Vienna, September 4, 2023

The use of radiomics against lung cancer: how more can be done for the patient

Lung cancer is one of the most common cancers and cancer-related causes of death worldwide. With radiomics, a special data analysis of existing radiological and nuclear medicine image data, new information on the oxygen saturation and metabolism of the tumour as well as its tissue properties can be obtained from existing image material. This is essential for the therapy decision and the success of the therapy. During the European Nuclear Medicine's Annual Congress, known as 'EANM'23', which will take place from September 9 to September 13 in the Austria Center Vienna, participants will discuss how radiomics can be brought more widely into hospitals.

'Radiomics, i.e. a specific analysis of existing image data that can extract even more information from the existing material, is a very important and new approach in nuclear medicine. With the help of radiomics, we can individualise the medical treatment of patients even more and thus, for example, significantly improve the success of treatment for cancers such as lung carcinoma. A few steps are still necessary to make radiomics possible on a broad, standardised basis in hospitals, but I am very confident that we will soon succeed in doing so for the first tumour types', says Prof. Dr. Felix Mottaghy, Board Member of the European Association of Nuclear Medicine (EANM) and clinic director of the Department of Nuclear Medicine at RWTH Aachen University Hospital.

Radiomics better reveals characteristics of lung cancer

Lung cancer is one of the most common types of cancer worldwide. In Austria alone, about 2,000 women and 2,700 men are diagnosed with it every year. In terms of cancer-related causes of death, lung cancer is currently even in first place in Austria for men and in second place for women. 'In order to make smaller lesions more easily visible and thus to be able to detect lung cancer earlier, especially when surgery is still possible, radiomics offers completely new possibilities', says Mottaghy. The underlying idea is that radiological and nuclear medicine image data can be used to make statistical statements about tissue properties, diagnoses and disease progression that would otherwise have to be based on the genome. 'With the help of radiomics, we generate new information about the oxygen saturation and the metabolism of the tumour with existing image material and see what the tissue between the tumours is like. This gives us important information about the vascular supply and condition of the tumour,' emphasises the nuclear medicine specialist. The tissue characteristics that have become visible and their changes also make it possible to predict whether there is a high probability that metastases will develop. This information is essential for oncologists, because it allows them to assess whether a therapy that is difficult to tolerate is promising for the patient or not and, if

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necessary, to start earlier with another therapy that is more promising for the patient's individual situation. Radiomics can thus provide a good assessment of the patient's physical reactions, help to determine the direction of therapy planning and also help to better adjust the necessary drug doses for the patient's treatment.

Radiomics: in the starting blocks for application at hospitals
Radiomics can be applied well not only in the diagnosis of lung cancer, but also in other cancers such as liver, breast, and prostate cancer as well as chronic lung diseases and rheumatic diseases. 'Radiomics offer the greatest benefit precisely when expensive drugs have to be used for therapies and the output that can be achieved with them is not always clear in advance. Every additional piece of information that we can extract here with the help of radiomics helps enormously in the decision-making process for therapy selection', says Mottaghy. Many hospitals are still using radiomics on an experimental basis. In order to be able to carry out radiomics validly, standards are now being developed - partly in the course of the congress - which will be defined in a catalogue in the future. 'This will provide the best basis for radiomics to be widely applied in hospitals as soon as possible - probably in the next one to five years', Mottaghy emphasises.

From Data Mining, Deep Learning and Radiomics
In general, radiomics is a subfield of medical image processing and basic radiological research, which deal with the analysis of quantitative image features in large medical databases. Radiomics is considered a child of 'data mining', i.e. the data analysis as well as semi-automatic evaluation of huge amounts of data, and 'deep learning', which is a special method of information processing or machine learning. 'The basis for a good application of radiomics is and remains the image quality of the radiological and nuclear medical images, because we know according to the 'garbage in, garbage out' principle that the analysis only provides valid and meaningful data if the underlying image data also fit. Here I am pleased that the technical developments of recording devices are progressing enormously and that the devices are becoming more and more sensitive and deliver even better image recordings. This also gives the application of radiomics a certain turbo,' says Mottaghy.

About the EANM
The European Association of Nuclear Medicine (EANM) is the largest organisation for nuclear medicine in Europe. In this capacity, EANM has become the umbrella organisation representing the entire sector to European institutions and other international organisations. Its headquarters are in Vienna. More than 7,000 international participants are expected at this year's EANM Congress, which will take place from September 9 to September 13 in the Austria Center Vienna. www.eanm.org

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