

**International Day of Radiology 2014**  
**Interview on brain imaging**  
**Estonia / Dr. Äli Roose**



**INTERNATIONAL  
DAY OF  
RADIOLOGY**  
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The ESR spoke to Dr. Äli Roose, senior consultant in radiology at the North Estonian Medical Centre, the largest teaching hospital in Estonia, about the how imaging helps diagnose brain disorders and what precautions are taken to ensure patient safety.

**European Society of Radiology: Imaging is known for its ability to detect and diagnose diseases. What kind of brain diseases can imaging help to detect and diagnose?**

**Äli Roose:** Brain imaging is helpful for diagnosing several central nervous system conditions. For example, radiology is vital for diagnosing tumours and explaining neurological deficits. On the other hand, patients often seek help for headaches, which usually do not have a visible underlying pathology and do not require imaging studies. It is then the clinician's job to perform imaging studies when appropriate. It is in our interest that patients only get brain scans of real value so that we can use our financial resources, workload and patient access in the best possible way. The development of imaging studies gives us more and more possibilities to image not only structural changes in brain anatomy, but also all kinds of functional disturbances. We are also able to make diagnoses prenatally and post mortem.

**ESR: How useful is imaging in brain disease management? Does it improve the understanding of disease or improve patient prognosis?**

**AR:** Nowadays, although a neurological examination remains primarily an evaluative tool and source of information, radiology is often necessary to confirm or rule out possible causes that could explain a patient's complaints or neurological status. Whether an organic pathology or functional deficit is suspected, different methods can be applied to further elaborate our hypothesis. In many cases imaging is essential. For example, with the proper use of MRI it is possible to differentiate multiple sclerosis from other similar syndromes or, in the case of brain tumours, decide which treatment is the most suitable one.

Furthermore, radiological studies usually do not require an invasive approach and are well-tolerated by patients. We take more and more into account every person's individuality – our real goal is personalised diagnosis and treatment. Proper treatment decisions definitely improve life quality and prognosis.

**ESR: What kind of technology and techniques do radiologists use to image the brain? Are there any specific techniques for particular diseases?**

**AR:** The modalities most often used for brain imaging are CT and MRI. CT is preferred in trauma patients to visualise haemorrhage and skull fractures. MRI's advantage is better soft-tissue differentiation, which makes it suitable for detecting brain tumours; using contrast agents this advantage is greatly enhanced. In addition, MRI-spectroscopy is a non-invasive diagnostic test for measuring biochemical changes in the brain, especially the presence of tumour cells in normal looking brain tissue, or differentiating post-treatment changes from real tumour recurrence. MRI-tractography is an imaging tool used increasingly in neurosurgical procedures to generate 3D maps of neuronal pathways as an aid to identify safe margins and surgical approach during resection. Using radioisotopes SPECT is useful for studying the dopamine system, differentiating Parkinson's disease from other conditions.

There are many diseases, but luckily radiology has a variety of tools to detect them.

**ESR: What is the difference between a radiologist and a radiographer? Who else is involved in performing brain imaging exams?**

**AR:** The radiographer performs the exam; he or she is the person the patient about to undergo a brain scan meets. The radiologist is the one who has to figure out what the collected information on the image means. The work done by biomedical engineers, who are responsible for maintaining the machines and guaranteeing the safety and quality of the images, is very important. Without engineers radiology would be unimaginable. Close collaboration between radiographers, radiologists and biomedical engineers gives us the best results and is of great benefit to our patients.

**ESR: How many patients undergo brain imaging exams in your country each year?**

**AR:** There are about 7,000 head MRI scans and 30,000 head CT scans performed every year in Estonia, whose total population is 1.3 million.

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

**AR:** Yes, though Estonia is small (1.3 million inhabitants), the equipment for all the necessary exams is available all over the country. In every county, there is at least one CT scanner, and all six of the largest hospitals in the country have MR machines, which are able to perform all kinds of exams. Regional hospitals in Tallinn and Tartu are equipped with CT and MR scanners as well as a PET/CT scanner.

**ESR: In many countries there are waiting lists for MRI exams. How long can patients typically expect to wait for an exam in your country?**

**AR:** It really depends on the patient's condition and the problem he or she has. If the case needs a quick solution, MRI is provided very quickly within the same day or the very next day. If we deal with the usual non-urgent outpatient case, the waiting list is about two to three months.

**ESR: As the global population gets older, the risk of developing neurocognitive and neurodegenerative disorders increases. How can imaging help tackle this issue?**

**AR:** Neurodegeneration is an inevitable part of normal ageing, but radiological imaging helps to identify patients with neurodegenerative disorders where appropriate treatment can improve the patient's quality of life or slow progression of the disease. For example, there are now treatment options for Alzheimer's disease, but for early and accurate diagnosis, MRI is needed to differentiate the disease from other causes of dementia.

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

**AR:** Ionising radiation is part of our daily life, for example one chest x-ray gives the same dose as 10 days of natural background radiation. The health risk from this amount of radiation is extremely low and a chest x-ray can considerably influence the patient's course of treatment. The most important and effective way to reduce the risks linked with radiation exposure is to conduct imaging exams only when they are really necessary and potentially alter the treatment. All imaging with ionising radiation is carefully monitored: routine maintenance of the equipment, protective shielding, low-dose imaging and careful study planning are used to ensure the patient's safety. Special attention is paid to child examinations with ionising radiation; plenty of MR scanners allow us to use MR instead of CT in many cases.

**ESR: What kind of role can imaging play in preventing and predicting brain diseases?**

**AR:** Imaging has an important role in disease prediction. Performing imaging studies, it is possible to detect many diseases before they display symptomatic clinical findings. For example, some small lacunar ischaemic lesions do not lead to any neurological deficit, but these may refer to a bigger upcoming ischaemic stroke. The earlier the vascular disease is diagnosed, the earlier the treatment can be started. Suitable radiological imaging also plays an important role in dynamic assessment of different diseases. Depending on these studies clinicians can decide when is the right moment to remove benign tumours and blood vessel aneurysms, or if surgery can be avoided at all.

**ESR: In general, patients don't see the radiologist. A patient will discuss the image with the neurologist, neurosurgeon or oncologist. When they ask a question, they're often told: "I'm not a radiologist". Why don't radiologists discuss the image with the patient first?**

**AR:** It is a legitimate concern that the value of radiology should be better demonstrated to patients and general public. Brain scans and other studies have a meaning only when analysed in the context of symptoms, patient history, clinical and laboratory findings, previous test results and other information that only the patient's physician has. In Estonia, radiologists have daily clinical-radiological meetings with different physicians to discuss radiological studies. For example, every week there are meetings with neurologists and neurosurgeons, during which the patient's brain scans are discussed to find the best treatment option.

**ESR: How expensive are radiological examinations to the health service and is there a risk that some of these examinations could be blocked by health technology assessment agencies deeming them to be not cost-effective? If so, how can patients help to ensure that these examinations are made available?**

**AR:** The equipment needed for radiological studies is very sophisticated and complex, and it is developing very quickly, that's the reason why radiological examinations are often quite expensive. Cost-effectiveness of new radiological studies is definitely very carefully considered by health technology assessment agencies, especially in Estonia, where we have universal public health insurance. For example, a free screening mammography programme is being conducted in Estonia, but due to certain financial reasons it doesn't cover as wide an age group as it ideally should.



*Äli Roose is senior consultant in radiology at the largest teaching hospital in Estonia – North Estonia Medical Centre. After specialising in neurology and neurosurgery in late 1980s, she specialised in diagnostic and interventional radiology in the 1990s. Dr. Roose was the first in Estonia to get fellowships in CT and MRI abroad; in Germany and US. Her current special interests are neuroradiology, oncological imaging, head & neck radiology, and paediatric radiology, with a special focus on brain imaging of newborns. She teaches radiology residents and is also very popular among the residents of other specialties, especially in neurology and neurosurgery. She is the chief radiology specialist for several clinical radiological working groups and is a well-known organiser of interdisciplinary workshops in radiology. She is also an active member of the Development Council of the Estonian Society of Radiology.*