Colorectal cancer screening

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Colorectal cancer is theoretically a preventable disease and is ideally suited to a population screening programme, as there is a long premalignant phase, during which there is ample opportunity to intervene with a variety of different screening modalities. In this article, the authors review the alternative tests for colorectal cancer screening and discuss the rationale behind the Bowel Cancer Screening Programme in England.

Colorectal cancer (CRC) is the second largest cause of cancer deaths in the UK among both sexes, and is the third most common cancer in men after prostate and lung cancer (Figure 1). In the UK there is approximately a 4 per cent lifetime risk of developing the disease, with nearly 40,000 new cases and 16,000 deaths annually.1

Most CRCs are thought to arise from benign adenomatous polyps, a process that takes approximately five to ten years. This long premalignant phase makes the disease ideally suited to a population screening programme.

The ultimate aim of a screening programme for CRC is to reduce mortality from the disease, which may be achieved in two ways. As five-year survival is closely related to the stage at which the cancer is detected (patients with Dukes' stage A cancer have a greater than 90 per cent five-year survival rate, while those with Dukes' stage D disease have a 7 per cent five-year survival rate), any screening modality that results in early detection of the disease will have a beneficial effect on survival through more effective treatment. Additionally, if benign adenomatous polyps are removed, cancer development is prevented, resulting in decreased mortality.

Figure 1. Colorectal cancer is the third most common cancer in men

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TESTS FOR COLORECTAL CANCER SCREENING
Tests for CRC include colonoscopy, flexible sigmoidoscopy (FS), virtual colonoscopy and faecal occult blood testing (FOBt).

Colonoscopy
Colonoscopy is arguably the gold standard for examination of the colon and has a high sensitivity and specificity for the detection of both benign adenomas and colorectal cancer. In addition, there is the opportunity to remove lesions during the same examination. Unfortunately, there are limitations to its use as a screening modality on a population level, although it may be the ideal choice of examination for an individual.

Colonoscopy is invasive and time-consuming, and requires full bowel preparation; the complication rate, although low, may still be unacceptable within a screening population. Additionally, the manpower and financial resources required to implement colonoscopy screening would also be restrictive in healthcare systems with limited resources, such as the NHS.

Flexible sigmoidoscopy
Flexible sigmoidoscopy as an alternative to colonoscopy has the advantage that no oral bowel preparation is required, as the subject uses an enema that can be taken at home. The procedure is quick, requires no sedation and examines the left colon, which is the site of 75 per cent of all colorectal neoplasia. If CO₂ insufflation is used, adenomas can be resected at the initial screening examination. This procedure does not, however, examine the right colon.

Virtual colonoscopy
Virtual colonoscopy, or computed tomography colonography (CTC), is another modality to examine the colon. It has been suggested that this examination has fewer complications and increased patient satisfaction when compared to colonoscopy, but with similar sensitivity and specificity for the detection of pathology.

There is no requirement for sedation and it has the advantage of detecting extracolonic pathology. It does, however, still require bowel preparation and colonic insufflation with CO₂, the latter still causing discomfort. Furthermore, it is not therapeutic and the lesions detected require endoscopic evaluation and resection.

If all abnormalities were to be further assessed, the colonoscopy conversion rate may be as high as 40 per cent, which is unacceptable, and it has therefore been suggested that small lesions should not be reported, or should be monitored with repeated scanning. There are, however, concerns with this approach, as a small percentage of diminutive lesions have advanced pathology. Additionally, anxiety may be caused if an abnormality is monitored but not removed, and multiple follow-up scans increase radiation exposure.

The introduction of faecal tagging (ingesting oral contrast to impregnate remaining stool so that it is in strong contrast to normal colonic structures) has improved the specificity of CTC and reduced the requirement for bowel preparation, which may increase the compliance and acceptability of CTC. Problems relating to cost, availability of resource and manpower, however, also apply to this examination.

Faecal occult blood testing
The guaiac FOBt detects the haem component in haemoglobin and can be used as a screening modality – individuals with abnormal results being offered colonoscopy. A Cochrane review of four randomised trials confirmed a reduction in mortality from CRC of 16 per cent, with a colonoscopy rate of 4 per cent.² This data was the stimulus for a pilot study using FOBt carried out by the Department of Health from 2000, and as a result the Bowel Cancer Screening Programme (BCSP) was launched in England in 2006.

THE BOWEL CANCER SCREENING PROGRAMME
All 60- to 74-year-olds (60–69 years in some areas) registered with a GP are sent an FOBt kit from one of the five national hubs and are asked to return six samples from three stools. Individuals outside the upper limit of the local age range are able to request a test kit directly from the hub.

Those with a normal result are sent a further kit every two years for as long as they remain in the age group for the programme. Those with an abnormal result are invited to attend a nurse-led appointment at a designated screening centre to discuss the rationale for colonoscopy (Figure 2). Colonoscopy is then performed at the screening centre and any lesions identified are removed. All follow-up of individuals with benign pathology is carried out within the BCSP screening centre according to
Figure 2. The National Bowel Cancer Screening Programme pathway

FOBt, faecal occult blood test.
guidelines (Figure 3) and malignant lesions are treated within the patient’s local cancer service.

Successes and limitations

Although the initial experience within the BCSP has been excellent, with large numbers of early cancers and adenomas successfully treated, associated with low complication rates and high patient satisfaction, there remain inherent problems with FOBT as a screening modality. The mortality benefit from FOBT is achieved by early cancer detection (Figures 4 and 5), but there is very little effect on CRC incidence, particularly in the early years of the programme. In addition, up to 50 per cent of cancers are missed by the FOBT and it is therefore imperative that subsequent symptoms should be investigated appropriately in individuals with a previously normal test result, and both the individual and health professionals need to guard against inappropriate reassurance from this result.

The future

These drawbacks of FOBT have stimulated a drive to improve the survival benefits of CRC screening in the UK even further. One approach would be to increase the sensitivity of the stool test used as the gateway to colonoscopy. The immunochemical FOBT uses antibodies against the globin component of human haemoglobin, and can therefore be used without dietary and drug restriction. This test produces a quantitative result, allowing the threshold for triggering colonoscopy to be set at will. It is more expensive than FOBT and there have been questions raised regarding the reliability of this test, with seasonal variations in performance.
Alternatively, it is possible to detect abnormal DNA originating from large polyps and cancers in stool, and this may be used as a non-invasive test before colonoscopic investigation. Again, these tests are expensive, and promising specificity and sensitivity results from early studies have not been reproduced in subsequent series. In addition, both of these approaches, if they were to be effective, would require an increase in the colonoscopy rate of screenees, which would impose increased financial and manpower demands.

A recently published study of ‘once-only’ FS, performed between the ages of 55 and 64 years, reported a 43 per cent reduction in mortality and a 33 per cent reduction in incidence of CRC in the screened group compared to controls. Individuals in the study with high-risk initial examinations (4 per cent) were offered colonoscopy. Participants reported a high satisfaction with this examination and compliance was acceptable, although invites to participate were taken from a selected group of interested individuals. The benefit from FS screening is confined to the distal colon and incidence and mortality rates for proximal cancers in the screened group were no different from controls. This is in contrast to the benefit seen in FOBt screening, which is pancolonic.

Based on the results from this study, the Department of Health has made the commitment to introduce FS screening as an adjunct to the present FOBt programme. Although pilot studies are currently ongoing and the final details are to be confirmed, it is likely that individuals will be offered FS at age 55 years and then will be eligible for the FOBt programme at age 60 years, as is currently the case.

CONCLUSION

In summary, there are multiple choices of initial tests that can be used to screen for colorectal cancer. They all have their advantages and drawbacks and the modality chosen in a given situation is dependent on many factors. In the UK, the introduction of FOBt screening and the future adoption of FS screening is certain to decrease the burden of this disease on society.

Declaration of interests: none declared.

REFERENCES


KEY POINTS

• Colorectal cancer is a potentially preventable disease and ideally suited to a screening programme
• There are multiple screening tests for colorectal cancer. The best modality will depend on individual patient and population factors, and limitations imposed by manpower and financial restrictions
• The Bowel Cancer Screening Programme sends a faecal occult blood test to all 60– to 74-year-olds, and all individuals with an abnormal result are offered a colonoscopy
• Initial experience with the Bowel Cancer Screening Programme has been very encouraging and ‘once-only’ flexible sigmoidoscopy is likely to be added to the current screening programme in the next few years, which is likely to further increase its effectiveness