51pm-3:56pm

PRESENTATION #23

When Does the Construct Need to Extend to the Thoracic Spine in Patients Undergoing Correction for Cervical Deformity?

Virginie C. Lafage, PhD

3:56pm-4:01pm

PRESENTATION #24

Durability and Failure Mechanisms of Cervical Deformity Correction Surgery

Themistocles S. Protopsaltis, MD

4:01pm-4:06pm

PRESENTATION #25

Identifying T1 Slope Thresholds for Optimal Functional and Clinical Outcomes in Cervical Deformity Correction

Peter G. Passias, MD

4:06pm-4:18pm

Discussion

4:18pm-4:23pm

PRESENTATION #26

Comparison of MRI-based Vertebral Bone Quality (VBQ) Score with Bone Mineral Density Measured by Quantitative Computer Tomography (QCT) in Patients undergoing Cervical Spinal Surgery

Manuel Moser, MD

4:23pm-4:28pm

PRESENTATION #27

Paraspinal Sarcopenia Predicts Worse Patient Reported Outcomes Following Posterior Cervical Fusion

Zachariah Pinter, MD

4:28pm-4:33pm


PRESENTATION #28

What are the Post-operative Consequences of Intraoperative Neuromonitoring Changes during Cervical Spine Surgery

Shalin Shah, DO

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Thursday, continued

- 4:33pm-4:38pm **PRESENTATION #29**
Impact of inhalational anesthetic agents on the baseline monitorability of upper extremity motor evoked potentials (MEPs) during cervical spine surgery: A review 16,559 procedures
W. Bryan Wilent, PhD
- 4:38pm-4:43pm **PRESENTATION #30**
Is the Use of rh-BMP associated with Increased Incidence of Cancer?
Nida Fatima, MD
- 4:43pm-4:56pm **Discussion**

5:00pm-6:30pm**Atrium BC****Reception for All Attendees****7:00pm-9:00pm****Industry Dinner Sponsored by NuVasive**

See details below.

Join us for an evening of intimate discussions during CSRS at one of the off-site dinner locations hosted by NuVasive

The future of cervical spine surgery

Surgeon moderators include: **Dr. Reg Haid, Dr. Todd Albert, Dr. Michael Groff and Dr. Vincent Traynelis**

Thursday, December 2, 2021

7:00 – 9:00 p.m.

Off-site restaurants and private dining rooms
Locations near the Marriott Marquis, Atlanta



RSVP to: <https://forms.gle/BcACytiX6zau4pn26> or email Natalie Norket at nnorket@nuvasive.com

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Friday
12/3/2021

6:30am-8:30am
Breakfast

Atrium Lobby

6:30am-5:30pm
Registration Open

Atrium Lobby

7:00am-8:30am

Atrium A


Session 4: Abstracts - Epidemiology, Etiology, and Natural History; Basic Science

Moderator(s): Erik Olsson, MD; Clinton Devin, MD

7:00am-7:05am	CSRS Welcome <i>Program Co-Chairs, Samuel K. Cho, MD; Steven C. Ludwig, MD</i>
7:05am-7:06am	Introduction <i>Erik Olsson, MD; Clinton Devin, MD</i>
7:06am-7:11am	PRESENTATION #69 Single-level Cervical Disc Replacement Using a PEEK-on-Ceramic Implant: Results of a Multicenter FDA IDE Trial with 24-month Follow-up <i>Richard D. Guyer, MD</i>
7:11am-7:16am	PRESENTATION #31 Cervical Myelopathy and Hip Fractures: Co-incidence, Epidemiology, and Costs of Care <i>Edward Baldwin, III, MD</i>
7:16am-7:21am	PRESENTATION #32 Racial and social determinants of health disparities in patient presentation for cervical spine surgery: census tract level disparities reveal greater preoperative morbidity and worse POD 90 patient reported outcomes <i>Sarthak Mohanty, BS</i>
7:21am-7:26am	PRESENTATION #33 No Difference in Reoperation Rates in Posterior Cervical Fusions Stopping at C7 versus T1/T2 for Adjacent Segment Disease (Operative ASD): A cohort of 875 Patients - Part 1 <i>Kern H. Guppy, MD, PhD</i>
7:26am-7:31am	PRESENTATION #34 Physical Examination Findings of Patients With Myelopathy and Diabetes Mellitus <i>Mena G. Kerolus, MD</i>
7:31am-7:36am	PRESENTATION #35 Do Favorable Short-term Patient Reported Outcomes after ACDF Predict Loss to One- and Two-Year Follow-Up? <i>Hannah A. Levy, BS</i>

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Friday, continued

7:36am-7:41am	PRESENTATION #36 The Impact of Social Determinants of Health (SDOH) on 30- and 90-Day Readmission Rates Following Spine Surgery <i>Comron Saifi, MD</i>
7:41am-7:52am	Discussion
7:52am-7:57am	PRESENTATION #37 Safety Evaluation of Hydroxyapatite-Demineralized Bone Matrix Composite Scaffold for Spinal Fusion <i>Wellington K. Hsu, MD</i>
7:57am-8:02am	PRESENTATION #38 Computed Tomography Osteoabsorptiometry (CT-OAM) Evaluation of Subchondral Bone Mineral Density in Cervical Endplates and Uncovertebral Joints: Implications for Subsidence and Clinical Practice <i>Athan G. Zavras, BA</i>
8:02am-8:07am	PRESENTATION #39 Novel In Vivo Imaging System of Grafted Human iPS Cell-Derived Neuron Activity after Spinal Cord Injury <i>Kentaro Ago, MD</i>
8:07am-8:12am	PRESENTATION #40 Long-term Selective Stimulation of Transplanted Neural Stem/Progenitor Cells for Spinal Cord Injury Improves Locomotor Function Mediated by Increased Synaptic Transmission <i>Momotaro Kawai, MD</i>
8:12am-8:17am	PRESENTATION #41 Chemical control of grafted human iPSC derived neurons demonstrated the contribution of graft neuronal activity to the recovery following spinal cord injury <i>Takahiro Kitagawa, MD</i>
8:17am-8:30am	Discussion

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Friday
12/3/2021

8:30am-9:41am 

Atrium A

Symposia 3: Deformity Consideration for the Everyday Cervical Degenerative Conditions

Moderator(s): Langston Holly, MD; Praveen Mummaneni, MD

8:30am-8:32am	Introduction <i>Langston Holly, MD; Praveen Mummaneni, MD</i>
8:32am-8:42am	Patient with Myelopathy/Radiculopathy Doesn't Have Perfect Alignment - Do They Really Need a Cervical Deformity Correction? <i>John Rhee, MD</i>
8:42am-8:52am	How to Prevent Iatrogenic Deformity <i>Regis Haid, MD, FAANS</i>
8:52am-9:02am	Choice of UIV <i>Stuart Hershman, MD</i>
9:02am-9:12am	Choice of LIV and When to Cross the CT Junction <i>Lee Tan, MD</i>
9:12am-9:22am	When Should I Include or Exclude an Adjacent Segment Disc <i>Andrew Dailey, MD, FAANS</i>
9:22am-9:41am	Discussion

9:30am-1:30pm

Atrium BC

Exhibit Hall Open

9:41am-10:11am

Atrium BC

Coffee Break

10:11am-10:50am


Atrium A

Presidential Address

10:11am-10:20am	Introduction <i>James Harrop, MD, FAANS</i>
10:20am-10:50am	Presidential Address <i>John Rhee, MD</i>

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Friday
12/3/2021

10:50am-12:06pm

Atrium A


Session 5: Abstracts - Biomechanics; Complications

Moderator(s): P. Justin Tortolani, MD; Daniel Sciubba, MD

10:50am-10:51am	Introduction <i>P. Justin Tortolani, MD; Daniel Sciubba, MD</i>
10:51am-10:56am	PRESENTATION #42 Longitudinal Changes in Adjacent Segment Disc Deformation After Cervical Arthrodesis <i>William J. Anderst, PhD</i>
10:56am-11:01am	PRESENTATION #43 Finite Element Modeling to Determine the Effect of a Hybrid Construct Adjacent to a Cervical Disc Arthroplasty <i>Jamie L. Baisden, MD</i>
11:01am-11:06am	PRESENTATION #44 In Vivo Deformation Patterns of Craniocervical Ligaments during Dynamic Head Axial Rotation <i>Thomas D. Cha, MD</i>
11:06am-11:11am	PRESENTATION #45 Supplemental Fixation of Lateral Mass Screws: A Strategy to Improve Posterior Cervical Fusion Fixation Strength <i>Robert M. Havey, MS</i>
11:11am-11:16am	PRESENTATION #46 Biomechanical Analysis of 3-level ACDF Construct Using a Finite-element Cervical Spine Model <i>Lee A. Tan, MD</i>
11:16am-11:21am	PRESENTATION #47 Adjacent Level Kinematics Following One- and Two-Level Anterior Cervical Disectomy and Fusion <i>William J. Anderst, PhD</i>
11:21am-11:26am	PRESENTATION #48 In Vivo Kinematics of the Head-Neck Complex during Dynamic Head Axial Rotation <i>Thomas D. Cha, MD</i>
11:26am-11:33am	Discussion
11:33am-11:38am	PRESENTATION #49 Delayed Upper Aerodigestive Tract Perforation from Anterior Cervical Spine Hardware: Treatment and Swallowing Outcomes <i>Catherine R. Carlile, MD</i>
11:38am-11:43am	PRESENTATION #50 The Effect of Undercorrection on Distal Junctional Kyphosis in Adult Cervical Deformity Patients <i>Oscar Krol, BA</i>

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Friday, continued

11:43am-11:48am	PRESENTATION #51 Failure in Cervical Total Disc Arthroplasty: Single Institution Experience, Systematic Review of the Literature, and Proposal of a Novel TDA Failure Classification System <i>Athan G. Zavras, BA</i>
11:48am-12:06pm	Discussion

12:10pm-1:20pm**A602****Members' Business Meeting & Lunch****12:10pm-1:20pm****Atrium BC****Lunch for Non-Members in Exhibit Hall**


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Friday
12/3/2021

1:25pm-2:06pm

Atrium A


Session 6: Meeting Previews; Awards - Paper & E-Poster Awards Presentations, Lifetime Achievement Award

Moderator(s): John Rhee, MD; Jeffrey Coe, MD

1:25pm-1:31pm	Introduction and Honoring of Dr. Whitesides <i>John Rhee, MD</i>
1:31pm-1:36pm	Meeting Preview - CSRS 50th Annual Meeting and 27th Instructional Course in San Diego, CA <i>Jean-Jacques Abitbol, MD</i>
1:36pm-1:41pm	2022 Meeting Preview - CSRS Europe <i>Heiko Koller, MD, PhD</i>
1:41pm-1:46pm	2022 Meeting Preview - CSRS Asia Pacific <i>Yu Sun, MD</i>
1:46pm-1:51pm	Awards - Recognition of 2021 Paper and E-Poster Awards <i>Jeffrey Coe, MD</i>
1:51pm-1:56pm	Lifetime Achievement Award - Introduction <i>John Rhee, MD</i>
1:56pm-2:06pm	Lifetime Achievement Award - Acceptance Speech <i>Ronald Apfelbaum, MD</i>

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Ronald Apfelbaum

Friday, December 3, 2021, 1:25pm-2:06pm



CSRS proudly awards Dr. Ronald I. Apfelbaum as the 2021 recipient of the Lifetime Achievement Award, marking his outstanding contributions to the field of cervical spine surgery throughout his career.

Dr. Apfelbaum has extensive leadership experience that propelled the society, most notably while serving as President of CSRS from 2007-2008. He also served as both Vice President and Secretary for CSRS.


Dr. Apfelbaum worked tirelessly throughout his career to evolve the field of spine surgery and made major impacts in several areas of the field. He was instrumental in the development of an FDA cleared Odontoid Fracture Fixation System in 2015. Building off his understanding of biomechanics, he developed one of the earliest Anterior Cervical Dynamic Plate systems for stabilization after ACDF, which is still being used today. He also developed a unique posterior C1-2 transarticular screw fixation system that pushed the state of the art in its time.

Dr. Apfelbaum has been very successful academically throughout his career. He served as Director and Co-Director for the Neurosurgery/Orthopaedic Spine Fellowship Program, as well as the Neurosurgery Residency Training Program at the University of Utah. Dr. Apfelbaum was a talented researcher, with hundreds of combined peer-reviewed journal articles, book chapters, and other publications. He presented at countless medical conferences all over the US and other parts of the world. Dr. Apfelbaum's ability to create bridges between the fields of neurosurgery and orthopaedic surgery has made both disciplines stronger and allowed him to develop a notable presence as a global leader.

For all this and more, CSRS is honored to present Dr. Ronald Apfelbaum with the 2021 Lifetime Achievement Award.

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Friday
12/3/2021

2:06pm-3:28pm

Atrium A

Session 7: Abstracts - Outcomes Pt. II

Moderator(s): Daniel Park, MD; Gurvinder Deol, MD

2:06pm-2:07pm

Introduction

2:07pm-2:12pm

PRESENTATION #52

Cervical Stiffness Disability Index (CSDI): Validation of a Novel Scoring System Quantifying the Effect of Post-Arthrodesis Cervical Stiffness on Patient Quality of Life

Andrew S. Jack, MD, MSc, FRCSC

2:12pm-2:17pm

PRESENTATION #53

Influence of preoperative smoking status on clinical outcomes of laminoplasty in patients with degenerative cervical myelopathy: a prospective study

Guoyan Liang, MD

2:17pm-2:22pm

PRESENTATION #3

Trends in 2 Year Outcomes of a Prospective Consecutively Enrolled Single-Center Adult Cervical Deformity Series: Optimal Realignment Correlates with Superior Outcomes

Bassel G. Diebo, MD

2:22pm-2:27pm

PRESENTATION #55

Long Term Associations Between Current Smoking Status and Outcome After Elective Cervical Spine Surgery

Gordon Preston, DO

2:27pm-2:32pm

PRESENTATION #56

Comparison of Laminoplasty and Posterior Fusion Surgery for Cervical Ossification of the Posterior Longitudinal Ligament: Data from a Prospective Multicenter Research Organization regarding Ossification of the Spinal Ligament

Hiroaki Nakashima, MD, PhD

2:32pm-2:37pm

PRESENTATION #57

Highest Achievable Outcomes for Patients Undergoing Cervical Deformity Corrective Surgery by Frailty

Virginie C. Lafage, PhD

2:37pm-2:50pm

Discussion


2:50pm-2:55pm


PRESENTATION #5

Preoperative Diagnosis of a Mental Health Disorder is Associated with Increased Postoperative Rates of Dysphagia after Anterior Cervical Spine Surgery

Athan G. Zavras, BA

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Friday, continued

- 2:55pm-3:00pm **PRESENTATION #59**
 What is the fate of pseudarthrosis detected 2 years after anterior cervical discectomy and fusion? Results of a minimum of 5-years follow-up
Dong-Ho Lee, MD, PhD
- 3:00pm-3:05pm **PRESENTATION #60**
 The associations between radiological and neurological findings of degenerative cervical myelopathy: Radiological analysis based on kinematic CT myelography and evoked potentials of spinal cord
Masahiro M. Funaba, MD
- 3:05pm-3:10pm **PRESENTATION #61**
 Analysis of Clinical Deterioration Following Adult Cervical Deformity Realignment Surgery: Two Year Outcomes of a Consecutive, Prospectively Enrolled Database
Oscar Krol, BA
- 3:10pm-3:15pm **PRESENTATION #62**
 Restored inhibitory signaling via AAV-mediated KCC2 upregulation recruits microglia to reorganize spinal neural circuits
Michael G. Fehlings, MD, PhD, FRCSC, FACS
- 3:15pm-3:28pm **Discussion**

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Friday
12/3/2021

3:28pm-3:52pm

Atrium Lobby

Coffee Break

3:52pm-5:00pm 

Atrium A

Symposia 4: Master Debate Series I

Moderator(s): Darrel Brodke, MD

- | | |
|---------------|--|
| 3:52pm-3:55pm | Introduction and Case Presentation I
<i>Darrel Brodke, MD</i> |
| 3:55pm-4:05pm | DEBATE - Cervical Disc Disease with Myelopathy: ACDF
<i>Sanford Emery, MD, MBA</i> |
| 4:05pm-4:15pm | DEBATE - Cervical Disc Disease with Myelopathy: CDR
<i>K. Daniel Riew, MD</i> |
| 4:15pm-4:26pm | Discussion |
| 4:26pm-4:29pm | Case Presentation II
<i>Darrel Brodke, MD</i> |
| 4:29pm-4:39pm | DEBATE - 3-Level CDD: ACDF
<i>John Heller, MD</i> |
| 4:39pm-4:49pm | DEBATE - 3-Level CDD: Hybrid Approach
<i>Vincent Traynelis, MD</i> |
| 4:49pm-5:00pm | Discussion |

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Saturday
12/4/2021

7:00am-9:00am

Atrium Lobby

Breakfast

7:00am-10:00am

Atrium Lobby

Registration Open

8:00am-8:56am 

Atrium A

Session 8 - Abstracts - Top Reviewed "Sweet Sixteen" Pt. II

Moderator(s): Christopher Witiw, MD, MS; Timothy Moore, MD

8:00am-8:10am

CSRS Welcome

Program Co-Chairs, Samuel K. Cho, MD; Steven C. Ludwig, MD

8:10am-8:11am

Introduction

Christopher Witiw, MD, MS; Timothy Moore, MD

8:11am-8:16am

 **SECOND PLACE CLINICAL RESEARCH AWARD PRESENTATION #63**

Predictive Factors for the Aggravation of Cervical Alignment after Posterior Cervical Foraminotomy

Hyung Rae Lee, MD

8:16am-8:21am

PRESENTATION #64

Surgical Treatment of Single level Cervical Radiculopathy: A Comparison of Anterior Cervical Decompression and Fusion (ACDF) vs. Cervical Disc Arthroplasty (CDA) vs. Posterior Cervical Foraminotomy

Kedar Padhye, MD

8:21am-8:26am

PRESENTATION #65

Surgical and Radiographic Outcomes in Patients with High T1 and C2 Slopes

Themistocles S. Protopsaltis, MD

8:26am-8:31am

 **FIRST PLACE CLINICAL RESEARCH AWARD PRESENTATION #66**

No Difference in Reoperation Rates in Posterior Cervical Fusions Stopping at C7 versus T1/T2 for Nonunions (Operative Nonunions): A cohort of 875 Patients - Part 2

Jacob H. Fennessy, MD

8:31am-8:36am


 **THIRD PLACE CLINICAL RESEARCH AWARD PRESENTATION #67**

Racial Disparities in Patients Undergoing Anterior Cervical Discectomy and Fusion: A Multi-Site Study

Comron Saifi, MD

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Saturday, continued

8:36am-8:41am

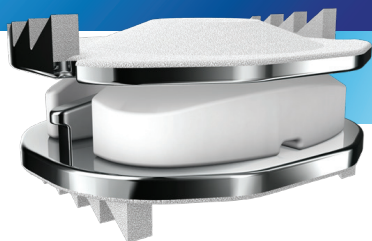
PRESENTATION #68

Stand-Alone Cages versus Cage and Plate Constructs for Primary One- and Two-level Anterior Cervical Discectomy and Fusion: A Prospective Randomized Controlled Trial
Athan G. Zavras, BA

8:41am-8:56am

Discussion

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Saturday
12/4/2021

8:56am-9:31am

Atrium A


Session 9: CSRS Past Research Grant Awards & Presentations

Moderator(s): Wellington Hsu, MD

- | | |
|---------------|---|
| 8:56am-9:02am | Introduction and Recognition of 2021 Research Grant Award Winners
<i>Wellington Hsu, MD</i> |
| 9:02am-9:04am | The Role of Calcitonin Gene-Related Peptide in Intervertebral Disc Neurogenic Inflammation: A Potential Therapeutic Target for Discogenic Pain
<i>Jose Canseco, MD</i> |
| 9:04am-9:06am | Analysis of the Human Serum Proteome in Cervical Radiculopathy Patients to Predict Who Will Fail Conservative Treatment and Require Surgery
<i>Steven Pressciutti, MD</i> |
| 9:06am-9:08am | Discussion |
| 9:08am-9:10am | Morphological, Biochemical and Biomechanical Characterization of Human Cervical Endplate in Degenerated Disc
<i>Nathan Buchweitz, PhD Student</i> |
| 9:10am-9:12am | Discussion |
| 9:12am-9:14am | Is Vaporized Nicotine as Detrimental to Spinal Fusions as Cigarette Smoke?
<i>Jesse Bible, MD</i> |
| 9:14am-9:16am | Treatment of Spinal Cord Injury With Bone Marrow Mesenchymal Stem Cell Derived Exosomes
<i>Ankit Mehta, MD</i> |
| 9:16am-9:18am | A Multi-Disciplinary Approach to Reduce Chronic Opioid Use Prior to Elective Cervical Spine Surgery
<i>Andrew Pugely, MD</i> |
| 9:18am-9:20am | Quantitative Histomorphological Characterization of Human Cervical Nerve Roots to Determine the Relationship with Postoperative C5 Palsy
<i>P. Justin Tortolani, MD</i> |
| 9:20am-9:22am | Exploring Prognostic Brain Biomarkers for Cervical Myelopathy: A Resting-State Functional MRI Multicenter Study
<i>Takashi Kaito, MD, PhD</i> |
| 9:22am-9:24am | Randomized Trial of Opioid vs. Non-Opioid Postoperative Pain Regimens After Anterior Cervical Discectomy and Fusion
<i>Amir Abtahi, MD</i> |

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Saturday, continued

- 9:24am-9:26am **3D Printed 2D Piezoelectric Materials to Deliver Stem Cells for Bone Repair and Regeneration**
Wellington Hsu, MD
- 9:26am-9:28am **Radiographic Evaluation of the Cervical Neck Surgical Approach and Its Relationship with BMI and Operative Characteristics Following ACDF.**
Michael Nolte, MD
- 9:28am-9:30am **Prediction of Admission Costs Following Anterior Cervical Discectomy and Fusion Utilizing Machine Learning**
Anirudh Gowd, MD
- 9:30am-9:31am **Discussion**

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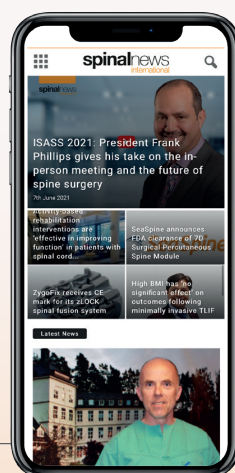
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Saturday
12/4/2021

9:31am-9:41am

Atrium A

Presidential Farewell & Induction of New President

9:31am-9:36am

Passing of the Medallion
John Rhee, MD

9:36am-9:41am

Induction of New President
James Harrop, MD, FAANS

9:41am-9:56am

Atrium Lobby

Coffee Break

9:56am-10:56am 

Atrium A

Symposia 5: Master Debate Series Pt. II

Moderator(s): Chris Shaffrey, MD; Michael Daubs, MD

9:56am-9:58am

Introduction
Chris Shaffrey, MD; Michael Daubs, MD

9:58am-10:07am

DEBATE - Traumatic Cervical Facet Fractures without
Dislocation: I fix them
Erica Bisson, MD, MPH

10:07am-10:16am

DEBATE - Traumatic Cervical Facet Fractures without
Dislocation: I put them in a collar
Addisu Mesfin, MD

10:16am-10:27am

Discussion

10:27am-10:36am

DEBATE - In an Awake, Alert, Cooperative Patient with a
Cervical Dislocation: Closed Reduction Always and then OR
Carlo Bellabarba, MD

10:36am-10:45am


DEBATE - In an Awake, Alert, Cooperative Patient with a Cervical
Dislocation: OR and Forget About the Closed Reduction
Vincent Traynelis, MD

10:45am-10:56am

Discussion

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Saturday

12/4/2021

10:56am-12:47pm**Atrium A****Session 10: Abstracts - Motion Preservation; Trauma; Other***Moderator(s): Lee Riley, III, MD; Comron Saifi, MD*

10:56am-10:57am

Introduction*Lee Riley, III, MD; Comron Saifi, MD*

10:57am-11:02am

PRESENTATION #84

The impact of anterior spondylolisthesis and kyphotic alignment on dynamic changes in spinal cord compression and neurological status in cervical spondylotic myelopathy: A radiological analysis involving kinematic CT myelography and

Takuya Sakamoto, MD

11:02am-11:07am

PRESENTATION #70

Range of Motion on Flexion and Extension at Long-Term Follow-Up After Cervical Total Disc Arthroplasty: A Systematic Review and Meta-Analysis

Athan G. Zavras, BA

11:07am-11:12am

PRESENTATION #71

Evaluation of Gait and Functional Stability in Preoperative Cervical Spondylotic Myelopathy Patients

Hamid Hassanzadeh, MD

11:12am-11:17am

PRESENTATION #72

Skip laminoplasty as a novel posterior decompression technique to decrease interlaminar fusion and preserve cervical range of motion

Jun Hee Lee, MD

11:17am-11:22am

PRESENTATION #73

Neuroimaging Biomarkers Correlate With Disease Severity In Degenerative Cervical Myelopathy

Muhammad Ali Akbar, MD

11:22am-11:27am

PRESENTATION #74

Early Surgical Decompression Enhances Motor Recovery in Traumatic Cervical ASIA A Spinal Cord Injury Patients: Analysis of Prospective, Multicentre Data in 420 Cases

Ali Moghaddamjou, MD

11:27am-11:37am

Discussion


11:37am-11:42am


PRESENTATION #75

Internet Video-Based Patient Education on ACDF and CTDR: A Quantitative Analysis of Content and Quality

Edward DelSole, MD

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Saturday, continued

- 11:42am-11:47am **PRESENTATION #76**
Risk Factors for MCID Drop-Off in Patients Undergoing Anterior Cervical Discectomy and Fusion
Conor P. Lynch, MS
- 11:47am-11:52am **PRESENTATION #77**
Incidence of Noncontiguous Cervical Injury in Patients with Thoracic Spine Fractures
Patrick Curtin, MD
- 11:52am-11:57am **PRESENTATION #78**
International Validation of the AO Spine Subaxial Injury Classification System: The Importance of Methodology
Brian A. Karamian, MD
- 11:57am-12:02pm **PRESENTATION #79**
Survival Rates in Atlanto-occipital Dissociation: A Look at the Past 20 Years
Gautham Prabhakar, MD
- 12:02pm-12:12pm **Discussion**
- 12:12pm-12:17pm **PRESENTATION #80**
Radiological factors associated with the severity of corticospinal tract dysfunctions for cervical spondylotic myelopathy: An analysis of the central motor conduction time and kinematic CT myelography
Masahiro M. Funaba, MD
- 12:17pm-12:22pm **PRESENTATION #81**
Enoxaparin promotes functional recovery after spinal cord injury by antagonizing PTPR sigma
Sadayuki Ito, MD
- 12:22pm-12:27pm **PRESENTATION #82**
Surgical outcome of cervical and thoracic extramedullary spinal tumor
Akinobu Suzuki, MD
- 12:27pm-12:32pm **PRESENTATION #83**
Laminectomy Alone versus Laminectomy with Fusion for Degenerative Cervical Myelopathy - a Long-term Study of a National Cohort
Eddie de Dios, MD
- 12:32pm-12:47pm **Discussion**

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Saturday
12/4/2021

12:47pm-12:55pm

Atrium A

Close of meeting from CSRS Program Co-Chairs

Program Co-Chairs, Samuel K. Cho, MD; Steven C. Ludwig, MD

E-Posters, E-Poster Awards, On-Demand Content

E-Posters

E-Posters available on the Annual Meeting Platform from December 2, 2021 – January 31, 2022.

Full list of e-posters available online as well as in the Abstract Book.

E-Poster Awards

GENERAL E-POSTER AWARD

Automated detection of cervical spinal cord compression and the reliability of morphometric parameters extracted with the Spinal Cord Toolbox


Magda MH. Horáková, MD

RESIDENT/FELLOW E-POSTER AWARD

Modified Kappa-line correlates better with neurological outcomes than modified K-line after laminoplasty for cervical myelopathy caused by ossification of the posterior longitudinal ligament


Seong Hun Song, MD

On-Demand Content

Sessions marked with a  icon are available on-demand December 6, 2021 – January 31, 2022. Registrants for on-demand sessions will be emailed a unique link to access on-demand sessions on December 6.

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It is the policy of CSRS to insure balance, independence, objectivity and scientific rigor in all of their educational activities. In accordance with this policy, CSRS identifies conflicts of interest with instructors, content managers and other individuals who are in a position to control the content of an activity. Conflicts are resolved by CSRS to ensure that all scientific research referred to, reported or used in a CME activity conforms to the generally accepted standards of experimental design, data collection and analysis. Complete faculty disclosures are included in the abstract book.

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Additional Resources

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Additional Resources

CSRS is maintaining strict health and safety requirements for all attendees throughout the Annual Meeting and Instructional Course. We are committed to disclose any COVID-19 exposure brought to our attention.

Testing

If you would like to be tested for COVID-19 while at the meeting in Atlanta, you may find test sites at www.fultoncountygga.gov/covid-19/covid-testing-sites.

Mandates

To view current Atlanta guidelines and mandates, visit <https://www.atlantaga.gov/government/mayor-s-office/city-of-atlanta-covid-19-response>

CSRS will be adhering to a strict mask mandate in all CSRS event spaces while not eating or drinking.

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To report a positive COVID-19 incident, please notify the CSRS staff at the Registration Desk.

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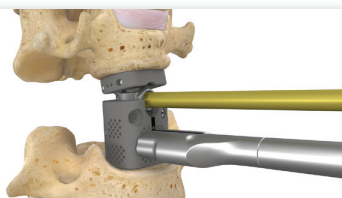
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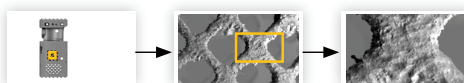
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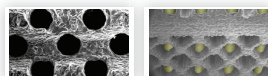


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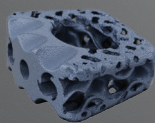
2. Loh OL and Choong C. "Three-dimensional scaffolds for tissue-engineering applications: Role of porosity and pore size." *Tissue Engineering Part B* 19 (2013): 485-502.

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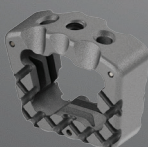
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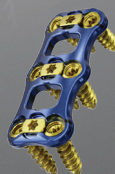
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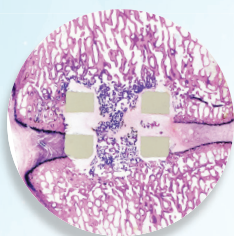
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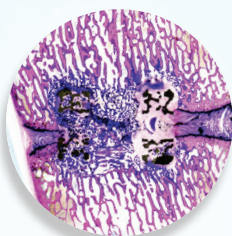
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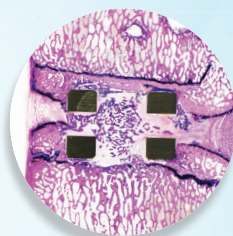
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21st Century Grant Awards

Conventional-therapy & FES-therapy In-Veritas Effects Study (C-FIVE Study): Rehabilitation of the upper extremity for new persistent C5 palsy after surgical treatment of patients with degenerative cervical myelopathy.

Toronto Rehabilitation Institute, University Health Network; University of Toronto
Primary Investigator: Julio Furlan, MD, MBA, MSc, PhD

Glycemic dysfunction in a cervical model of rodent spinal cord injury

University of Mississippi Medical Center
Primary Investigator: Bernadette Grayson, PhD

Seed Starter Grant Award

Objective functional status changes following decompression for cervical spondylotic myelopathy

Emory University
Primary Investigator: Sandra Hobson, MD

Resident/Fellow Grant Awards

Osteogenic effects of varenicline: an in vitro study of human mesenchymal stromal cells and osteoblasts

Rothman Orthopaedic Institute
Primary Investigator: Brian Karamian, MD

Using Ecological Momentary Assessment and Digital Phenotyping to Create a Novel Cervical Radiculopathy Disease Profile

Washington University in St. Louis
Primary Investigator: Jacob Greenberg, MD, MSCI

The Effect of Cervical Orthoses on Intervertebral Kinematics

University of Pittsburgh
Primary Investigator: Stephen Chen, MD

A Patient Centered Quantitative Analysis of Preoperative Expectations and Post-operative Satisfaction in Cervical Fusion

Northwestern University
Primary Investigator: Nicholas Arpey, MD

Spinal Cord Injury Grant Award

The impact of timing of surgery on neurological and functional outcome in traumatic spinal cord injury: a prospective, observational multicenter study (D-SCIRET: Database of Spinal Cord Injury on Recovery and Evaluation of Timing)

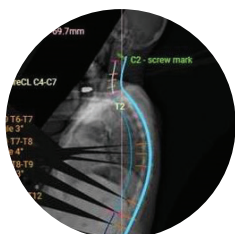
Leiden University Medical Center
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*Special thanks to Irene Hay for her special contribution
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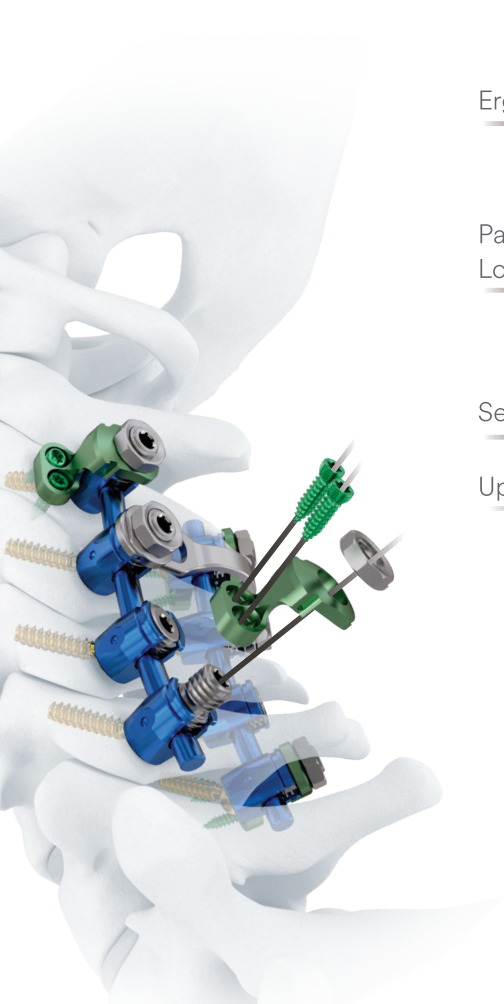
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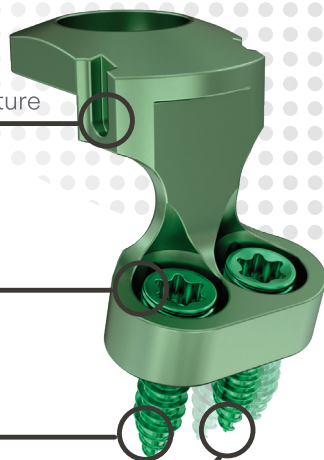


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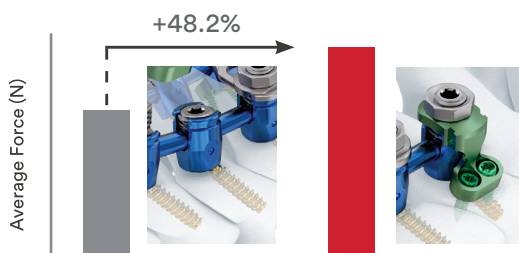
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