Colorectal cancer screening via smartphone?

Colorectal cancer screening programs are currently underutilized in Germany. This also applies to testing for blood in the stool. The immunological stool tests can detect tiny amounts of blood in the stool. Scientists at the German Cancer Research Center (DKFZ) have investigated whether smartphone-based testing could be a meaningful alternative or supplement to traditional laboratory tests.

Currently, two alternatives are offered in Germany for colorectal cancer screening for men and women aged 50 and above: Colonoscopy and fecal immunochemical testing (FIT). However, despite an invitation program, uptake among the population has been insufficient to date. FIT is an immunochemical test: Specific antibodies that recognize the blood pigment hemoglobin are used to detect blood in the stool that is not visible to the eye. Blood in the stool can come from malignant tumors of the mucous membrane or from benign polyps, which are precursors to cancer, but there are also other causes. If the stool test is positive, the person affected is advised to have a colonoscopy to determine the exact cause. Colonoscopy is considered the gold standard for early detection of colon cancer because it has the highest accuracy rate. Precancerous lesions detected at an early stage can be removed directly during the examination, reducing the risk of disease. For people who refuse colonoscopy, FIT is offered.

One would expect this non-invasive form of early detection to be better accepted. In fact, there are countries where a large percentage of the population uses FIT for colorectal cancer screening. In the Netherlands, for example, the figure is more than 70%. In Germany, on the other hand, there is still a lot of room for improvement in terms of FIT acceptance: currently, only around 20% of the population is tested regularly.

Stool analysis via app

Researchers at the DKFZ asked themselves how they could encourage more people to take advantage of the excellent opportunities available for colorectal cancer screening. Michael Hoffmeister explains: "When looking for ways and means, it is obvious to think of digital technologies and, in particular, smartphones, which have become a constant, frequently used companion for many people and are now an integral part of everyday life. Why shouldn't smartphones also be used for stool analysis?"

This is actually technically possible by combining a rapid hemoglobin test with a smartphone app. The rapid test is already commercially available, and the application software for the stool test is available free of charge in major app stores.

The rapid test can be carried out conveniently at home: the test stick is dipped three times into the stool sample and then into a tube containing a test solution. After shaking the sample, three drops are placed on the test cassette. Then you wait 15 minutes and take a photo of the test cassette with your smartphone. The app does the rest: based on the color intensity, the app can determine whether or not there are suspicious traces of blood in the stool. The result is immediately displayed on the screen. Compared to the classic FIT, the procedure is much more patient-friendly: no doctor's visits, no sending samples to the lab, no waiting days for the test results.

Just as accurate as the laboratory test

The question remains: Is the smartphone really as good as a laboratory? Is the accuracy with which traces of blood in stool are detected really comparable with app-based self-testing? This question was investigated by the DKFZ research group led by Michael Hoffmeister. Participants in the BLITZ study who were scheduled to undergo a colonoscopy in gastroenterology practices in southern Germany between 2021 and 2023 were offered the opportunity to take part in the comparison of the two FIT tests. The colonoscopy was performed as planned.

The 654 participants were free to decide whether they wanted to take a smartphone-based stool test in addition to the traditional FIT. 361 (55 percent) opted to do so, and 89 percent of them subsequently rated the smartphone test as a useful alternative to the traditional test in a standardized questionnaire.

“The smartphone can actually keep up with the laboratory,” says Michael Hoffmeister. “The sensitivity of the smartphone test proved to be just as good as that of the traditional laboratory test.” A comparison with the colonoscopy findings showed that advanced, potentially cancerous mucosal changes were detected by the app in 28 percent of cases. A comparable sensitivity of 34 percent was determined for laboratory testing. The specificity—the second important criterion for the informative value of a diagnostic test—was 92 percent for both methods. This means that the rate of false positive test results was low.

“Based on our results, smartphone-based FIT testing could be a meaningful alternative or supplement to traditional laboratory tests,” says co-author Herrmann Brenner. “I see a realistic chance that this additional option will enable us to get more people on board to participate in early colon cancer detection and take advantage of the associated opportunities for colon cancer prevention.”

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Further information

- German Cancer Research Center (DKFZ)