New Concepts in Limiting Liver Metastasis

Metastasis is the process by which cancer cells that originate in one organ, spread to a new site or organ within the body. It is the number one cause of all cancer-related deaths worldwide as confirmed by the World Health Organization.

Nearly all solid cancer types including stomach, prostate, esophageal, lung, breast, colon, melanoma, and pancreatic cancer can metastasize to the liver. Cancer researchers are now exploring what it is about the liver that makes it so welcoming to different types of cancer cells, with the hope that such an understanding could lead to an effective treatment for liver metastasis or prevent metastasis from occurring.

In a recent review article published in *Clinical and Experimental Metastasis*, the official journal of the Metastasis Research Society, Dr. Olga Golubnitschaja describes the importance of preventing and managing liver metastasis with a focus on breast, colon, and prostate cancer.

Dr. Golubnitschaja says that, "under certain health conditions the liver creates a so-called 'pre-metastatic niche' – an area which is highly advantageous for nesting tumor cells that have escaped the original tumor and are circulating in the blood stream. The liver environment is particularly supportive for secondary tumors which grow quickly leading to highly aggressive metastases within the affected liver tissue."

When asked what kind of health conditions may predispose the liver to forming pre-metastatic niches, Dr. Golubnitschaja replied, "any kind of chronic inflammation in the liver or hepatitis, frequent intake of toxic substances such as alcohol, chronic hypoxia (lack of oxygen caused by blood vessel dysregulation and/or other disorders), and additional diseases such as diabetes mellitus."

All of these risk factors are detectable and the majority of them are preventable and/or treatable. Identifying and screening cancer patients most at-risk may, "substantially reduce the number of patients suffering from fatal metastatic disease in the liver," said Dr. Golubnitschaja. This is important because liver metastases are very difficult to treat, and often become resistant to current therapies. Many patients would benefit from the prevention of established liver metastases in the first place.

In addition to identifying and screening at-risk patients, Dr. Golubnitschaja puts forward the case that liquid biopsies may have prognostic value and could be used to guide treatment options in at-risk patients and patients being treated for metastatic liver disease.

Liquid biopsies are non-invasive blood tests used to collect the cancer cells that have escaped from primary and/or metastatic tumors and are in circulation in the blood stream. These tumor cells are known as circulating tumor cells, or CTCs.

Dr. Golubnitschaja argues that more effective treatment strategies can be tailored to each patient based on prognostic information obtained by an individual's liquid biopsy results. CTCs collected by the biopsies can be used to generate specific panels of molecular markers that can be used to predict treatment outcomes and prognosis.

Dr. Golubnitschaja proposes that, “individualized patient profiles should be created based on pathology-relevant questionnaires and molecular biological tests. This would result in optimal patient stratification by disease-specific ‘multi-level biomarker panels’ in order to predict liver metastasis individually and also to select effective preventive strategies and targeted treatments, if necessary.”

However, Dr. Golubnitschaja says that implementing molecular panel analysis of CTCs after liquid biopsy in the clinic to improve outcomes will be difficult. She says this is mainly due to “an evident lack of multi-professional cooperation, insufficient financial support of corresponding research areas, poor understanding of great advantages for the entire healthcare system and, unorganized regulations by policy-makers.” All of these challenges affect the scientist's ability to bring personalized medical and technological approaches from the lab to the clinic.

Still, progress in research from scientists such as Dr. Golubnitschaja is further evidence that *personalized medicine* holds great promise and is capable of improving patient care. This in itself should be sufficient reason to accelerate its funding and further development while health leaders and policy makers continue to look for ways to keep associated costs affordable for all.

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