

**International Day of Radiology 2015**  
**Interview on paediatric imaging**  
**Croatia / Prof. Goran Roić**



**INTERNATIONAL  
DAY OF  
RADIOLOGY**  
AN INITIATIVE OF THE ESR, ACR AND RSNA

**Paediatric imaging in Croatia**

**An interview with Goran Roić, head of paediatric radiology at the Children's Hospital Zagreb, professor of radiology at the School of Medicine, University of Rijeka, and head of the Department of Radiology, University of Applied Health Sciences in Zagreb.**

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

**Goran Roić:** Paediatric imaging is a subspecialty of radiology involving imaging of the foetus, neonates, infants, children, adolescents and young adults. Paediatric imaging is very specific compared with general imaging, due to children's anatomic, physiological and pathological specificities. It is necessary to understand the specifics of certain ages since the age range of paediatric patients is very wide. It should be highlighted that the patient in paediatric radiology is not only the child, but also his parents and relatives. Therefore good communication and cooperation with them is crucial for high-quality diagnostic process. Paediatric imaging today uses all the modalities used in general radiology, with the prerequisite of having knowledge and understanding of clinical paediatrics. Generally, the aim of imaging is the evaluation, diagnosis, understanding and monitoring of diseases and abnormalities. However, unlike adult radiology, in which imaging is indicated mostly for patients for whom there is a high clinical suspicion, paediatric imaging is very often used to rule out the presence of disease or abnormalities, even in cases with low clinical suspicion.

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

**GR:** Paediatric radiology is, together with neuroradiology, the oldest subspecialty of radiology. A few months after Roentgen's discovery of x-rays, this new diagnostic method started to be applied to children. In 1897, the first paediatric radiology department was founded in Graz, Austria. In 1910, the first textbook in children's radiology was published. Paediatric radiology experienced further momentum in the late 1940s with the development of both paediatrics and radiology. Intensive technological and IT development between the 1960s and the early 1990s resulted in the introduction of new imaging methods (ultrasonography, computed tomography, digital radiography, magnetic resonance imaging, teleradiology), and paediatric radiology grew into paediatric imaging. Paediatric imaging today is a recognisable and clearly defined branch of radiology, and an inseparable part of modern children's medicine.

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

**GR:** Paediatric imaging uses all the imaging modalities of adult radiology, but the algorithm of diagnostic procedures, techniques and protocols are adapted to the specific needs of child healthcare. To correctly set the indication for an imaging examination, the algorithms of diagnostic imaging methods in paediatric radiology in a particular clinical situation need to be well known. Close cooperation and communication with the referring physician is key in selecting the most appropriate imaging method or algorithm to offer a high quality and reliable diagnosis, taking into account the potential harmful effects, duration of examination and invasiveness. The choice of the most appropriate imaging method depends on the age of the patient and on the differences primarily in anatomy and physiology. However, it is

always essential to get to the correct and reliable diagnosis in the shortest possible time and in the least invasive way possible.

**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?**

**GR:** It is well known that children are more sensitive to ionising radiation due to biological factors and their longer remaining expected lifespan, in which the possible harmful effects of radiation may materialise. Although the individual risk for a child is very small, the increase in the number of examinations each year makes it necessary to make use of methods that use ionising radiation. Fortunately, today, we have imaging techniques that do not use ionising radiation but at the same time give us high quality and reliable diagnostic information. We give them priority in the algorithm of diagnostic imaging methods whenever possible. The most important protection methods are the correct indication of imaging methods, especially those that use ionising radiation, and the use of appropriate protocols and techniques in children. Of course, we also use protection devices and technological solutions to maximise child protection.

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

**GR:** General radiologists' awareness of adaption of the imaging techniques and use of paediatric protocols is growing every year. However, paediatric imaging protocols and recommendations regarding low dose exams are still not used everywhere. There is a difference in the approach of paediatric radiologists, for whom paediatric imaging is a core business, and general radiologists, who as a part of their profession are sometimes engaged in paediatric radiology. In my opinion, it is necessary to provide additional training for all radiologists who deal with paediatric radiology as a part of their work, in order for them to be aware of the appropriate techniques and protocols that apply to the specific requirements of paediatric radiology. This is primarily related to the recommended imaging algorithms and protocols that are applied in modalities that use ionising radiation.

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

**GR:** Awareness of parents and relatives about the potential harmful effects linked with radiation exposure is increasing year after year, and today they often ask which imaging technique will be applied to their child and whether this technique involves the use of ionising radiation. The vast majority of parents today are familiar with the fact that many imaging methods do not use ionising radiation, such as magnetic resonance imaging (MRI) and ultrasound (US). Good cooperation and partnership with parents and relatives is essential for a high-quality diagnostic procedure. Therefore, parents should be involved in the diagnostic process, and the benefits as well as limitations of individual imaging methods should be explained to them. Proper use of imaging methods that are available today can realistically reduce the risk of the potential negative effects of harmful radiation to a minimum level.

**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?**

**GR:** There is a constant tendency for imaging examinations to become less unpleasant for children and thus for parents, thanks to improved performance, shorter examination duration and lower exposure to ionising radiation. MRI examinations are still often long, which can sometimes result in some discomfort and fear for the child. Preparing the child well is crucial and must be done ahead of the exam. It is important to prepare and familiarise the child with the exam and the way it will be performed. The cooperation of parents and medical staff is essential. Teamwork and coordination are extremely

important in communication with patients and their parents. The continuous advancement of technology helps us to shorten the duration of examinations and to make the experience as comfortable as possible for the child.

**ESR: How many imaging examinations are performed on paediatric patients in Croatia each year?**

**GR:** In Croatia, there is one dedicated comprehensive children's hospital, while in other hospitals paediatric imaging is carried out as a part of general radiology, most often in hospitals that have a paediatric department. Unfortunately, there is no single registry that gives us the total number of imaging exams, but we know that every year the number is increasing. This is due to the decentralisation of institutions performing paediatric imaging and to better education of general radiologists in the field of paediatric imaging. As I said earlier, in contrast with adult radiology, paediatric imaging is very often used to exclude the presence of disease or abnormalities even in patients with low clinical suspicion, which significantly increases the number of examinations.

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

**GR:** There is a problem with the replacement and upgrading of radiological equipment, and in some institutions radiological equipment is technologically out-dated and of questionable quality. But I think that the bigger problem is general radiologists who have received insufficient training in paediatric imaging and the correct use of imaging equipment when the patient is a child. There is also the problem of waiting lists for some more sophisticated diagnostic procedures (for instance MRI under anaesthesia), due to the small number of specialised diagnostic imaging centres that carry out these procedures.

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

**GR:** Paediatric radiology and radiology in general are developing extremely rapidly, which is due to the rapid development of medical and information technology. The development of digital ultrasound technology as well as MRI technology for children have significantly enhanced and enriched paediatric radiology over the last few decades. Nowadays we can realistically talk about paediatric imaging without radiation, which was unimaginable a few years ago. Paediatric imaging has become an inseparable part of paediatric medicine in all clinical areas; without it, modern paediatric medicine is unimaginable.

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

**GR:** I believe we will soon manage to have paediatric imaging without or with minimal ionising radiation. In addition, we will experience further rapid development of ultrasound and MRI technology and sophisticated computed tomography (CT) and x-ray devices. There is already very sophisticated digital radiography and CT equipment with minimum possible doses of radiation. Also, significant progress in ultrasound and MRI diagnostics has resulted in higher quality and very reliable diagnosis, and they can almost fully replace methods that use ionising radiation in many clinical situations. Further technological improvement of existing imaging modalities will certainly further strengthen paediatric imaging, even though that seems, from today's perspective, unrealistic. In the area of education, our aim should be to reduce the differences in indications, choices of imaging methods, approach and performance of paediatric imaging procedures between general and paediatric radiologists.



**Goran Roić** is head of paediatric radiology at the Children's Hospital Zagreb, the largest, and only comprehensive, specialist children's hospital in Croatia. He is also professor of radiology at the School of Medicine, University of Rijeka, and head of the Department of Radiology, University of Applied Health Sciences in Zagreb. He specialises in paediatric radiology and is mainly interested in paediatric ultrasonography and paediatric abdominal imaging. Dr. Roić has authored or co-authored more than 60 original papers and five book chapters or monographs, and is a reviewer for five international journals. He is the current vice-president of the Croatian Society of Radiology, a member of the Radiology Advisory Committee of the Croatian Ministry of Health, and past vice-president of the Croatian Medical Association.