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BRIEF ARTICLE

Feasibility of a finger prick-based self-testing kit in first- and second-degree relatives of children with coeliac disease

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Abstract

AIM: To assess feasibility of a finger prick-based kit as method for self-testing of first and second-degree relatives of coeliac disease (CD) patients.

METHODS: A total number of 379 subjects were invited to participate in this study, consisting of 197 first-degree and 182 second-degree relatives of CD patients. The self-testing kit (Biocard™) was sent out with included instructions for use. Completed tests were sent back to the study coordinator for assessment.

RESULTS: One hundred and ninety-six invited relatives carried out the Biocard™ test at home. Amongst these, 70% were children. In 97% of the cases the test was performed correctly. Three tests revealed a positive result, all of which were later confirmed by serology and histology as coeliac disease.

CONCLUSION: Our study indicates that Biocard™ test is a reliable, easy to use and well-accepted tool for home testing of first- and second-degree relatives of CD patients.

Key words: Coeliac disease; Self-testing kit; Second-degree relatives

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INTRODUCTION

Coeliac disease (CD) is an autoimmune disorder induced by gliadin in genetically predisposed individuals. The "classical" gastrointestinal malabsorption syndrome is characterised by the acute onset of diarrhoea, steatorrhoea, weight loss and anaemia, which typically occurs in children under the age of one year following their first gluten exposure during the weaning process. However, the vast majority of CD patients frequently present later with mild and less specific symptoms such as abdominal discomfort, bloating, altered stool habit and reduced energy levels. An increasing number of children are completely asymptomatic but are detected as part of screening programs[1,2]. Disease prevalence has been rapidly increasing and several serological screening studies from Europe, South America, Australasia and the USA

have shown a prevalence of up to 0.5%-1% with disease affecting both children and adults equally[3]. Given the fact that CD is a lifelong condition that can be treated by strict gluten exclusion, early diagnosis is desirable as it helps avoid unnecessary symptoms and reduces long-term complications[4,5].

While a screening of all healthy individuals is difficult to perform, routine testing of asymptomatic individuals in high-risk groups is being increasingly recommended. Amongst the groups at greater risk are first- and second-degree relatives of patients with CD[6]. Currently, the most frequently used screening tools are based on the detection of specific IgA against endomysial antibody (EMA) and tissue transglutaminase (tTG) and are routinely performed on patients in primary and secondary care[7]. Whilst testing symptomatic individuals can often be done by venepuncture at their primary visit, screening asymptomatic patients would be made much easier if this were possible outside a healthcare environment and without the need for a trained phlebotomist. Testing first- and second-degree relatives with such a test should improve acceptability and hence uptake of the test. The Biocard™ Coeliac Test (ANI Biotech) measures serum levels of anti-tTG IgA antibodies and total IgA levels in 15 min using a finger prick blood sample. This test has been specifically designed for use by non-professionals and has already demonstrated high efficacy in clinical settings[8]. The result is stable over time and hence can be returned by mail for confirmation.

The aim of this study was to assess the feasibility of using the Biocard™ Coeliac Test as a method for home self-testing of first- and second-degree relatives of CD patients.

MATERIALS AND METHODS

Patient recruitment and testing procedure

All first- and second-degree relatives of children with known CD who attended an outpatient clinic for follow-up at the Centre for Paediatric Gastroenterology, Royal Free Hospital (London, UK) were invited to participate in the study. CD of all paediatric index cases had been diagnosed according to the European Society of Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) criteria[9]. One or both parents of eligible families were contacted by telephone or asked during their child's clinic appointment to participate in the study. All invited participants had not been tested for CD previously. Detailed information on the study was provided and written consent obtained from parents and relatives, as well as from older children as appropriate. Following recruitment, all families received Biocard kits with included written instructions and contact details of the study coordinator by post. Adult participants were asked to perform the test at home using manufacturer's instructions only. Parents were asked to perform the test on their children. Completed tests were returned in a pre-paid envelope. All patients with a positive test result for the Biocard™ Coeliac Test were followed up in hospital and underwent serum testing for anti-tTG IgA, EMA IgA and total IgA. In the case of a confirmed positive test result, an upper endoscopy was offered to affected individuals.

Table 1 Participant characteristics

Invited family members	379
Male	174 (46%)
Female	205 (54%)
Age (yr), mean (range)	37.5 (1.3-85.1)
0-18	70 (18.5%)
> 18	309 (81.5%)
First-degree relatives	197
Second-degree relatives	182

In the period from March 2008 to March 2009, 67 families were contacted and a total of 423 family members were invited to take part in the study. Amongst these, 379 subjects agreed to try out the test (197 first-degree and 182 second-degree relatives of CD patients) (Table 1). The mean age of subjects was 37.5 years (range, 1.3-85.1 years); including 70 children (0-18 years) and 309 adults (> 18 years).

Description of Biocard test

The test requires 1 drop (10 μL) of blood, obtained by performing a finger prick with a sterile lancet. The drop of blood is collected in a capillary tube which is inserted into the testing tube with the reagent solution. Following the insertion of the sample strip into the test reagents, results are available after 15 min. There are two separate indicator fields on the test strip. A test is considered positive if a line appears both in the control field as well as in the test field. The line in the test field indicates that there are anti-tTG IgA antibodies present in the blood sample, while the control line indicates normal levels of total IgA. Hence, a test is considered positive if both lines are visible, and negative if a line is present only in the control field but not in the test field. If there is no line or only a faint line in the control field, the result is indeterminate, indicating insufficient IgA antibody levels (or IgA deficiency) requiring further serological tests (tTG IgG and/or EMA IgG and total IgA).

Ethical approval

Ethical approval was obtained prior to the start of the study (Royal Free Hospital and Medical School Research Ethic Committee, 08/H0720/29).

RESULTS

Patient compliance

Of 379 subjects who agreed to participate in the study, 196 (51%) carried out the Biocard test at home. Amongst these, 70% were children (Table 2). In 100% of the cases the test was performed correctly, confirmed by clear lines in the appropriate test/control field on return of the test strip. One hundred and eighty-eight (49%) of the enrolled participants did not perform the test (adult 82%, children 18%). Families who failed to return the test strip received

Table 2 Feasibility and results of Biocard test

Tests performed	196
Correctly performed at home	196 (100%)
Test not performed	188 (49%)
Change of mind	185
Afraid	2
Felt too unwell to perform test	1

a phone call to record reasons for not completing the test; 98.5% of enrolled subjects admitted to changing their mind after initially agreeing to take part. Only 2 subjects (1%) stated they were afraid of performing the test, while 1 subject had felt too unwell.

Test results and follow-up

Of the 196 subjects who performed the Biocard test correctly, 3 tested positive with clear lines in control and test field. CD was then confirmed by serological testing as well as on histology following duodenal biopsy. One of these 3 individuals had a positive line in the test field and no line in the control field, indicating an IgA deficiency, which was also confirmed on more formal testing.

DISCUSSION

First- and second-degree relatives of patients with CD have been identified as one of the main groups at higher risk of silent CD and hence are recommended to be screened. Additionally, doctors involved in the care of CD patients are often confronted with great anxiety that other family members could be affected. Hence, in such situations, reliable, minimally invasive and easy to perform tests should be offered. However, current screening tests are cost- and labour-intensive as well as requiring venepuncture performed by trained health professionals. In this study, we aimed to assess the feasibility of using a finger prick-based kit as a method for home self-testing of first- and second-degree relatives of CD patients. A recent study validating this test has demonstrated sensitivity and specificity comparable to those of conventional serological coeliac screening[8]. Moreover, the test can easily be performed by non-professionals following only written instructions. Results are available within 15 min and include a reference test line to confirm adequate levels of total IgA antibodies. Of all relatives enrolled in our study, 51% (n = 196) performed the test at home. Despite the fact that 49% of potential family members chose not to perform the test, the majority (98.5%) did so for reasons unrelated to the test itself, a phenomenon frequently encountered amongst populations undergoing voluntary screening programs. Importantly, all returned tests revealed valid results as assessed by the study coordinator, indicating that it was performed correctly. Also, the fact that our study included a significant proportion of children further highlights the potential of this test to be used in this population. However, it is important to state that a positive test result currently still requires further investigation and follow-up by appropriate paediatric medical and dietetic health professionals.

In summary, results of our study indicate that the Biocard™ Coeliac Test is suitable for use in home self-testing of first- and second-degree relatives of children with CD. Moreover, given that the test can reliably be performed by non-professionals combined with its high validity, the application of this test could be further extended and offered to high risk groups in a non-specialist outpatient setting such as general practitioners surgeries or health practitioner clinics.

COMMENTS

Background

Frequently, coeliac disease (CD) presents with mild, non-specific abdominal symptoms or is even diagnosed in asymptomatic individuals. Being at an increased risk, first- and second-degree relatives of CD patients are often screened routinely or request to be screened. Highly reliable, cost effective and easy to use tests are required to meet this growing demand. The aim of this study was to assess the feasibility of using a finger prick-based kit as a method for home self-testing of first- and second-degree relatives of CD patients.

Research frontiers

The Biocard™ Coeliac Test (ANI Biotech) measures serum levels of anti-tissue transglutaminase IgA antibodies and total IgA levels in 15 min using a finger-prick blood sample. This test has been specifically designed for use by non-professionals and has already demonstrated high efficacy in clinical settings.

Innovations and breakthroughs

First- and second-degree relatives of patients with CD have been identified as one of the main groups at higher risk of silent CD and hence are recommended to be screened for the disease. Doctors involved in the care of CD patients are often confronted with great anxiety that other family members could be affected. Hence, in such situations, reliable, minimally invasive and easy to perform tests should be offered. However, current screening tests are cost and labour intensive, as well as requiring venepuncture performed by trained health professionals.

Applications

The authors' study indicates that the Biocard™ Coeliac Test is suitable for use in home self-testing of first- and second-degree relatives of children with CD. Moreover, given the test can reliably be performed by non-professionals combined with its high validity, the application of this test could be further extended and offered to high risk groups in a non-specialist outpatient setting such as general practitioners surgeries or health practitioner clinics.

Peer review

The manuscript presents original data on feasibility of self-testing for CD among patients' relatives. This strategy could improve the compliance to a screening test among asymptomatic subject, while maintaining good sensitivity and reliability.

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