

# 18<sup>th</sup> Annual International Congress on Early Onset Scoliosis and the Growing Spine

November 13–15, 2024 | Scottsdale, Arizona

Wednesday, November 13

<b>2:00–5:00 pm</b>	<b>ICEOS 2024 General Registration Opens</b>	<b>Maricopa/Papago Hall</b>
<b>Session 1</b>	<b>ICEOS Opening Session – The Past</b>	<b>Maricopa Room</b>
	<i>Moderators: L. Blakemore, G. Redding</i>	
4:40 pm	Welcome	R. El-Hawary
4:45	The Past - Introduction	G. Redding
4:47	The History of Early Onset Scoliosis Treatment	B. Akbarnia
4:55	My Experience with Traditional Growing Rods	G. Thompson
5:03	My Experience with VEPTR	J. Emans
5:11	European Experience with Growth Friendly Treatment	R. Castelein
5:19	Asian Experience with Early Onset Scoliosis	T. Zhang
5:27	Round Table Discussion <i>Moderators: R. Murphy, G. Hogue</i> Panel: B. Akbarnia, G. Thompson, J. Emans, C. Johnston, D. Brockmeyer, R. Betz, J. Smith, R. Castelein	
6:05	Corporate Recognition and Thank-You to Top Supporters	P. Sponseller
6:10	Introduction to Smith Family Lecture	J. Smith, MD
<b>6:15</b>	<b>Smith Family Lecture   Stephen Murphy</b>	
6:30	Adjourn	
<b>6:30 pm</b>	<b>Welcome Reception</b>	<b>Apache Room</b>

Thursday, November 14

<b>6:45 am</b>	<b>Registration</b>	<b>Maricopa/Papago Hall</b>
<b>7:00</b>	<b>Continental Breakfast and Exhibit Viewing</b>	<b>Apache Room</b>
<b>Session 2</b>	<b>EOS—The Present (Best Evidence)</b>	<b>Maricopa Room</b>
	<i>Moderators: B. Yaszay, D. Sucato</i>	
7:30 am	Welcome	R. El-Hawary
7:35	Tethered Spinal Cords	V. Ravindra
7:42	Spinal Tumor Classification (Intramedullary and Extramedullary)	M. Groves
7:49	Managing the Cervical Spine in Young Children	A. Jea
7:56	Discussion	
8:05	Better Together – Neurosurgery and Orthopaedic Surgery (Spondy)	R. Anderson, M. Vitale
8:12	Better Together – Intra-Operative Mentorship	B. Ramo, C. Johnston

8:19	Discussion	
8:26	Genetics Primer on Bone Dysplasias	K. White
8:35	Genetics of Scoliosis and Personalized Medicine	N. Miller
8:42	Discussion	
8:49	Genetics of Early Onset Scoliosis	C. Wise
8:56	Disc Biomechanics as an Etiology of Scoliosis	R. Castelein
9:03	Biologic Solutions and Tissue Engineering	C. Johnston
9:10	Discussion	

**9:15 am Refreshment Break and Exhibit Viewing Apache Room**

**Session 3 Scientific Papers #1–21 Maricopa Room**

*Moderators: F. Pellise, J. Gomez*

9:45 am	Paper #1   Longitudinal Pulmonary Function after Surgery in Early Onset Scoliosis: We Need to Do Better	S. Yang
9:49	Paper #2   Increases in Three-Dimensional Spine Length during Growth Friendly Treatment for Early Onset Scoliosis are Moderately Correlated with Improved Pulmonary Function	A. Mishreky
9:53	Paper #3   Dynamic 4D Computed Tomography can Measure Increased Ventilation Heterogeneity in Thoracic Insufficiency Syndrome Rabbit Model	J. Jordan
9:57	Discussion	
10:03	Paper #4   Serial Changes in Respiratory Muscle Function among Children with EOS	G. Redding
10:07	Paper #5   Relevant Basic Science Supporting Extraspinal Fixation for Severe Pediatric Spinal Deformity	R. Gross
10:11	Paper #6   The Biological Responses to Titanium Alloy Debris Using a Pediatric Animal Model	B. Henry
10:15	Discussion	
10:21	Paper #7   Flexion/Extension MR is Safe in Infants and Children	B. Shannon
10:25	Paper #8   Safety of Traditional Growing Rods in Patients with Early-Onset Congenital Scoliosis Associated with Type-I Split Cord Malformation	H. Sun
10:29	Paper #9   Tethered Cord Release Either Prevents or Slows Scoliosis Progression	S. Lee
10:33	Discussion	
10:39	Paper #10   Clinical Outcomes of One-stage Posterior Hemivertebra Resection and Mono-segment Fusion for Growing Children at the End of Spinal Growth: A Mean 10-year Follow-up Study	Y. Zhao

10:43	Paper #11   Clinical and Radiological Outcomes of Posterior-Only Hemivertebra Resection and Short-Segment Fusion with Pedicle Screw Fixation in Children Under the Age of 5, Followed Until Skeletal Maturity	M. Enercan
10:47	Paper #12   Lessons Learned from Posterior Hemivertebra Resection and Short Segment Fusion for Congenital Early Onset Scoliosis: A Minimally 10-Year Follow-Up Study Until Skeletal Maturity	J. T. Zhang
10:51	Discussion	
10:57	Paper #13   Severe, Focal Early-Onset Congenital Scoliosis Treated with Hemivertebra/3-Column Osteotomy: Outcomes of Growth Guidance vs. Distraction-Based Constructs	A. Martinez Rivera
11:01	Paper #14   Comparative Assessment of 3-Dimensional True Spine Length (3D-TSL) Between Growth-Guidance Surgery (GGS) and Magnetically Controlled Growing Rods (MCGR) for Idiopathic Early Onset Scoliosis (i-EOS)	S. Luhmann
11:05	Paper #15   Growth Guidance Surgery: What Makes it Fail?	W. ElNemer
11:09	Discussion	
11:15	Paper #16   Long-term Neurologic Outcomes, Pseudoarthrosis Rates, and Re-operation Rates in Skeletal Dysplasia Patients Undergoing Cervical Fusion, Occiput-cervical Fusions, and Post-operative Bracing	J. Avendano
11:19	Paper #17   Rod Fracture After MCGR is Related to Rod Diameter but Lower Than TGR	B. Roye
11:23	Paper #18   Complications of Magnetically Controlled Growth Rods (MCGR) Using the Modified Clavien-Dindo-Sink (mCDS) Classification	J. Anari
11:27	Discussion	
11:33	Paper #19   Law of Diminishing Returns Revisited: A 3D Analysis of Spine Growth	R. El-Hawary
11:37	Paper #20   Nearly One out of Four Spondylolysis are Missed by MRI in Pediatric Patients with Low Back Pain	K. Illingworth
11:41	Paper #21   Spinal Fusion Should Be the Definitive End Point of Growth Guidance Surgery	W. ElNemer
11:45	Discussion	
<b>11:55 am</b>	<b>Lunch Served in Exhibit Hall</b>	

**Lunch with Non-CME Workshops**

12:15 pm	Workshop #1   Sponsored by Globus Medical <b>Decision Making in Vertebral Body Tethering for Progressive Idiopathic Scoliosis: Technique Evolution, Instrumentation, and Considerations for Successful Procedures</b>	<b>Maricopa Room</b> Mod: A. Samdani D. Hoernschemeyer J. Rodriguez-Olaverri
12:15 pm	Workshop #2   Sponsored by OrthoPediatrics <b>From Challenges to Triumphs: A Historical and Technological Journey in Early Onset Scoliosis Treatment</b>	<b>Papago I</b> T. Guillaume, C. Hardesty S. Luhmann, P. Sturm
12:15 pm	Workshop #3   Sponsored by Medtronic <b>Navigating Complex EOS: Innovative Approaches for Challenging Situations</b>	<b>Papago II</b> M. Erikson, Y. Li M. Oetgen
1:05	Walking Break	

**Session 4 Scientific Papers #22–38 Maricopa Room***Moderators: C. Bonfield, C. Nnadi*

1:20	Paper #22   Surgical Indications and Outcomes for Upper Cervical Instability in Down Syndrome Patients	J. Pahys
1:24	Paper #23   Safety and Accuracy of Cervical Pedicle Screw Navigation Based on AI-generated, MRI-based Synthetic-CT versus CT	R. Castelein
1:28	Paper #24   Spine MRI in Patients with Arthrogyrosis is Compulsory Due to High Rates of Tethered Cord/low-Lying Conus Medullaris and Scoliosis	A. Hariharan
1:32	Discussion	
1:38	Paper #25   Rib-On-Pelvis Deformity: A Modifiable Driver of Pain and Poor Health-Related Quality of Life in Cerebral Palsy	M. Bowen
1:42	Paper #26   Do Cerebral Palsy Scoliosis Patients with Postoperative Complications have Worse CPCHILD Scores Two Years after Surgery?	P. Cahill
1:46	Paper #27   Outcomes of Spinal Fusion Surgery in Cerebral Palsy: Analysis of Complications, Reoperations, and Clinical and Radiographic Outcomes with Minimum 5-year Follow Up	A. Hariharan
1:50	Discussion	
1:56	Paper #28   Spinal Pathoanatomy of Spinal Muscular Atrophy in the Era of Disease Modifying Therapies	H. Matsumoto
2:00	Paper #29   A Changing EOS Phenotype in SMA: Nusinersen Use is Associated with Increased Curve Magnitude and Kyphosis at the Time of Index Surgery	J. Vorhies
2:04	Paper #30   Risk Model Prediction for Proximal Junctional Kyphosis (PJK) Following Spine Deformity Surgery in Spinal Muscular Atrophy (SMA) Patients with Early Onset Scoliosis (EOS)	H. Matsumoto
2:08	Discussion	
2:14	Paper #31   Growth-friendly Surgery Improves Diaphragm Intrusion and Thoracic Dimensions in Patients with Neuromuscular Scoliosis	Z. Elsabbagh

2:18	Paper #32   Does Spine Fusion Limit Functional Outcomes in Spina Bifida Patients with Severe Spine Deformity?	C. Louer
2:22	Discussion	
2:26	Paper #33   “Cured” Patients with Early Onset Idiopathic Scoliosis After Serial Casting Are at Risk of Recurrence at Intermediate Follow-up	R. Abid
2:30	Paper #34   Can Early Brace Wear Compliance of Patients with Adolescent Idiopathic Scoliosis Predict Future Wear?	M. T. Hresko
2:34	Discussion	
2:38	Paper #35   Spine 2.0: The Tech Revolution in Pediatric Spine Surgery	G. Hogue
2:42	Paper #36   Development of a Machine Learning Tool to Improve Intraoperative Neurophysiological Monitoring: Proof of Concept	V. Arvind
2:46	Paper #37   Predicting Unplanned Return to the Operating Room in Early-Onset Scoliosis Patients Using Machine Learning Techniques: A Multicenter Model	B. Lullo
2:50	Paper #38   MRI-Based Synthetic CT in Pediatric Spine Patients: A Case Series	K. Illingworth
2:54	Discussion	

**3:05 pm Refreshment Break and Exhibit Viewing Apache Room**

**3:35–5:10 pm Concurrent Breakout Sessions**

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<b>Breakout One</b>	<b>Pediatric Back Pain / Spondylolisthesis</b> <i>Moderators: J. Murphy, P. Sponseller</i> Faculty: C. Bonfield, S. Garg, D. Sucato, M. Vitale, M. Kelly, S. Upasani	<b>Papago I+II</b>
<b>Breakout Two</b>	<b>Cervical Spine Trauma</b> <i>Moderators: D. Hedequist, R. Anderson</i> Faculty: R. Iyer, B. Yaszay, J. Pahys, S. Parent	<b>Pueblo I+II</b>

5:10 Adjourn

**5:30 pm PSSG New Member Reception – By Invitation Only Garden Court**

**Friday, November 15**

**7:00 am Registration Maricopa/Papago Hall**  
**Continental Breakfast and Exhibit Viewing Apache Room**

**Session 5 Master Techniques – How I Do It from A to Z Maricopa Room**  
*Moderators: Y. Li, S. Luhmann*  
**Non-CME Session**

7:25 am	Welcome	R. El-Hawary
7:30	How I Treat a Severe Congenital EOS Patient	P. Grabala
7:37	How I Treat an EOS Traditional Growing Rods Graduate	C. Hardesty

7:44	How I Treat an EOS VEPTR Graduate	P. Cahill
7:51	Discussion	
8:00	Traction for Cervical Spine Deformity	D. Bauer
8:07	Traction for Thoracolumbar Spine Deformity	J. Brooks
8:14	How to Set Up a Home Traction Program	K. Smit
8:21	Discussion	
8:30	Percutaneous Robotic Treatment for Spondylolisthesis	D. Skaggs
8:37	Robotic Assisted PSFI	D. Hedequist
8:44	Intra-operative Education with the Use Enabling Technologies	J. Flynn
8:51	Discussion	

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**Session 6**      **The Future of Pediatric Spine Surgery – An Industry Perspective**      **Maricopa Room**  
*Moderators: G. Hogue*      *Non-CME Session*

9:00 am	Round Table Question and Answer	
9:23 am	Refreshment Break and Exhibit Viewing	Apache Room

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**Session 7**      **Scientific Papers, Akbarnia Award, Presidential Address, Keynote**      **Maricopa Room**  
*Moderators: M. Oetgen, J. Smith*

**Free Papers #39–52**

9:53 am	Paper #39   Time to First Reoperation: Modern Luque Trolley vs. Other Fusionless Surgery for EOS: A Prospective Cohort Study with Matched Historical Control Group	J. Ouellet
9:57	Paper #40   Effect of The Spring Distraction System on Different Etiologies in Early Onset Scoliosis	R. Castelein
10:01	Paper #41   Research and Development of a Novel Growth Guidance System	Y. Du
10:05	Paper #42   Complications of the Nemost Growth Rod	K. Lundine
10:09	Discussion	
10:15	Paper #43   Anterior Scoliosis Correction for the Treatment of Patients 5 to 10 Years of Age with Early Onset Scoliosis	R. Betz
10:19	Paper #44   Addressing the Curve: A Comparative Analysis of Vertebral Body Tethering and Posterior Spinal Fusion Outcomes in Older Early Onset Scoliosis Patients	J. Rodriguez Olaverri
10:23	Paper #45   Matched Comparison of Non-Fusion Surgeries for Adolescent Idiopathic Scoliosis: Posterior Dynamic Distraction Device and Vertebral Body Tethering	J. Todderud
10:27	Paper #46   Early Outcomes in Hybrid Spine Fixation for Adolescent/Juvenile Idiopathic Scoliosis: Posterior Spinal Fusion with Combined Anterior Vertebral Body Tethering	A. Samdani
10:31	Discussion	

10:37	Paper #47   Bilateral Anterior Lumbar Vertebral Body Tethering: A Feasibility Cohort Study	A. Samdani
10:41	Paper #48   Single-Row vs. Double-Row Anterior Vertebral Body Tethering: Which Offers Better Clinical and Radiographic Outcomes for AIS Patients?	J. Rodriguez Olaverri
10:45	Paper #49   Early Tether Rupture Compromises 3D Growth Modulation by Failing to Impede Convex Growth	C. Louer
10:49	Paper #50   Thoracic Anterior Vertebral Body Tethering for Adolescent Idiopathic Scoliosis: Long-Term Outcomes with Minimum 5-Year Follow-Up	T. Oh
10:53	Discussion	
11:00	<b>Akbarnia Award Winner, Paper #51   Complications and Unplanned Return to the Operating Room (UPROR) at 5-Years Postoperative Vertebral Body Tethering for Idiopathic Scoliosis</b>	<b>Flavia Alberghina</b>
11:05	<b>Akbarnia Award Winner, Paper #52   Does Open Triradiate Cartilage Lead to Poor Outcomes Among Cerebral Palsy Patients Undergoing Spinal Fusion?</b>	<b>John S. Vorhies</b>
11:10	Discussion and Akbarnia Award Presentation	R. El-Hawary, B. Akbarnia
11:18	Campbell Award Announcement	R. El-Hawary
11:23	Campbell Award Acceptance	Charles E. Johnston
11:30	PSF Presidential Address	P. Sponseller
11:41	ICEOS 2025	Y. Li
11:45	Keynote Introduction	R. El-Hawary
11:46	<b>Keynote Address: Artificial Intelligence in the Evaluation and Treatment of Spine Deformity</b>	<b>Ferran Pellisé</b>
12:10 pm	Q&A and Discussion	
12:16 pm	Lunch Served Outside of Workshop Space	Maricopa/Papago Hall
<b>Lunch with Non-CME Workshops</b>		
12:25 pm	Workshop #4   Sponsored by Highridge Medical <b>Optimal Applications of VBT and PSF for Treating AIS</b>	<b>Maricopa Room</b> L. Blakemore, J. Brooks, A. Harihan, K. Illingworth
12:25 pm	Workshop #5   Sponsored by nView Medical <b>From Routine to Complex Procedures...How We Use Technology to Make Surgeries Safe and Efficient</b>	<b>Papago I</b> S. Luhmann, B. Ramo, D. Sucato
12:25 pm	Workshop #6   Sponsored by ATEC <b>Advancing Early Onset Care: The Future of Treatment with ATEC &amp; EOS</b>	<b>Papago II</b> R. Lark, G. Mundis
1:15	Walking Break	

<b>1:20–2:05 pm</b>	<b>Concurrent Breakout Sessions</b>	
<b>Breakout Three</b>	<b>The Role of Social Media in the Spine Surgeon’s Practice</b> <i>Moderators: R. Fitzgerald, C. Louer</i> Faculty: J. Brooks, A. McIntosh, M. Welborn, J. Anari	<b>Papago I</b>
<b>Breakout Four</b>	<b>Growth Guidance Surgery</b> <i>Moderators: L. Blakemore, B. Snyder</i> Faculty: S. Luhmann, J. Ouellet, R. Castelein, L. Andras	<b>Maricopa Room</b>
<b>Breakout Five</b>	<b>The Future of Pediatric Spine Deformity Education</b> <i>Moderators: J. Flynn, R. Anderson</i> Faculty: D. Skaggs, S. Parent, M. Glotzbecker, W. Truong	<b>Papago II</b>
2:05 pm	Walking Break	
<b>Session 8</b>	<b>Debates</b> <i>Moderators: A. Samdani, D. Hoernschemeyer</i>	<b>Maricopa Room</b>
	Debate #1 – 100 Years from Now – Casting for EOS	
2:10	2124 – We Will Still Be Casting for EOS	Y. Li
2:17	2124 – We Will Not Still Be Casting for EOS	M. Glotzbecker
2:24	Debate Rebuttals/Final Comments	
	Debate #2 – Vertebral Body Tethering	
2:28	VBT - We Have the Ability to Predict the Results of VBT	C. Aubin
2:35	VBT – It’s a Shot in the Dark	L. Andras
2:42	Debate Rebuttals/Final Comments	
	Debate #3 – 100 Years from Now – Spinal Fusion?	
2:46	2124 – We Will Still Be Performing Spinal Fusion Surgery	M. Vitale
2:53	2124 – We Will Not Still Be Performing Spinal Fusion Surgery	S. Parent
3:00	Debate Rebuttals/Final Comments	
	Debate #4 – Enabling Technologies	
3:04	Enabling Technologies Improve Intra-Operative Education	M. Erickson
3:11	Enabling Technologies Impede Intra-Operative Education	J. Gomez
3:18	Debate Rebuttals/Final Comments	
3:25	Closing Remarks	R. El-Hawary
<b>3:30</b>	<b>18<sup>th</sup> Annual ICEOS Adjourns</b>	