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Precise blood diagnostics improve treatment outcome in non-small cell lung cancer patients

Non-small cell lung carcinoma is a particularly aggressive type of lung cancer. Tumor cells and tumor DNA (ctDNA) in the blood of patients with the disease can be analyzed by means of liquid biopsy throughout the course of the disease. This information is important in order to be able to target the constantly changing tumor. A study from the University of Bayreuth is the first to show that liquid biopsy significantly improves treatment outcomes in many cases and can be cost-effective in the German care system. The scientists present their research results in the Journal of Cancer Research and Clinical Oncology.

In order to successfully treat non-small cell lung cancer, it is important to detect so-called driver mutations as early as possible to interrupt tumour growth. This information is required for clinical decision making. The mutations represent changes in the genome of the tumour cells that lead to faulty signalling chains responsible for the invasive growth and spread of cancer. However, as soon as they have been detected and precisely determined, a targeted therapy can be tailored to the individual disease. Such therapies are already available for an increasing number of driver mutations. "The minimally invasive liquid biopsy makes it possible to identify driver mutations and other markers in the blood very precisely. The information is relevant for early clinical decision making throughout the course of the disease. Despite treatment, minimal residual disease (MRD) is typically present. Although its location is not accessible with imaging, it can be characterized by liquid biopsy. In the light of NSCLC heterogenicity, related information has a significant impact on outcome as it enables faster and earlier clinical decision making," explains Prof. Dr. Dr. Klaus Nagels, principal investigator of the study and Chairholder of Healthcare Management and Health Services Research at the University of Bayreuth.

Tissue biopsy is still considered to be the gold standard when it comes to the histological analysis of the tumour and the identification of driver mutations. However, the sampling of tumour tissue by tissue biopsy is not always possible. Liquid biopsy is a minimal invasive alternative that can identify driver mutations and other markers of growing importance with a high degree of reliability. Furthermore, NSCLC tumours evolve in the course of the disease, driver mutations change and the tumour becomes resistant to therapy. These genetic changes can be detected at a very early stage with liquid biopsy, long before the tumour becomes detectable with imaging.

"In our study, we modelled typical course of the disease in patients suffering from non-small cell lung cancer. Scenarios involved patients who were diagnosed with tissue biopsy while liquid biopsy was used as add on. So, we were quite conservative. The results suggest that the more comprehensive information on cancer progression obtained with liquid biopsy generates clear patients benefits, as the therapy can be adapted to the state of tumour evolution, thus clinical decision making on therapy selection can be based on precise and early information. For many patients, this results in better clinical treatment outcomes and improved quality of life," says Nagels.

Another central result of the study concerns the health economic evaluation of liquid biopsy. For the first time, it shows that, in relation to the German health care system, this form of precision diagnostics will not drive up costs for the treatment of non-small cell lung cancer at all. "Liquid biopsy enables longer survival and good quality of life, and

moreover, proves to be cost-effecive because it helps to focus therapy on targeted and therefore effective measures already in the early stages of the disease. In this respect, liquid biopsy is already complemented and strengthened by methods of genetic and molecular biological diagnostics – especially NGS (next generation sequencing). It is expected that these diagnostic capabilities will be expanded in the future," says Fabienne Englmeier, first author of the study and doctoral student of Prof. Dr. Dr. Klaus Nagels at the University of Bayreuth.

Lung cancer specialists Prof. Dr. Annalen Bleckmann (University Hospital Münster), Prof. Dr. Wolfgang Brückel (Nuremberg), and Prof. Dr. Frank Griesinger (University Hospital Oldenburg and CRISP Registry) contributed significantly to the success of the study. Dr. Annette Fleitz, iOMEDICO (Freiburg) and Dr. Annette Hipper (Arbeitsgemeinschaft Internistische Onkologie in der Deutschen Krebsgesellschaft e.V.) made a large part of the clinical data basis for the modelling accessible via the CRISP registry. Further, Dr David Liesenfeld and Dr Claudia Ivascu (Roche) contributed to the content of the study. Roche Pharma AG providing financial support for the study.

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