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The Value of Eliminating Foods According to Food-specific Immunoglobulin G Antibodies in Irritable Bowel Syndrome with Diarrhoea

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OBJECTIVE: This study investigated the role of food intolerance in irritable bowel syndrome with diarrhoea (D-IBS). METHODS: Specific immunoglobulin G (IgG) antibodies against 14 common food antigens in the serum were measured in 77 patients with D-IBS and 26 healthy controls. Food-specific IgG antibodies were identified in 39 (50.65%) patients with D-IBS patients compared with four (15.38%) controls. For 12 weeks following the serological testing, 35 patients with D-IBS and food intolerance consumed diets that excluded the identified food. Changes in the main symptoms of D-IBS were evaluated before treatment and regularly during treatment in these patients. RESULTS: After 4 weeks' dietary therapy, most symptoms of D-IBS had improved. By 12 weeks, all symptom scores had decreased significantly compared with the baseline scores. CONCLUSIONS: The 12-week specific-food exclusion diets resulted in significant improvements in abdominal pain (bloating level and frequency), diarrhoea frequency, abdominal distension, stool shape, general feelings of distress and total symptom score compared with baseline in patients with D-IBS.

KEY WORDS: Irritable bowel syndrome with diarrhoea; Food intolerance; Immunoglobulin G antibodies; Diet therapy; Abdominal symptoms

Introduction

Irritable bowel syndrome (IBS) is a chronic functional bowel disorder with an increasing global incidence rate.[1 – 8] IBS affects people's quality of life to varying degrees and uses a lot of medical resources.[9 – 15] Due to the complexity of the aetiology of IBS there are, at present, no effective drug treatments available. A higher prevalence of food intolerance has been found in patients with IBS and, if such patients restrict their dietary intake of foods that increase their immunoglobulin G (IgG) antibody levels, their gastrointestinal tract symptoms reduce significantly.[16 – 18] Some physicians remain sceptical about the involvement of food intolerance in IBS, however, and there has been little research in this area in China.

To explore the relationship between food intolerance and IBS, the present study

investigated the levels of 14 common types of food antigen-specific IgG antibodies in the serum of patients with diarrhoea-predominant IBS (D-IBS). Based on the results of these food antigen-specific IgG antibody tests, the patients then consumed a specific-food restricted diet for 12 weeks, during which time their gastrointestinal symptoms were assessed.

Patients and methods

STUDY POPULATION

The study included consecutive patients with D-IBS who fulfilled the Rome III criteria,[19] who were treated at the Department of Gastroenterology Outpatients, The First Affiliated Hospital of Henan University of Science and Technology (Luoyang, China), between January 2009 and September 2010. Patients with durations of D-IBS ranging between 6 months and 15 years were included, after the absence of intestinal organic disease has been confirmed by colonoscopy. Patients with the following were also excluded from the study: endocrine diseases; connective tissue diseases and other organic diseases; allergic rhinitis, allergic asthma and other allergic diseases; abdominal surgery; antihistamine or corticosteroid use within 1 month of the start of the study. Healthy subjects without gastrointestinal symptoms, attending the hospital during the same time period for routine examination who had normal clinical and laboratory evaluations without evidence of hypertension, coronary heart disease, diabetes, or allergic diseases, were enrolled in the control group.

The study was conducted with the approval of the Institutional Review Board of The First Affiliated Hospital of Henan University of Science and Technology. Verbal informed consent was obtained from all study participants.

FOOD-SPECIFIC IMMUNOGLOBULIN G ANTIBODY TESTS

A blood sample (2 ml) was taken from the cubital vein of each patient and stored for 1 h at room temperature prior to centrifugation at 1087 ***g*** to separate the serum. Serum samples were stored at –20 °C prior to analysis. An enzyme-linked immunosorbent assay semiquantitative detection kit (Food Intolerance Assay Kit; Biomerica Inc., Irvine, CA, USA) was used to detect the presence of the following 14 types of food allergen-specific IgG antibodies in the serum samples: beef; chicken; codfish; corn; crab; egg; mushroom; milk; pork; rice; shrimp; soybean; tomato; wheat. According to the absorbance value obtained for the serum samples, the concentrations of specific IgG antibodies were used to classify patients as follows: < 50 IU/ml, negative; ≥ 50 to < 100 IU/ml, mild sensitivity; ≥ 100 to < 200 IU/ml, moderate sensitivity; and > 200 IU/ml, high sensitivity.

DIETARY EXCLUSION OF FOOD

Patients with D-IBS in whom increased levels of specific lgG antibodies (≥ 50 IU/ml) were identified strictly followed 12-week diets that removed the food identified by the specific lgG antibody test results.

EFFICACY EVALUATION

To evaluate any changes in the symptoms of D-IBS, patients completed a questionnaire[20] before treatment and at 4, 8 and 12 weeks after treatment started. The questionnaire recorded the degree of severity of the major symptoms of D-IBS using a four-point scoring system for each symptom. Abdominal pain – bloating level was scored as: asymptomatic, 0 points; mild symptoms, does not affect daily work and life, 1 point; moderate symptoms, slightly affects work and life, 2 points; and severe symptoms seriously affects daily work

and life, 3 points. Abdominal pain – frequency was scored as: did not occur in 1 week, 0 points; abdominal pain occurred 1 – 3 times/week, 1 point; abdominal pain occurred 4 – 7 times/week, 2 points; and abdominal pain occurred ≥ 8 times/week, 3 points. Diarrhoea frequency was scored as: 0 – 2 times/day, 0 points; 3 – 4 times/day, 1 point; 5 – 6 times/day, 2 points; and ≥ 7 times/day, 3 points. Abdominal distension was scored as: asymptomatic, 0 points; mild symptoms that do not affect daily work and life, 1 point; moderate symptoms that slightly affect work and life, 2 points; and severe symptoms that seriously affect daily work and life, 3 points. Stool shape used the Bristol Stool Scale[21] as its basis, scoring as: smooth and soft faeces, 0 points; soft dough, with clear edge, 1 point; paste, shapeless, 2 points; and watery, no solid components, 3 points. General feelings of distress in patients with IBS were self scored as: asymptomatic, 0 points; mild, 1 point; moderate, 2 points; and severe, 3 points. Evaluation of total efficacy was scored as: marked improvement, symptoms disappeared (or occasionally returned to the 1 or 0 level); effective, symptoms improved compared with before treatment (symptoms reduced by at least 1 point compared with pretreatment levels); invalid, no improvement of symptoms.

STATISTICAL ANALYSES

Statistical analyses were carried out using the SPSS® statistical package, version 13.0 (SPSS Inc., Chicago, IL, USA) for Windows®. Serum food-specific IgG antibody positivity in the two groups was compared using the χ^2-test. Total symptom scores before and after treatment were compared by analysis of variance. Individual symptom scores before and after treatment were compared using the Wilcoxon rank-sum test. A P-value < 0.05 was considered to be statistically significant.

Results

A total of 77 D-IBS patients (46 males, 31 females) with a mean ± SD age of 38.05 ± 12.75 years (range 17 – 73 years) were enrolled in the study; 26 healthy subjects (16 males, 10 females) with a mean ± SD age of 35.04 ± 12.21 years (range 18 – 66 years) were recruited as controls. The two groups were comparable in terms of age, sex and general demographic characteristics (data not shown).

Positivity for serum food-specific IgG antibodies in patients with D-IBS was significantly higher than in the healthy controls (P = 0.002) (Table 1). In the D-IBS group, 39 patients had varying degrees of food intolerance, of whom three patients did not want to undergo the dietary intervention and one patient was lost to follow-up. Consequently, symptom changes were monitored over the 12-week period of the study in 35 patients with D-IBS.

The total mean ± SD symptom score decreased significantly from 9.06 ± 2.06 to 6.40 ± 2.57 after 4 weeks' dietary therapy, to 4.54 ± 2.59 after 8 weeks, and to 3.60 ± 2.58 after 12 weeks (P < 0.01 for all comparisons).

After 4 weeks' dietary therapy, abdominal pain – bloating level, degree of abdominal distension, stool shape and general feelings of distress were significantly improved compared with patients' pretreatment scores. After 8 weeks, abdominal pain – bloating level, abdominal pain – frequency, frequency of diarrhoea, abdominal distension, stool shape and general feelings of distress were significantly improved, and after 12 weeks, all symptoms continued to improve (P < 0.01 for all comparisons) (Table 2). At 12 weeks after initiation of dietary treatment, 23 of 35 patients (65.71%) experienced basic symptom relief, eight (22.86%) experienced improved symptoms and four (11.43%) had no improvement in their symptoms; total efficacy was, therefore, 88.57% (31/35 patients).

TABLE 1:
Serum food-specific immunoglobulin G (SIgG) antibody positivity in patients with diarrhoea-predominant irritable bowel syndrome (D-IBS) compared with healthy control subjects

Group	*n*	Serum SIgG positivity			Total positive, *n*	Positivity rate (%)
		Mild	Moderate	High		
D-IBS patients	77	19	13	7	39	50.65[a]
Control group	26	3	1	0	4	15.38

[a]$P = 0.002$, $\chi^2 = 9.939$, versus control group.

TABLE 2:
Comparison of median symptom scores before (baseline) and at 4, 8 and 12 weeks after initiation of dietary restriction treatment in patients with diarrhoea-predominant irritable bowel syndrome (*n* = 35)

Symptoms	Baseline score	4 weeks			8 weeks			12 weeks		
		Score	*Z*-value	Statistical significance[a]	Score	*Z*-value	Statistical significance[a]	Score	*Z*-value	Statistical significance[a]
Abdominal pain – bloating level	1.57	1.09	–2.246	$P = 0.025$	0.78	–4.274	$P < 0.001$	0.63	–4.335	$P < 0.001$
Abdominal pain – frequency	1.43	1.17	–1.536	NS	0.86	–2.996	$P = 0.003$	0.54	–3.992	$P < 0.001$
Frequency of diarrhoea	1.14	0.83	–1.772	NS	0.57	–2.891	$P = 0.004$	0.40	–3.981	$P < 0.001$
Abdominal distension	1.46	0.77	–3.453	$P = 0.001$	0.40	–3.992	$P < 0.001$	0.40	–3.992	$P < 0.001$
Stool shape	1.60	1.20	–2.952	$P = 0.003$	1.06	–3.649	$P < 0.001$	1.00	–3.871	$P < 0.001$
General feelings of distress	1.80	1.31	–3.038	$P = 0.002$	0.89	–4.197	$P < 0.001$	0.60	–4.287	$P < 0.001$

Data presented as medians.
[a]Compared with the baseline score.
Symptom scores before and after treatment compared using the Wilcoxon rank-sum test. NS, not statistically significant ($P > 0.05$).

Discussion

Food intolerance is a complex allergic condition. The human immune system usually surveys the wide variety of foods that enter the body, looking for any harmful substances against which it then mounts an immune response. If the immune system incorrectly identifies normal food components as being harmful, it may produce an inappropriate immune response to these substances, which results in food-specific IgG antibodies.[22] Food-specific IgG antibodies and food particles form immune complexes that can trigger an inflammatory response.[23]

A growing body of evidence has identified mild inflammation or immune responses in the intestinal mucosa of patients with IBS, with increased levels of intestinal mast cells and inflammatory intestinal cells.[24–26] Zar *et al.*[26] demonstrated that IgG_4 might play a pathophysiological role in IBS. The gastrointestinal mucosa is the body's largest lymphoid tissue; it plays an important role in the transfer of food antigens to the blood circulation and in the identification of 'foreign' food antigens, subsequent antibody production and the triggering of an immune response in the form of food allergy.

Stefanini *et al.*[27] demonstrated a high prevalence of adverse reactions to foods in patients with D-IBS. Multicentre studies have shown that there is a higher incidence of adverse reactions to dietary factors in patients with IBS, especially those with D-IBS, compared with the incidence figures in other participants.[28] The present study showed that, in patients with D-IBS, the incidence of food intolerance (as identified by specific IgG antibody positivity) was significantly higher than in the control group. These findings suggest that a type III IgG-mediated allergic reaction might play an important role in the pathogenesis of D-IBS.

It has been suspected for some time that IBS may be associated with diet[29] and it has been confirmed that bowel symptoms in patients with IBS may be improved by adjusting their diet.[30] Yang and Li[31] found that removing the food that was positively identified by the lgG antibody test for 8 weeks resulted in IBS symptom resolution in 31.4% of patients and IBS symptom relief in 34.3% of patients. The specific IgG antibody data in the present study indicated the foods to which the participants were intolerant and was used to guide the dietary exclusion therapy. At 4 weeks after initiation of dietary treatment, most symptoms began to improve and the total symptom score had decreased significantly. Thus, patients with abnormal gastrointestinal motility and visceral perception showed marked improvement. In addition, the patients' quality of life improved, as indicated by reductions in measurements of general feelings of distress.

The symptoms caused by food intolerance can be extremely subtle, making it difficult for most people to determine that they might have a food intolerance. If the diet is not adjusted in a timely manner, an abnormal immune response can develop, leading to continued tissue injury and symptoms.[32] The use of food-specific IgG antibody testing to identify the offending food so that the diet can be modified might not only improve gastrointestinal symptoms, but may also improve quality of life, reduce the burden on medical resources and reduce the financial burden on patients. As food-specific IgG antibody testing and dietary exclusion appear to be simple and effective methods for treating patients with D-IBS, they are worthy of further research in larger patients groups.

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Hospital of Henan University of Science and Technology who were involved in the collection of patient data.

Conflicts of interest

The authors had no conflicts of interest to declare in relation to this article.

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