Food intolerance and the irritable bowel syndrome

R NANDA, R JAMES, H SMITH, C R K DUDLEY, AND D P JEWELL

From the Gastroenterology Unit, Radcliffe Infirmary, Oxford

SUMMARY   Two hundred patients (156 women) with the irritable bowel syndrome were treated with dietary exclusion for three weeks. Of the 189 who completed this study, 91 (48·2%) showed symptomatic improvement. Subsequent challenge with individual foods showed that 73 of these 91 responders were able to identify one or more food intolerances and 72 remained well on a modified diet during the follow up period (mean (SD), 14·7 (7·98) months). Of the 98 patients who showed no symptomatic improvement after three weeks of strict exclusion only three were symptomatically well at follow up (mean (SD), 12·48 (8·09 months). There was no close correlation between response and symptom complex. There was a wide range of food intolerance. The majority (50%) identified two to five foods which upset them (range 1–14). The foods most commonly incriminated were dairy products (40·7%) and grains (39·4%).

In a general population, it has been estimated that 14–22% suffer from the irritable bowel syndrome[1][2] which accounts for about 50% of the referrals to many gastroenterology clinics.[3] Treatment is notoriously unsatisfactory and usually includes reassurance, the exclusion of organic disease and the use of antispasmodics, bulking agents and centrally acting drugs. Recent controlled trials have shown the advantages of combination therapy.[4][5] Nevertheless, the longterm benefit of medical therapy is much less certain with as little as 12%[6] or as many as 70%[7] having prolonged improvement in symptoms.

There has recently been renewed interest in the role of diet. Lessof *et al*,[8] Alun Jones *et al*,[9] and Farah *et al*[10] have shown by double blind challenges that individual foods can reproduce symptoms in some patients although the precise proportion of patients that benefit from dietary manipulation has been variously reported.[8-15]

The purpose of this study was to determine the proportion of patients with an irritable bowel syndrome who would respond well to an exclusion diet and to document the longterm effects of dietary manipulation.

Methods

PATIENTS

Two hundred Caucasian patients with irritable bowel syndrome were entered into the study. The diagnosis was made on the basis of the history, a negative clinical examination and a normal rectal and sigmoidoscopic examination. The criteria for entry were (1) a diagnosis of an irritable bowel syndrome and (2) failure of conventional therapy (antispasmodics, tranquillisers, high fibre diets, and bulking agents) to induce a symptomatic response. Features in the history required to make the diagnosis were a combination of abdominal pain, change in bowel habits with diarrhoea and/or constipation, distension of the abdomen, and passage of flatus (wind per rectum). In addition, all patients had a normal blood count, ESR and serum liver tests. Radiological examination was only usually carried out in patients presenting over the age of 50 years or in the younger patients where the clinicians felt it justified. All barium enema examinations were normal.

A detailed history was recorded which included details of symptoms, their duration and severity, a drug history, a dietary history, and a history of allergies or atopy. Food intolerance was recorded if symptoms were thought to be brought on by one or

more specific foods. Tables 1 and 2 list the symptoms that were recorded. The purpose of the study was explained to each patient and the nature of the diet further clarified by an interview with the dietitian (RJ).

DIETARY THERAPY

Patients were advised to follow a strict exclusion diet for three weeks. Foods excluded were dairy

Table 1 *Symptom complex characteristics of responders and non-responders*

	Total		Responders*		Non-responders*	
Symptom	Freq	%	Freq	%	Freq	%
Abdominal pain	184	92·5	86	95·6	89	90·8
Flatus	131	65·8	64	70·3	58	59·2
Distension	149	75·3	70	76·9	71	73·2
Diarrhoea	66	33·0	28	30·8	33	33·7
Constipation	38	19·1	15	16·5	21	21·6
Alternating diarrhoea and constipation	64	32·2	35	38·5†	25	25·8†
Relief with defecation	39	20·3	17	19·5	19	20·0
Premenstrual exacerbation	25	13·0	12	14·1	12	12·4
Stool properties normal	53	26·5	22	24·2	31	31·6
Pencil	7	3·5	4	4·4	3	3·1
Rabbit pellets	40	20·0	17	18·7	20	20·4
Watery diarrhoea	100	50·0	48	52·7	44	44·9

*Other symptoms did not show significant differences;
†p value=0·097.

Table 2 *Other characteristics of responders and non-responders*

		Total		Responders‡		Non-responders‡	
Character		Freq	%	Freq	%	Freq	%
History of food intolerance		41	21·7	22	25·9	14	15·1
*Duration of symptoms	1	11	5·5	7	7·7	3	3·1
	2	161	80·5	71	78·0	82	83·7
	3	28	14·0	13	14·0	13	13·0
†Symptom episodes	1	135	67·5	57	62·6	73	74·5
	2	52	26·0	26	28·6	21	21·4
	3	13	6·5	8	8·8	4	4·1
Asthma		10	5·1	6	6·7	3	3·1
Eczema		13	6·6	7	7·8	5	5·2
Hayfever		18	9·1	10	11·1	7	7·3
Drug allergy		13	6·6	7	7·8	5	5·2
Atopy		6	3·1	3	3·3	3	3·2
Other allergies		3	1·5	2	2·2	1	1·1

*Duration of symptoms – 1: <12 months; 2: >2 years; 3: between 1 and 2; †Symptom episodes – 1: every day; 2: >1/week; 3: <3/week; ‡p values – not significant.

products, cereals, citrus fruits, potatoes, tea, coffee, alcohol, additives and preservatives. Any food that the patient had already identified as a cause of symptoms was also excluded. Foods allowed included fresh meat and fish, vegetables, rice and products derived from goats', sheep, or soya milk.

Complete compliance to the diet was stressed. All current medications were terminated.

At the end of three weeks, the patients were reassessed by a physician and the dietitian. If there was no improvement, they were advised to return to their normal diet and firmly told that food intolerance was not the cause of their problems.

If patients improved over this initial period they were asked to reintroduce foods singly in a specific order of testing. The order was the same for each patient and is given in Table 3. Each food was tested for two days and if symptoms did not return, the new food was then incorporated into the existing diet. If symptoms returned and intolerance identified, the offending food was avoided but retested at the end of the reintroduction phase. The reintroduction phase lasted for two to three months, and patients were asked to record symptoms and foods tested throughout by means of a diary. Patients were contacted and monitored at regular intervals by the dietitian to ensure compliance and nutritional adequacy of the final diet. Vitamin and calcium supplements were occasionally needed. Once the diet was established, the offending foods were avoided wherever possible.

Improvement was defined as a reduction in the amount of abdominal pain with a return to a more normal bowel habit, assessed by the answers to the detailed questionnaire which was used to compile Tables 1 and 2 as well as from the patients' diary. Response was assessed globally by patient and doctor and classified as: no response, some improvement, complete resolution, or worse.

FOLLOW UP

All patients were in contact with the dietitian during the periods of dietary exclusion and challenge. They were seen by a physician (DPJ, RN) towards the end of the challenge and all were followed in the clinic whether or not they had shown a symptomatic response. At the end of follow up, answers to the questionnaire (Tables 1 and 2) were again obtained in order to assess current status.

For patients responding to dietary exclusion the mean follow up (SD) was 14·7 (7·98) months compared with 12·48 (8·09) months for the non-responders. The difference in follow up between the two groups was not significant. At the final follow up details of symptomatology, the current diet, and the need of medication was recorded.

Table 3 *Order of re-introduction of food*

Potatoes
Milk
Yeast
Tea
Rye
Butter
Onions
Eggs
Oats
Coffee
Chocolate
Barley
Citrus fruits
Corn
Cheese
White wine
Shell fish
Yoghurt
Wheat (wholemeal bread)
Nuts
Preservatives – for example, fruit squashes, tin foods, sausages, smoked fish etc
Saccharin

Table 4 *Demographic characteristics of responders and non-responders*

Character	Total	Responders*	Non-responders*
Average age (SD)	43·7 (15·1)	43·87 (14·5)	42·91 (16·7)
Sex			
M	44 (22%)	18 (19·8%)	22 (22·4%)
F	156 (78%)	73 (80·2%)	76 (77·6%)
Social class			
1	2·5%	2·5%	1·0%
2	18·1%	19·8%	14·3%
3	21·6%	23·1%	21·4%
4	3·0%	2·2%	4·1%
5	36·2%	31·9%	42·9%
6	18·6%	20·9%	16·3%

*p values – no significant difference.

Table 5 *Result of previous treatment*

Result	Total %	Responders %	Non-responders %
No response	63·6	57·4	72·5
Partial improvement	34·7	40·2	26·4
Resolution then relapse	1·7	2·4	1·1
		p=0·057	

STATISTICAL ANALYSIS

Data from patients were entered onto a detailed proforma and then fed into a computer (IBM PC) using the data entry and management package, D-Base III (Ashton Tate). The data were analysed using the SPSS-software (statistical package for the social sciences). The specific tests used were, Student's t tests (unpaired), χ^2 tests and a multivariate discriminant analysis.

Results

Two hundred Caucasian patients were entered into the study with a mean age (SD) of 43·7 (15·1) years (range 15–80). There were 156 women (78%) and 44 men (22%). Eleven patients were not assessed, as 10 failed to start the exclusion diet, because of its difficulty or expense, and one 'could not be bothered'. One elderly man (80 years) did not complete the study as he died from chronic obstructive airways disease.

Of the 189 patients who started the dietary therapy, 91 (48·1%) claimed symptomatic improvement after three weeks of the exclusion diet (responders) whereas the remaining 98 (51·9%) showed no improvement (non-responders). Table 4 shows that there were no demographic differences between these two groups. Likewise, there were no differences at the 5% level in symptoms although, at the 10% level of probability, response correlated with alternating diarrhoea and constipation (p=0·097) (Tables 1 and 2). A history of allergies or atopy was present in 22·8% of the whole group

but did not differ between responders and non-responders.

By χ^2 analysis, patients <30 years with a history of food intolerance were more likely to respond than the others (p=0·03). Further analysis with respect to the duration of previous food intolerance was not done as the latter data were not collected because their validity could not be checked. Patients >50 years who had complained of flatus as a predominant symptom (p=0·064) were also more likely to respond to dietary exclusion. Analysis by sex showed that women suffering from flatus also showed a tendency to respond to the exclusion diet (p=0·07). The overall response in women, however (73 of 156) was similar to that of men (18 of 144) (Table 4).

Patients who failed to respond after the three weeks of dietary exclusion had shown a poor response to previous medical treatment as compared with responders (p=0·057) who had often shown a partial response (Table 5).

After the three week period of strict dietary exclusion, the mean (SD) weight loss of those with symptomatic improvement was 3·45 kg (2·52) compared with 2·10 kg (2·37) in the non-responders (p<0·0001).

DIETARY CHALLENGE

The 91 patients, responding to the three week period of strict dietary exclusion, challenged themselves with individual foods, as described above, with

Table 6   *Number of foods causing intolerances*

Intolerances	Number	%
1	8	10·8
2–5	37	50·0
6–10	23	31·1
11–19	6	8·1

Table 7   *Food intolerances (named by responders embarking on challenges)*

Food	% patients naming food		
Cheese	35·2	Alcohol	8·8
Onions	35·2	Fruit	7·7
Others	34·1	Yeast	5·5
Milk	31·9	Vegetables	5·5
Wheat	29·7	Red meat	4·4
Chocolate	27·5	Salad	2·2
Butter	25·3	Lamb/pork	2·2
Yoghurt	24·7	Spicy foods	2·2
Coffee	24·2	Soya	2·2
Eggs	23·3	Additives and saccharin	2·2
Nuts	18·0	Fish	2·2
Citrus	17·8	Root vegetables	1·1
Tea	17·6	Pulses	1·1
Rye	17·6	Bran	1·1
Potatoes	15·4	Fat	1·1
Barley	13·3		
Oats	12·1		
Corn	11·1		

careful monitoring by the dietitian (RJ). Seventy three patients (81·3%) were able to identify individual food intolerances during the challenge. Most of them identified more than one food and over half of them were intolerant to two to five foods (range 1–14) (Table 6).

Table 7 gives the frequency with which individual food items were identified as a cause of symptoms. Dairy products (milk, cheese, butter), chocolate, eggs, and wheat products were major causes of symptoms. Nuts, tea, coffee, citrus fruits and potatoes were also commonly incriminated.

RESULTS AT LONGTERM FOLLOW UP
For the 91 responders, 73 (80·2%) were still continuing with dietary restriction at the time of the final follow up (mean (SD) 14·7 (7·98) months while 18 (19·8%) were taking a normal diet. For those continuing with dietary restriction, all but one patient (98·6%) had prolonged benefit. For those on a normal diet, 12 (66·7%) had also had a longterm improvement in symptoms. For the 98 patients who did not respond to dietary exclusion, 95 (96·9%) continued to have symptoms during the follow up period (12·48 (8·09) months) (Fig. 1). At the time of the final follow up more non-responders were taking medication than were the responders (p=0·021).
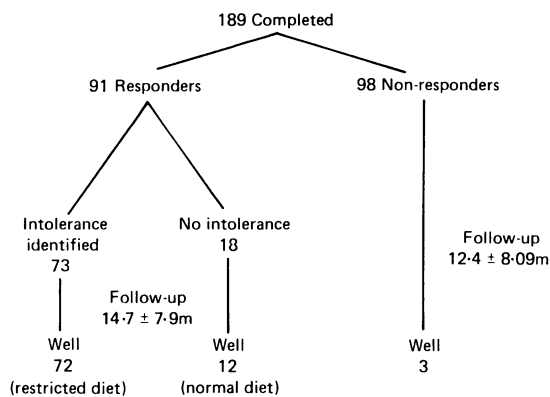

Figure   *Response to dietary therapy in patients completing the study.*

RELATION BETWEEN FINAL RESPONSE AND INITIAL SYMPTOMS
Patients showing longterm improvement after dietary manipulation, were more likely to have flatus as an initial symptom (p=0·031) than non-responders. In particular, women more than 50 years old with flatus seemed to respond (p=0·032).

A history of food intolerance was also associated with a favourable resposne (p=0·047) especially in women less than 30 years (p=0·018). The only specific food intolerances associated with specific symptoms were wheat and rye which were associated with abdominal distension (p<0·042, <0·037 respectively). There were no other associations between any of the other symptoms or demographic features and subsequent response.

Discussion

The treatment of the irritable bowel syndrome is unsatisfactory, although there is a tendency for symptoms to ameliorate with time.[6 7 16] Regimens of tranquillisers, antispasmodics and bulking agents have proved useful over a four month period in clinical trials[4 5] but it is common experience that symptoms frequently recur. The role of bran and high fibre diets has been controversial and, in general, is disappointing.[17] Psychoanalysis[18] and hypnotherapy[19] have also been used and can be useful in selected patients. Clinical trials are difficult in a situation where the symptomatology is highly variable, where 35% of patients improve on placebo,[20] and where there are no objective criteria for measuring improvement.

The symptoms of hypolactasia are often mistaken for those of the irritable bowel syndrome but this only accounts for a small proportion of patients.[21] Excessive fermentation of wheat starch[22] and of other

sugars such as sorbitol[23] and fructose[24] may also be a cause of symptoms. Intolerance to other dietary components has been shown, however, using double blind challenges.[8 9] From the results of such studies, Hunter et al,[14] found that 79% of patients improved on exclusion diets and, of these, the majority (67%) were able to detect specific food intolerance and adjusted their diet accordingly. The mechanisms underlying food intolerance are undoubtedly multiple and this study was not designed to investigate them. Reduction in carbohydrate load may have been an essential factor in reducing the degree of distension and flatus. The role of a 'placebo response' is always a possibility and is difficult to assess. Both responders and non-responders received equal attention during the initial assessment, exclusion period and the challenge. During the follow up period the non-responders received considerably more medical attention than the responders as they continued to have symptoms. Another explanation might be that the response to diet was determined by psychological factors. Formal psychological testing of patients was not performed, however, nor were data collected concerning the patients perception of the role of diet at entry into the study.

The results of the present study, which included observations on 200 patients, have shown that virtually half of them (48%) had marked improvement in their symptoms after the first three weeks of strict exclusion. These patients who responded to the dietary restriction lost significantly more weight than the non-responders. This suggests, but by no means proves, that non-compliance was a major factor for a poor response. During the subsequent challenge, the majority of the responders (81·3%) were able to identify one or more food intolerances. During the follow up period the non-responders acted as a control group for the responders, the mean length of follow up being 12·4 and 14·7 months respectively. The difference in symptoms between the two groups was striking. Thus, of those responding to the diet (n=91), 73 were continuing with some dietary restriction and all but one were well. Eighteen patients who had initially responded had gone back on to a normal diet and 12 of these remained well. In contrast, 95 of the 98 non-responders continued to have symptoms and no improvement had occurred except in three.

Thus, it is reasonable to conclude on the basis of these results that dietary manipulation is effective in about half of the patients with an irritable bowel syndrome and that there is a very high probability of prolonged symptomatic benefit in those that do respond. The main problem with dietary exclusion is compliance. Strict adherence to the diet requires a major alteration in eating patterns and this, together with the self-discipline needed during the two to three months of challenge, requires considerable motivation on the part of the patient. Nevertheless, dietary manipulation appears to offer considerable benefit to many patients with the irritable bowel syndrome. It is frequently welcomed by patients and should be considered as a possible therapeutic approach to this difficult problem.

References

1 Thompson WG, Heaton KW. Functional bowel disorders in apparently healthy people. *Gastroenterology* 1980; **79:** 283–8.

2 Whitehead WE, Winget C, Fedoravicius AS, Wooley S, Blackwell B. Learned illness behaviour in patients with irritable bowel syndrome and peptic ulcer. *Dig Dis Sci* 1982; **27:** 202–8.

3 Harvey RF, Salih SY, Read AW. Organic and functional disorders in 2000 gastroenterology outpatients. *Lancet* 1983; i: 632–4.

4 Ritchie JA, Truelove SC. Comparison of various treatments for irritable bowel syndrome. *Br Med J* 1980; **281:** 1317–9.

5 Ritchie JA, Truelove SC. Treatment of irritable bowel syndrome with lorazepam, hyoscine butyl bromide and ispaghula husk. *Br Med J* 1979; i: 376–8.

6 Waller SL, Misiewicz JJ. Prognosis in the irritable bowel syndrome. *Lancet* 1969; ii: 753–6.

7 Harvey RF, Manard EG, Brown AM. Prognosis in the irritable bowel syndrome: a 5 year prospective study. *Lancet* 1987; i: 963–5.

8 Lessof MH, Wraith DG, Merrett TG, Merett J, Buisseret PD. Food allergy and intolerance in 100 patients – local and systemic effects. *Q J Med* 1980; **99:** 259–71.

9 Alun Jones V, Shorthouse M, McLoughlan P, Workman E, Hunter JO. Food intolerance: A major factor in the pathogenesis of irritable bowel syndrome. *Lancet* 1982; ii: 1115–7.

10 Farah DA, Calder I, Benson L, MacKenzie JF. Specific food intolerance: its place as a cause of gastrointestinal symptoms. *Gut* 1985; **26:** 164–8.

11 Bently SJ, Pearson DJ, Rix KJB. Food hypersensitivity in IBS. *Lancet* 1983; ii: 295–6.

12 Gerrad JW. Food intolerance. *Lancet* 1984; ii: 413–4.

13 Smith MA, Youngs GR, Barnes RMR, Finn R. Food intolerance and atopic status in the irritable bowel syndrome [Abstract]. *Gut* 1985; **26:** A572.

14 Hunter JO, Workman E, Alun Jones V. Dietary studies. In: Gibson PR, Jewell DP, eds. *Topics in gastroenterology 12.* Oxford: Blackwell Scientific, 1985: 305–13.

15 McKee AM, Prior A, Whorwell PJ. Exclusion diets in irritable bowel syndrome: are they worthwhile? *J Clin Gastroenterol* 1987; **9:** 526–8.

16 Chaudhary NA, Truelove SC. The irritable colon syndrome. *Q J Med* 1962; **616:** 307–22.

17 Lucey MR, Clark MI, Lowndes JO, Dawson AM. Is bran efficacious in irritable bowel syndrome. A double

blind placebo cross over study. *Gut* 1987; **28:** 221–5.

18 Svedlund J, Sjodin J, Ottosson JO, Dotevall G. Controlled study of psychotherapy in irritable bowel syndrome. *Lancet* 1983; ii: 589–92.

19 Whorwell PJ, Prior A, Colgan SM. Hypnotherapy in severe irritable bowel syndrome: further experience. *Gut* 1987; **28:** 423–5.

20 McHardy G, Sekinger D, Balart L, Cradic HE. Chlordiazepoxide clidinium bromide in gastrointestinal disorders: controlled clinical studies. *Gastroenterology* 1968; **54:** 508–13.

21 Peña AS, Truelove SC. Hypolactasia and the irritable bowel syndrome. *Scand J Gastroenterol* 1972; **7:** 433–7.

22 Anderson IH, Levine AS, Levitt MD. Incomplete absorption of the carbohydrate in all purpose wheat flour. *N Engl J Med* 1981; **304:** 891–2.

23 Hyams JS. Sorbitol intolerance: an unappreciated cause of functional gastrointestinal complaints. *Gastroenterology* 1983; **84:** 30–4.

24 Ravich WJ, Bayless TM, Thomas M. Fructose: incomplete intestinal absorption in humans. *Gastroenterology* 1983; **84:** 26–9.