

International Day of Radiology 2015
Interview on paediatric imaging
Austria / Prof. Erich Sorantin



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Paediatric radiology in Austria

An interview with Professor Erich Sorantin, acting head of the Division of Paediatric Radiology, Department of Radiology, Medical University Graz, Austria.

European Society of Radiology: What is paediatric imaging? What age are the patients, and how is it different from regular imaging?

Erich Sorantin: In most European countries, paediatric imaging involves all kinds of imaging in foetuses and patients up to 18 years old. Children differ from adults in many respects, like anatomy, circulation, metabolism and radiation sensitivity – the latter being considerably higher compared to adults and depending on age. Younger patients are more sensitive to radiation than older ones.

Size matters: in adults, body mass can vary from 40kg to 160kg, representing a mass factor of 4. Paediatric radiology, excluding the foetal stage, starts in premature babies weighing 300g to obese youngsters who weigh more than 120kg, which equals a mass factor of 400. To cut a long story short: what is right in imaging does not depend on body weight.

Children grow and body composition changes, for instance, children's bones are more cartilaginous and they present with less retroperitoneal fat than adults, meaning ultrasound is preferred. Additionally, there is a different disease prevalence; stroke, myocardial infarction and pulmonary embolism occur less frequently than in adults. The causes of disease are usually multi-factorial – a combination of congenital anomalies (e.g. vascular, thrombophilic conditions) and environmental factors like dehydration or the use of contraceptive pills in adolescent girls. The tumour spectrum is also different – there are fewer breast and colon carcinoma, but more leukaemia, brain and bone tumours.

The paediatric radiologist has to map all these factors when deciding examination protocols in consideration of potential exposure to ionising radiation. For example, at my institution, there are 250 different types of plain films done – all these 250 types have to be adjusted to all age groups, considering their differences in body composition and growth patterns.

ESR: Since when has paediatric imaging been a speciality in its own right?

ES: In 1897, the first x-ray unit was installed in Graz, Austria. The first scientific papers and books were published at the turn of the 20th century. In 1963 the European Society of Paediatric Radiology was founded. In Germany, a working group of the Society of Paediatrics was founded in 1963, and the first meeting took place in Munich one year later. The *Gesellschaft für Pädiatrische Radiologie* (Society for Paediatric Radiology), which was international, but dominated by German speakers, was founded in 1968. Only in a few countries, for instance the United States, is paediatric radiology regarded as a subspecialty of its own.

ESR: Which imaging modalities are usually used to examine paediatric patients? Does this change depending on the age of the patient?

ES: All available imaging modalities are used; scintigraphy and interventional radiology are usually done in cooperation with colleagues from adult radiology, except in large paediatric centres.

ESR: Some imaging techniques, like x-ray and CT, use ionising radiation. What risk does this radiation pose to paediatric patients? What kind of safety measures are in place to protect children?

ES: As mentioned earlier, children are more sensitive to radiation than adults. The long-term risk is the occurrence of radiation-induced cancer. Similar to sunburn in melanoma, every piece of radiation counts. Therefore, efforts have to be made to reduce radiation dose levels following the 'as low as reasonably achievable' (ALARA) principle in order to make a diagnosis. This can be done in numerous ways, from using non-ionising imaging methods such as ultrasound and magnetic resonance imaging (MRI), to selecting appropriate equipment and optimising exposure settings. Furthermore, shielding should be used in all patients, whenever possible, in order to protect body parts which are not relevant to the examination. Exposure settings and dose quantities should be kept in line with national and international regulations.

ESR: Do general radiologists always use lower radiation doses when imaging children; are there any guidelines to follow?

ES: Since children are not simply 'small adults', adjusting according to body size or age is not appropriate and will either lead to suboptimal (even non-diagnostic) image quality or overexposure. There is evidence in the literature that institutions where paediatric patients represent only a small proportion of the CT examinations tend to use higher doses in children compared to dedicated paediatric radiology units. There are several guidelines, both national and international, such as those provided by the *EuroSafe Imaging* campaign or *Image Gently* campaign, as well as guidelines for obtaining paediatric chest films.

ESR: How aware are parents and relatives of the risks of radiation exposure? How do you address the issue with them?

ES: Radiation awareness of parents naturally varies, but many of them find unfiltered information on the Internet – which can cause anxiety. A constructive talk, balancing the radiation risk in relatable terms (e.g. comparing it to natural background radiation) against the benefit of the examination, usually helps. It has to be considered that those discussions need time and that multiple people are involved in paediatric radiology, such as the patient and parents, other relatives, and caregivers. It is sometimes not easy to communicate with concerned parents.

ESR: Undergoing an imaging examination, especially a long procedure like MRI, can be an uncomfortable and sometimes frightening experience for some children. How can it be made more bearable?

ES: First of all streamline the examination and reduce MRI examinations to just the scans that are necessary to make the diagnosis. Next, explain the examination to children, give them time to feel comfortable, do not put them on the examination table and attach coils immediately. When setting the examination date, inform them that they can bring their favourite CD or mp3s. In some MR machines, it is even possible for patients to watch videos during examinations.

ESR: How many imaging exams are performed on paediatric patients in Austria each year?

ES: Unfortunately I do not have exact figures, but it will be around 450,000 to 500,000 examinations per year in Austria.

ESR: Access to modern imaging equipment is important for paediatric imaging. Are hospitals in Austria equipped to provide the necessary exams?

ES: Basically, yes, but paediatric optimisation could be better, based on my experience working outside of my own institution very often.

ESR: What has changed in paediatric radiology during your lifetime?

ES: I have now been working for 33 years in hospitals, 31 of which in paediatric medicine and 25 in paediatric radiology. In the 80s, imaging was limited to plain films in children. Some academic institutions started to use ultrasound. I started using sonography in 1984 at a non-academic institution, and every day we found new applications beyond the abdomen and heart, in the brain, hip, lung, pyloric stenosis, etc. In the 90s, imaging was widened to children, with limited access to

cross-sectional imaging. Still, at that time, many examination protocols were copied from adults with minor modifications for children.

Today we can use all kinds of imaging modalities for children and paediatric radiologists no longer copy protocols from adult imaging, but develop specific patient-tailored protocols for children. I am convinced that paediatric radiologists are quite more aware of radiation protections than their colleagues in other subspecialty fields.

ESR: Where do you see the next developments in your field?

ES: Ultrasound will step into 3D scanning in daily routine, CT will increase time resolution and new detector technologies will decrease dose. Advancing MRI technology will provide faster functional results (e.g. functional MRI and spectroscopy). Moreover, using nuclei other than hydrogen will enable fascinating new applications.

Other non-invasive imaging modalities like electrical impedance tomography will find their place. All imaging modalities will benefit from increased computer speed and support usage of more complex algorithms in real time. Therefore hybrid imaging will be much easier to perform.

***Erich Sorantin** is the acting head of the Division of Paediatric Radiology, Department of Radiology, Medical University Graz.*

He first trained as a general practitioner and did a residency in paediatrics. He switched to the department of radiology at the Medical University Graz, where he completed a residency in radiology with a special focus on paediatric radiology. He became a professor in 2002.

His scientific interests include paediatric radiology, biocomputing, biosimulation, radiation protection, non-invasive imaging, signal and image processing, and artificial intelligence.

As a paediatrician, he published a paper on computing of neonatal mechanical ventilation. In 1995 and 1996 he led the first EC Research Project of the University of Graz in breast cancer detection and artificial intelligence. He also served as a computer graphics consultant to Siemens for more than 10 years, developing virtual endoscopy applications for two workstations. Additionally, he introduced digital imaging for children in Graz and optimised software for paediatric use.

Prof. Sorantin is the coordinator for a multi-institutional, international interdisciplinary research network, covering 36 academic institutions in 14 countries, which organises six schools and an academy for paediatric medicine each year.

He is a board member and serves in different roles in various scientific societies.

Erich Sorantin has been married for 31 years and has three sons.



