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Review Article

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Should FODMAP Diet be Preferred in Inflammatory Bowel Diseases? [Version 2]

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Abstract

Incompletely absorbed but highly fermentable oligo-, di-, mono-, saccharides, carbohydrates and polyols were defined as FODMAPs in 2005 for the first time [1]. Low-FODMAP diet has become more important with its usage in irritable bowel syndrome and significant reduction in the symptoms of irritable bowel syndrome.

In recent years, dietary factor which is involved within the environmental factors has started to become crucial for the inflammatory bowel diseases (IBD) whose etiopathogenesis present a great variety. However, it still brings various questions along. In this article, all the published articles related to FODMAP diet and IBD are summarized.

Keywords

FODMAP Diet; Irritable Bowel Disease; Inflammatory Bowel Disease

Current Updates in Hepatology and Gastroenterology

Introduction

Inflammatory bowel diseases (IBD) are group of diseases which follow the course of inflammations and remissions and whose etiopathogenesis has not been completely understood yet [2]. The variety in the etiopathogenesis has caused the variety of the treatment methods. Lack of a definitive treatment of the IBD has lead to an increasing amount of research and trial of more treatment alternatives. Among the multifactor of the etiopathogenesis, environmental factors have come to be more and more emphasized.

FODMAP diet which contains incompletely absorbed but highly fermentable oligo-, di-, mono-, saccharides, carbohydrates and polyols was defined in 2005 for the first time [1]. FODMAPs include fructo-oligosaccharides (wheat, onion, and legumes), lactose (milk, ice-cream, and yogurt), fructose (apples, pears, corn syrup, and honey), galactans (legumes, wheat, cabbage, broccoli, and watermelon), sorbitol (stone fruits, artificial sweetener) (Table 1) [6]. Due to their molecular size and osmotic effects, they increase the delivery of liquid to the small and large intestine lumen. In addition to this, being fermented by the intestinal bacteria, they extensively cause gas formation [7-9]. FODMAP diet has an impact on intestinal inflammation with its effect of increasing gastrointestinal permeability and the gut microbiome. [3,4]. However, dietary advice is included at a minor rate in published guidelines [5].

Table 1: Characteristics of the Low-FODMAP Diet.

| | Include | Avoid |
|----------------------|--|--|
| Grains | Gluten-free foods, oat, rice, quinoa | Wheat, barley, rye |
| Fruits | Banana, blueberry, cantaloupe, clementine, grape, kiwi, lemon, lime, mandarin, melons (variety), orange, passion fruit, pineapple, raspberry, strawberry | Apple, applesauce, apricot, blackberry, canned fruit, date, dried fruit, grapefruit, mango, nectarine, pear, peach, plum, prune, watermelon |
| Vegetables | Alfalfa, bean sprout, bell pepper, bok choy, broccoli (≤1/2C), Brussels sprout (≤2 sprouts), carrot, corn, cucumber, eggplant, green bean, kale, lettuce, potato, spinach, spring onion (only green top), squash, tomato, turnip, zucchini | Artichoke, asparagus, avocado, beetroot, cauliflower, cabbage, garlic, leek, mushroom, onion, pea, shallot, snow-pea, sweet corn, sweet potato |
| Proteins | All others | Breaded meat or meat made with HFCS |
| Nuts, seeds, legumes | Almond (≤10 nuts), chia seed, nut butter, macadamia, peanut, pecan, pumpkin seed, walnut | Bean, cashew, chickpea, lentil, pistachio, soybean |
| Dairy | Lactose-free yogurt and milk, almond, coconut, rice, or soy milk (from soy protein), hard-draw lactose cheese | Cow, goat, sheep, condensed, and evaporated milk; butter-milk, soy milk (from soybean), soft cheese and cream |
| Beverages | Fruit and vegetable juice made with allowed foods (limit to 1/2 Cat at a time), wine (5 floz), vodka, gin (1.5 floz) | Coconut water, green tea, rum, soft drinks, sports drinks, white tea |
| Other | Brown sugar, dark chocolate, maple syrup, gold-ensyrup, stevia | Milk chocolate, sweeteners ending in "-ol," honey, HFCS |
| Reference | Gibson PR, Shepherd SJ. Evidence-based dietary management of functional gastrointestinal symptoms: the FODMAP approach. <i>J Gastroenterol-Hepatol</i> . 2010;25(2):252-258. | |

HFCS-High Fructose Corn Syrup; IBD-Inflammatory Bowel Disease; IBS-Irritable Bowel Syndrome.

Discussion

The following terms; FODMAP, IBD, ulcerative colitis (UC), Crohn diseases (CD) were used for searching in PubMed data bases and total 20 articles are encountered. After a further search, the total of 13 articles examines the relationship between IBD and FODMAP has been found. Compared to the past years since 2005, significant increase observed at 2016 on the number of articles looking for an answer to the relationship between diet and IBD.

In 2005, Gibson et al. published an article presenting the effect of FODMAP diet on CD. In this article, FODMAP diet was defined exhaustively and attention was drawn in to the effects of diet components on the distal small intestine and proximal large intestine in the patients with CD [6].

In a study carried out by Croagh C. et al. in 2007, 8 UC patients with colectomy were included. When FODMAP diet restrictions were applied on these patients, it was observed in retrospective analysis that the number of feces regressed from 8 to 4 daily. However, in prospective analysis, there were no positive effects on 5 patients [10].

In 2008, Geary et al. reported that in 52 patients with CD and 20 patients with UC who were followed by low-FODMAP diet for three month, abdominal symptoms, abdominal pain, bloating, wind and diarrhea were reduced, nevertheless, constipation was not improved. According to these results, it was stated that FODMAP diet restriction treatment could be suggested for the ones with functional gut symptoms in IBD. Due to the design of the study, the relationship between diet and the activity of the disease could not be examined [8].

In 2013, Donnellan et al. mentioned FODMAP diet in their article *Nutritional Management of Crohn's Disease*. They pointed out the diet's decreasing effect on functional symptoms, particularly in patients with CD, by reducing the osmotic load and bacterial fermentation rather than its anti-inflammatory activity [11].

In 2014, in two abstracts published in European Crohn's and Colitis Organization (ECCO), Pedersen et al. indicated that in 89 patients with IBD (CD; 28, UC; 61) FODMAP-reduced diet decreased IBS like symptoms. They determined a decrease in the activity of the disease in UC patients in addition to a significant reduction in IBS like symptoms in IBD patients. In this study, they observed that 70% of the IBD patients who had IBS symptoms were dysbiotic at the beginning of the diet, and following a period of 6 weeks of the diet, 50% were dysbiotic. They revealed that a reduced FODMAP diet of 6 weeks led to no significant change in the microbiota of these patients [12,13].

In a study by Sepulveda KK et al. in 2015, diets which could be used in patients with IBD were mentioned. Specific carbohydrate diet, paleolithic diet, anti-inflammatory diet and FODMAPs diet were defined and benefit and loss relationships of the diets were investigated. As a result, they concluded that

Current Updates in Hepatology and Gastroenterology

low FODMAPs and IBD anti-inflammatory diets provided balanced nutrition without causing weight loss in patients with IBD [14].

In 2016, the subjects of FODMAPs and IBD were further focused and a total of 6 articles on this topic appeared in PubMed website.

In the review by Durchschein et al. published in World Journal of Medicine, the issue of IBD and all diet therapies used in IBD were discussed. They underlined three reasons that FODMAP diet reduced IBS like symptoms in IBD. The first reason was in Western countries increasing general consumptions of FODMAP and fructose-intensive diet styles in recent decades. The second one was the relationship between increased sugar intake and CD. The third one was the fact that the increased consumption in FODMAP diet style would increase intestinal permeability and lead to predisposition for CD [6]. They pointed out that low FODMAP dietary consumption would be better in IBD because of these reasons. The limitations of these studies reviewed in this article were being retrospective and uncontrolled, and lack of objective data between diet and inflammatory changes [5].

A study that may answer some of the questions in the Durchschein et al.'s review, shortly after published in the Clinical and Translational Gastroenterology. In their randomized study, from Australia, Emma P. Halmos et al. investigated the effect of Australian, habitual and low FODMAP diet in a period of 21 days on 9 patients with CD whose diseases were not active. They studied calprotectin, pH, short-chain fatty acid (SCFA) and bacterial content in the stools of the patients. Out of these patients, 8 complied with the conditions of diet and stool collection. Studying the results of the patients, it was observed that there was no change in SCFA, pH and total bacterial count; however, there were relative changes in the existence of bacteria. It was encountered that butyrate-producing Clostridium cluster XIVa and Akkermansia muciniphilla bacteria were higher, and Ruminococcus torques was lower in the patients receiving Australian diet, as compared to the receivers of low FODMAP diet. It was determined that diet types did not cause any change on fecal calprotectin; however, the symptoms doubled in the Australian diet. It was concluded that in inactive CD patients, low FODMAP diet reduced IBS symptoms in IBD by changing the fecal microbiota and creating a prebiotic effect [15].

Following this article which was accepted in February 2016, Emma Halmos et al. prepared a supplement article in June 2016, and in this article, they mentioned that FODMAP diet could have a negative impact on microbiota. They mentioned that some of the articles were pointed out, intake of low FODMAP diet mimics changes in the fecal bacterial of the CD. In these articles low FODMAP diet and the activation phase of the CD, led to a decrease in butyrate-producing bacteria, Bifidobacteria spp. and A. muciniphilla, and an increase in R. torques and Ruminococcus gnavus bacteria, among the fecal bacteria [16-

18]. Hence, they suggested that low FODMAP diet could cause dysbiosis in patients with CD by negatively affecting microbiota [19].

In the review written by Ahmed et al. published in June 2016, it was expressed that SCFA, such as butyrate and propionate, resulting from the fermentation of carbohydrates by intestinal microbiota. It was revealed that especially patients with UC had fewer butyrate producing bacteria (such as Roseburia hominis and Faecalibacterium prausnitzii) causing lower butyrate levels [20-21]. Also propionate can effect de novo generation of regulatory T cells in the peripheral immune system. Hence, they suggested that butyrate- and propionate-producing microbiome could be used to treat in IBD such as UC. However, anti-inflammatory mechanism of butyrate and other short-chain fatty acids poorly defined and further studies needed in this area. Clinicians advocate that low FODMAP diet reduces IBS symptoms, such as abdominal pain, gas and diarrhea in IBD patients [22].

Similarly, in a systematic review written by Ashley Charlebois et al. in 2016, it was stated that the success of the treatment in IBD patients was connected with healing the inflammation as well as reducing the symptoms of the disease, and it was emphasized that diet with its supportive effect should accompany existing medical and surgical therapies. In this review, they covered three studies which included FODMAP diet [1,8,10]. According to these studies, they concluded that FODMAP diet had therapeutic benefits for IBD [23].

In the review published in 2016, Frank M. Rummel assessed the diet's mechanism of action on the inflammatory process and compared enteral nutrition, specific carbohydrate diet, FODMAP diet and paleo diet. He suggested that FODMAP diet reduced mucosal inflammation by decreasing intestinal bacterial overgrowth and intestinal barrier. Strict restrictions on the fruit and vegetable consumption and assessment of only two studies are the weak points of FODMAP diet [4].

Conclusion

Low FODMAP diet can relieve IBS symptoms in inflammatory bowel diseases. Nevertheless, due to lack of clear answers to the question marks about the effects of FODMAP diet on the fecal microbiota, further researches are necessary so that it would rank among treatment alternatives of IBD.

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Current Updates in Hepatology and Gastroenterology

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