Lifestyle Guidance and Diet for Inflammatory Bowel Disease (IBD) Patients

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Abstract: Inflammatory bowel disease (IBD) reaches a peak among people in their twenties when they are most socially active. Since the disease is refractory, the patients remain under medical supervision for a long period and their quality of life (QOL) deteriorates. Measures to achieve an appropriate lifestyle are required to prevent the recurrence of IBD, maintain remission for long periods, and ensure a high QOL. IBD patients must lead a well-regulated life, avoid excessive stress, and take their medication appropriately. In Crohn's disease, dietary therapy is important and fat intake should be limited to 20 to 30 g per day. However, medium-chain fatty acids and n-3 polyunsaturated fatty acids, such as eicosapentaenoic acid, have an anti-inflammatory effect. Pectin, a water-soluble dietary fiber, produces butyric acid in the bowels, which is one of the sources of energy for the intestinal mucosa. Butyric acid also has an anti-inflammatory action. In dietary therapy for Crohn's disease, the appropriate constituents must be selected in accordance with the pathophysiology, and the cooperation of comedical staff is important to ensure a proper diet.

Key words: Ulcerative colitis; Crohn's disease; Elemental diet; Butyrate; Trace element

Introduction

Ulcerative colitis and Crohn’s disease are both diseases of unknown etiology. These refractory forms of inflammatory bowel disease (IBD) occur in the young and show repeated episodes of remission and relapse. Since many IBD patients are young, various problems arise including those related to activities at school, advancing to higher grades and university, employment, marriage, sexual life, pregnancy, delivery, and raising children, as well as dietary problems and prejudices concerning the disease, and anxiety concerning the future for those burdened with IBD. Therefore, the patients require long-term medical care and have to live together with IBD itself. A program to enhance the quality of life (QOL) must be established in

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accordance with the pathophysiology of each patient.

**Lifestyle Guidance**

Lifestyle guidance is basically the same as that for other gastrointestinal diseases: patients should lead a regular life, avoid excessive stress, not overeat or drink too much alcohol, and abstain from fatty foods. However, IBD is common in young patients who tend to have a highly active social life and it is often difficult to comply with these restrictions. In the active stage of IBD, rest and occasionally hospitalization should be considered. However, when the symptoms start to improve, patients often become very active although they know they still have the illness and then the symptoms become worse again. In patients with Crohn’s disease, maintaining a strict diet for a long time is difficult.

Ulcerative colitis and Crohn’s disease are both classed as IBD, but their pathophysiology shows marked differences. The main lesions of ulcerative colitis are chronic and diffuse mucosal erosions and ulcers in the colon, and most patients have abdominal pain and diarrhea, especially bloody stools. In patients with moderate to severe ulcerative colitis, loss of plasma protein occurs in association with inflammation. Since improvement may not be achieved with oral intake of nutrients, intravenous hyperalimentation is sometimes required.

However, drug treatment is the main form of therapy and education about medication should be given with easy-to-understand explanations of the actions of the drugs. Especially when the patients are given corticosteroids, the adverse effects of steroid therapy should be explained and efforts should be made to ensure proper administration. During administration of corticosteroids, the patients are recommended to avoid strenuous physical exercise, but appropriate sports activities are acceptable during periods of remission.

In the selection of further education and employment, the patients are advised to avoid schools and careers where they must use 100% of their strength, since the disease is chronic and patients must become skilled at living with it for a long time.

Relapse of ulcerative colitis often occurs due to stress, so it is important to develop proper methods to alleviate stress.

The ideal time for pregnancy is during a 3 to 6 month remission period when no drugs are administered. However, no effect of Salazopyrin® on the fetus has been detected in the West or in Japan.

**Diet**

In patients with intestinal diseases, abdominal symptoms such as pain, diarrhea, and nausea often occur, and oral intake of food is generally insufficient. Also, intestinal absorption is often disturbed by lesions such as extensive inflammation, erosion, and ulceration in the bowel. Because of the loss of plasma protein from the intestines, the general condition of the patient deteriorates. Since IBD is a chronic disease, severe malnutrition with symptoms such as weight loss, anemia, and edema can occur.

In the dietary therapy of IBD patients, it is usually best to avoid foods with high levels of residue or a high fat content, as well as food that is highly stimulating. However, excessive restriction of the diet can result in the patients worrying too much about their food intake.

When the disease is active, extra energy in addition to that needed in the healthy state is required to recover from the pathological condition, i.e., it is necessary to supply additional energy for the healing erosions and ulceration. However, because the lesions affect the gastrointestinal tract, oral intake of sufficient energy from an ordinary diet is difficult. Therefore, supplemental feeding such as enteral nutrition or intravenous alimentation is used.

In patients with ulcerative colitis and Crohn’s disease, the effects of nutritional therapy differ, and nutritional therapy is the treatment of the
first choice for Crohn’s disease.

**1. Enteral nutrition**

Elemental diet therapy is placed on the primary therapy in the treatment of Crohn’s disease. The parenteral nutrient Elental® contains amino acids with low antigenicity, the lipid content is very low (0.6%), and the carbohydrate consists of α-limited dextrin. All of these constituents are readily absorbed without digestion. It is not clear which constituents of this nutrient are useful for improving Crohn’s disease and healing the ulcers.

It has been reported that the remission ratio does not change if the lipid intake is less than 30 g per day. However, in a study performed by the “Intractable Inflammatory Bowel Disorders” study group of the Japanese Ministry of Health, Labor and Welfare (chairman: Prof. Takashi Shimoyama), the patients with active Crohn’s disease were randomly allotted to three groups, which were an Elental only group and groups receiving Elental plus 13.5 g or 27 g of lipid. When the remission ratio was compared after four weeks, the results were significantly better in the Elental only group. This is an interim report and the study is ongoing, so a conclusion should be reached about the role of lipids soon.

The nitrogen source of enteral nutrients includes peptides in addition to amino acids. The results of *in vivo* and *in vitro* studies have shown that peptides are superior to amino acids with respect to absorption and *in vivo* metabolism. Enteral nutrients containing peptides as the nitrogen source include Enterued® and Twin-line®, but these preparations have a high lipid content of about 5%.

Remission can be achieved by infusing 1,800 to 2,100 kcal/day of enteral nutrients into the stomach and duodenum via a nasal tube. When at least 30 kcal per kg of body weight is provided daily using the enteral nutrient Elental®, relapse can be largely avoided (Fig. 1). However, young people find it difficult to tolerate a long-term diet of Elental® alone and its disturbs their social life, so they often stop using it or decrease its use, resulting in repeated relapses. Therefore, it is necessary to devise a richer diet to improve compliance.

**2. Dietary therapy**

We have prepared a diet for Crohn’s disease at our hospital. During remission, an enteral

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Fig. 1 Remission maintenance ratio in relation to constituent nutrients (Fukuda, Y. *et al*., Hyogo College of Medicine)
supplement of 600 to 800 kcal/day is given with the ordinary diet and stress is placed on maintaining a balance between taste, appetite, and nutrition. Introduction of the Crohn’s disease diet has improved compliance with enteral nutrition at home and has made it possible to achieve long-term nutritional management.

The Crohn’s disease diet consists of 90 g of carbohydrate, 35 g of protein, 20 g of lipid, and 5 g of dietary fiber, totalling about 700 kcal/day (Table 1). The lipids are long-chain and medium-chain fatty acids. Long-chain fatty acids are the most susceptible to digestion and absorption disorders, while medium-chain fatty acids are easily digested and absorbed and are a useful energy source. In an in vitro study, when the intestine 407 cell line was stimulated with IL-1β or TNF-α and medium-chain fatty acids were added, the production of IL-8 was not increased very much, but long-chain fatty acids caused IL-8 production to increase markedly. Therefore, long-chain fatty acids seem to be more likely to cause inflammation than medium-chain fatty acids. For this reason, it is better to restrict

### Table 1 Crohn’s Disease Diet Initiation Protocol (latter half)

<table>
<thead>
<tr>
<th>Main menu</th>
<th>Mean intake per menu</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy (kcal)</td>
</tr>
<tr>
<td>Baked egg and shrimp, boiled vegetables</td>
<td>542</td>
</tr>
<tr>
<td>Salmon meniere, boiled vegetables</td>
<td>639</td>
</tr>
<tr>
<td>Stickleback fish grilled with soy, boiled vegetables</td>
<td>577</td>
</tr>
<tr>
<td>Flounder grilled with salt, boiled vegetables</td>
<td>610</td>
</tr>
<tr>
<td>Sauteed chicken, vegetable soup</td>
<td>646</td>
</tr>
<tr>
<td>Mackerel grilled with soy, boiled vegetables</td>
<td>668</td>
</tr>
<tr>
<td>Tofu with liquid starch, boiled vegetables, miso soup</td>
<td>644</td>
</tr>
<tr>
<td>Mean nutritional content</td>
<td>618</td>
</tr>
</tbody>
</table>

n-3 : n-3 polyunsaturated fatty acids, n-6 : n-6 polyunsaturated fatty acids

### Table 2 Foods Containing High Levels of n-3 or n-6 Polyunsaturated Fatty Acids

<table>
<thead>
<tr>
<th>n-6 (linoleic acid)</th>
<th>n-3 (α-linoleic acid)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safflower oil, sunflower oil</td>
<td>Beefsteak plant oil</td>
</tr>
<tr>
<td>Corn oil, soy oil</td>
<td>Perilla oil</td>
</tr>
<tr>
<td>Margarine</td>
<td>Fish oil</td>
</tr>
<tr>
<td>Mayonnaise</td>
<td>Eicosapentaenoic acid (EDA)</td>
</tr>
<tr>
<td>Dressing</td>
<td>Docosahexaenoic acid (DHA), etc.</td>
</tr>
<tr>
<td>Animal foods, etc.</td>
<td></td>
</tr>
</tbody>
</table>
Among the long-chain fatty acids, n-3 polyunsaturated fatty acids block the metabolism of n-6 polyunsaturated fatty acids. Leukotriene B₃, a metabolite of eicosapentaenoic acid, a typical n-3 polyunsaturated fatty acid, competitively binds to the receptor for leukotriene B₄, a potent leukocyte-activating factor. It also inhibits the production of cytokines such as TNF-α and eliminates free radicals. Therefore, intake of long-chain fatty acids with a high n-3/n-6 ratio (i.e., 0.8 to 0.9) is advised for patients with intestinal disease, so they are recommended to eat fish that contain high levels of n-3 polyunsaturated fatty acids (Table 2).

Recently, attention has been focused on butyric acid, which is produced by the intestinal flora. Pectin is a water-soluble form of dietary fiber that is degraded by the intestinal flora to produce butyric acid, which is not only an important energy source for the intestinal epithelial cells but also has an anti-inflammatory action.

In vitro IL-8 production was increased when HT-29 cells were stimulated with TNF-α. However, when butyric acid was added to cultures, IL-8 production was reduced in a concentration-dependent manner (Fig. 2). This was also confirmed at the IL-8 mRNA level, and it was related to the inhibition of NF-KB activity by an intracellular transcription factor. In a rat colitis model produced by administration of dextran sulfate, the ulcer coefficient and inflammation score were markedly reduced by a butyric acid enema. When Clostridium bacteria were administered orally, the butyric acid level of the intestinal contents increased and the ulcer coefficient and inflammation score were both reduced. Recently, it has been found that the wheatgerm GBF diet improves fecal properties in patients with ulcerative colitis, and butyric acid is considered to be involved.

These dietary constituents are involved in tissue repair and in the suppression of inflammation. The Crohn’s disease diet is a composite of such constituents. It not only helps to alleviate the pathophysiology, but also contains many foods with scientifically proven mechanisms of action and forms the basis for dietary guidance in patients with IBD.

According to dieticians, when there are abdominal symptoms such as diarrhea in the active stage of ulcerative colitis, the main diet should be about 30 g of lipid per day in the form of gruel, with protein obtained mainly from eggs, soybeans, and fish. Milk should be avoided at this stage.

In patients with active left-sided colitis and total colitis, the activity of lactase in the small intestinal mucosa is significantly reduced and the lactose contained in milk is not decomposed, which can lead to an increase of diarrhea. Foods with a high content of dietary fiber or irritant foods should also be avoided. An ordinary diet can be eaten after the symptoms subside and remission occurs.

In Crohn’s disease, dietary therapy is even more important. In the active stage, enteral nutrition can lead to remission. When enteral nutrition is too difficult, intravenous hyperalimentation is used, but is switched to enteral nutrition at an early stage. About 1,200 to 1,400 kcal per day is obtained from enteral nutrition and the remainder is obtained from
the Crohn’s disease diet consisting of food with high levels of \( n-3 \) polyunsaturated fatty acids. Long-term nutritional management not only requires certain quantities of protein, lipid, and carbohydrate to be eaten, but also involves evaluation of the quality of nutrition to ensure that there is a sufficient content of essential amino acids, essential fatty acids, vitamins, and trace elements.

When nutritional management is solely based on enteral nutrients, caution is required since trace elements such as zinc and selenium are reduced, as shown in Fig. 3, so foods with high levels of trace elements such as those shown in Table 3 are required.

**Conclusion**

The patients with IBD have some problems on social life as well as long-term nutritional management, so it is important to form a team consisting of a physician, nurse, dietician, and pharmacist in order to maintain a high quality of life (QOL) with the support of family members.

**REFERENCES**


