Personalised ‘liquid biopsy’ could detect return of breast cancer nearly eleven months earlier than hospital scans

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A new study at five UK hospitals has found that a personalised blood test for women with early breast cancer could detect the return of the disease nearly eleven months earlier than hospital scans.

The study, funded by Breast Cancer Now and with support from the NIHR Biomedical Research Centre (BRC) at The Royal Marsden NHS Foundation Trust and The Institute of Cancer Research, London, found that the test, which measures the levels of cancer DNA circulating in the blood, could detect the return of the disease after treatment on average 10.7 months before patients developed symptoms or secondary tumours became visible on scans.

The test, developed by scientists at The Institute of Cancer Research, London (ICR) and The Royal Marsden NHS Foundation Trust, was found to work in all types of breast cancer, and could detect the early signs of the spread of the disease around the body, with the exception of secondary tumours formed in the brain.

Further research is now needed to understand how the test could be used in the clinic to help guide treatment and improve patient outcomes, with UK trials now underway to assess new treatments alongside the test in triple negative breast cancer.

Detecting recurrence with 'liquid biopsies'

Blood tests that can detect cancer DNA in the bloodstream - known as 'liquid biopsies' - have emerged as an exciting new field in cancer research. The tests aim to monitor how a patient’s cancer is responding to treatment in real-time, detect emerging resistance to treatment and spot any recurrences at the earliest possible stage.

In a new prospective study of 101 women across five UK hospitals, scientists led by Professor Nicholas Turner at the ICR and The Royal Marsden NHS Foundation Trust assessed the potential of a new personalised blood test to detect recurrence in patients diagnosed with
early breast cancer who had no signs of secondary tumours. The tests are tailored to the make-up of each woman’s tumour to enable the levels of cancer DNA in their bloodstream to be monitored.

**Tracking cancer DNA**

By analysing cancer DNA from tumour samples collected before treatment, the researchers identified mutations that could distinguish cancer DNA from all other DNA in the blood and could be tracked over time. Overall, in the 101 patients, 165 different trackable mutations were found, with 78 participants having one trackable DNA mutation and 23 patients having multiple mutations.

Blood samples were collected from participants every three months during their first year after treatment, and then every six months for up to five years thereafter. To assess the test’s ability to detect recurrence at a molecular level in different breast cancer sub-types, the researchers combined the data with a previous proof-of-principle study to establish a bigger cohort of 144 patients.

At follow-up of approximately three years (median 36.3 months), 29 of 144 patients (20.1%) had seen their breast cancer return. 23 of these 29 patients (79.3%) had cancer DNA detected in their blood prior to relapse, with the ‘liquid biopsies’ spotting the signs of recurrence on average 10.7 months before their clinical diagnosis.

'A new treatment paradigm for breast cancer'

With the test accurately indicating the return of breast cancer across all major subtypes, the authors suggest that upcoming trials could lead to a ‘new treatment paradigm for breast cancer’, in which therapy could be offered at the first signs of relapse at a molecular level, rather than at a later stage once symptoms have appeared.

In addition, the researchers also conducted a sub-analysis of 80 patients who had blood samples taken at their diagnosis with circulating cancer DNA being detected in 41 of these women. These patients were found to be 5.8 times more likely to experience a relapse during the first three years after treatment than those without detectable levels of cancer DNA prior to treatment, demonstrating that the test may also have prognostic potential in the future.

**Professor Nicholas Turner, Professor of Molecular Oncology at The Institute of Cancer Research, London, Consultant Medical Oncologist at The Royal Marsden NHS Foundation Trust and Leader of the NIHR BRC’s Genotypes, Phenotypes and Cancer Evolution Theme**, said:

> These new blood tests can work out which patients are at risk of relapse much more accurately than we have done before, identifying the earliest signs of relapse almost a year before the patient will clinically relapse.
We hope that by identifying relapse much earlier we will be able to treat it much more effectively than we can do now, perhaps even prevent some people from relapsing. But we will now need clinical trials to assess whether we can use these blood tests to improve patient outcome. We have launched the first of these studies already, and hope to launch large studies in the future.

The study is published in JAMA Oncology and was largely funded by Breast Cancer Now, with additional support from The Royal Marsden Cancer Charity and the NIHR Biomedical Research Centre at The Royal Marsden NHS Foundation Trust and the ICR.

Our research: Breast Cancer

Find out more about our Breast Cancer research theme, which is identifying new approaches to predicting individual patient outcomes and discovering new targeted treatments.

Our research: Genotypes, Phenotypes and Cancer Evolution

Find out more about this research theme, which aims to improve patient outcomes through precisely defining when, who and how to treat by developing innovative molecular diagnostics and analytic techniques.


Links
[5] https://www.icr.ac.uk/