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# Brain tumour: radioactive amino acid improves diagnosis and treatment

**(Vienna, 23 April 2013) Cerebral glioma is a life-threatening brain tumour. A novel imaging technique, based on radioactively labelled amino acids, allows earlier detection and a much more precise localisation of the cancer tissue, thus enhancing the chances of fighting the disease. "This method has proven its high reliability in numerous studies and is ready to be introduced into practice on a large scale. The benefit for patients is significant," says Professor Karl-Josef Langen, expert of the European Association of Nuclear Medicine (EANM).**

Cerebral glioma is the most common type of primary brain tumours. Five to six new cases per 100,000 individuals occur annually. For the majority of patients, the disease is fatal. The cancer, which arises from glial cells that form the support structure of the nervous system, is usually being diagnosed by magnetic resonance imaging (MRI). But according to EANM expert Prof. Karl-Josef Langen (Institute of Neuroscience and Medicine, Research Centre Jülich, Germany), this technique, which makes use of magnetic and radio frequency fields, has a limited capacity to distinguish between tumour tissue and other tissue changes that are not cancerous. However, a precise spotting of the tumour is vital for biopsy, as well as for the planning of surgery or for an effectively targeted radiation therapy, which destroys the tumour, while at the same time preserving the surrounding healthy tissue as far as possible.

**Joining forces: MRI and FET-PET**

To improve the diagnostic outcome of MRI, physicians have been using positron emission tomography (PET) as a supplementary method for quite a long time. PET spots cancerous cells by making their metabolism visible through tracers (radioactively labelled substances the patient is injected with), and thus provides valuable information that can be fused with the more anatomically oriented images of MRI. For the PET examination of brain tumours, the radio-labelled amino acid C-11-methyl-L-methionine (MET) has been used as the standard tracer so far. MET can clearly delineate the cerebral glioma, as the uptake of this tracer by the tumour is markedly higher than by the surrounding healthy tissue. Hence, this amino acid outperforms other tracers that are being used frequently, such as glucose (fluoro-deoxyglucose/FDG), which in the case of gliomas fails to sufficiently differentiate low-grade tumours from normal tissue.

Nevertheless, MET also has its downside: it is complicated to produce and it has a half-life of only 20 minutes, which restricts the use of MET-based methods to the few diagnostic centres that are equipped with an in-house cyclotron that allows to produce this tracer on site, so that it can be administered immediately. To overcome these difficulties, Prof. Langen and his colleagues have been employing a different tracer, a fluorine-18-labelled amino acid, called FET. Its half-life of 109 minutes allows for transport from the production site to multiple

external PET centres, so patients who have to undergo FET-PET examination need not travel long distances. There are other pros: FET, by contrast with MET, shows no uptake in inflammatory cells or in inflammatory lymph nodes, thus avoiding to create misleading data. Moreover, it is better in distinguishing recurrent glioma from non-cancerous tissue changes, which makes it altogether more accurate than MET in targeting the tumour cells.

**Precision rate of over 90 per cent**

By comparing the diagnostic results of both combined FET-PET/MRI and MRI alone with the "gold standard" of tumour biopsies, Prof. Langen and his team could demonstrate that the outcome of FET-PET together with MRI is significantly better than the application of MRI alone. "The combination of methods enabled us to determine the location and the extent of tumours with a precision rate of more than 90%, while MRI alone proved to be far less accurate: only half of the tissue changes detected by MRI turned out to be cancerous," says Prof. Langen. "The advent of FET-PET has virtually revolutionised brain tumour diagnosis. The possibility to integrate this method with any of the several existing MRI variants in one investigation improves the planning of surgical as well as radiotherapeutic treatment. A restriction of the target volume to the actual tumour size can substantially lessen the negative side effects of radiation therapy, while at the same time permitting treatment of the tumour itself with a higher dose than otherwise possible. Furthermore, the treatment response can also be judged reliably at an early stage."

According to Prof. Langen, more than 20 university clinics in Germany and a number of centres in Austria, Denmark, France, Italy, the Netherlands and Poland have already established this method. He estimates that more than 10,000 FET-PET scans have been performed in the last five years. Side effects have not been reported so far. The patients' exposure to radiation during FET-PET is not higher than that of a usual x-ray examination. "It is very likely that the further introduction of this method into clinical practice will improve the treatment of this extremely severe disease. Apart from the patients' benefit, the costs of these techniques will be well justified as they help saving the costs caused by the repeated use of diagnostically less reliable methods," says Prof. Langen.

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