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MRI data can predict patient response to treatment and survival in advanced ovarian cancer

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30 January 2020

A simple test using an MRI scan can be used to predict how well people with advanced ovarian cancer will respond to treatment, according to the results of a new study.

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MRI data can predict patient response to treatment and survival in advanced ovarian cancer

In a large clinical trial, scientists have shown a new way to assess how well treatment is working and give an indication of its future effectiveness, which may help optimise outcomes in patients who are at a high risk of relapse after receiving treatment.

The research, led by **The Institute of Cancer Research, London** [8] (ICR), and **The Royal Marsden NHS Foundation Trust** [9], may also be helpful in patients who have been diagnosed with relapsed disease and are being re-treated.

Patients with advanced epithelial ovarian cancer, the most common form of the disease, have a very high rate of relapse, with nearly 75 per cent of individuals experiencing recurrence of their disease after treatment. Most patients relapse with a form of the cancer that is impossible to treat and has very poor survival rates.

Currently, there are some markers at the time of diagnosis which help clinicians to understand how well a patient is likely to respond to treatment and to predict their overall survival, such as a patient?s age, the stage of their cancer, and different cellular markers. But new markers are needed which can help make these predictions earlier in the course of the disease.

Measuring movement of water molecules

In the study, which was funded by **Cancer Research UK** [10] and supported by fromthe NIHR Biomedical Research Centre at The Royal Marsden and the ICR, scientists looked at a measurement called the apparent diffusion coefficient, which is a calculation that describes the distances diffused by water molecules within tissues over time. Water molecules are restricted from moving by structures in their vicinity, such as cell membranes. Measuring how much or how little the water molecules are restricted gives scientists clues about the structure of the tumour tissue. The research was **published in the journal *Radiology*** [11].

Judging how the tumour responds

Professor Nandita deSouza [12], Professor of Translational Imaging at The Institute of Cancer Research, London, and Clinical Consultant in Imaging at The Royal Marsden NHS Foundation Trust, said:

> *?The apparent diffusion coefficient gives a picture of what is going on across an entire lump of tumour, and at each tumour site, rather than just one small sample from a single site, like in a biopsy.*

> *?These data can be used as an imaging marker and can be related to the microstructure of the tumour. The measurements also allow us to make judgements about how the tumour is responding. We can relate changes we see over time on the scans to the responses of patients and their likelihood of surviving without progression of their disease.?*

Patients included in this trial had either high grade serous, endometrioid or clear cell ovarian, primary peritoneal, or fallopian tube cancers, with at least one solid lesion measuring larger than 2cm.

Two cohorts of patients were recruited; those in cohort one had newly diagnosed disease, while those in cohort two were on their first or subsequent relapse of the disease.

Checking ovarian cancer markers

Patients in the newly diagnosed cohort had an MRI within seven days before starting treatment. Patients were treated with three cycles of chemotherapy and scanned again, prior to having surgery to remove their tumours.

Patients in the relapsed cohort had an MRI within seven days before starting treatment, and another scan after one and after three cycles of chemotherapy.

In both cohorts, the response to treatment was assessed by checking levels of an ovarian cancer marker called cancer antigen 125, or CA125, and using radiological scans.

Data were analysed from 125 women in total, 47 newly diagnosed women in cohort one and 78 women with relapsed disease in cohort two.

Analysis of all the scan data combined with other key clinical data showed that patients with epithelial ovarian cancer who were responding to treatment with chemotherapy had a higher apparent diffusion coefficient than patients who were not responding.

After three cycles of platinum-based chemotherapy, changes to the apparent diffusion coefficient gave an indication of whether or not the patient was responding to the treatment.

In patients with relapsed disease, an increase in the apparent diffusion coefficient after just one treatment cycle indicated that a patient was likely to have improved progression-free survival ? the amount of time a patient lives with their cancer without it getting worse.

Predicting patients' outcomes

Professor Emma Hall [13], Deputy Director of Clinical Studies at the ICR Clinical Trials and Statistics Unit [14], said:

> ?The data from this trial are useful to add to the toolbox of markers we use to predict patient outcomes. We weren?t able to find an association between the apparent diffusion coefficient and a patient?s overall survival, but there is a link to progression-free survival.

> ?From our study, we can see that the apparent diffusion coefficient increases more in patients whose cancer is responding to treatment compared to those whose cancer is not responding. This indicates changes to the microstructure of the tumour, and these changes are detectable very early on in treatment.

> ?In future, this could mean we could make changes to a patient?s treatment earlier in the process, if we have signals that their cancer is not responding.?

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