Treatment of congenital vascular malformations in children

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disclosures

• Proctoring
  • Covidien/medtronic, W. L. Gore, ab medica, plus medica

• Consulting / lectures
  • Covidien/medtronic, ab medica, St. Jude, Terumo, flowmedical, itm, Siemens, Phillips, Telekom, Boston Scientific, Toshiba
Pediatric Focus at UMC Regensburg

• Interdisciplinary Vascular Anomalies Center
  • 11 medical subspecialities. Lead by IR
  • Largest center in Germany
  • About 40% of the patients are children
  • About 85% interventions, 15% open surgery
• Interdisciplinary Center for Pediatric-Interventional Radiology
  • Only center in Germany
  • Pediatrics, Pediatric Surgery, Transplant Surgery, Anaesthesiology, Radiology
  • Dedicated to the specific needs of children
Specific needs in pIR: technical considerations

- Radiation dose
  - ALARA
  - What is reasonable?
- Amount of CM / body weight
  - Severe restrictions in small children / babys
  - Biplane mandatory
- Biplane angio suite
  - Saves intervention time
  - Improves guidance
- Catheters / devices
  - Miniaturized (3F systems, shortened)
  - Custom-made (e.g. closure device)
  - Dedicated ped angio sets (preprogrammed)
Specific needs in pIR: clinical considerations

• Dedicated team approach
  • Ped IR
  • Ped surgery, Ped transplant team
  • GI team
  • Case management
  • Ped Anaesthesiology / pain management
  • Infectiology / antibiotics
  • Hemostaseology / anticoagulation
  • Dedicated RTs
  • Many others

• Relations to parents
  • You are treating not only the patient

• Minimally invasive does not mean small complications
  • Ped Interventional Conference, M & M conferences
  • Awareness and information (parents!)
Clinical pictures in pIR

• Major topic: Vascular Malformations
  • Venous, arteriovenous, lymphatic, combinations
  • VM Syndromes + hyperplasia
    • KTS, CLOVES, HHML, Proteus, etc.
  • Pulmonary sequestration
  • Congenital Portosystemic Shunts / Abernethy Malformation
  • Congenital Arterioportal Shunts
Many procedures to be expected - ALARA

2-year boy, venous malformation

Before multiple sclerotherapies with Ethanolgel
Prevent unnecessary radiation
→ Optimize patient/C-arm position before first Fluoro
Now you can step on Fluoroscopy.......
Setting FL – (Fluoroscopy)
18 nGy/f, Cu 0.9mm fix, 70kV

Single Shot
3.000 nGy/f, Cu 0.4 - 0.9mm, 70kV

What image quality is neccessary?
ALARA – What is reasonable?

• Technical aspect
  • Top-level modern angio suite
  • Settings + possibilities of your angio suite → dose reduction
  • High-quality images can be provided

• User aspect
  • You have to know the settings
  • Get used to grainy images
  • Highly dependent on tissue volume
    • Patient weight (age)
    • Body region (pelvis, abdomen, thorax, head, extremity)
  • Angulation (oblique = higher dose)
3 weeks boy, extensive venous malformation, D-Dimer ↑↑↑, Fibrinogen not measurable, LIC → DIC

SCLEROTHERAPY WITH ETHANOLGEL
Low-dose fluoroscopy, 3f/s

No DSA run!

Save Fluoro for documentation

CM drainage in spite of tourniquet
Guess who’s fingers these are.....

Low-dose safes the day
If you push dose reduction too far......

Pelvis + 32kg + oblique projection can be too much for your low-dose settings
Born with high-output cardiac failure due to high-flow av-shunt

INTRALOBAR LUNG
SEQUESTRATION
High-flow situation, fast movement (heart rate) →
DSA with high f/s needed to differentiate arterial vs. venous component
Summary pIR in Vascular Anomalies

• Reduce
  • Program settings
  • Know your excellent equipment
  • Fluoro > DSA

• Talk
  • Interventions are surgical procedures
  • Parents and colleagues

• Love it
  • It’s interdisciplinary
Thank you for your attention

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Documentation: saved Fluoro vs. DSA

• Documentation is important in pIR
  • > 70 years to live up to a stochastic radiation damage……..

• Hook-up your in-room Ultrasound machine to PACS
  • Paper print-outs will vanish

• Dose of one frame (image) in DSA up to 100 x more radiation than in Fluoro

• Standard DSA settings are optimized for brilliant images (unnecessary for pIR)
  • Change settings before starting the series
  • Reduce frame-rate

• Frame-rate of Fluoro (3 – 10 f/s) is often higher than in DSA (1 – 3 f/s)
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