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Nuclear medicine as a ‘sniffer dog’ against prostate carcinoma - Giving hope for other types of cancer

Prostate carcinoma is the most common cancer in men. With PSMA radioligand therapy, nuclear medicine offers a promising, non-invasive procedure for the diagnosis and treatment of prostate carcinoma.

Up to 50 % of end-stage patients and 80 % of patients for whom other initial therapy was unsuccessful respond well to it. In the future, the same ‘theranostic’ principle, i.e. the combination of diagnostics and therapy based on the same substances, will also be used to treat other types of cancer that are currently difficult to treat. This and other possible applications of nuclear medicine in oncology, cardiology and neurology will be discussed at this year’s European Nuclear Medicine Annual Congress ‘EANM’23’, which will take place from September 9 to September 13 in the Austria Center Vienna (ACV).

‘We started in the 1940s with thyroid diagnostics, but in recent years nuclear medicine has developed from a niche discipline into a highly sought-after service provider for medicine, thanks to new major fields of application such as oncology, cardiology and neurology. Our USP is that we can make processes in the body visible in a targeted manner with very small amounts of radioactive substances - and this especially in those regions of the body that are otherwise difficult to access. This makes us an essential partner in diagnostics and therapy. This is particularly evident today in the treatment of prostate carcinoma’, says Priv.-Doz. Dr. Wolfgang Wadsak, Member of the Board of the European Association of Nuclear Medicine (EANM), Associate Professor at MedUni Vienna and Business Unit Director of CBmed GmbH- Center for Biomarker Research in Medicine.

Prostate carcinoma: the most common type of cancer in men

Every year, 6,000 Austrians are diagnosed with prostate carcinoma. That is a quarter of all cancer diagnoses in men. ‘Men over the age of 65 are particularly affected - two-thirds of them develop a change in the prostate gland, which - depending on the type of change - has to be continuously monitored or treated if necessary’, says Wadsak. Until now, classical imaging methods, blood samples and biopsies were available for diagnosis. With their help, the enlargement itself, the protein value of the prostate-specific antigen (PSA) could be measured, and the removed tissue analysed. With the use of PSMA ligands, nuclear medicine now offers a completely new and non-invasive option for both diagnostics and targeted therapy.

PSMA ligands as the "sniffer dog" of prostate carcinoma

PSMA stands for the prostate-specific membrane antigen, a specific feature of tumour-like degenerated cells of the prostate on its surface. Certain radioactive molecules - so-called radioligands - are now sent into the body like a 'sniffer dog' and indicate without much intervention where how many tumour cells are located in the body near the prostate and the nearest lymph nodes, as well as distant metastases, if any. 'If we use drugs with gamma rays for pure diagnostics, which only mark the cancer briefly and are completely broken down within a few hours, we equip the 'sniffer dog' with a local bomb during therapy. These are then beta or alpha emitters that remain locally in the body at the cancer site for several days and weeks and destroy the tumour and its DNA exactly there through the natural decay process', explains the radiochemist.

Up to 50% effect with end-stage use

PSMA ligand therapy is very promising. Currently, the drug Pluvicto is approved in the treatment of prostate cancer when all other therapies have been exhausted. 'At this late stage, up to 50% of patients respond to therapy. We manage to slow down or stabilise the disease for these people and improve their quality of life enormously. I have seen patients who, because of the metastases, still use a wheelchair during the first treatment, use a walking stick during the second treatment and can already walk without further assistance during the third treatment', Wadsak describes. A cure is usually not possible at such a late stage, but life expectancy can be extended by a few months with a significantly improved quality of life.

Use as second-line therapy shows up to 80 % success rate

In order to be able to use PSMA ligand therapy in earlier courses of prostate cancer, several international clinical trials are currently in the final spurt. In these trials, PSMA ligand therapy is used when therapy is not successful after completion of the first cancer treatment. 'When PSMA ligand therapy is used as a second-line therapy on a trial basis, up to 80% of patients respond. Some of them even have a complete remission after 3-4 treatments - meaning the prostate carcinoma is then no longer visible or measurable', Wadsak explains. He is very confident that PSMA ligand therapy with Pluvicto can be offered as standard second-line therapy from next year.

Next step: FAP ligands for use in other cancer types

Following the success of PSMA ligand therapy, nuclear medicine research is working on extending this theranostic 'sniffer dog principle' to other types of cancer. For this purpose, preparations are currently being developed that attach to the fibroblast activation protein (FAP), which is found in cancer-associated fibroblasts. 'About 28 tumour types have this protein. If we already have good nuclear medicine preparations at hand for the diagnosis of these tumour types, it still takes time to develop preparations that can then also act longer in the body and are thus suitable for therapy', explains Wadsak. There is already great hope in FAP ligand therapy for the treatment of those

types of cancer that are currently difficult to treat, such as ovarian, pancreatic and triple-negative breast cancer.

Nuclear medicine - drugs without major side effects

The great advantage of all these nuclear medicine drugs is that they have a very local effect on the tumour, do not release any radioactivity into the environment, can largely be performed on an outpatient basis and have hardly any noticeable side effects for the patient himself. 'We work here in the diagnostic field with very small amounts of radioactivity, resulting in a dose of about 3 to 5 millisieverts. Every person living in a larger city like Vienna, for example, is already naturally exposed to an annual dose of about 2 millisieverts through the atmosphere, soil and food. In other words, the exposure to the body during nuclear medicine diagnostics - whether PSMA ligands or, in the future, FAP ligands - corresponds to the radiation exposure of just 2 years of city life and at the same time does great things for the strategy to fight cancer', explains Wadsak. In the subsequent nuclear medicine therapy itself, after careful risk-benefit assessment, it is clear that much higher doses are applied locally, as this is the only way to achieve lasting damage to the cancer cells.

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 at the Austria Center Vienna. www.eanm.org

About IAKW-AG

Internationales Amtssitz- und Konferenzzentrum Wien, Aktiengesellschaft (IAKW-AG) is responsible for maintaining the Vienna International Centre (VIC) and operating the Austria Center Vienna (ACV). The Austria Center Vienna is Austria's largest conference centre. With 19 halls, 180 meeting rooms and some 26,000 square metres of exhibition space, it is one of the top players on the international conference circuit. www.acv.at

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