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\(^1\),\(^2\)

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1. Test Report TR-1220
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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

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:00pm-8:30pm</td>
<td>Registration Open</td>
<td>Atrium Lobby</td>
</tr>
<tr>
<td>3:00pm-4:30pm</td>
<td>Resident and Fellow Pre-Conference Session</td>
<td>A601</td>
</tr>
<tr>
<td>7:30pm-8:30pm</td>
<td>Welcome Reception for Attendees</td>
<td>Atrium Lobby</td>
</tr>
</tbody>
</table>

## Thursday, December 2

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

## Friday, December 3

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>6:30am-8:30am</td>
<td>Breakfast</td>
<td>Atrium Lobby</td>
</tr>
<tr>
<td>6:30am-5:30pm</td>
<td>Registration Open</td>
<td>Atrium Lobby</td>
</tr>
<tr>
<td>7:00am-5:00pm</td>
<td>Scientific Program – Annual Meeting</td>
<td>Atrium A</td>
</tr>
<tr>
<td>9:00am-11:00am</td>
<td>Guest Breakfast</td>
<td>Pulse Loft</td>
</tr>
<tr>
<td>9:30am-1:30pm</td>
<td>Exhibit Hall Open</td>
<td>Atrium BC</td>
</tr>
<tr>
<td>9:41am-10:11am</td>
<td>Coffee Break in Exhibit Hall</td>
<td>Atrium BC</td>
</tr>
<tr>
<td>12:10pm-1:20pm</td>
<td>Members’ Business Meeting &amp; Lunch</td>
<td>A602</td>
</tr>
<tr>
<td>12:10pm-1:20pm</td>
<td>Lunch for Non-Members in Exhibit Hall</td>
<td>Atrium BC</td>
</tr>
<tr>
<td>3:28pm-3:52pm</td>
<td>Coffee Break</td>
<td>Atrium Lobby</td>
</tr>
</tbody>
</table>

## Saturday, December 4

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00am-9:00am</td>
<td>Breakfast</td>
<td>Atrium Lobby</td>
</tr>
<tr>
<td>7:00am-10:00am</td>
<td>Registration Open</td>
<td>Atrium Lobby</td>
</tr>
<tr>
<td>8:00am-12:55pm</td>
<td>Scientific Program – Annual Meeting</td>
<td>Atrium A</td>
</tr>
<tr>
<td>9:00am-11:00am</td>
<td>Guest Breakfast</td>
<td>Pulse Loft</td>
</tr>
<tr>
<td>9:41am-9:56am</td>
<td>Coffee Break</td>
<td>Atrium Lobby</td>
</tr>
<tr>
<td>12:47pm-12:55pm</td>
<td>Close of Meeting</td>
<td>Atrium A</td>
</tr>
</tbody>
</table>

---

*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.
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 wresting 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

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

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.
Twenty-Sixth Instructional Course

of the

CERVICAL SPINE RESEARCH SOCIETY

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

**Degenerative Pt. I**  
*Moderator(s): Charles Crawford, MD; Paul Arnold, MD*

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Moderator(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00pm</td>
<td>CSRS Welcome</td>
<td>John Rhee, MD; Brian Kwon, MD, PhD, FRCSC</td>
</tr>
<tr>
<td>7:05pm</td>
<td>Introduction</td>
<td>Charles Crawford, MD; Paul Arnold, MD</td>
</tr>
<tr>
<td>7:07pm</td>
<td>Surgical Decision Making for Single-Root Radiculopathy In the Setting of Multi-Level Spondylosis: Choosing Levels, Approaches, and Techniques</td>
<td>John Rhee, MD</td>
</tr>
<tr>
<td>7:15pm</td>
<td>Discussion</td>
<td></td>
</tr>
<tr>
<td>7:21pm</td>
<td>Master Class Video: Posterior Foramontomy for Cervical Radiculopathy</td>
<td>Thomas Mroz, MD</td>
</tr>
<tr>
<td>7:29pm</td>
<td>Master Class Video: Posterior Endoscopic Techniques for Cervical Radiculopathy</td>
<td>Sang Hun Lee, MD</td>
</tr>
<tr>
<td>7:37pm</td>
<td>Discussion</td>
<td></td>
</tr>
<tr>
<td>7:45pm</td>
<td>DEBATE - Mildly Symptomatic Myelopathy: Wait and Watch</td>
<td>Samuel Cho, MD</td>
</tr>
<tr>
<td>7:53pm</td>
<td>DEBATE - Mildly Symptomatic Myelopathy: Operate</td>
<td>Jason Savage, MD</td>
</tr>
<tr>
<td>8:01pm</td>
<td>Discussion</td>
<td></td>
</tr>
</tbody>
</table>

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.
**INSTRUCTIONAL COURSE FINAL PROGRAM**

All times are listed in Eastern Time (ET).

Sessions marked with a ![LIVE](https://example.com/live-icon) icon are available virtual-live on date and time listed in the session title.

Sessions marked with a ![on-demand](https://example.com/on-demand-icon) icon are available on-demand December 6, 2021 – January 31, 2022.

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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

GlobusMedical.com/COALITIONMIS

---

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Sessions marked with a ![LIVE](https://example.com/live-icon) icon are available virtual-live on date and time listed in the session title.
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<thead>
<tr>
<th>Time</th>
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<th>Moderator(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7:00pm-7:03pm</td>
<td>CSRS Welcome</td>
<td>John Rhee, MD; Neill Wright, MD</td>
</tr>
<tr>
<td>7:03pm-7:05pm</td>
<td>Introduction</td>
<td>Michael Gerling, MD; Sang Hun Lee, MD</td>
</tr>
<tr>
<td>7:05pm-7:15pm</td>
<td>Tumor: Prognostication, Surgery (Or Not) for Advanced Cervical Metastasis</td>
<td>Langston Holly, MD</td>
</tr>
<tr>
<td>7:15pm-7:25pm</td>
<td>Tumor: Surgical Options for Cervical Metastasis (Fusion or Not, Fixation Methods, Mis, Innovative Options Navigation, Robotics, etc.)</td>
<td>Jean-Paul Wolinsky, MD</td>
</tr>
<tr>
<td>7:25pm-7:30pm</td>
<td>Discussion</td>
<td></td>
</tr>
<tr>
<td>7:30pm-7:40pm</td>
<td>Tumor: Radiation Treatment Update on Cervical Metastasis</td>
<td>Kristin Redmond, MD</td>
</tr>
<tr>
<td>7:40pm-7:50pm</td>
<td>Infection: Update on The Primary Cervical Infection (Discitis, Epidural Infection), Surgical Options (Fixation, Graft Material), Perioperative Management</td>
<td>Jesse Bible, MD</td>
</tr>
<tr>
<td>7:50pm-8:00pm</td>
<td>Infection: Post-Surgical Infection of the Cervical Spine, Update and New Technologies</td>
<td>Peter Passias, MD</td>
</tr>
<tr>
<td>8:00pm-8:12pm</td>
<td>Discussion</td>
<td></td>
</tr>
</tbody>
</table>

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Tuesday
11/30/2021

8:20pm-9:30pm  📹 LIVE 📹

Cervical Trauma Pt. I
Moderator(s): Jefferson Wilson, MD; Jesse Bible, MD

8:20pm-8:21pm  Introduction
Jefferson Wilson, MD; Jesse Bible, MD

8:21pm-8:31pm  Management of The Octa- Or Nonagenarian in Nursing Home with Odontoid Fracture. What are my Treatment Considerations?
Chris Kepler, MD

8:31pm-8:36pm  Discussion

8:36pm-8:46pm  Role and Timing of Surgery in Acute Central Cord Syndrome Patient with a Stable Spine
Alpesh Patel, MD, MBA

8:46pm-8:51pm  Discussion

8:51pm-9:01pm  Hemodynamic Management of Cervical Spinal Cord Injury Patients: What Should We be Targeting?
Brian Kwon, MD, PhD, FRCSC

9:01pm-9:06pm  Discussion

9:06pm-9:16pm  Neuroprotective and Regenerative Options for Spinal Cord Injury In 2021 and 2031
Michael G. Fehlings, MD, PhD, FRCSC, FACS

9:16pm-9:30pm  Discussion

Visit the CSRS VIDEO ARCHIVE
- Lectures
- Debates
- Symposia

www.csrs.org/video_archive/

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<tr>
<th>Time</th>
<th>Session</th>
<th>Location</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5:00pm-5:05pm</td>
<td>CSRS Welcome</td>
<td>Atrium A</td>
<td>Neill Wright, MD; Brian Kwon, MD, PhD, FRCSC</td>
</tr>
<tr>
<td>5:05pm-5:07pm</td>
<td>Introduction</td>
<td>Atrium A</td>
<td>Jefferson Wilson, MD; Jesse Bible, MD</td>
</tr>
<tr>
<td>5:07pm-5:12pm</td>
<td>Cervical Facet Dislocation: Closed Reduction Tips and Tricks</td>
<td>Atrium A</td>
<td>Steven Ludwig, MD</td>
</tr>
<tr>
<td>5:12pm-5:20pm</td>
<td>DEBATE - Bilateral Cervical Facet Dislocation: Anterior Fixation is Best</td>
<td>Atrium A</td>
<td>Brandon Lawrence, MD</td>
</tr>
<tr>
<td>5:20pm-5:28pm</td>
<td>DEBATE - Bilateral Cervical Facet Dislocation: Posterior Fixation is Best</td>
<td>Atrium A</td>
<td>James Harrop, MD, FAANS</td>
</tr>
<tr>
<td>5:28pm-5:37pm</td>
<td>Discussion</td>
<td>Atrium A</td>
<td></td>
</tr>
<tr>
<td>5:37pm-5:49pm</td>
<td>Management of Recurrent Metastatic Cervical Tumors After Surgery/Radiation Therapy</td>
<td>Atrium A</td>
<td>Daniel Sciubba, MD</td>
</tr>
<tr>
<td>5:49pm-6:01pm</td>
<td>Management &amp; Avoidance of Surgical Complications (Anterior/Posterior Wound Complication, Mechanical Complication Etc.)</td>
<td>Atrium A</td>
<td>Ziya Gokaslan, MD</td>
</tr>
<tr>
<td>6:01pm-6:12pm</td>
<td>Discussion</td>
<td>Atrium A</td>
<td></td>
</tr>
</tbody>
</table>

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**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**

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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)

NuVasive

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

DePuy Synthes

GLOBUS MEDICAL

Stryker

Zimmer Biomet

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

In-Kind Media Sponsor

spinalnews international
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.

<table>
<thead>
<tr>
<th>Company</th>
<th>Booth</th>
<th>Company Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additive Implants</td>
<td>500</td>
<td>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.</td>
</tr>
<tr>
<td>atec</td>
<td>302</td>
<td>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.</td>
</tr>
<tr>
<td>Bone Foam</td>
<td>200</td>
<td>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.</td>
</tr>
<tr>
<td>Camber Spine Technologies</td>
<td>208</td>
<td>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.</td>
</tr>
<tr>
<td>Centinel Spine</td>
<td>202</td>
<td>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®).</td>
</tr>
<tr>
<td>Cerapedics</td>
<td>408</td>
<td>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.</td>
</tr>
<tr>
<td>Curiteva</td>
<td>213</td>
<td>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.</td>
</tr>
<tr>
<td>Company</td>
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<td>Company Description</td>
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<tr>
<td>DePuy Synthes</td>
<td>104</td>
<td>DePuy Synthes, the Orthopaedics Company of Johnson &amp; 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.</td>
</tr>
<tr>
<td>Eminent Spine</td>
<td>406</td>
<td>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.</td>
</tr>
<tr>
<td>Globus Medical</td>
<td>105</td>
<td>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.</td>
</tr>
<tr>
<td>Immertec</td>
<td>212</td>
<td>Immertec is a software company that provides an immersive, peer-to-peer collaboration platform for physicians to observe cases remotely.</td>
</tr>
<tr>
<td>Innovasis</td>
<td>402</td>
<td>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.</td>
</tr>
<tr>
<td>Kuros Biosciences</td>
<td>206</td>
<td>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.</td>
</tr>
<tr>
<td>Life Instruments</td>
<td>300</td>
<td>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.</td>
</tr>
<tr>
<td>Medtronic</td>
<td>100</td>
<td>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.</td>
</tr>
</tbody>
</table>
## 2021 Exhibit Companies

<table>
<thead>
<tr>
<th>Company</th>
<th>Booth</th>
<th>Company Description</th>
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<tbody>
<tr>
<td>MiRus</td>
<td>207</td>
<td>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.</td>
</tr>
<tr>
<td>NuVasive</td>
<td>101</td>
<td>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.</td>
</tr>
<tr>
<td>Orthofix</td>
<td>409</td>
<td>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 <a href="http://www.Orthofix.com">www.Orthofix.com</a> to learn more.</td>
</tr>
<tr>
<td>Piezosurgery</td>
<td>413</td>
<td>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.</td>
</tr>
<tr>
<td>Providence Medical Technology</td>
<td>209</td>
<td>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.</td>
</tr>
<tr>
<td>SeaSpine</td>
<td>401</td>
<td>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 <a href="http://www.seaspine.com">www.seaspine.com</a> for more information.</td>
</tr>
<tr>
<td>Spine Wave</td>
<td>303</td>
<td>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.</td>
</tr>
<tr>
<td>SpineCraft</td>
<td>301</td>
<td>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.</td>
</tr>
<tr>
<td>SpineGuard</td>
<td>403</td>
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</tbody>
</table>
## 2021 Exhibit Companies

<table>
<thead>
<tr>
<th>Company</th>
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<tbody>
<tr>
<td><strong>Stryker</strong></td>
<td>203</td>
<td>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.</td>
</tr>
<tr>
<td>Surgalign Spine Technologies</td>
<td>501</td>
<td></td>
</tr>
<tr>
<td>Surgeons Capital Management</td>
<td>407</td>
<td>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</td>
</tr>
<tr>
<td>Terumo BCT</td>
<td>400</td>
<td>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.</td>
</tr>
<tr>
<td>Zimmer Biomet Spine</td>
<td>201</td>
<td>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.</td>
</tr>
</tbody>
</table>
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 to learn more.

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50th Annual Meeting & 27th Instructional Course

San Diego

November 16-19 2022

Call for Abstracts March 1 - April 18, 2022

Visit www.csrs.org
Forty-Ninth Annual Meeting

of the
CERVICAL SPINE RESEARCH SOCIETY

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. Haïd, MD, FAANS • Craig A. Kuhns, MD
Sergio A. Mendoza-Lattes, MD • Justin W. Miller, MD • Ahmad Nassr, MD
Daniel K. Park, MD • Jeffrey A. Rihn, MD • Carlo Santaguida, MD, FRCSC
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 Instrucional Course, Annual Meeting Scientific Program, E-Posters, Industry Workshops, or Technical Exhibits.

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.
Monday 11/29/2021

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.
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

Tuesday 11/30/2021

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

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Sessions marked with a 🎥 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
*Program Co-Chairs, Samuel K. Cho, MD; Steven C. Ludwig, MD*

7:10am-7:11am  Introduction
*S. Tim Yoon, MD, PhD; Ra’Kerry Rahman, MD*

7:11am-7:16am  PRESENTATION #1
Impact of Depression Severity on Patient Reported Outcomes Following Multilevel Anterior Cervical Discectomy and Fusion
*Elliot DK. Cha, MS*

7:16am-7:21am  PRESENTATION #2
No Difference in Clinical Outcomes When Instrumenting Across the Cervicothoracic Junction in Multilevel Posterior Cervical Fusion
*Gregory R. Toci, BS*

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
*Eddie de Dios, MD*

7:26am-7:31am  PRESENTATION #4
Is it better to stop at C2 or C3/4 in elective posterior cervical decompression and fusion?
*Scott L. Zuckerman, MD*

7:31am-7:36am  PRESENTATION #58
Surgical Apgar Score and Controlling Nutritional Status Score are significant predictors of major complications after cervical spine surgery
*Kousei Miura, MD, PhD*

7:36am-7:47am  Discussion

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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.
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
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
Neill Wright, MD; Alpesh Patel, MD, MBA

8:25am-8:30am Global Perspectives - United States
Rick Sasso, MD

8:30am-8:35am Global Perspectives - Europe
Heiko Koller, MD, PhD

8:35am-8:40am Global Perspectives - Asia Pacific
Yoon Ha, MD, PhD

8:40am-8:47am Discussion

8:47am-8:53am DEBATE - Is Telemedicine Here to Stay? Yes, It’s Awesome
W. Ryan Spiker, MD

8:53am-8:59am DEBATE - Is Telemedicine Here to Stay? No, It’s Worthless
Andrew Hecht, MD

8:59am-9:05am Discussion

9:05am-9:11am Using the Telemedicine Platform - How to Perform a Virtual Cervical Physical Examination
Gregory Schroeder, MD

9:11am-9:17am Using the Telemedicine Platform - How Telemedicine Improved My Ability to Care for Cervical Spine Patients
Sheeraz Qureshi, MD, MBA

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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<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Presenter</th>
</tr>
</thead>
</table>
| 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 Equipoise  
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 |                                                                  |
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
Dan Cavanaugh, MD; Alpesh Patel, MD; Tim Yoon, MD
A701

DePuy Synthes
Innovations in Lateral Mass Fixation to Address Complex Cervical Deformity Featuring: DePuy Synthes Spine SYMPHONY™ OCT System & MULTIPOINT SECURE
Christopher Ames, MD
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
Cesar Silva, MD, Clinical Study Director, Kuros Biosciences; Katherine Sage, MD, Director of Scientific Affairs, Kuros Biosciences
A702

Medtronic
Intelligence-based medicine: how big data, analytics and patient-specific implants are changing cervical spine surgery
Lee Tan, MD; Peter Passias, MD; Christopher Kleck, MD
A704

NuVasive
Seeing is knowing: How visualization is advancing anterior cervical surgery
Rick Sasso, MD; Charles Crawford, MD; Jack Zigler, MD, FACS
A706

Stryker
360 View of the Cervical Spine
Griffin Baum, MD; Erica Bisson, MD; Scott Parker, MD
A705

Zimmer Biomet
Minimizing Complications in Cervical Arthroplasty Procedures
Neill Wright, MD
A703

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Thursday 12/2/2021

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.

*Data on file. Based on review of publicly available materials at the time of production.

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2:05pm-3:10pm  Atrium A

This event will not be recorded.

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

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

**3:40pm-4:56pm**

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
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/BcACytjX6zau4pn26 or email Natalie Norket at nnorket@nuvasive.com

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Sessions marked with a 📡 icon are available virtual-live on date and time listed in the session title.
6:30am-8:30am  Atrium Lobby

Breakfast

6:30am-5:30pm  Atrium Lobby

Registration Open

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

7:05am-7:06am  Introduction
Erik Olsson, MD; Clinton Devin, MD

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
Richard D. Guyer, MD

7:11am-7:16am  PRESENTATION #31
Cervical Myelopathy and Hip Fractures: Co-incidence, Epidemiology, and Costs of Care
Edward Baldwin, III, MD

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
Sarthak Mohanty, BS

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
Kern H. Guppy, MD, PhD

7:26am-7:31am  PRESENTATION #34
Physical Examination Findings of Patients With Myelopathy and Diabetes Mellitus
Mena G. Kerolus, MD

7:31am-7:36am  PRESENTATION #35
Do Favorable Short-term Patient Reported Outcomes after ACDF Predict Loss to One- and Two-Year Follow-Up?
Hannah A. Levy, BS

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Sessions marked with a 🎥 LIVE icon are available virtual-live on date and time listed in the session title.
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  
Comron Saifi, MD

7:41am-7:52am  Discussion

7:52am-7:57am  PRESENTATION #37  
Safety Evaluation of Hydroxyapatite-Demineralized Bone Matrix Composite Scaffold for Spinal Fusion  
Wellington K. Hsu, MD

7:57am-8:02am  PRESENTATION #38  
Computed Tomography Osteoabsortiometry (CT-OAM) Evaluation of Subchondral Bone Mineral Density in Cervical Endplates and Uncovertebral Joints: Implications for Subsidence and Clinical Practice  
Athan G. Zavras, BA

8:02am-8:07am  PRESENTATION #39  
Novel In Vivo Imaging System of Grafted Human iPS Cell-Derived Neuron Activity after Spinal Cord Injury  
Kentaro Ago, MD

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  
Momotaro Kawai, MD

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  
Takahiro Kitagawa, MD

8:17am-8:30am  Discussion

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Symposia 3: Deformity Consideration for the Everyday Cervical Degenerative Conditions  
_Moderator(s): Langston Holly, MD; Praveen Mummaneni, MD_

8:30am-9:41am  
_Atrium A_

8:30am-8:32am  
**Introduction**  
_Langston Holly, MD; Praveen Mummaneni, MD_

8:32am-8:42am  
**Patient with Myelopathy/Radiculopathy Doesn’t Have Perfect Alignment - Do They Really Need a Cervical Deformity Correction?**  
_John Rhee, MD_

8:42am-8:52am  
**How to Prevent Iatrogenic Deformity**  
_Regis Haid, MD, FAANS_

8:52am-9:02am  
**Choice of UIV**  
_Stuart Hershman, MD_

9:02am-9:12am  
**Choice of LIV and When to Cross the CT Junction**  
_Lee Tan, MD_

9:12am-9:22am  
**When Should I Include or Exclude an Adjacent Segment Disc**  
_Andrew Dailey, MD, FAANS_

9:22am-9:41am  
**Discussion**

9:41am-10:11am  
_Atrium BC_

9:41am-10:11am  
**Coffee Break**

10:11am-10:50am  
_Atrium A_

10:11am-10:20am  
**Introduction**  
_James Harrop, MD, FAANS_

10:20am-10:50am  
**Presidential Address**  
_John Rhee, MD_

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Sessions marked with a 🎥 icon are available virtual-live on date and time listed in the session title._
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
P. Justin Tortolani, MD; Daniel Sciubba, MD

10:51am-10:56am
PRESENTATION #42
Longitudinal Changes in Adjacent Segment Disc Deformation After Cervical Arthrodesis
William J. Anderst, PhD

10:56am-11:01am
PRESENTATION #43
Finite Element Modeling to Determine the Effect of a Hybrid Construct Adjacent to a Cervical Disc Arthroplasty
Jamie L. Baisden, MD

11:01am-11:06am
PRESENTATION #44
In Vivo Deformation Patterns of Craniocervical Ligaments during Dynamic Head Axial Rotation
Thomas D. Cha, MD

11:06am-11:11am
PRESENTATION #45
Supplemental Fixation of Lateral Mass Screws: A Strategy to Improve Posterior Cervical Fusion Fixation Strength
Robert M. Havey, MS

11:11am-11:16am
PRESENTATION #46
Biomechanical Analysis of 3-level ACDF Construct Using a Finite-element Cervical Spine Model
Lee A. Tan, MD

11:16am-11:21am
PRESENTATION #47
Adjacent Level Kinematics Following One- and Two-Level Anterior Cervical Disectomy and Fusion
William J. Anderst, PhD

11:21am-11:26am
PRESENTATION #48
In Vivo Kinematics of the Head-Neck Complex during Dynamic Head Axial Rotation
Thomas D. Cha, MD

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
Catherine R. Carlile, MD

11:38am-11:43am
PRESENTATION #50
The Effect of Undercorrection on Distal Junctional Kyphosis in Adult Cervical Deformity Patients
Oscar Krol, BA

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Sessions marked with a 📺 LIVE icon are available virtual-live on date and time listed in the session title.
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  
Athan G. Zavras, BA

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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Sessions marked with a 📅 icon are available virtual-live on date and time listed in the session title.
### Session 6: Meeting Previews; Awards - Paper & E-Poster Awards Presentations, Lifetime Achievement Award

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

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

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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.
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.
2:06pm-2:28pm  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-2:22pm  
**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-2:27pm  
**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-2:32pm  
**PRESENTATION #55**  
Long Term Associations Between Current Smoking Status and Outcome After Elective Cervical Spine Surgery  
*Gordon Preston, DO*

2:27pm-2:37pm  
**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-2:45pm  
**PRESENTATION #57**  
Highest Achievable Outcomes for Patients Undergoing Cervical Deformity Corrective Surgery by Frailty  
*Virginie C. Lafage, PhD*

2:45pm-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*
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
### Syposium 4: Master Debate Series I

**Moderator(s):** Darrel Brodke, MD  

<table>
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<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker(s)</th>
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<tbody>
<tr>
<td>3:52pm-3:55pm</td>
<td><strong>Introduction and Case Presentation I</strong></td>
<td>Darrel Brodke, MD</td>
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<tr>
<td>3:55pm-4:05pm</td>
<td><strong>DEBATE - Cervical Disc Disease with Myelopathy: ACDF</strong></td>
<td>Sanford Emery, MD, MBA</td>
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<tr>
<td>4:05pm-4:15pm</td>
<td><strong>DEBATE - Cervical Disc Disease with Myelopathy: CDR</strong></td>
<td>K. Daniel Riew, MD</td>
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<tr>
<td>4:15pm-4:26pm</td>
<td><strong>Discussion</strong></td>
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<tr>
<td>4:26pm-4:29pm</td>
<td><strong>Case Presentation II</strong></td>
<td>Darrel Brodke, MD</td>
</tr>
<tr>
<td>4:29pm-4:39pm</td>
<td><strong>DEBATE - 3-Level CDD: ACDF</strong></td>
<td>John Heller, MD</td>
</tr>
<tr>
<td>4:39pm-4:49pm</td>
<td><strong>DEBATE - 3-Level CDD: Hybrid Approach</strong></td>
<td>Vincent Traynelis, MD</td>
</tr>
<tr>
<td>4:49pm-5:00pm</td>
<td><strong>Discussion</strong></td>
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</table>

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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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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
ANNUAL MEETING FINAL PROGRAM

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
Wellington Hsu, MD

9:02am-9:04am
The Role of Calcitonin Gene-Related Peptide in Intervertebral Disc Neurogenic Inflammation: A Potential Therapeutic Target for Discogenic Pain
Jose Canseco, MD

9:04am-9:06am
Analysis of the Human Serum Proteome in Cervical Radiculopathy Patients to Predict Who Will Fail Conservative Treatment and Require Surgery
Steven Pressciutti, MD

9:06am-9:08am
Discussion

9:08am-9:10am
Morphological, Biochemical and Biomechanical Characterization of Human Cervical Endplate in Degenerated Disc
Nathan Buchweitz, PhD Student

9:10am-9:12am
Discussion

9:12am-9:14am
Is Vaporized Nicotine as Detrimental to Spinal Fusions as Cigarette Smoke?
Jesse Bible, MD

9:14am-9:16am
Treatment of Spinal Cord Injury With Bone Marrow Mesenchymal Stem Cell Derived Exosomes
Ankit Mehta, MD

9:16am-9:18am
A Multi-Disciplinary Approach to Reduce Chronic Opioid Use Prior to Elective Cervical Spine Surgery
Andrew Pugely, MD

9:18am-9:20am
Quantitative Histomorphological Characterization of Human Cervical Nerve Roots to Determine the Relationship with Postoperative C5 Palsy
P. Justin Tortolani, MD

9:20am-9:22am
Exploring Prognostic Brain Biomarkers for Cervical Myelopathy: A Resting-State Functional MRI Multicenter Study
Takashi Kaito, MD, PhD

9:22am-9:24am
Randomized Trial of Opioid vs. Non-Opioid Postoperative Pain Regimens After Anterior Cervical Discectomy and Fusion
Amir Abtahi, MD

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Sessions marked with a 📸 icon are available virtual-live on date and time listed in the session title.
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
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 Disclocation: I fix them
  
  *Erica Bisson, MD, MPH*

- 10:07am-10:16am  DEBATE - Traumatic Cervical Facet Fractures without Disclocation: 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 Disclocation: Closed Reduction Always and then OR
  
  *Carlo Bellabarba, MD*

- 10:36am-10:45am  DEBATE - In an Awake, Alert, Cooperative Patient with a Cervical Disclocation: OR and Forget About the Closed Reduction
  
  *Vincent Traynelis, MD*

- 10:45am-10:56am  Discussion
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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<th>Time</th>
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<th>Title</th>
<th>Speaker</th>
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<tbody>
<tr>
<td>11:42am-11:47am</td>
<td>#76</td>
<td>Risk Factors for MCID Drop-Off in Patients Undergoing Anterior Cervical Discectomy and Fusion</td>
<td>Conor P. Lynch, MS</td>
</tr>
<tr>
<td>11:47am-11:52am</td>
<td>#77</td>
<td>Incidence of Noncontiguous Cervical Injury in Patients with Thoracic Spine Fractures</td>
<td>Patrick Curtin, MD</td>
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<tr>
<td>11:52am-11:57am</td>
<td>#78</td>
<td>International Validation of the AO Spine Subaxial Injury Classification System: The Importance of Methodology</td>
<td>Brian A. Karamian, MD</td>
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<td>11:57am-12:02pm</td>
<td>#79</td>
<td>Survival Rates in Atlanto-occipital Dissociation: A Look at the Past 20 Years</td>
<td>Gautham Prabhakar, MD</td>
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<td>12:02pm-12:12pm</td>
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<td>12:12pm-12:17pm</td>
<td>#80</td>
<td>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</td>
<td>Masahiro M. Funaba, MD</td>
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<td>12:17pm-12:22pm</td>
<td>#81</td>
<td>Enoxaparin promotes functional recovery after spinal cord injury by antagonizing PTPR sigma</td>
<td>Sadayuki Ito, MD</td>
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<tr>
<td>12:22pm-12:27pm</td>
<td>#82</td>
<td>Surgical outcome of cervical and thoracic extramedurally spinal tumor</td>
<td>Akinobu Suzuki, MD</td>
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<td>12:27pm-12:32pm</td>
<td>#83</td>
<td>Laminectomy Alone versus Laminectomy with Fusion for Degenerative Cervical Myelopathy - a Long-term Study of a National Cohort</td>
<td>Eddie de Dios, MD</td>
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<td>12:32pm-12:47pm</td>
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E-Posters, E-Poster Awards, On-Demand Content

E-Posters
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

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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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HEDRON™ DEMONSTRATED MORE TOTAL BONE VOLUME*  
AT 6 WEEKS POST-OP

51%  63%  
MORE  MORE  
VS PEEK  VS Ti

HEDRON™ DEMONSTRATED MORE BONE ONGROWTH*  
AT 6 WEEKS POST-OP

175%  295%  
MORE  MORE  
VS PEEK  VS Ti

A pre-clinical sheep interbody study using HEDRON™, Titanium (Ti), and PEEK implants was performed to compare bone ingrowth and ongrowth.

3D PRINTED INTERBODY SPACERS
GLOBUSMEDICAL.COM/HEDRON
Congratulations to the 2021 CSRS Research Grant Award Winners

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 spondyloitic 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 Postoperative Satisfaction in Cervical Fusion
Northwestern University 
Primary Investigator: Nicholas Arpey, MD

Spinal Cord Injury Grant Award

Leiden University Medical Center 
Primary Investigator: Charlotte Adegeest, MD

Special thanks to Irene Hay for her special contribution to CSRS for the Spinal Cord Injury Grant.
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 to learn more.

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Expanding Fixation
MULTIPOINT SECURE™

Ergonomic Holding Feature
Patented Variable Angle Locking Technology
Self-Drilling Tip
Up to 25° Cone of Angulation

Comparison of Pullout Strength in Bone

<table>
<thead>
<tr>
<th></th>
<th>Average Force (N)</th>
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<tbody>
<tr>
<td>LM Screw</td>
<td></td>
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<tr>
<td>LM Screw with MP</td>
<td>+48.2%</td>
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</tbody>
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LM = Lateral Mass
MP = MULTIPOINT SECURE™ Adapter with 2 Screw Fixation

SYMPHONY™ OCT System

Please refer to the Instructions For Use for a complete list of indications, contraindications, warnings and precautions.
Reference: Internal Documentation on File – ADAPTV103584004
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