



## **Paediatric radiology in Slovenia**

**An interview with Damjana Ključevšek, consultant paediatric radiologist at the Children's Hospital of the University Medical Centre of Ljubljana, Slovenia.**

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

**Damjana Ključevšek:** Paediatric imaging at my institution includes imaging of foetuses, neonates, toddlers, infants, preschool children, school children and adolescents. Young adults are examined in cases of chronic disease (e.g. some storage diseases, unusual or very uncommon congenital disorders). Paediatric protocols are adapted to different ages and clinical questions.

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

**DK:** The history of paediatric imaging began with the beginning of x-ray imaging (a roentgen print of an infant's arm). In my institution, a radiology unit was established in 1952 under the leadership of Dr. Šilc, who was a paediatrician. He gained additional training in the field of paediatric radiology in Leyden, Germany<sup>1</sup>.

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

**DK:** Ultrasonography, conventional radiography and magnetic resonance imaging (MRI) are usually used to examine paediatric patients. A lot of attention is paid to the development of different ultrasound (US) techniques, including intravesical (echo-enhanced voiding urosonography) and intravenous application of US contrast agents for the characterisation of liver lesions and inflammation of the bowel wall, and different US-guided interventions. Computed tomography (CT) is used for special clinical issues. Where MRI and CT have the same diagnostic outcome, MRI is preferred.

**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?**

**DK:** It is well known that ionising radiation has stronger effects on children than on adults. Therefore, all safety procedures are respected in our patients, according to the 'as low as reasonably achievable' (ALARA) principle and image safety strategy. The first task of the radiologist is to confirm whether the proposed examination is necessary or not, and if the chosen examination is the right one to answer specific clinical questions. In line with the ALARA principle, we use numerous devices (lead protection, 'mulda' device) and paediatric imaging protocols (e.g. paediatric low-dose protocols for CT examination) to protect children. Radiographers and radiologists are trained to explain to parents and children all about the examinations, and answer parents' questions about x-ray exposure and the estimated effective dose for a certain examination performed in our department.

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

**DK:** My personal opinion, based on long-term experience, is that radiologists don't always use lower radiation doses when imaging children, particularly in smaller hospitals without radiologists dedicated to paediatric radiology. In fact, general radiologists in Slovenia don't have official written

guidelines to follow. In 2012, a recommendation about paediatric imaging in general hospitals was accepted: "At least one radiologist in every general hospital should be in charge of paediatric patients and she/he must have the opportunity for additional training in the field of paediatric radiology." Unfortunately, this recommendation has not yet been followed in all general hospitals.

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

**DK:** It depends on the parents. Written informed consent is obligatory before x-ray, MR and US examinations, examinations with US contrast agents, and US-guided interventions. Parents first talk with a radiographer and if there are any questions, a radiologist is called to give additional information, including information about ionising exposure. If parents do not agree with the examination or are afraid of ionising radiation, a conversation is the first tool to use. Most parents are satisfied with explanations and give their consent for the examination. If they don't agree despite all the explanations, parents have to write cancellation papers.

**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?**

**DK:** Again, the most important is how we approach parents and children. We talk with children, we explain that they must lie calm and not move, we show them the examination room and the images, and they are able to choose music or fairy tales. Parents are allowed to be in the MRI room with the child. During the examination, we encourage young children to say whether they are doing well, and ask them to be just a little more patient. After the examination, they get the reward they chose before the examination.

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

**DK:** No, only the Children's Hospital of the University Medical Centre in Ljubljana is equipped to provide all the necessary exams.

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

**DK:** The development of US with new techniques including US contrast medium has changed many protocols, which have become more child-friendly and non-invasive. The number of x-ray contrast examinations like voiding cystourethrography and contrast examinations of the gastrointestinal tract has been significantly reduced. Magnetic resonance imaging now replaces a lot of CT examinations and has thus reduced the radiation burden. There is an increasing awareness of children safety during various examinations.

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

**DK:** I expect further development and clinical use of different US techniques (e.g. elastography, more user-friendly 3D ultrasound and Doppler examinations). I expect further development of contrast-enhanced ultrasonography and the introduction of shorter and movement-independent MRI sequences allowing MRI scanning without sedation or anaesthesia. I also expect the combination of morphology and function in new functional examinations. I think that such progress will lead to safer and more child-friendly examinations.

<sup>1</sup> ref. Ključevšek D. 60-year of Paediatric Radiology in Slovenia (in Slovenian). Slov Pediatr 2012; 19 (1):89-93.)

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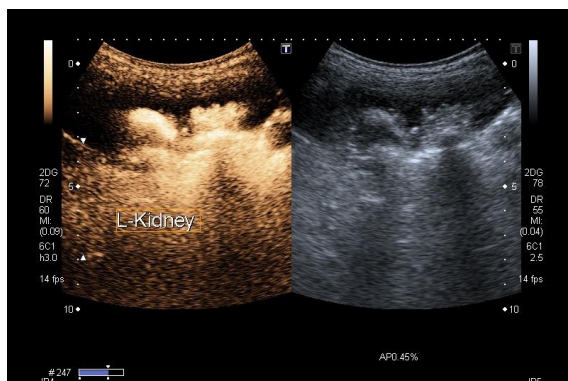


Dr. Ključevšek is a member of the European Society of Paediatric Radiology and works as a European coordinator for paediatric radiology in Slovenia. She is also a member of the European Society of Radiology, the Slovenian Association of Ultrasound in Medicine and Biology, and the Slovenian Society of Radiology.



Radiographic equipment ('mulda') adapted for use in newborns and infants up to 15kg (two sizes). It enables safer child immobilisation, more accurate limitation of the field of view, and proper patient positioning. The examination can be performed faster, and radiation dose can be significantly reduced.

Radiographic equipment adapted for x-ray voiding cystourethrography. It allows safe child immobilisation.



Echo-enhanced voiding urosonography, radiation-free method. US contrast medium is seen in the left kidney pyelocalyceal system.