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# Are bowel symptoms and psychosocial features different in irritable bowel syndrome patients with abdominal discomfort compared to abdominal pain?

Fang XC *et al.* Features of pain and discomfort IBS

Xiu-Cai Fang, Wen-Juan Fan, Douglas D Drossman, Shao-Mei Han, Mei-Yun Ke

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## Abstract

### BACKGROUND

The Rome IV criteria eliminated abdominal discomfort for irritable bowel syndrome (IBS), previously included in Rome III. There are questions as to whether IBS patients with abdominal discomfort (seen in Rome III but not Rome IV) are different from those with abdominal pain (Rome IV).

### AIM

To compare bowel symptoms and psychosocial features in IBS patients diagnosed with Rome III criteria with abdominal discomfort, abdominal pain and pain & discomfort.

### METHODS

We studied IBS patients meeting Rome III criteria. We administered the IBS symptom questionnaire, psychological status and IBS quality of life (IBS-QOL). Patients were classified according to the predominant abdominal symptom associated with defecation into an only pain group, only discomfort group, and pain & discomfort group. We compared bowel symptoms, extra-intestinal symptoms, IBS-QOL, psychological status and healthcare-seeking behaviors and efficacy among the three groups. Finally, we tested risk factors for symptom reporting in IBS patients.

### RESULTS

Of the 367 Rome III IBS patients enrolled, 33.8% (124 cases) failed to meet Rome IV criteria for an IBS diagnosis. There were no meaningful differences between pain group

( $n = 233$ ) and discomfort group ( $n = 83$ ) for the following: (1) Frequency of defecatory abdominal pain or discomfort; (2) bowel habits; (3) coexisting extra-gastrointestinal pain; (4) comorbid anxiety and depression; and (5) IBS-QOL scores except more patients in the discomfort group reported mild symptom than the pain group (22.9% vs 9%). There is significant tendency for patients to report their defecatory and non-defecatory abdominal symptom as pain alone, or discomfort alone, or pain and discomfort (all  $P < 0.001$ ).

## CONCLUSION

IBS patients with abdominal discomfort have similar bowel symptoms and psychosocial features to those with abdominal pain. IBS patients manifested as abdominal pain or discomfort may primarily due to different sensation and reporting experience to the symptoms.

**Key Words:** Irritable bowel syndrome; Abdominal pain; Abdominal discomfort; Diagnosis; Psychosocial distress; Quality of life

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**Core Tip:** It is generally accepted that abdominal pain is the most predominant symptom of irritable bowel syndrome (IBS) and Rome IV eliminated abdominal discomfort as diagnostic criteria for IBS. Asian studies showed about one-third of IBS patients diagnosed using Rome III criteria had abdominal discomfort alone. In this study, we compared bowel symptoms, extra-intestinal symptoms, IBS-quality of life, psychological status and healthcare-seeking behaviors and efficacy between the abdominal pain and abdominal discomfort expecting to find the difference between the two groups. We also tried to find risk factors for symptom reporting for IBS patients.

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## INTRODUCTION

Irritable bowel syndrome (IBS) is a common functional bowel disorder with a global prevalence of 4.1% according to the Rome IV and 10.1% with Rome III criteria<sup>[1]</sup>. Using the Rome III definition, IBS is characterized by recurrent abdominal pain or discomfort associated with altered bowel frequency or stool form<sup>[2]</sup>. However, the term “discomfort” was deleted from the 2016 Rome IV diagnostic criteria because some languages do not have a word for discomfort or it has different meanings in different languages or cultures<sup>[3,4]</sup>. Possibly abdominal discomfort has qualitative and quantitative levels of distinction with abdominal pain<sup>[5]</sup>. The data from a population-based survey of adults in the USA, Canada and the United Kingdom showed that eliminating “discomfort” from the criteria for IBS affected diagnostic rates only slightly<sup>[6]</sup> and only 10% Rome III-IBS patients among the Swedish cohort did not fulfill Rome-IV IBS diagnosis due to reporting only abdominal discomfort and not pain<sup>[7]</sup>. However, clinical studies from Thailand and central China revealed that about one-third of patients with IBS diagnosed using Rome III criteria had abdominal discomfort alone<sup>[8,9]</sup>, this rate is as high as 84.2% from another clinical retrospective report from Tianjin, China<sup>[10]</sup>. Evidence regarding pathophysiological differences between abdominal pain and abdominal discomfort such as whether these symptoms are categorically different or exist on a continuum of severity is lacking<sup>[11,12]</sup>. It is also unclear whether there are clinical or phenotypical distinctions with IBS presenting with abdominal pain *vs* abdominal discomfort, as to how this change of criteria impacts on the clinical practice.

This study aimed to (1) compare the bowel and extra-intestinal symptoms of patients with IBS presenting with abdominal discomfort alone to those with pain alone, as well as with pain & discomfort; (2) evaluate the anxiety, depression, quality of life and symptom reporting tendency for patients with pain and discomfort; and (3) to validate whether the discomfort is milder than pain on a continuum of severity for Chinese

patients. The clinical data were drawn from the IBS database of Peking Union Medical College Hospital (PUMCH).

## **MATERIALS AND METHODS**

### ***Subjects***

Consecutive patients with IBS aged 18-65 years from PUMCH gastroenterology clinics were enrolled in this study from June 2009 to February 2016. All patients met Rome III diagnostic and subtype criteria<sup>[2]</sup>, including IBS with diarrhea (IBS-D), IBS with constipation (IBS-C), and mixed IBS (IBS-M). Patients with organic gastrointestinal diseases and metabolic diseases were excluded based on the results of routine tests for blood, urine, stool; liver, kidney, and thyroid function; measurements of carcinoembryonic antigen, erythrocyte sedimentation rate, and C-reactive protein; and abdominal ultrasound and colonoscopy/barium enema in the past year. The participating patients provided oral or written consent to participate before study enrollment. This study was approved by the PUMCH Ethics Committee (S-234).

### ***IBS symptom questionnaire***

The IBS symptom questionnaire was administered by well-trained investigators in face-to-face interviews. The questionnaire was adapted from a previous symptom-related questionnaire for adult functional gastrointestinal disorders (FGIDs) in Beijing<sup>[13]</sup>, the Rome III diagnostic questionnaire for adult FGIDs, and the Rome III psychosocial alarm questionnaire for FGIDs<sup>[2]</sup>. Information collected included demographic data, IBS disease course, frequency and severity of IBS symptoms, defecation-related symptoms, extra-intestinal symptoms, physical examination and supplementary examination results, and IBS treatments in the whole disease course and the last year.

Patients were evaluated according to abdominal pain, abdominal discomfort or both abdominal pain & discomfort just before defecation (pre-defecatory) while IBS onset and between IBS symptom episodes without association to defecation (ordinary). Patients with the presence or worsening of pre-defecatory abdominal pain and without

pre-defecatory abdominal discomfort were categorized as the pain group regardless of whether they had abdominal pain or discomfort during ordinary period. Similarly, patients with pre-defecatory abdominal discomfort and without pre-defecatory abdominal pain were categorized as the discomfort group, and patients with pre-defecatory abdominal pain and discomfort were categorized as the pain & discomfort group. The main intestinal symptom score for IBS-D was calculated according to the report by Zhu *et al*<sup>[14]</sup>. Diagnosis of gastroesophageal reflux disease (GERD) and functional dyspepsia (FD) were made according to the Montreal consensus<sup>[15]</sup> and Rome III diagnostic and subtype criteria<sup>[2]</sup>, respectively. Patients who did not meet Rome IV diagnostic criteria for IBS (including patients with pre-defecatory abdominal discomfort alone or symptom frequency < 1 d/wk) were evaluated for possible diagnosis of other functional bowel disorders using Rome IV criteria, including functional diarrhea, functional constipation, functional abdominal bloating/distension, and unspecified functional bowel disorder<sup>[3]</sup>.

### *Quality of life evaluation*

The simplified Chinese version of the IBS-Quality of Life (IBS-QOL) instrument was used to evaluate patients' quality of life<sup>[16]</sup>, which was translated from IBS-QOL<sup>[17]</sup> and well validated. This instrument was completed by patients according to the instructions provided; the total score and eight domain scores were calculated as the previous publication<sup>[14]</sup>.

### *Psychological evaluation*

The Hamilton Anxiety (HAMA) and Hamilton Depression (HAMD) scales were used to evaluate patients' psychological status by specially trained professionals through conversation and observation. A HAMA score  $\geq 14$  was judged as anxiety and  $\geq 21$  as moderate-to-severe anxiety. A HAMD score  $\geq 17$  was judged as depression and  $\geq 24$  as moderate-to-severe depression<sup>[18,19]</sup>.



### 3 Statistical analysis

All analyses were performed using SPSS version 19.0 (IBM Corporation, Somers, NY, United States). Parametric distribution was evaluated by Kolmogorov-Smirnov test. Parametric and categorical data are presented as mean  $\pm$  SD or rate, respectively. Nonparametric data were presented as median and interquartile range (IQR). Comparisons among the three groups were made by one-way analysis of variance (ANOVA) for parametric data, Kruskal-Wallis test for nonparametric data and chi-square tests for categorical variables. Spearman's test was performed to assess nonparametric correlations between two quantitative variables. Bonferroni test was used to adjust for pairwise comparison among the three groups after ANOVA. Multiple logistic regression analysis was used to determine the independent factors for abdominal pain or abdominal discomfort.  $P < 0.05$  was considered statistically significant.

## RESULTS

### Demographic data

In total, 367 patients meeting Rome III criteria for IBS were enrolled in this study (205 males and 162 females), with an average age of  $43.0 \pm 11.4$  years.

There were 233 patients (63.5%) in the pain group, 83 patients (22.6%) in the discomfort group, and 51 patients (13.9%) in the pain & discomfort group. There were more males in the discomfort group than in the pain group (67.5% vs 50.2%,  $P = 0.01$ ). There were no significant differences in age, body mass index, educational level, physical work, family economic status, marriage status, the average IBS disease course, and IBS subtype distribution among the three groups ( $P > 0.05$ ) (Table 1).

### Characteristics of abdominal pain, discomfort, and pain & discomfort

In the three groups, the locations of abdominal pain, discomfort or pain & discomfort before defecation were mainly in the umbilical region, lower abdomen, and left lower quadrant. There was no significant difference in distribution of symptom location, even

though more patients in the discomfort group reported the symptom location as “others” (indicating varied or obscure locations) than in the pain group (21.7% vs 10.3%,  $P = 0.009$ ). There was a significant difference in the severity of pain and/or discomfort among the three groups ( $P = 0.007$ ), and more patients in the discomfort group reported mild symptom than those in the pain group. There was no significant difference in frequency among the three groups (Table 2).

There were significant differences in the prevalence of ordinary abdominal pain or/and discomfort among the three groups ( $P < 0.001$ ), more patients in the pain group reported ordinary abdominal pain than those in the discomfort group and pain & discomfort group, while more patients in the discomfort group reported ordinary abdominal discomfort than those in pain group and pain & discomfort group, and 54.9% patients in pain & discomfort group reported having ordinary pain and discomfort, which was significant higher than other two groups (Table 2).

In total, there were 52 patients (14.2%) with onset frequency of  $< 1$  d/wk (i.e., 3 d/mo), including 37 cases in the pain group, 11 cases in the discomfort group, and 4 cases in the pain & discomfort group, the proportion of less frequency was 15.9%, 13.3% and 7.8% respectively, without significant difference ( $P = 0.32$ ). According to Rome IV diagnostic criteria, a total of 124 patients (33.8%) would not meet an IBS diagnosis (Figure 1).

### **Bowel movements and stool form**

In 345 patients with IBS-D, the average bowel movements during symptom non-onset period of pain group ( $1.5 \pm 0.9$ /d) were less than discomfort group ( $1.8 \pm 1.1$ /d) and pain & discomfort group ( $1.9 \pm 1.1$ /d) ( $P = 0.004$ ), but there were no significant differences in average bowel movements during symptom onset period ( $3.8 \pm 1.5$  vs  $3.8 \pm 1.4$  vs  $3.6 \pm 1.5$ ,  $P > 0.05$ ) (Figure 2A). There were no significant differences in stool form during symptom non-onset and onset periods among the three groups (all  $P > 0.05$ ) (Figure 2B).



### **Abdominal pain and/or discomfort improvement after defecation**

Abdominal pain and/or discomfort improved after defecation except for one patient in the pain group. There was no significant difference in the waiting time and degree for improvement among three groups (Figure 2C and D).

In IBS-D patients, the main intestinal symptom score was  $9.3 \pm 1.6$  in the pain group,  $9.4 \pm 1.5$  in the discomfort group and  $9.6 \pm 1.3$  in the pain & discomfort group, respectively ( $P > 0.05$ ).

### **Defecation-related symptoms**

The prevalence of defecation related symptoms such as abdominal bloating, urgency, sensation of incomplete evacuation, and passing mucus were high overall for all 3 groups. More patients in the discomfort group reported having urgency, sensation of incomplete evacuation, and passing mucus than those in the pain group (all  $P < 0.05$ ). In the pain & discomfort group, the prevalence of abdominal bloating, abdominal distension, anorectal pain was significantly higher than that in the pain group (all  $P < 0.05$ ) (Table 2).

### **Extra-intestinal symptoms**

There were no significant differences in the prevalence of GERD or FD between the pain group and the discomfort group ( $P > 0.05$ ), but the prevalence of epigastric pain syndrome, mainly epigastric pain was higher in the pain group than the discomfort group (21.0% vs 7.2%, 18.5% vs 6.0%,  $P < 0.05$ ). More patients in the pain & discomfort group reported early satiation, dyspareunia, menstrual pain for women than in the pain group (all  $P < 0.05$ ), the prevalence of dyspareunia in the pain & discomfort group was also higher than in the discomfort group ( $P < 0.001$ ) (Table 3).

### **Comorbid anxiety and depression**

There were no significant differences in HAMA score, HAMD score, or the prevalence and severity of anxiety and depression among three groups (Table 4).

### **IBS-QOL**

The quality of life of patients with IBS showed an obvious decrease with an IBS-QOL score of  $72.2 \pm 17.9$  in the pain group,  $72.0 \pm 20.0$  in the discomfort group and  $70.4 \pm 15.0$  in the pain & discomfort group while comparing to the mean overall score in healthy Chinese subjects ( $95.50 \pm 6.73$  with the scores on each of the eight domains being  $\geq 90.00$ )<sup>[16]</sup>, the most meaningful impairment for all 3 groups was food avoidance, following by dysphoria, interference with activity and health worry. There were no significant differences in the eight domain scores between the pain group and discomfort group (Figure 3), while patients in pain & discomfort group had lower QOL than patients having discomfort alone ( $P = 0.03$ ).

### **Healthcare-seeking behaviors and efficacy**

There were no significant differences among three groups in the average number of consultations and colonoscopies in the whole disease course and the average consultations, intermittent and long-term medication use in the last year (all  $P > 0.05$ ). More patients in discomfort group used the antispasmodics (muscarinic cholinergic receptor antagonists and selective intestinal calcium channel blockers) and all patients who used the antispasmodics got a reasonably good response (response rate over 50%). The overall satisfaction rate (including complete satisfaction and satisfaction) with medical care showed no significant difference among the three groups ( $P > 0.05$ ) (Table 5).

### **Risk factors for IBS patients describing pre-defecatory symptoms as abdominal pain alone, discomfort alone, and pain & discomfort**

Twelve variables differing between pain group and discomfort group at a  $P$  value with significant difference in Tables 1-3 were carried in for a multiple logistic regression analysis. We found that male patients (OR = 1.955, 95%CI: 1.104-3.462,  $P = 0.021$ ) and patients with mild defecatory abdominal pain or discomfort (OR = 4.020, 95%CI: 1.436-

11.253,  $P = 0.008$ ) were the predictors for patients to describe their pre-defecatory symptoms as abdominal discomfort alone rather than abdominal pain alone (Table 6). Similar analyses were performed between pain group and pain & discomfort group (11 variables), discomfort group and pain & discomfort group (10 variables), we found the abdominal bloating (OR = 2.238, 95%CI: 1.080-4.638,  $P = 0.030$ ), anorectal pain (OR = 2.979, 95%CI: 1.347-6.585,  $P = 0.007$ ) were the predictors for patients to describe their symptom as pain & discomfort rather than pain alone (Table 6), and no predictors were found for patients to describe their symptom as discomfort alone or pain & discomfort.

#### *Diagnosis of patients with abdominal discomfort alone according to Rome IV criteria*

Among 83 patients having pre-defecatory abdominal discomfort alone and not meeting Rome IV criteria for IBS, 48 patients (57.8%) met the diagnosis for functional diarrhea, 28 patients (33.7%) for functional abdominal bloating/distension, two patients (2.4%) for functional constipation, and 5 patients (6.0%) were classified as unspecified functional bowel disorder.

## **DISCUSSION**

The present study comprehensively compared the bowel symptoms and psychosocial features of IBS patients with pre-defecatory abdominal pain alone to pre-defecatory abdominal discomfort alone, and abdominal pain & discomfort. We found that patients with abdominal discomfort had similar bowel and extra-intestinal symptoms, comorbid anxiety and depression, QOL and healthcare-seeking behaviors to those with abdominal pain.

It is generally accepted that abdominal pain is the most predominant symptom of IBS<sup>[3]</sup>, however, a previous clinical study from United States found only 21% of IBS patients with moderate to severe symptoms reported their predominant symptom in terms of abdominal pain<sup>[11]</sup>. Another study conducted by Lembo *et al*<sup>[12]</sup> showed that the proportions of IBS patients reported pain or gas (bloating-type discomfort) as one of their viscerosensory symptoms were similar (60% vs 66%). Currently, several studies

22 compared the diagnostic rate between Rome III and IV criteria for IBS in general population and consulting cohorts, the proportions of having abdominal discomfort varied among the western countries (2.4%-9.9%)[6,7,20-22] and the eastern countries (29.8%-84.2%)[8-10]. In this study, IBS patients with abdominal discomfort accounted for 22.6%. The elimination of abdominal discomfort from the diagnostic criteria had little effect on the diagnosis of IBS for the Western[3], while a significant proportion of IBS patients were no longer IBS as this change in Asian, as well as in China[8-10].

The significant difference between the Western and the Eastern reports indicates there may be cultural factors that affect the experience and reporting of abdominal symptoms. The definition of abdominal pain is more uniformly accepted, while the definition for abdominal discomfort is ambiguous, 29 "discomfort means an uncomfortable sensation not described as pain" as in the Rome III criteria[2]. Further, there are no comparison studies concerning abdominal discomfort descriptions in cross-cultural cohorts. In this study, Chinese patients with IBS can accurately reported abdominal discomfort, including the location and association with defecation (both in pre-defecatory and non-defecatory periods), as well as other defecation related symptoms (*i.e.*, urgency and so on), and its symptom characteristics were similar with abdominal pain, which indicated that abdominal discomfort was a relative explicit symptom for Chinese patients, unlike the impression from a cognitive study from American IBS patients[6], in which abdominal discomfort might encompass a wide 27 range of symptoms such as bloating, gas, fullness, flatulence, sensation of incomplete evacuation, and urgency.

Abdominal pain and discomfort are both visceral perceptions of abnormality 4 on the same continuum with pain appearing at the more severe end of the spectrum[11]. In this study, there were no meaningful differences between pain alone group and discomfort alone group in frequencies as well as the main intestinal symptom score for IBS-D patients except 9 more patients in the discomfort group reported mild symptom than the pain group. Besides, we indeed found patients with mild defecatory abdominal pain or discomfort were predisposed to describe their pre-defecatory 4 symptoms as abdominal



discomfort alone rather than abdominal pain alone, which indicated abdominal discomfort may appear as the milder form of pain. However, it was reported more IBS patients rank abdominal discomfort as their most bothersome symptom than abdominal pain, as 60% *vs* 29% in American<sup>[12]</sup>, 15.3% *vs* 4.5% of IBS-C in Japanese<sup>[23]</sup>, and the severity of abdominal discomfort had the strongest independent relationship with QOL impairment<sup>[10]</sup>. Patients in the three groups had similar healthcare-seeking behavior and satisfaction to medical care in this study. So we speculated in terms of the symptom itself, the overall severity of IBS and occupation of medical resources, abdominal discomfort is as important as abdominal pain.

Nevertheless, more patients in the discomfort group reported accompanying with urgency, sensation of incomplete evacuation, and passing mucus than the pain group. Patients with abdominal pain & discomfort had a higher prevalence of abdominal bloating/distension, anorectal pain than patients with abdominal pain alone, and a lower score of QOL than patients with abdominal discomfort alone. In addition, we truly found abdominal bloating and anorectal pain were the predictors for patients to describe their symptom as pain & discomfort rather than pain alone, suggesting coexisting symptoms played important roles in the generation of discomfort feeling.

We noticed that the previous studies seldom paid attention to the abdominal symptoms of IBS patients during non-defecatory period. An interesting finding in this study is more patients having pre-defecatory abdominal discomfort alone also reported non-defecatory abdominal discomfort than other two groups, and a similar report tendency for patients with pain alone and pain & discomfort during defecatory period and non-defecatory period. In terms of extra-intestinal symptoms, more patients in pain group reported coexisting epigastric pain. The possible explanation for this reporting tendency is individual sensation and reporting experience to the similar stimulations and pathophysiological changes<sup>[11]</sup>.

It has been noted the relationships between diary stress, psychological distress and severity of abdominal discomfort symptoms in women with IBS<sup>[24]</sup>. In this study, the scores of HAMA and HAMD, comorbid anxiety and depression are comparable

between the pain group and the discomfort group, the impact of mental status to the symptom sensation and reporting could be ignored.

To date, studies on the pathophysiology of IBS mainly focused on abdominal pain<sup>[12,25-28]</sup>, as far as we know, there was no direct evidence focused on mechanism of abdominal discomfort or comparison the difference of pathogenesis between abdominal pain and discomfort. Abdominal discomfort could simultaneously improve with abdominal pain or and bloating to antispasmodics tiotropium and octylonium, secretagogue linaclotide, or simethicone and *Bacillus coagulans* for IBS or IBS-C patients<sup>[29-32]</sup>. It is unclear whether the treatments focused on bloating, diarrhea or constipation could relieve the abdominal discomfort well for those patients having defecatory abdominal discomfort alone while they are diagnosed as other bowel disorder according to Rome IV criteria (as showed in results). Therefore, we realized that it may be more beneficial to classify patients with bowel-related abdominal discomfort into IBS from the therapeutic consideration.

There are several limitations in this study. We only included the IBS patients with typical changes of bowel habits, i.e., IBS-D and IBS-C, therefore some IBS-M and IBS-unclassified patients might be missed<sup>[7,32]</sup>. We enrolled patients with Rome III criteria and did not concern the abdominal pain and discomfort during or soon after bowel movement, the proportion of Rome III suspected IBS patients with this kind pain or discomfort was low as 2.9% according to Bai *et al*<sup>[9]</sup> study. Moreover, we did not ask patients to describe the difference between abdominal pain and discomfort. The data for response to therapies were retrospective recall, including prescription and over-the-counter. In addition, there are several characteristics of Chinese IBS patients, the prevalence of IBS in general population for male was lower than female (4.1% vs 5.4%)<sup>[33]</sup>, but an equal or higher ratio of male to female consulting patients was reported in clinical studies<sup>[9,14]</sup>. It is unclear whether male patients have more vigorous healthcare seeking behaviors or priority of medical care than female, but more female patients reported frequent consulters and colonoscopies during whole disease course of IBS than male<sup>[34]</sup>. IBS-D is the predominant subtype, which accounted for 74.1% in general



population of South China<sup>[35]</sup> and 66.3% in the consulting patients<sup>[32]</sup>. Besides <sup>2</sup> this is a single-center study.

## **CONCLUSION**

Chinese patients with IBS can differentiate and report abdominal pain or/and abdominal discomfort as their key bowel symptom, the patients with abdominal discomfort had similar bowel symptoms and psychosocial features to those with abdominal pain. There is a tendency for IBS patients to report their defecatory and non-defecatory abdominal symptom as pain alone, or discomfort alone, or pain and discomfort. Pre-defecatory abdominal discomfort should be considered as an important symptom for IBS patients. Further studies focused on the pathophysiology and therapeutic response (including the cultural influence) of abdominal pain and discomfort are needed.

## **ARTICLE HIGHLIGHTS**

### ***Research background***

The Rome IV criteria eliminated abdominal discomfort for irritable bowel syndrome (IBS), previously included in Rome III. Asian studies showed the rate of IBS patients with abdominal discomfort alone was high.

### ***Research motivation***

There are questions as to whether IBS patients with abdominal discomfort (seen in Rome III but not Rome IV) are different from those with abdominal pain (Rome IV).

### ***Research objectives***

To compare the bowel and extra-intestinal <sup>8</sup> symptoms of patients with IBS presenting with abdominal discomfort alone to those with pain alone, as well as with pain & discomfort and <sup>8</sup> to evaluate the anxiety, depression, quality of life and symptom reporting tendency for patients with pain and discomfort.

### *Research methods*

We enrolled IBS patients and collected their clinical data. Patients were classified to only pain group, only discomfort group, and pain & discomfort group. We compared bowel symptoms, extra-intestinal symptoms, IBS-quality of life (IBS-QOL), psychological status and healthcare-seeking behaviors and efficacy among the three groups and tested risk factors for symptom reporting in IBS patients.

### *Research results*

About one third of patients meeting Rome III criteria failed to meet Rome IV criteria for an IBS diagnosis. There were no meaningful differences between pain group and discomfort group for frequency of defecatory abdominal pain or discomfort, bowel habits, coexisting extra-gastrointestinal pain, comorbid anxiety and depression, and IBS-QOL scores.

### *Research conclusions*

IBS patients with abdominal discomfort have similar bowel symptoms and psychosocial features to those with abdominal pain.

### *Research perspectives*

Further studies focused on the pathophysiology and therapeutic response (including the cultural influence) of abdominal pain and discomfort are needed.

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**Figure 1 Constitution diagram of irritable bowel syndrome patients diagnosed with Rome III and Rome IV criteria.** About one third of irritable bowel syndrome (IBS)

patients (parts dragged out of ring) diagnosed with Rome III criteria failed in IBS diagnosis with Rome IV criteria because of only having abdominal discomfort before defecation (in green, 22.6%) or frequency of abdominal pain less than one day per week (in light colors, 14.2%), 3% patients among them have discomfort alone with less frequency (in light green). IBS: Irritable bowel syndrome.

**Figure 2 Comparison of bowel movements and stool forms in irritable bowel syndrome with diarrhea patients and improvement of abdominal pain or discomfort after defecation in irritable bowel syndrome patients among the abdominal pain alone, abdominal discomfort alone and abdominal pain & discomfort groups.** A: Bowel movements during irritable bowel syndrome with diarrhea (IBS-D) non-onset and onset status; B: Stool forms based on Bristol Stool Form Scale (BSFS) during IBS-D non-onset and onset status; C: Degree of improvement of abdominal pain and discomfort with defecation; D: Waiting time for improvement of abdominal pain and discomfort with defecation in IBS patients. Numbers in the column are percentages. <sup>b</sup>P < 0.01.

**Figure 3 Comparison of irritable bowel syndrome-quality of life.** There were no significant differences in the total score and eight domain scores among the three groups. Numbers in the column are percentages. IBS-QOL: Irritable bowel syndrome-quality of life.

**Table 1** Demographic data for irritable bowel syndrome patients with abdominal pain alone, abdominal discomfort alone and abdominal pain & discomfort

| Variable                                    | Pain group ( <i>n</i> = 233) | Discomfort group ( <i>n</i> = 83) | Pain & discomfort group ( <i>n</i> = 51) | <i>P</i> value    |
|---|------------------------------|-----------------------------------|--|-------------------|
| Male (%)                                    | 117 (50.2)                   | 56 (67.5)                         | 32 (62.7)                                | 0.01 <sup>2</sup> |
| Age (yr)                                    | 43.7 ± 11.7                  | 42.3 ± 10.6                       | 40.8 ± 11.0                              | 0.23              |
| BMI (kg/m <sup>2</sup> )                    | 23.0 ± 4.0                   | 22.8 ± 4.0                        | 22.3 ± 3.8                               | 0.56              |
| Education level (college and above, %)      | 71 (30.5)                    | 29 (34.9)                         | 13 (25.5)                                | 0.51              |
| Physical labor (%)                          | 135 (57.9)                   | 42 (50.6)                         | 34 (66.7)                                | 0.18              |
| Family economic status (well-off & above %) | 105 (45.1)                   | 44 (53)                           | 18 (35.3)                                | 0.13              |
| Marriage status (married %)                 | 201 (86.3)                   | 71 (85.5)                         | 41 (80.4)                                | 0.56              |
| IBS disease course (years) <sup>1</sup>     | 6 (7.5)                      | 5.3 (7.0)                         | 6 (7.0)                                  | 0.38              |
| IBS-D: IBS-C: IBS-M (%)                     | 95.7:3.0:1.3                 | 96.4:2.4:1.2                      | 86.3:7.8:5.9                             | 0.06              |

<sup>1</sup>Data presented as median (interquartile range), Kruskal-Wallis test. Note: *P* value is the difference among pain group, discomfort group and pain & discomfort group, superscript letter is significantly different at a *P* < 0.05.

<sup>2</sup>The difference is between pain group and discomfort group.

Data presented as number (%) or mean ± SD. ANOVA and chi-square tests.

IBS: Irritable bowel syndrome; BMI: Body mass index.

**Table 2** Characteristics of bowel symptoms in irritable bowel syndrome patients with abdominal pain alone, abdominal discomfort alone and abdominal pain & discomfort

| Variable                        | Pain group ( <i>n</i> = 233) | Discomfort group ( <i>n</i> = 83) | Pain & discomfort group ( <i>n</i> = 51) | <i>P</i> value |
|---------------------------------|------------------------------|-----------------------------------|--|----------------|
| Location <sup>1</sup> (%)       |                              |                                   |  | 0.213          |
| Left lower quadrant             | 67 (28.8)                    | 14 (16.9)                         | 12 (23.5)                                |                |
| Umbilical                       | 79 (33.9)                    | 27 (32.5)                         | 20 (39.2)                                |                |
| Lower abdomen                   | 65 (27.9)                    | 23 (27.7)                         | 15 (29.4)                                |                |
| Epigastric                      | 11 (4.7)                     | 2 (2.4)                           | 2 (3.9)                                  |                |
| Whole abdomen                   | 12 (4.0)                     | 8 (9.6)                           | 5 (9.8)                                  |                |
| Others                          | 24 (10.3)                    | 18 (21.7)                         | 7 (13.7)                                 |                |
| Severity (%)                    |                              |                                   |  | 0.007          |
| Mild                            | 21 (9.0)                     | 19 (22.9)                         | 6 (11.7)                                 |                |
| Moderate                        | 160 (68.7)                   | 55 (66.3)                         | 37 (72.6)                                |                |
| Severe                          | 52 (22.3)                    | 9 (10.8)                          | 8 (15.7)                                 |                |
| Frequency (%)                   |                              |                                   |  | 0.290          |
| 3 d/mo                          | 37 (15.9)                    | 11 (13.3)                         | 4 (7.84)                                 |                |
| 1 d/wk                          | 25 (10.7)                    | 5 (6.0)                           | 2 (3.9)                                  |                |
| >1 d/wk                         | 108 (46.4)                   | 38 (45.8)                         | 27 (52.94)                               |                |
| Every day                       | 63 (27.0)                    | 29 (34.9)                         | 18 (35.3)                                |                |
| Ordinary pain/ discomfort (%)   |                              |                                   |  | < 0.001        |
| Pain alone                      | 84 (36.1)                    | 6 (7.2)                           | 6 (11.8)                                 |                |
| Discomfort alone                | 21 (9.0)                     | 43 (51.8)                         | 3 (5.9)                                  |                |
| Pain & discomfort               | 7 (3.0)                      | 2 (2.4)                           | 28 (54.9)                                |                |
| No pain or discomfort           | 121 (51.9)                   | 32 (38.6)                         | 14 (27.4)                                |                |
| Defecation-related symptoms (%) |                              |                                   |  |                |

|                                    |            |           |           |                     |
|------------------------------------|------------|-----------|-----------|---------------------|
| Abdominal bloating                 | 93 (39.9)  | 43 (51.8) | 35 (68.6) | 0.001 <sup>3</sup>  |
| Abdominal distension               | 21 (9.0)   | 13(15.7)  | 12 (23.5) | 0.01 <sup>3</sup>   |
| Urgency                            | 197 (84.6) | 80(96.4)  | 42 (82.4) | 0.01 <sup>2,4</sup> |
| Defecation straining               | 70 (30.0)  | 25(30.1)  | 23 (45.1) | 0.10                |
| Sensation of anorectal obstruction | 62 (26.6)  | 30(36.1)  | 19 (37.3) | 0.13                |
| Anorectal pain                     | 28 (12.0)  | 15 (18.1) | 17 (33.3) | 0.001 <sup>3</sup>  |
| Sensation of incomplete evacuation | 164 (70.4) | 74 (89.2) | 39 (76.5) | 0.003 <sup>2</sup>  |
| Passing mucus                      | 141 (60.5) | 66 (79.5) | 39 (76.5) | 0.002 <sup>2</sup>  |

<sup>1</sup>Some patients reported more than one location. Chi-square test, data presented as number (%).

<sup>2</sup>The difference is between pain group and discomfort group.

<sup>3</sup>The difference is between pain group and pain & discomfort group.

<sup>4</sup>The difference is between discomfort group and pain & discomfort group.

Note: *P* value is difference among pain group, discomfort group and pain & discomfort group, superscript letters are significantly different at a *P* < 0.05.

IBS: Irritable bowel syndrome.



**Table 3** Coexisting extra-intestinal symptoms of irritable bowel syndrome patients with abdominal pain alone, abdominal discomfort alone and abdominal pain & discomfort

| Variable                       | Pain group<br>(n = 233) | Discomfort group (n = 83) | Pain & discomfort group (n = 51) | P value                |
|--------------------------------|-------------------------|---------------------------|----------------------------------|------------------------|
| GERD (%)                       | 60 (25.8)               | 14 (16.9)                 | 10 (19.6)                        | 0.20                   |
| Heartburn                      | 35 (15.0)               | 6 (7.2)                   | 6 (11.8)                         | 0.18                   |
| Acid reflux                    | 44 (18.9)               | 10 (12.1)                 | 5 (9.8)                          | 0.15                   |
| Food regurgitation             | 14 (6.0)                | 4 (4.8)                   | 3 (5.9)                          | 0.92                   |
| Retrosternal chest pain        | 10 (4.3)                | 3 (3.6)                   | 2 (3.9)                          | 0.96                   |
| Functional dyspepsia (%)       | 86 (36.9)               | 23 (27.7)                 | 18 (35.3)                        | 0.32                   |
| Epigastric pain syndrome       | 49 (21.0)               | 6 (7.2)                   | 7 (13.7)                         | 0.01 <sup>2</sup>      |
| Epigastric pain                | 43 (18.5)               | 5 (6.0)                   | 7 (13.7)                         | 0.02 <sup>2</sup>      |
| Epigastric burning             | 12 (5.2)                | 2 (2.4)                   | 3 (5.9)                          | 0.54                   |
| Postprandial distress syndrome | 64 (27.5)               | 22 (26.5)                 | 15 (29.4)                        | 0.94                   |
| Postprandial fullness          | 57 (24.5)               | 20 (24.1)                 | 9 (17.7)                         | 0.57                   |
| Early satiation                | 14 (6.0)                | 6 (7.2)                   | 9 (17.7)                         | 0.02 <sup>3</sup>      |
| Somatic pain (%)               |                         |                           |                                  |                        |
| Headache                       | 7 (45.9)                | 37 (44.6)                 | 26 (51)                          | 0.76                   |
| Neck pain                      | 1 (9.0)                 | 7 (8.4)                   | 3 (5.9)                          | 0.77                   |
| Backache                       | 1 (17.6)                | 8 (9.6)                   | 7 (13.7)                         | 0.21                   |
| Dyspareunia                    | 2 (5.2)                 | 6 (7.2)                   | 11 (21.6)                        | < 0.001 <sup>3,4</sup> |
| Menstrual pain <sup>1</sup>    | 0 (25.9)                | 10 (37.0)                 | 11 (57.9)                        | 0.016 <sup>3</sup>     |

<sup>1</sup>The number of female patients in the abdominal pain, abdominal discomfort and pain & discomfort groups was 116, 27, and 19 respectively. Chi-square test. Data presented as number (%).

<sup>2</sup>P value is difference between pain group and discomfort group.

<sup>3</sup>The difference is between pain group and pain & discomfort group.

<sup>4</sup>The difference is between discomfort group and pain & discomfort group.

Note: *P* value is the difference among pain group, discomfort group and pain & discomfort group, <sup>16</sup>superscript letters are significantly different at a  $P < 0.05$ .

<sup>1</sup>IBS: Irritable bowel syndrome; GERD: Gastroesophageal reflux disease.

**Table 4** Comorbid anxiety and depression among irritable bowel syndrome patients with abdominal pain alone, abdominal discomfort alone and abdominal pain & discomfort

| Variable                          | Pain group (n = 233) | Discomfort group (n = 83) | Pain & discomfort group (n = 51) | & P value |
|-----------------------------------|----------------------|---------------------------|----------------------------------|-----------|
| HAMA score                        | 16.1 ± 7.3           | 15.5 ± 7.3                | 17.3 ± 7.4                       | 0.36      |
| Comorbid anxiety (%)              | 141 (60.5)           | 49 (59.0)                 | 38 (74.5)                        | 0.14      |
| Mild                              | 69 (29.6)            | 25 (30.1)                 | 21 (41.2)                        | 0.26      |
| Moderate-severe                   | 72 (30.9)            | 24 (28.9)                 | 17 (33.3)                        | 0.86      |
| HAMD score                        | 13.2 ± 6.2           | 12.3 ± 6.1                | 14.3 ± 5.5                       | 0.18      |
| Comorbid depression (%)           | 66 (28.3)            | 22 (26.5)                 | 18 (35.3)                        | 0.53      |
| Mild                              | 54 (23.2)            | 20 (24.1)                 | 17 (33.3)                        | 0.31      |
| Moderate-severe                   | 12 (5.2)             | 2 (2.4)                   | 1 (2.0)                          | 0.40      |
| Comorbid anxiety & depression (%) | 62 (26.6)            | 20 (24.1)                 | 18 (35.3)                        | 0.35      |

Data presented as mean ± SD or number (%). Student's *t* test and chi-square tests. Note: *P* value is difference among pain group, discomfort group and pain & discomfort group. IBS: Irritable bowel syndrome; HAMA: Hamilton Anxiety Scale; HAMD: Hamilton Depression Scale.

Table 5 Consultations and medications of irritable bowel syndrome patients with abdominal pain alone, abdominal discomfort alone and abdominal pain & discomfort

| Variable   | Pain group (n = 233) | Discomfor t group (n = 83) | Pain & discomfort group (n = 51) | P value            |
|--|----------------------|----------------------------|----------------------------------|--------------------|
| In the whole disease course                      |                      |                            |                                  |                    |
| Consultation times per year <sup>1</sup>         | 4.6 ± 6.7            | 5.7 ± 6.2                  | 4.2 ± 4.1                        | 0.54               |
| Colonoscopies <sup>2</sup>                       | 1.9 ± 1.4            | 1.5 ± 0.8                  | 1.6 ± 0.9                        | 0.22               |
| In the last year                                 |                      |                            |                                  |                    |
| Consultation times <sup>1</sup>                  | 4.0 ± 5.7            | 4.5 ± 4.5                  | 4.9 ± 4.7                        | 0.54               |
| Medications (intermittent and long-term use) (%) | 164 (70.4)           | 56 (67.5)                  | 43 (84.3)                        | 0.09               |
| Antispasmodics use                               |                      |                            |                                  |                    |
| Use rate   | 29 (12.4)            | 24 (28.9)                  | 12 (23.5)                        | 0.002 <sup>3</sup> |
| Response rate                                    | 22 (75.9)            | 13 (54.2)                  | 10 (83.3)                        | 0.12               |
| Overall satisfaction to medical care (%)         | 125 (53.7)           | 39 (47.0)                  | 21 (41.2)                        | 0.21               |

<sup>1</sup>Consultation times were average consultation times of consulters.

<sup>2</sup>Colonoscopies were average colonoscopies of patients who performed colonoscopies.

<sup>3</sup>The difference is between pain group and discomfort group.

Data presented as mean ± SD or number (%). ANOVA and chi-square test.

Note: P value is difference among pain group, discomfort group and pain & discomfort group, superscript letter is significantly different at a

Irritable bowel syndrome.

**Table 6 Risk factors for irritable bowel syndrome patients describing symptoms as abdominal pain alone, abdominal discomfort alone and abdominal pain & discomfort**

|  | Partial regression coefficient | Standard error | Wald $\chi^2$ | 95%CI                | P value            |
|--|--------------------------------|----------------|---------------|----------------------|--------------------|
| Abdominal discomfort alone <i>vs</i> abdominal pain alone  |                                |                |               |                      |                    |
| Gender (male)  | 0.671                          | 0.291          | 5.293         | 1.955 (1.104-3.462)  | 0.021 <sup>a</sup> |
| Severity (mild defecatory pain or discomfort)              | 1.391                          | 0.525          | 7.018         | 4.020 (1.436-11.253) | 0.008 <sup>a</sup> |
| Abdominal pain alone <i>vs</i> abdominal pain & discomfort |                                |                |               |                      |                    |
| Abdominal bloating   | 0.805                          | 0.372          | 4.692         | 2.238 (1.080-4.638)  | 0.030 <sup>a</sup> |
| Anorectal pain   | 1.091                          | 0.405          | 7.272         | 2.979 (1.347-6.585)  | 0.007 <sup>a</sup> |

<sup>a</sup> $P < 0.05$ .

Multiple logistic regression analysis. Superscript letter is significantly different at a  $P < 0.05$ . IBS: Irritable bowel syndrome; CI: Confidence interval.

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