Can an automated Faecal Immunochemical Test (FIT) determine whether faecal haemoglobin (f-Hb) concentrations can aid in stratifying symptomatic patients referred for colonoscopy

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Introduction

This study aimed to determine whether faecal haemoglobin concentrations (f-Hb) could aid in stratifying symptomatic patients referred for lower gastrointestinal (LGI) tract endoscopy and whether it could be used to fast-track the need for an endoscopy in those with an increased suspicion of malignancy.

Method

1000 patients with a variety of gastrointestinal symptoms, referred for LGI endoscopy within Lanarkshire were sent sampling pickers for f-Hb (**Figure 1**) with their bowel preparation and instructions. They were asked to take a faeces sample using this picker and return it to the laboratory at Monklands Hospital in pre-paid padded envelope by first class post. f-Hb were measured on single samples from 507 patients who also underwent a LGI endoscopy within NHS Lanarkshire during this period in 2013-14. The age of the patients ranged from 15 to 89 years (median: 60). Samples were stored on receipt at 4°C and f-Hb was measured using an automated Faecal Immunochemical Test (FIT) on the HM-JACKarc analyser (Kyowa Medex, Japan) as a batch on a weekly basis (**Figure 2**). Following LGI endoscopy, patient's notes were reviewed and each classified according to colonoscopy and pathology findings, these were then compared with the f-Hb results.

Figure 1 - Sampling pickers for f-Hb

Figure 2 – HMJACKarc Analyser

Results

Results showed f-Hb increased significantly with age ($p=0.018$) and was higher amongst men ($p<0.0001$); on average men in the study were 5 years older than women. F-Hb was higher in those with benign and malignant organic bowel disease ($p<0.0001$) but had no association with diverticular disease. No association was found between f-Hb and number and/or size of polyps.

11 (2.2%) participants were found to have adenocarcinoma, all of whom had f- Hb >150 µg Hb/g faeces (maximum value = 881.6 µg Hb/g) thus illustrating potential use in the referral and treatment pathway for colorectal cancer. At a cut-off of 10 µg Hb/g, the NPV for cancer and high-risk adenoma combined was 94% with a sensitivity of 54% and a specificity of 78%; receiver operating characteristic curves are presented to illustrate this relationship (**Figure 3**).

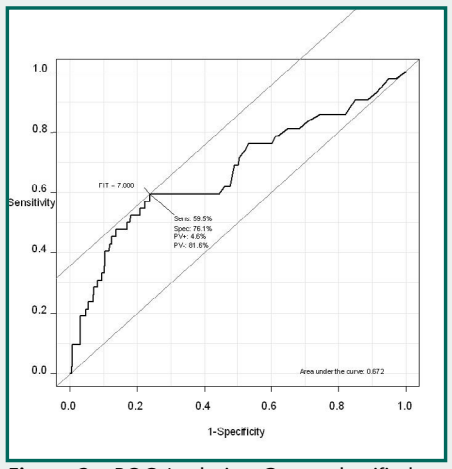

Figure 3 – ROC Analysis – Group classified as Gastrointestinal Malignancy or High Risk Adenoma

One patient had a histologically confirmed neuroendocrine tumour and a microcytic anaemia, their f-Hb result was 1.8 µg Hb/g faeces indicating that the test is specific to indentifying gastrointestinal malignancies.

Discussion

The nature of these results in identifying which of the cohort were likely to have a malignancy has resulted in a proposal to incorporate a f-Hb measurement by FIT into the referral pathway for LGI endoscopy. Patients with Cancer and other significant gastrointestinal diseases (High risk adenoma, low risk adenoma and inflammatory bowel diseases) have high f-Hb concentrations. However ROC curve analysis with Areas Under the Curve (AUC) showed that f-Hb is a poor rule-in test (sensitivity of 54% and a specificity of 78%), however a Negative Predictive value of 100% for Cancer and 94% for Cancer and High Risk Adenoma combined showed that the FIT test has significant potential to be used as a rule out test for these conditions, thus reducing unnecessary endoscopy and may be used in conjunction with other tests (e.g. Calprotectin) in a diagnostic pathway. An example of such a pathway is presented in **Figure 4**.

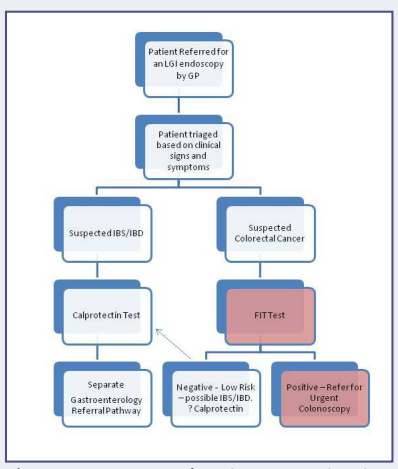

Figure 4 - Proposed Patient Investigation Pathway including FIT

Acknowledgements

Mairi White and Matthew Davis at Alpha Laboratories for their input into the study design. Alpha Laboratories Ltd. and Kyowa Medex Co. Ltd. for provision of the reagents and loan of the HM-JACKarc analyser to complete the study.