

The SPIR  
10<sup>th</sup> International Meeting  
September 26 - 28, 2022  
The Galmont Hotel & Spa  
Galway, Ireland



*inSPIRe*





## Society for Pediatric **Interventional** Radiology

Dear Colleagues,

We made it – SPIR 2022 is here! This year the theme is “inSPIRe” titled as such, as I hope to inspire participants to seek new and innovative ways to solve challenging problems. The program this year features sessions dedicated to some newer imaging techniques and innovative procedures. We will have in depth sessions on contrast enhanced US, neurovascular intervention, lymphatic intervention and precision therapies in oncology and vascular anomalies. This year also brings a new foray into a “Jeopardy” style quiz, pitting young female faculty against young male faculty, in what promises to be a fun filled educational experience. The debate session and “how I do it” sessions were very popular last year and will be continued this year. Hearing experts debate controversial topics, and present pearls of wisdom in “how I do it” sessions are invaluable. In addition, we have invited faculty to present a challenging case of their choice, which I am sure will have very beneficial teaching points.

Words cannot express how grateful I am to all the faculty, who have given their time to shape this year’s program. I am delighted to have so many young faculty on the program this year, and that so many are attending this meeting in person, despite the uncertainty of post Covid travel. To those who must present virtually, I appreciate your willingness to do this, and for bringing your invaluable expertise to SPIR 2022.

This is the first post pandemic combined in person and hybrid meeting and it seems that we have renewed vigor for participation in person, and finally seeing each other once again face to face. The abstract submission process this year was as competitive as ever, with over 50 submissions and judging by the content it will showcase great research.

This meeting would not be possible without the hard work and efforts of many, including the Board of Directors, scientific committee and, as always, our industry partners who continue to show great generosity in their support of this meeting, despite the very real challenges of recent times. A personal thank you to Susan Harned for her tireless work spent in the planning and organization of this meeting.

Finally, a special welcome to those who are new to SPIR – I hope you have a great educational and Irish cultural experience here over the next three days and are inspired to explore PIR and perhaps join our Society. We feel honored to share this meeting with you all.

Those who are attending live in Galway, Ireland, we are excited to be linking with all of you who cannot travel but are with us online. This hybrid meeting format continues to be a new and exciting venture for our Society, and I thank each of you for helping to make it happen.

Regards,

Anne Marie Cahill



**Society for Pediatric Interventional Radiology**  
**10th International Meeting**  
**September 26 - 28, 2022**  
**Galway, Ireland**

SPIR Board of Directors .....	4
SPIR Past Presidents .....	4
Faculty .....	6
Scientific Committee .....	8
Continuing Education .....	8
Speaker Evaluations.....	8
SPIR Gold Medal Recipient.....	11
Keynote Speaker .....	12
Pioneers Award .....	13
Program Agenda .....	14
Scientific Paper Abstracts.....	20

*All attempts have been made to ensure information contained in this program is current. There may be substitutions/additions that occurred after this program was sent to print.*



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**Dr. Victoria Young** Stanford University Medical Center, US  
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## SPEAKER EVALUATIONS

*Thank you for taking the time to evaluate our presenters. We appreciate the feedback as do the presenters.*

Contrast Enhanced  
US in IR



Precision Oncology/  
Vascular Anomalies



How I do It:  
The Experts



Innovative Imaging  
Techniques/Devices



Education &  
Research



Lymphatic  
Interventions



Neurointerventions/  
Thyroid



Challenging/  
Innovative Cases



Venous Intervention/  
Vascular Access



Global Outreach  
in IR



Scientific Papers  
Session 1



Scientific Papers  
Session 2



Scientific Papers  
Session 2



A photograph of a Philips Azurion with FlexArm C-arm in a clinical setting. The machine is white and blue, with the Philips logo on its side. Several medical professionals in blue scrubs and masks are positioned around the machine, which is positioned over a patient on a table. The scene is brightly lit, typical of a hospital operating room.

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## GOLD MEDAL

The Gold Medal is the highest honor accorded to a member of the SPIR. The recipient must meet at least one of the following:

- Substantial contributions to the specialty of pediatric interventional radiology through clinical excellence, education, mentoring and research.
- Extraordinary contributions to enhance the development and/or stature of pediatric interventional radiology, including service to the Society.
- Outstanding lifetime service to pediatric interventional radiology



Past Gold Medal recipients:

**Dr. Bairbre Connolly (2017)**

**Dr. Danièle Pariente (2017)**

**Dr. Philip Stanley (2018)**

**Dr. James S. Donaldson (2019)**

**Dr. Richard Towbin (2019)**

**Dr. Dennis W W Shaw (2020)**

**Dr. Patricia Burrows (2021)**

**Dr. Derek Roebuck (2021)**

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## **GOLD MEDAL RECIPIENT**

### **Charles A. James, MD FACR**

Following medical school at the University of Tennessee in Memphis, Charles James completed Radiology residency training at Mallinckrodt Institute of Radiology at Washington University in St Louis. It was late in his final year of residency that he rotated on a newly established “Interventional Radiology” rotation.

In 1990 “CJ” began his Pediatric Radiology fellowship at Arkansas Children’s Hospital (ACH). As only rare pediatric image guided procedures were being offered at that time, he sought adult IR training from the University of Arkansas for Medical Sciences (UAMS), passed the VIR CAQ board exam and began the slow process of building a pediatric IR service. In 1999, after CJ and his colleague Janice Murphy built the case volume to 400/year, the first Pediatric IR fellowship trained staff (Mary Beth Moore) was recruited to ACH from Jim Donaldson’s program. New procedures were offered and Pediatric IR became a distinct workday assignment. In these early growth years, CJ benefitted greatly from visiting fellowships at the Hospital for Sick Children in Toronto learning about percutaneous cecostomy and Pediatric IR team building from Peter Chait and Bairbre Connolly.



From 2004-2007 CJ was the SPR Vascular/Interventional Radiology committee chair when the vision of several leaders to form a Pediatric IR society was being led by Manrita Sidhu at Seattle Children’s Hospital. CJ was selected to serve on the inaugural board of the new SPIR society in 2008 and served as the society’s third president in 2012. He developed American Board of Radiology approved SAM educational content for the first 3 SPIR meetings. CJ, Manrita and David Lord collaborated to capture the society’s origin and early milestones by publishing *SPIR: the 1<sup>st</sup> Decade (Shutterfly, 2019)*.

Significant educational projects achieved by CJ include editing two Casebase books in Pediatric Radiology, RSNA workshops on vascular anomalies and Pediatric IR test question writing for the ABR MOC exam. Awards include Best Doctors in America, ACH Teamwork Award, UAMS Radiology Residents Award of Distinction and UAMS Red Sash Outstanding Faculty Award. When serving as Arkansas Children’s Radiology Chief, CJ was the inaugural chairholder of Lee Roy and Melba T. Beasley Endowed Chair in Pediatric Radiology.

CJ has received significant support from his pediatrician wife, Laura James and his children, Luke, Grace and Elizabeth. Outside the hospital, CJ likes to paddleboard on lakes and rivers across Arkansas.

## KEYNOTE SPEAKER

### Matthew Lungren, MD MPH



Matt Lungren is Principal for Clinical AI/ML at Amazon Web Services in World Wide Public Sector Healthcare. He also holds affiliate positions with UCSF, Duke, and Stanford University. Prior to joining AWS, Dr. Lungren was an interventional radiologist and research faculty at Stanford Medical School where he co-led the Stanford Center for Artificial Intelligence in Medicine and Imaging (AIMI). His NIH and NSF funded research focused on multi-modal data fusion models for healthcare applications, new computer vision and natural language processing approaches for healthcare specific domains, opportunistic screening with machine learning for public health applications, open medical data as public good, and prospective clinical trials for clinical AI translation. His work has resulted in more than 100 scientific papers, keynote talks on AI and healthcare around the world, and he has been featured on popular news outlets like NPR, Scientific American, and Vice News. Dr. Lungren is also a top rated instructor on the Coursera platform and his course Fundamentals of Machine Learning in Healthcare, designed especially for learners with clinical non-technical backgrounds, has been completed by more than 10k students around the world.

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## PIONEERS AWARD

This is awarded for the best scientific paper presented at the annual meeting in honor of pioneering innovators of pediatric interventional radiology.

Past Pioneers Award recipients:

- 2021: **Safety and efficacy of the Cryoablation of pulmonary and pleural metastases in pediatric patients**  
Prajapati HJ, Proctor K, Patel PN, Agrawal V, Maller V, Talbot L, Gold R, Zoltan P
- 2020: **Minimally invasive treatment for unicameral bone cysts with chemical sclerosis and bone graft substitute: A preliminary report.**  
Rajeswaran S, Khan A, Samet J, Donaldson J, Attar S, Green J
- 2019: **Ultrasound-Guided Inguinal Hernia Repair.**  
Jarboe M, Hirsche RB, Ladino-Torres M
- 2018: **Catheter-directed pharmacologic thrombolysis for acute submassive and massive pulmonary emboli in children and adolescents.**  
Shah J, Gill A, Ji D, Durrence W, Paden M, Patel K, Hawkins CM
- 2017: **The contribution of IR to the management of children with button battery ingestion injury.**  
Barnacle A, Rose E, Roebuck D, McLaren C.

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## Monday September 26, 2022 - Morning Session

07:00 - 08:00 **Registration Check-In**

07:00 - 08:00 **Continental Breakfast** (Exhibitor Hall)

08:00 - 08:10 **Presidential Welcome** (Anne Marie Cahill)

08:10 - 08:30 **Still Growing Forward** (Richard Towbin)

08:30 - 10:00 **Contrast Enhanced US in IR**

Moderators: Naif Alsaikhan, Alex Barnacle

*Establishing a CEUS program in your institution (Kassa Darge)*

*Microbubbles the basics, IV and intra-cavitary techniques (Trudy Morgan)*

*CEUS intra-cavitary applications in the IR suite (Abhay Srinivasan)*

*CEUS IV applications in the IR suite (Michael Acord)*

*CEUS applications in the lymphatic system (Ganesh Krishnamurthy)*

*Safety of Contrast US in Children (Aikaterini Ntoulia)*

10:00 - 10:30 **Refreshment Break** (Exhibitor Hall)

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10:30 - 11:30 **Controversies Debate**

Moderators: Manish Patel, Amir Pezeshkmehr

*The pediatric IR generalist versus specialist (Joao Amaral, Eric Monroe)*

*Short versus prolonged biliary drainage (Stephanie Franchi-Abella, Murthy Chennapragada)*

*Doxycycline versus cryoablation for ABC (Leah Braswell, Anne Gill)*

*Surgical versus IR biopsy of Primary Neuroblastoma (Marcus Jarboe, Kish Minhas)*

11:30 - 12:30 **Scientific Papers Session 1**

Moderators: Ajit Yadav, Andy Healey

Abstracts start on page 20

12:30 - 13:30 **Lunch** (Marinas Restaurant)

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## Monday September 26, 2022 - Afternoon Session

### 13:30 - 14:45 **Precision Oncology/Vascular Anomalies**

Moderators: Walter Wohlgemuth, Narayan Karunanithy  
*Precision medicine and vascular anomalies (Denise Adams)*  
*Precision therapy in oncology - 101 (Theodore Laetsch)*  
*Large vessel occlusion - tips and tricks (Ahmad Alomari)*  
*Percutaneous and Endovascular Ablation in Bone Tumors (Fernando Gómez Muñoz)*  
*Percutaneous Ablation in Vascular Anomalies and Desmoid Tumors - tips and tricks (Raja Shaikh)*

### 15:00 - 16:00 **How I do it - The Experts**

Moderators: Alberto Hernandez, Carrie Schaefer  
*Neonatal arterial access (Josée Dubois)*  
*Quality initiatives in IR (Seth Vatsky)*  
*Cystogastrostomy (Premal Patel)*  
*Histotripsy (John Swietlik)*  
*Portal Vein Access tips and tricks (Stephanie Franchi-Abella)*  
*Orbital vascular anomalies - tips and tricks (Alex Barnacle)*  
*Yttrium 90 therapy : Patient selection (Allison Aguado)*

### 16:00 - 17:00 **Education & Training Workshop**

Presented by Dr. Gulraiz Chaudry, Boston Children's Hospital  
*Breakout session to review workforce requirements, training pathways and standardization of pediatric IR training. All are welcome to attend.*

### 17:30 - 20:00 **Welcome Event at The Claregalway Castle**

Transportation will be provided. Buses will depart from the Galmont Hotel at 17:30 and depart from Claregalway Castle at 20:00pm

The logo for Cook Medical, featuring the word "COOK" in a large, white, serif font with a registered trademark symbol (®) to its upper right. Below "COOK" is a dark red trapezoidal shape containing the word "MEDICAL" in a white, bold, sans-serif font.

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## Tuesday September 27, 2022 - Morning Session

- 07:00 - 08:00 **Registration Check-In**
- 07:00 - 08:00 **Continental Breakfast** (Exhibitor Hall)
- 08:00 - 08:50 **Keynote Address: Matthew Lungren MD MPH**  
*The Road Less Traveled Bridging Academia, Big Tech and Healthcare*
- 09:00 - 10:00 **Innovative Imaging Techniques/Devices**  
Moderators: Roger Tomihama, Francis Marshalleck  
*Innovative Imaging in the IR lab - what's new, what's better (John Racadio)*  
*HIFU/MR guided applications (Karun Sharma)*  
*Listening to the light- optoacoustic Imaging for vascular malformations (Moritz Wildgruber)*  
*Biodegradable stents for biliary stenosis (Paolo Marra)*
- 10:00 - 10:30 **Refreshment Break** (Exhibitor Hall)  
Featuring Platinum Level Sponsor Philips
- 10:30 - 11:30 **Scientific Papers Session 2**  
Moderators: David Rea, Kent Cabatingan  
Abstracts start on page 26
- 11:30 - 12:30 **Education & Research**  
Moderators: Matt Hawkins, Michael Temple  
*Applications of Additive Manufacturing (3d printing) in Interventional Radiology practice and education (Elizabeth Silvestro)*  
*E - learning platforms in IR (Gulraiz Chaudry)*  
*Hololens technology, another dimension in IR (Ganesh Krishnamurthy)*  
*Successful grant writing in IR (Gilles Soulez)*
- 12:30 - 12:45 **Delegate Photo** (Location TBD)
- 12:45 - 13:45 **Lunch** (Marinas Restaurant)

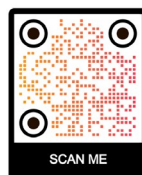


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## Tuesday September 27, 2022 - Afternoon Session

### 13:34 - 14:45 IR Jeopardy

Moderators: John Donnellan, Janice McDaniel

Team Cailini: Sheryl Tulin-Silver, Rachelle Durand,  
Siobhan Hoare, Fabiola Weber

Team Buachailli: Jean-Nicolas Racicot, Greg Gardner  
Stacy White, Andy Healey

### 14:45 - 16:00 Lymphatic Interventions

Moderators: David Moe, Sheena Pimpalwar

Plastic Bronchitis Advanced Therapeutics (Max Itkin)

Diagnostic Nodal Lymphangiography (Geert Maleux)

PLE: Novel Techniques in Embolization (Deborah Rabinowiz)

Intervention for Central Conduction Lymphatic Disorders (Abhay Srinivasan)

Surgical intervention in lymphatic disorders (Pablo Laje)

### 16:00 - 17:00 Global IR Workshop

Presented by Dr. Sheena Pimpalwar, Children's Medical Center

1. To understand the process and challenges of starting global outreach for pediatric IR

2. To volunteer resources and join the SPIR mission to provide global outreach services

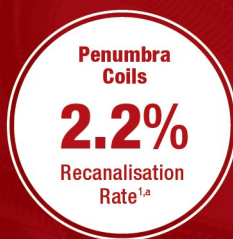
### 18:00 - 22:00 SPIR Awards Banquet (Veranda Lounge)



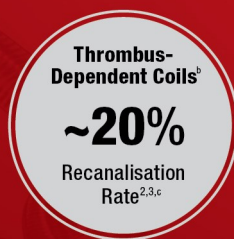
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1. Vogler J, Gemender M, Samoilov D. Packing density and long-term occlusion after transcatheter vessel embolization with soft, bare-platinum detachable coils. *Am J Interv Radiol*. 2020;4(2). doi:10.25259/AJIR\_31\_2019.

2. Enriquez J, Javadi S, Murthy R, et al. Gastroduodenal artery recanalization after transcatheter fibered coil embolization for prevention of hepatocentric flow: incidence and predisposing technical factors in 142 patients. *Acta Radiol*. 2018;54(7):790-794. doi:10.1177/0284185113461696.

3. Fohlen A, Namur J, Ghagadban H, et al. Midterm recanalization after arterial embolization using hydrogel-coated coils versus fibered coils in an animal model. *J Vasc Interv Radiol*. 2019 Jun;30(6):940-948. doi:10.1016/j.jvir.2018.05.005. Epub 2018 Aug 31.

a. 90 patients in GDA embolization. Mean follow-up 13.4 months. b. Animal study comparing fibered coils to hydrogel coils showed recanalization rate >20%. n=12 sheep. Mean follow-up 4 months. c. 142 patients in GDA embolization. Mean follow-up 101 days.

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## Wednesday September 28, 2022 - Morning Session

07:00 - 08:00 **Continental Breakfast** (Exhibitor Hall)

08:00 - 10:00 **Neurointerventions/Thyroid**

Moderators: Luke Toh, Carrie Schaefer

*Concepts of angiogenesis and vasculogenesis and their applications in pediatric brain vascular malformations (Timo Krings)*

*"What is old is new" - suboccipital puncture for gene therapy (Bryan Pukenas)*

*Nonvascular spine interventions (Mesha Martinez)*

*Spectrum of Pediatric Intracranial AV Shunting Lesions and Endovascular Strategies (Prakash Muthusami)*

*Interventional Neuro Devices - where else can they go ? (Manraj Heran)*

*Ablation Techniques for Pediatric Thyroid Disease (Fernando Escobar)*

10:00 - 10:30 **Refreshment Break** (Exhibitor Hall)

10:30 - 11:30 **Challenging/Innovative Case Presentations**

Moderators: Roger Harned, Walter Wohlgemuth

*Endovascular IVC reconstruction to treat extensive acute DVT (Narayan Karunanithy)*

*MR-guided cryoablation of an orbital desmoid tumor (Victoria Young)*

*Occlusion of retroesophageal pseudoaneurysm in 13-month-old child (Vijaykumar Agrawal)*

*Bilateral Renal Fungal balls in neonate : IR to rescue (Ajit Yadav)*

*Challenging NICH vascular tumors (Josée Dubois)*

*The curious case of chyluria (Aparna Annam)*

11:30 - 12:30 **Scientific Papers Session 3**

Moderators: John Donnellan, Jebb Baker

Abstracts start on page 32

12:30 - 13:45 **SPIR Business Meeting & Lunch**

Boxed lunches will be available outside of the Meeting Hall

SPIR Members please join us in the Meeting Hall for the annual business meeting.

## 2022 EMERITUS MEMBERS

*Congratulations to the following SPIR member who is retiring this year. Thank you for your many years of service to Pediatric Interventional Radiology.*

**Dr. William J. Banks** Dell Children's Medical Center

## Wednesday September 28, 2022 - Afternoon Session

### 13:45 - 15:15 **Venous Interventions/Vascular Access**

Moderators: Kamlesh Kukreja, Vaz Zavaletta

*Tips & Tricks for Successful and Safe Venous Recanalization in the Pediatric Patient (Deepak Sudheendra)*

*Treatment strategies for Endovascular Therapy of Portosystemic Shunts (James Donaldson)*

*Ellipsys Endovascular Fistula Creation in Pediatric (Kevin Koo)*

*Innovative vascular access methods (Kevin Wong)*

### 15:20 - 16:10 **Global Outreach in IR**

Moderators: Moritz Wildgruber, Sudhen Desai

*Instituting a sustainable global outreach program (Kassa Darge)*

*Global Outreach in Vietnam (Sheena Pimpalwar)*

*Road to IR - Tanzanian experience (Sarah Khoncarly)*

*Pediatric IR outreach in India (Manraj Heran)*

### 16:10 - 16:20 **Pioneer Award Presentation, Closing Remarks, Meeting Adjourned**

### 16:20 - 17:20 **Research and Registries Workshop**

Presented by Dr. Michael Temple, The Hospital for Sick Children

*The research workshop will 1) discuss progress made on the PIR research consortium and announce the first collaborative trial, 2) review pediatric initiatives underway with the VIRTEX registry and 3) feature a discussion on remote analysis of noncentralized data for collaborative research.*

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# SCIENTIFIC PAPER SESSION #1

## Establishing an Inpatient Interventional Radiology Consult Service

Heft M, Wong K, James C, Lewis S, Jensen H, Liu D, Kaukis N, Ashton D

Presented by Mallory Heft

### Purpose

Delineate Interventional Radiology (IR) inpatient consult growth and resulting collections after implementation of an IR consult service.

### Materials and Methods

An inpatient IR consult process was created at a single children's hospital by an IR physician leader who coached 3 IR physician colleagues. Standardized IR consult note templates were created in Epic with charge generation linked to differing levels of Evaluation & Management (E&M) service relating to current procedural terminology (CPT) inpatient consult codes 99251 (20 minutes), 99252 (40 minutes) and 99253 (50 minutes). Use of the -25 modifier was encouraged for consults entered on the same day as the IR procedure. The hospital Informatics division identified IR consult notes entered from October 2019 to January 2022. The Radiology business office provided available charge/collection/relative value units (RVU) information during this study period, noting which consults utilized the -25 modifier.

### Results

2153 inpatient IR consults were performed in this 27-month period, increasing 13.4 % from 2020 to 2021. Monthly consult peak was reached 5 months into the study period. Consult level: 99251-8.7%, 99252-81.7% and 99253-8.8%. Median consult charge/collection/RVU: 99251-\$208/\$53/1.0, 99252- \$208/\$72/1.5 and 99253-\$208/\$98/2.27. Billing/collection information was provided for 70% of total consults; payments were received in 96.4% of billed consults with \$143,976 new IR service revenue. Median collection with and without use of the -25 modifier was identical.

### Conclusion

Monthly IR consult volume reached peak soon after project implementation and annual growth was realized. Collections followed in nearly all consults resulting in previously uncaptured IR service revenue.



## SCIENTIFIC PAPER SESSION #1

### Clinical and Subclinical Brain Microemboli Following Neuroangiography in Children

Alghamdi I, Dmytriw AA, Amirabadi A, Lebarron S, Muthusami P

Presented by Ibrahim Alghamdi

#### Purpose

To assess the frequency, imaging appearances, and clinical correlations of brain microemboli following pediatric neuroangiography, as assessed by early diffusion-weighted MR imaging (DWI).

#### Materials and Methods

This study is a single-centre retrospective analysis, reviewing the frequency, imaging appearance and clinical correlates of microemboli following neuroendovascular procedures in children, as assessed by early diffusion-weighted imaging (DWI). Patients (age 0-18 years) who underwent diagnostic neuroangiography, and also received MRI with DWI within seven days following the procedure, were included. Clinical and procedural parameters and MRI findings were recorded. Findings on follow-up MRI studies were analyzed where available. Clinical and radiological correlates of diffusion positivity and symptoms were assessed. Univariate and multivariate analyses were performed on the following risk factors: age, weight, known vasculopathy, use of intra-procedural heparin, procedure time and the number of angiographic runs. A p-value <0.05 was considered statistically significant.

#### Results

Eighty-two patients were included (M:F=33:49), with mean age  $10.1 \pm 4.5$  years (range: 7 months – 17 years). Of these procedures, 89% were transfemoral and 11% transradial. The mean interval between angiography and MRI was  $2.6 \pm 2.1$  days. There were no intra-procedural thromboembolic complications. Post-procedural reversible symptoms were seen in two patients, both showed DWI positivity for microemboli and . Among the other 80 diagnostic angiograms, DWI positivity for silent microemboli was found in one (1.2%) instance. There were no territorial infarcts. Children with underlying vasculopathy had a higher risk of microemboli from angiography than children without vasculopathy (27.3% vs. 0%,  $p < 0.0001$ ). Univariate analysis showed a significant association between diffusion positivity and the number of angiographic runs (OR=1.2, 95%CI=1.0-1.3,  $p = 0.002$ ) and this remained significant on multivariate analysis (OR=1.2, 95%CI=1.0-1.3,  $p = 0.004$ ). Follow-up MRI with FLAIR imaging was performed in all three patients with DWI positivity, at a mean interval of  $21.3 \pm 15.0$  days, which showed no residual abnormal signal.

#### Conclusion

In a high-volume pediatric practice, cerebral microemboli are unusual following uncomplicated neuroangiography in the absence of underlying vasculopathy.



## SCIENTIFIC PAPER SESSION #1

### Left axillary artery access for renovascular and aortic intervention in children

Patel PA, Davies L, Barochia D, Redhead E, Minhas K, Roebuck D

Presented by Premal A Patel

#### Purpose

Radial artery access is common in adult endovascular intervention but is not appropriate in small children. Paediatric aortic and renal artery intervention is often technically more feasible to perform using an antegrade approach. We assess the feasibility and safety of left axillary artery access (LAAA) for intervention in children with renovascular hypertension (RVH).

#### Materials and Methods

Retrospective case notes review of all children undergoing intervention for RVH from 2001-22 who had LAAA as part of the procedure. No cases were excluded. LAAA was performed using ultrasound and fluoroscopic guidance. Haemostasis was achieved by manual compression of the left axillary artery against the humeral head following sheath removal. Descriptive data is given as median (range).

#### Results

In 11 years, 152 patients underwent 298 interventions for RVH. 35 patients underwent 60 episodes of LAAA. Age at access was 3y 3m (3m 9d – 17y 6m). Sheath size was most commonly 4 Fr (n=24) and ranged from 3 – 6). LAAA was performed once in 21 children, twice in 7, thrice in 4, four times in 2 and five times in one child. In children who had multiple LAAA, time interval between access was 7m 5d (2m 10d – 5y 6m). Duration of clinical follow up after the most recent LAAA was 8m 15d (2d – 11y 2m). Two complications (3%) occurred: one transient upper limb weakness and one axillary artery pseudoaneurysm. Neither required treatment.

#### Conclusion

In keeping with a previous smaller study, this study demonstrates endovascular intervention using LAAA in children is feasible and has an acceptably low complication rate.

## SCIENTIFIC PAPER SESSION #1

### Image-guided Interstitial Bleomycin Injections to Treat Challenging Vascular Malformations

Gill A, Shah J, Hawkins M

Presented by Annie Gill

#### Purpose

Experienced vascular anomalies centers have expanded the use of endovascular bleomycin for sclerotherapy of low flow vascular malformations. Image-guided percutaneous interstitial bleomycin (IPIB) injection has been proposed as an alternative treatment for vascular anomalies (VA), but has not been critically studied. The purpose of this study is to evaluate clinical efficacy and safety of IPIB for vascular anomalies.

#### Materials and Methods

IRB-approved, retrospective review of a single, pediatric VA clinic for patients who received IPIB as isolated or concomitant therapy. IPIB is defined as injection of reconstituted bleomycin under ultrasound guidance directed at the interstitium (perivascular space) of the VA. Indications for IPIB included VAs in superficial locations, adjacent to motor nerves, and/or at high risk of complication from surgical resection or endovascular therapy.

#### Results

34 patients [15 AVMs (mean age: 11.7y, range: 6-19), 5 FAVAs (mean: 14.4y, range: 11-18), 5 non-involuting hemangiomas (mean: 5.2y, range: 1-15), and 9 low-flow VA (mean: 11.5y, range: 3-20)] were treated with IPIB. Mean IPIB treatments = 2.8, range: 1-10. 12/34 (35.3%) patients had IPIB as the only treatment modality. Remaining patients had concomitant treatment with arterial embolization, endovascular sclerotherapy, and/or cryoablation. 11/34 (32.3%) patients had complete resolution of symptoms. 15/34 (44.1%) had improved symptoms. 3/34 (8.8%) had no improvement. 5/34 (14.7%) are awaiting clinical follow-up. Transient skin staining from IPIB occurred in 3 (8.8%) patients; no major complications. Avg clinical follow-up = 9.9 mos.

#### Conclusion

IPIB shows promising efficacy and safety for multiple types of vascular anomalies, regardless of type or location.

## SCIENTIFIC PAPER SESSION #1

### **Interventional Radiology Placement of Ultrafiltration (Aquapheresis) Catheters in premature neonates and infants: Initial Experience**

Schoeman S, Cahill AM, Srinivasan A, Escobar F, Krishnamurthy G, Gaballah M, Cajigas-Loyola S, Vatsky S

Presented by Sean Schoeman

#### **Purpose**

To evaluate ultrafiltration catheter function and technical success in young children with renal failure.

#### **Materials and Methods**

Patients from a single institution who underwent ultrafiltration catheter placement in interventional radiology (IR) over a 4-year period were reviewed. Imaging and medical records were reviewed for indications, procedure details and outcomes.

#### **Results**

10 patients [16 procedures, median initial age 8 days (IQR: 2.3-19.5) and median weight 1.96 kg (IQR: 1.6-2.8 kg)] were included. Four patients required at least one catheter salvage procedure. The commonest initial insertion site was right internal jugular 60% (n=6), and most common device was a 6 F non-cuffed polyurethane dual-lumen catheters (n=8); other sizes were 7 F (n=1) and 8 F (n=1).

Initial median catheter dwell time was 11.5 days (IQR: 7 d-21.5 d; n=10), second catheter dwell time was 9.5 d (IQR 6.75 d-26.75 d; n=4), and third catheter dwell time was 25.5 (IQR 15.25-35.75; n=2). Median ultrafiltration period was 11.5 d (IQR: 7.3-40.5 d). Ultrafiltration catheter effectively treated AKI/ARF in three patients (30%), with subsequent renal recovery and line removal. One patient (10%) was bridged to dialysis. 5 patients (50%) died secondary to other comorbidities while on therapy. At submission one patient was undergoing ultrafiltration treatment.

All patients survived the initial catheter cannulation. Complications included hemorrhage (n=1), requiring transfusion and episodes of vasospasm/hematoma of vein (n=2), requiring an alternative vessel access.

#### **Conclusion**

Ultrafiltration via central venous catheter is feasible in young infants and has the potential to bridge to renal replacement therapy or renal recovery.

## SCIENTIFIC PAPER SESSION #1

### **Image-guided percutaneous cryoablation for the treatment of aneurysmal bone cysts in pediatric patients: initial experience as first-line and salvage therapy.**

Páez-Carpio A, Macías N, Zarco FX, Serrano E, Clemente EJI, Martínez de la Torre IB, Rubies FT, Gómez FM  
Presented by Alfredo Páez-Carpio

#### **Purpose**

To evaluate the efficacy and safety of percutaneous image-guided cryoablation as a first-line or salvage treatment in pediatric patients with aneurysmal bone cysts (ABCs) during our initial experience at our institution.

#### **Materials and Methods**

This study included all patients  $\leq 18$  years old who underwent cryoablation to treat ABCs between 2017 and 2022 at our institution. A baseline assessment was performed by determining the lesion imaging characteristics and the presence of symptoms. Procedural details, complications, imaging and clinical follow-up were subsequently analyzed. Primary outcomes were the presence of, and time to, lesion healing and clinical improvement, and the secondary outcome was the occurrence of procedure-related adverse events (CIRSE classification).

#### **Results**

A total of 19 patients received 27 cryoablations (mean: 1.4 [range: 1-3]), with 7 (26%) performed combined with doxycycline sclerotherapy. Seven patients (36.8%) had an alternative treatment prior to cryoablation. Clinical and imaging follow-up had a median duration of 24 months (IQR: 16.8-28.8). Follow-up demonstrated lesion healing in 16 patients (84.2%), with a median lesion volume reduction of 47% (IQR: 3.3-65.6) and a median of 8 months (IQR: 2.0-13.8) until imaging improvement. Eighteen patients showed clinical improvement at the last follow-up (94.7%), with a median time to clinical improvement of 5.5 months (IQR: 2.0-13.8). One patient (5.3%) presented recurrence during follow-up and is pending second cryoablation. No complications grade 3 or higher were reported.

#### **Conclusion**

In our initial experience, image-guided percutaneous cryoablation significantly improves symptoms caused by ABCs, with an excellent healing rate and safety profile.

## SCIENTIFIC PAPER SESSION #2

### One-step Retrograde Balloon Gastrostomy Tube Insertions in Children - Cumulative Experience of Over 400 Patients

Mubarak W, Robinson A

Presented by Walid Mubarak

#### Purpose

To evaluate the safety and technical success and outcome of image-guided 'one-step' retrograde balloon gastrostomy tube insertions in children.

#### Materials and Methods

A retrospective single center review was conducted by querying our RIS/PACS system to retrieve all gastrostomy procedures between 2018 and 2022. Each case was individually reviewed to determine the technique, what type of device was inserted, any procedural complications, and other potentially relevant demographic data.

The procedures were performed under general anesthesia or moderate to deep sedation, using a primary balloon gastrostomy kit (Avanos) with an additional securement device. Ultrasound and fluoroscopic guidance were used in all procedures. Gastrostomy tube insertion technique, technical success, safety, and outcome were analyzed. All patients were followed up until full feeds were reached. Patients were then seen in the gastrostomy clinic 2 weeks and 8 weeks after the procedure.

#### Results

There was a total of approximately 400 primary balloon gastrostomy procedures, comprising one step button insertions and 7 retrograde pigtail gastrostomy insertions. The pigtail gastrostomies were inserted as a fall back plan when the one step button gastrostomy insertions were deemed too risky.

Technical success was achieved in approximately 395 procedures; 5 were aborted and referred for laparoscopic gastrostomy insertion. Approximately 99% were uneventful (2 major complications, 3 minor complications).

#### Conclusion

Image-guided 'one-step' retrograde balloon gastrostomy tube insertions are a valuable and safe technique for establishing gastric feeding in children.

## SCIENTIFIC PAPER SESSION #2

### Diagnosis and management of anastomotic portal vein stenoses after pediatric split liver transplantation: correlation between color-Doppler parameters and hemodynamics findings

Marra P, Carbone F, Dulcetta L, Muglia R, Bonaffini PA, Sironi S

Presented by Paolo Marra

#### Purpose

The aim of this study was to compare color-Doppler ultrasound (CDUS) parameters with hemodynamic findings of anastomotic portal vein stenoses after split liver transplantation (SLT), to define cutoffs for the interventional management.

#### Materials and Methods

CDUS parameters of patients < 18 years-old who underwent transhepatic portography for suspected portal vein anastomotic obstruction after SLT were retrospectively (2020-2021) analyzed and compared with invasive trans-stenotic pressure gradient before and after angioplasty. A trans-stenotic gradient  $\geq 5$  mmHg was considered hemodynamically significant. The following CDUS data were evaluated: peak anastomotic velocity (PAV), pre-anastomotic velocity, and anastomotic to pre-anastomotic velocity ratio (APVR). Procedural data were collected and clinical and imaging follow-up was assessed.

#### Results

Ten patients (7 females; median age 3 years, IQR 4.7 years) with suspected portal vein obstruction based on conventional CDUS criteria (morphologic stricture  $\leq 3$  mm; APVR  $> 3$ ) underwent transhepatic portography. Mean APVR decreased from 7.6 before treatment, to 1.5 after treatment ( $p < 0.005$ ). Mean PAV decreased from 146 cm/s before treatment, to 63.5 cm/s after treatment ( $p < 0.001$ ). Mean pre-anastomotic velocity increased from 23.6 cm/s before treatment, to 40.6 cm/s after treatment ( $p = 0.005$ ). Both APVR and PAV demonstrated a good correlation with the mean trans-stenotic pressure gradient, respectively  $r = 0.74$  ( $p = 0.01$ ) and  $r = 0.81$  ( $p = 0.005$ ). The best performing area under the ROC curve was 0.84 for pre-anastomotic velocity with a cut off value of 15 cm/s.

#### Conclusion

CDUS parameters closely correlate with hemodynamic findings in portal vein obstructions. Pre-anastomotic velocity  $< 15$  cm/s at CDUS can confidently diagnose hemodynamically significant stenoses. CDUS can be considered accurate in the diagnosis and management of portal vein stenoses in pediatric patients with SLT.

## SCIENTIFIC PAPER SESSION #2

### **Interventional radiological management of arterial complications after pediatric liver transplant surgery: experience from a single tertiary center**

Marra P, Dulcetta L, Carbone FS, Muglia R, Bonaffini PA, Sironi S

Presented by Paolo Marra

#### **Purpose**

Pediatric liver transplant surgery is burdened by a relatively high rate of arterial complications due to technical difficulties in performing very tiny vascular anastomoses. The interventional radiological (IR) management is not yet standardized. We report the outcomes of a single center cohort of pediatric patients with post-surgery hepatic artery (HA) complications treated by IR.

#### **Materials and Methods**

From December 2019 to April 2022, consecutive pediatric patients, with deceased-donor split liver transplants and who underwent IR procedures due to suspected HA complications were prospectively collected and reviewed. Clinical and procedural data were analyzed, with focus on: type of complication (pseudoaneurysm, thrombosis, stenosis), time of development (acute=<15days, subacute=15-30days, late=>30days), IR technique (angioplasty, stenting), technical success and clinical outcome.

#### **Results**

Fourteen pediatric patients (8 male; median age 3 years) underwent 19 right transfemoral hepatic arteriography procedures for the treatment of 6 acute or subacute thrombosis, 3 acute or subacute stenosis, 3 acute pseudoaneurysm with stenosis, and 2 late stenosis. Three patients underwent more than 1 intervention. Primary technical success was obtained in 14/19 (74%) procedures, secondary technical success in 1 case. Angioplasty alone was technically successful in three cases of stenosis; in all the other treatments arterial stenting was required and performed with balloon expandable stents or grafts (all but one coronary devices). The clinical outcome was good for 11/14 (79%) patients with patent HA at a median follow up of 8 months. One patient underwent retransplantation. Two patients died: 1 due to hemorrhagic shock and multiorgan failure (MOF) and 1 developed HA stent thrombosis with liver necrosis and died due to MOF.

#### **Conclusion**

In pediatric patients who present HA complications after liver transplant the IR management often provides good clinical outcomes. In a cohort of predominantly acute and subacute conditions, arterial stenting was deemed necessary in most cases, requiring coronary devices.



## SCIENTIFIC PAPER SESSION #2

### **Bare metal stent as salvage treatment for refractory benign biliary strictures after pediatric liver transplantation: preliminary experience in a single-center cohort**

Marra P, Dulcetta L, Carbone FS, Muglia R, Bonaffini PA, Sironi S

Presented by Paolo Marra

#### **Purpose**

In split liver transplant (SLT) anastomotic and intrahepatic strictures frequently relapse after the standard percutaneous management with bilioplasty or surgical revision. The aim of the study was to describe a preliminary experience with metallic stents as salvage treatment in selected patients before relisting for retransplantation.

#### **Materials and Methods**

Eight pediatric patients (3 female; mean age 20 months) after split left LT with refractory biliary strictures were treated with percutaneous transhepatic implantation of vascular balloon-expandable or biliary self-expandable bare metallic stents. Indication for stenting were the presence of symptoms or signs of cholestasis, histologically-proven cirrhosis and failure of standard management with percutaneous transhepatic bilioplasty and/or surgical revision.

#### **Results**

A total of 18 stents (3 biliary, 15 vascular) were implanted. Technical success was 100% without adverse events. A single anastomotic stent was used in 3 patients. Two parallel stents with the kissing-balloon technique to cover the confluence between segment 2 and 3 were implanted in 6 patients. In 1 patient 3 stents were imbricated due to incomplete coverage of the stenosis. Before stents implantation a mean of 3.6 PTC per patient were performed (7.8 months observation); after stents implantation a mean of 0.6 PTC (13.1 months follow-up). In one case stent patency was observed after 9 years.

#### **Conclusion**

Preliminary data suggest that after pediatric LT, relapsing biliary stricture could be safely treated with metallic stents to reduce the number of interventional procedures before relisting for retransplantation.

## SCIENTIFIC PAPER SESSION #2

### **Percutaneous cecostomy: 25-year multi-institution experience**

Seay R, James C, Hogan M, James L, Braswell L, Kaukis N, Jensen H, Moore M  
Presented by Charles James

#### **Purpose**

Identify long-term outcome of percutaneous cecostomy at 2 centers

#### **Materials and Methods**

Long term follow-up percutaneous cecostomy tubes placed between May 1997 and August 2011 at 2 institutions (A, B) was performed with respective institutional review board approval and retrospective chart review through May 2022. Patient data collected: age at tube insertion, technical success, % with active flushes/age, % lost to follow-up/age, % satisfied with tube remaining, % with tube removal (dissatisfied or improved bowel function), deaths/months of tube access and duration between maintenance cecostomy tube exchanges.

#### **Results**

215 procedures were performed (90 institution A, 125 institution B) with median age 10.0 years; technical success was 98.1%. 36.1% of patients are maintaining active flushes (median age 25.0 years). 21.4% of patients have been lost to follow-up (median age 20.4 years). 5 deaths have occurred in both groups after 4.6 years of median tube access. 55.5% of patients were satisfied with tube remaining. 15.2% of patients were dissatisfied requesting tube removal; 29.3% of patients had tube removal following improved bowel function. Median duration between maintenance tube exchanges was 13.6 months. Patients at institution A were older when lost to follow-up ( $p=0.0003$ ) with higher % satisfied with tube remaining ( $p=0.0003$ ) and longer duration between maintenance tube exchanges ( $p < 0.0001$ ). Patients at institution B had younger age at insertion ( $p=0.01$ ) and higher % with tube removal with improved bowel function ( $p=0.0005$ ).

#### **Conclusion**

Percutaneous cecostomy provides long term benefit in a majority of patients with tube maintenance plan frequently required into adulthood.

## SCIENTIFIC PAPER SESSION #2

### The Use of Real-Time Magnetic Resonance Imaging Guidance In Anorectal Malformation Repair

Ralls MW, Dougherty D, Ladino-Torres M, Jarboe MD

Presented by Danielle Dougherty

#### Purpose

A challenge when repairing imperforate anus is positioning the neo-rectum into the center of the sphincter muscle complex (SMC) with limited muscle injury and scarring. Because the path through SMC is often non-linear, muscle injury is common and can affect subsequent bowel function. We have developed a procedure in which real-time magnetic resonance imaging (MRI) guidance is used to delineates the muscle complex and guides a needle through the center of the complex SMC, thus decreasing injury.

#### Materials and Methods

A retrospective chart review was completed of the patients who underwent anorectal repair with real-time MRI guidance at one institution between 2014 and 2021. Information gathered included details of the malformation, operations, and outcomes.

#### Results

Thirty patients underwent this procedure between 2014 and 2021. The average age was 9 months (range 3-22). Average procedure length was 284 minutes (range 129-832). The most common lesion was bulbar fistulas (n=8, 27%), followed by prostatic (n=6, 20%) and bladder neck (n=6, 20%). The average age of follow-up is 3 years (range 0-7). Postoperative complications were minimal, with only 3 documented wound infections (10%). Five patients (17%) underwent prolapse repairs and 9 (30%) underwent stricturoplasties. Of the 7 patients who have been followed beyond age 4, only 1 requires daily enemas.

#### Conclusion

Real-time MRI guidance used during anorectal malformation repair enables precise needle control/neo-rectum placement through the key components of the often non-linear SMC with minimal muscle damage. This could help to improve continence, minimize needed bowel regimens, and provide a better quality of life in later years.

## SCIENTIFIC PAPER SESSION #3

### Image-Guided Biopsy for the Diagnosis and Molecular Profiling of Neuroblastoma

Schoeman S, Bagatell R, Gaballah M, Maris J, Mosse Y, Pogoriler J, Srinivasan A, Acord M  
Presented by Sean Schoeman

#### Purpose

To determine whether image-guided percutaneous core biopsy (PCB) is adequate for the diagnosis and full molecular characterization of primary neuroblastoma.

#### Materials and Methods

Patients with neuroblastoma who underwent initial PCB in interventional radiology over a 3-year period were reviewed. Pre-procedure imaging and procedure details were assessed. An adequate biopsy yielded tissue for histologic classification and a sufficient biopsy allowed for the evaluation of all genomic markers utilized in the Children's Oncology Group risk stratification version 2.

#### Results

27 patients [11 females, median age 2.2 years (IQR: 0.6-4.6 y) and median weight 10.9 kg (IQR: 9.2-16.2 kg)] were included. Most patients had International Neuroblastoma Risk Group stage M disease (n=16, 59.3%). Median longest axis of the tumor target was 8.9 cm (IQR: 5.8-11.8 cm). A 16-gauge biopsy instrument was used most often (n=16, 51.6%) with a median of 22 passes (IQR: 14-27). 18 specimens were assessed by a pathologist during biopsy, and 10 procedures were performed with contrast-enhanced ultrasound guidance. There was 1 post-procedure hemorrhage (3.7%) treated with transfusion. All biopsies were adequate for histologic classification and 88.9% (n=24) were sufficient for genomic testing. Two patients required subsequent surgical biopsy. The number of passes did not differ between patients with sufficient vs insufficient biopsies ( $24 \pm 6$  vs  $16 \pm 6$  passes,  $p=0.39$ ), though the number in the latter group was small.

#### Conclusion

In this single-center study, PCB with a high number of passes resulted in a high rate of diagnosis and successful molecular profiling for the pre-treatment risk assessment of neuroblastoma.

## SCIENTIFIC PAPER SESSION #3

### **Application of shear wave elastography for evaluation of thyroid nodules with biopsy correlation. Early experience in children**

Fleury A, Krishnamurthy G, Cahill AM, Fikadu W, Whitaker J, Bauer A, Escobar F

Presented by Anilawan Fleury

#### **Purpose**

Shear wave elastography (SWE) have been widely studied in adult thyroid disease. However, evaluation in pediatric patients has yet to be published.

We aim to evaluate the feasibility and safety of SWE for thyroid nodules in children at the time of cytologic biopsy.

#### **Materials and Methods**

An IRB approved prospective study of children who underwent US-guided thyroid nodule biopsy was performed. SWE protocol; 9 mHz GE EPIQ E9 linear probe, regions of interest placed on nodules and normal thyroid gland (as a control) to obtain an SWE value. Exclusion criteria included thyroid cysts or diffuse thyroid abnormality.

#### **Results**

27 patients (20F, 7M), 31 nodules were included, mean age 14.8 years (5-20). Mean maximal diameter of nodules was 17.9 mm (5-47). There were 24 solid and 8 solid/cystic nodules. There were 15 Bethesda grade 2 (hyperplastic) nodules, 8 Bethesda grade 3 (follicular lesion of undetermined significance) nodules, 5 Bethesda grade 4 (follicular neoplasm), one Bethesda grade 5 (Suspicious for Malignancy), two Bethesda grade 6 (malignant). There was significant higher SWE value with higher Bethesda grade (p-value 0.0016). The SWE of higher Bethesda grades (combined grade 4, 5, 6) were significantly higher than lower grades (combined grade 2, 3) with p-value 0.011.

#### **Conclusion**

This is the first evaluation of SWE characterization of thyroid nodules in children. This pilot study demonstrates that SWE is safe and technically feasible for evaluation of thyroid nodules in children with higher SWE values correlating with higher Bethesda grades.

## SCIENTIFIC PAPER SESSION #3

### **C-arm Cone Beam CT Localization of Pulmonary Nodules for Thoracoscopic Resection: A Collaborative IR/Surgery Approach in a Hybrid OR**

Racadio J, Hilvert N, Dasgupta R, Patel M, von Allmen D, Johnson N

Presented by John Racadio

#### **Purpose**

Traditionally pulmonary nodules have been localized by interventional radiologists under conventional CT. The patient would then have to be transferred to the OR for thoracoscopic resection by surgery. In a hybrid OR setting both the localization and resection could potentially be performed in the same setting. The purpose of this study was to evaluate the feasibility, success rate, and complication rate of C-arm Cone Beam CT localization of pulmonary nodules for thoracoscopic resection in a hybrid OR.

#### **Materials and Methods**

IRB approved retrospective analysis from 4/2018 - 7/2022 of all pulmonary nodules localized for thoracoscopic resection using fluoroscopy overlay onto C-arm Cone Beam CT in a hybrid OR. Nodules were localized using Kopans needle/wire +/- methylene blue blood patch +/- microcoil. Localizations were performed by 3 different pediatric interventional radiologists and thoracoscopic resections performed by 6 different surgeons.

#### **Results**

67 pulmonary nodules were localized in 56 patients with mean age of 16 years (range 2-38). Nine patients had 2 or more nodules localized under the same anesthesia. Mean nodule size 4.4mm. All nodules were successfully localized for thoracoscopic resection: 34 metastatic disease (including sarcoma, Wilms, hepatoblastoma), 16 infection/inflammation, 14 lymph node, 3 other. Two complications: 1 pneumothorax requiring aspiration in order to be able to localize a second nodule and 1 retained Kopan's needle fragment. Mean number of cone beam CT scans (full or collimated) was 3.8.

#### **Conclusion**

C-arm Cone Beam CT localization of pulmonary nodules for thoracoscopic resection in a hybrid OR is a safe and effective method allowing imaging and resection to be performed in a single operative setting.

## SCIENTIFIC PAPER SESSION #3

### **Biodegradable Airway Stents In Children - Our experience with 17 Procedures**

Mubarak W, Robinson A, Durward A  
Presented by Walid Mubarak

#### **Purpose**

To evaluate the safety, technical success and outcome of biodegradable airway stent placement in children by a multidisciplinary team involving interventional radiology and interventional bronchoscopy.

#### **Materials and Methods**

A retrospective single center review was conducted by querying our RIS/PACS system to retrieve all airway stenting procedures between 2018 and 2022.

There was a total of 17 procedures on 9 patients, comprising placement of biodegradable stents in the airway for various indications. All stents were placed as a last resort, when no other options were feasible or available. Stenting was performed after adequate airway imaging, bronchoscopy and airway compliance testing.

Procedures were performed after approval of a complex airway multi-disciplinary team involving several specialties by an interventional radiologist, interventional bronchoscopist and small group of anesthesiologists familiar with the procedure.

#### **Results**

Technical success was achieved in 100% of the procedures. One stent was removed at the patient's family's request due to resistant dry cough in spite of satisfactory placement. One patient had to undergo cauterization of granulomas secondary to stent placement. Otherwise, the procedures were uneventful.

#### **Conclusion**

Biodegradable stent placement is a valuable and safe technique for maintaining airway patency in children, when the decision is navigated in a multidisciplinary fashion.



## SCIENTIFIC PAPER SESSION #3

### **Interventional radiologic management of acute post-transplant portal vein thrombosis in small liver recipients**

Moreno NF, Upton A, Chau A, Nader MO, Galvan NTN, Goss J, Hernandez JA  
Presented by Nicolas Moreno

#### **Purpose**

From July 2019 to April 2022, 11 children were treated by 1 interventional radiologist after acute post-liver transplant portal vein thrombosis. Patients were treated with percutaneous recanalization at median of 6 days post-transplant. Reason for liver transplant included BA (n=8), alpha-1-antitrypsin deficiency (n=2), and MCAD (n=1). Median age at the time of transplant was 13 months and weight was 9.5kg. Following an acute rise in liver enzymes, diagnoses were made via duplex ultrasound with Doppler.

#### **Materials and Methods**

Portal venous access was obtained via transhepatic (n=5) and/or trans-splenic (n=6) approach under ultrasound guidance. Venogram was performed to evaluate thrombus burden, and mechanical thrombectomy (n=4), balloon angioplasty (n=11) and tPA (n=3) were performed to restore flow to the portal system. Stents were not used in any case.

#### **Results**

Technical success was achieved in all cases (n=11). Two patients with particularly extensive thromboses required serial treatment over 4 and 6 days. Two other patients had residual portal vein stenosis on follow-up imaging requiring further balloon dilation but with no complications. The median reduction in portal venous pressure gradient was 10mmHg. Primary patency at 1 year was 73% (8/11) and secondary patency was 100%. There were no procedure-related complications.

#### **Conclusion**

Acute post-transplant portal vein thrombosis is a major complication post-liver transplant with high morbidity. In the early post-transplant period, endovascular interventions to restore portal flow are safe and can produce durable results.

## SCIENTIFIC PAPER SESSION #3

### Retrospective comparison of complications in pediatric internal jugular and subclavian totally implantable venous access ports

Mychajlowycz M, Baker C, Andrews K, Radadia N, Donnellan J

Presented by Nisarg Radadia

#### Purpose

Totally implantable access ports (TIAPs) are widely used for long-term intravenous therapies, especially chemotherapy, because of their low rate of infection compared to percutaneous catheters. A few studies have compared TIAP complications based on venous access site, internal jugular (IJV) or subclavian vein (SCV), but very few have examined pediatric populations where the use of TIAPs is ubiquitous.

#### Materials and Methods

Single center, retrospective review of ultrasound-guided IJV and SCV cutdown TIAPs removed between October 1, 2016 and May 1, 2021. The primary outcome was total complication rate. Secondary outcomes were first attempt success rate and insertion and removal procedure duration.

#### Results

118 patients with TIAPs were included, 73 with IJV access and 45 with SCV access. Average dwell times were 601.8 and 1099.4 days, respectively. There was no significant difference in total complication rate between the IJV (27.4%) and SCV (26.7%) groups ( $P=1.000$ ). Complication subgroups were also not significantly different between the IJV and SCV groups, including line infection (9.6% vs 4.4%,  $P=0.480$ ), malfunction (11.0% vs 8.9%,  $P=1.000$ ), and migration (6.8% vs 13.3%,  $P=0.330$ ). The success rate on first attempt was significantly higher in IJV group (100.0%) than in the SCV group (86.5%) ( $P=0.003$ ). The mean duration of TIAP insertion was significantly faster for IJV access (69.7 minutes) than SCV access (90.3 minutes) ( $P=0.029$ ); however, mean removal time for uncomplicated TIAPs did not differ between groups taking 54.8 and 59.0 minutes ( $P=0.204$ ), respectively. Complicated TIAPs in the IJV group (84.2 minutes) were removed more quickly than in the SCV group (108.8) ( $P=0.032$ ).

#### Conclusion

Pediatric TIAPs inserted through the IJV and SCV do not significantly differ in complication rate, which is consistent with adult literature. However, the IJV insertion approach is faster and more often successful on the first attempt.











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