



EANM PRESS RELEASE

Immunotherapy against cancer: Patients benefit from molecular imaging

(Vienna, 29 October 2019) Immunotherapy gives hope to numerous cancer patients who do not respond satisfactorily to chemotherapy. However, this kind of treatment is not efficacious in all patients and it can even be harmful. “Positron emission tomography (PET) allows to accurately monitor the treatment process and assess its outcome,” says Prof. Nicolas Aide, expert of the European Association of Nuclear Medicine (EANM). “This molecular imaging method is essential for patients’ care since it enables doctors to discriminate clearly between beneficial and harmful effects of immunotherapy.”

Immunotherapy is a revolution in cancer treatment and has become a new hope for many patients. So far, its main fields of application have been melanoma and lung cancer, where immunotherapy has proven beneficial in numerous patients who did not respond satisfactorily to chemotherapy. The medication used for immunotherapy is based on so-called immune checkpoints inhibitors (ICI) – antibodies that do not target the tumour directly, but strengthen the body’s own defence system. In principle the immune system is capable to detect and destroy cancer cells. These cells, however, can employ mechanisms to bypass or obstruct this defence through certain signalling pathways that “put the brakes” on the immune response.

Loosen the brakes

The brakes the tumour uses are so-called immune checkpoints. These are receptors on the membrane of the body-defending T-cells, which are meant to prevent these cells from autoimmune reactions that harm the body. Unfortunately, certain tumour cells are able to trick these checkpoints by activating them, thus escaping the immune system. This is where the immune checkpoint inhibitors (ICI) come into play.

These proteins block the immune checkpoints, allowing the T-cells to do their job and attack the cancer cells.

If the immune system manages to identify the tumour as an enemy it usually works very efficient, destroying the tumour wherever it grows. However, as with most cancer treatments immunotherapy is not efficacious in all patients and can even be detrimental. Its effects depend to a great deal on particular characteristics of the tumour tissue. This requires a thorough examination of the patient and a precise monitoring of the treatment process and its outcomes. The only imaging technique to fulfill these demands is Positron Emission Tomography (PET). This method is based on radioactively labelled substances such as glucose (FDG), which the patient is injected with. These so-called tracers detect cancer cells as well as other cell alterations with high accuracy and reliability by making visible their metabolism.

Distinguishing beneficial from adverse effects

One of the issues that have to be clarified by FDG PET examinations concerns the response to immunotherapy in combination with possible side effects. An important sign for response is the increased uptake of tracer in the spleen which is due to immune activation triggered by immunotherapy. Equally significant is the detection of adverse effects such as gastrointestinal disorders, thyroiditis, pneumonitis or rash which frequently accompany immunotherapy. Clear identification is not only needed for managing these disorders. They are also promising indicators for a successful outcome since patients experiencing immune-related side effects are more likely to respond to treatment. On the other hand, if the tumour continues to grow in spite of immunotherapy this seems to be a clear sign to switch to a new line of treatment. What makes the decision complicated, though, is the fact that the patterns of response to immunotherapy differ from those to chemotherapy. In certain types of cancer, mainly melanoma, patients' health may deteriorate immediately after the onset of immunotherapy before the treatment then starts to be effective. "We have developed novel PET criteria that enable us to reliably discriminate between this kind of pseudoprogression and real progression of the disease. The same applies to cases of so-called hyperprogression where immunotherapy leads to an acceleration of tumour growth. PET provides sound information that is essential for the oncologist to

take the appropriate decision and choose the treatment that is tailored to the individual patient's needs," says Prof. Aide.

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