Stepwise Treatment With Plant-Based Diet and Medication for Patient With Mild Ulcerative Colitis

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ABSTRACT

Introduction: We regard inflammatory bowel disease as a lifestyle disease mainly mediated by a westernized diet. We developed a plant-based diet (PBD) to counter the westernized diet. PBD can induce remission without medication in a subset of mild cases of ulcerative colitis. Medication is provided when induction of remission is not achieved solely with PBD. We describe such a case in this report.

Case Presentation: A 34-year-old woman visited us in October 2016 with a complaint of loose stool for nearly 5 years. Laboratory examination revealed mild abnormalities including elevation of C-reactive protein (CRP). Ulcerative colitis was diagnosed due to diffuse colonic inflammation and pathological findings consistent with ulcerative colitis. She was admitted for educational hospitalization for 19 days in the middle of November, during which PBD was provided. A few days after admission, her stool became normal. CRP concentration decreased to within the normal range. However, colonoscopy on discharge showed minimum improvement. Thereafter, CRP was abnormal on three successive occasions, and her stool alternated between normal and loose. Sulfasalazine was initiated at the end of March 2017. Thereafter, her stool was normally formed, and CRP decreased to normal. Endoscopic remission was confirmed in August. Her PBD score, which evaluates adherence to PBD, was 8 before admission, and 37 and 16 at 7 and 21 months after discharge, respectively.

Conclusion: Medication was administered when restoration of a healthy dietary lifestyle was insufficient to induce remission. Our stepwise treatment makes the shift from one-size-fits-all medication toward medication to the right patient.

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INTRODUCTION

Inflammatory bowel disease (IBD) is a collective term for ulcerative colitis (UC) and Crohn disease. IBD is no longer a disease mainly seen in Europe and North America and is now a global disease. The etiology of IBD is generally stated as unknown. However, we regard a westernized diet in an affluent society as a ubiquitous environmental factor among various environmental factors underlying IBD. It is apparent now that diet shapes gut microbiota. A westernized diet, ie, high in animal protein and fat and low in dietary fiber, tends to decrease microbial diversity (dysbiosis), resulting in production of microbial metabolites that are proinflammatory and detrimental to our health. This is a risk factor not only for IBD but also for other metabolic chronic diseases.

We developed a plant-based diet (PBD), ie, a lacto-ovo-semi-vegetarian diet, to counter the westernized diet, and we have provided it to all inpatients with IBD starting in 2003. The modality incorporating PBD brought far better outcomes than the current modality in both Crohn disease and UC irrespective of active or quiescent stage. Therefore, we recommend PBD for IBD. Gut microbial dysbiosis has been consistently observed in IBD. PBD, ie, low in animal protein and fat and high in dietary fiber, tends to increase microbial diversity, resulting in sufficient production of beneficial metabolites such as butyrate. Butyrate is well known as a key substance in maintaining homeostasis including nutrition, immunology, and mucosal barrier function (enhanced mucus secretion and increased antimicrobial peptide). Namely, PBD is anti-inflammatory. PBDS are listed as variations of USDA healthy eating patterns and are recommended to the public to prevent common chronic diseases.

We try to treat all initial patients with IBD on an inpatient basis. During hospitalization, patients experience PBD and become familiar with PBD. Mild cases of UC with or without symptoms are advised to undergo educational hospitalization lasting about 2 weeks. In our practice, the PBD is first provided for mild cases of UC. When remission is induced or improvement is observed during hospitalization, medication is not prescribed. Medication is provided when induction of remission is not achieved solely with the PBD. Here, we present such a case among 60 cases that underwent educational hospitalization. This case report was prepared following the CARE Guidelines.
CASE PRESENTATION

A 34-year-old woman, the mother of two children, visited us in the middle of October 2016 with a complaint of loose stool or diarrhea three to four times a day for nearly 5 years (Figure 1). She did not observe bloody stool. Although she was worried about her stool, she had been busy with marriage, pregnancy, and taking care of her children, and she did not have a chance to visit a clinic. She had a bilateral tonsillectomy at the age of 18. Bronchial asthma was diagnosed at the age of 31. Her mother died of renal cancer. Her father had an aneurysm of the abdominal aorta. There was neither a family history of IBD nor psychosocial history. She did not take any supplements. Her height was 153 cm and weight was 39.8 kg. Physical examination was noncontributory. There was no sign of hyperthyroidism such as tachycardia, goiter, exophthalmos, or hand tremor. Anal fistula and anal skin tag were absent. Laboratory examination revealed mild abnormalities in C-reactive protein (CRP: normal range ≤ 0.19 mg/dL), erythrocyte sedimentation rate (< 15 mm/h), hemoglobin (12.0-16.0 g/dL), platelet count (13.0-32.0 × 10^4/mm³), serum albumin (4.0-5.0 g/dL), and α2-globulin (4.8-8.6%), which were 0.64 mg/dL, 24 mm/h,
11.0 g/dL, 45.3 × 10^9/mm^3, 3.7 g/dL, and 10.8%, respectively. The white blood cell count was 7,300/mm^3 with a normal differential count. Fecal occult blood test was negative. Abdominal ultrasonography revealed colonic dilatation in the entire colon. Esophagogastroduodenoscopy was unremarkable. Colonoscopy revealed diffuse inflammation in the whole colon but not in the rectum (Figure 2A). Pseudopolyps or ulcers were not observed. Pathological findings of biopsy specimens showed crypt abscess and depletion of goblet cells. Findings consistent with UC together with exclusion of other diseases causing chronic diarrhea resulted in a diagnosis of UC: initial episode case, pancolitis, and moderate in severity.\textsuperscript{20} Although moderate in severity due to minimal systemic abnormalities,\textsuperscript{20} her daily activity was not disturbed. Therefore, we advised her to undergo educational hospitalization lasting about 2 weeks when she found it convenient.\textsuperscript{15} Two weeks later, she was admitted for educational hospitalization for 19 days (Figure 1). PBD (1,400 kcal/d), a lacto-ovo-semi-vegetarian diet with fish once a week and meat once every 2 weeks,\textsuperscript{4} was provided. A few days later, she was glad that her stool returned to normal (Figure 1). One week later, CRP concentration decreased to within the normal range: 0.18 mg/dL (Figure 1). However, colonoscopy before discharge showed minimum endoscopic improvement (Figure 2B). She received dietary guidance on the PBD and was advised to continue the PBD after discharge.\textsuperscript{15}

One month after discharge, she was well with a normal stool, but CRP had increased to 0.98 mg/dL, as was the case before admission (Figure 1). One tablet of iron (sodium ferrous citrate 50 mg/tablet) every other day was initiated. Because CRP was abnormal on three successive occasions and her stool alternated between normal and loose, sulfasalazine (2.0 g/d) was initiated (Figure 1). Her stool subsequently became formed, and CRP decreased to normal. In the middle of May 2017, all abnormal laboratory data normalized (Figure 1). Endoscopic remission was confirmed in August (Figure 2C). She has been well without relapse to the present (March 2021) (Figure 1).

Her PBD score (PBDS) was 8 before admission and 35 during educational hospitalization (a higher PBDS indicates greater adherence to the PBD\textsuperscript{21}). It was 37 and 16 at 7 and 21 months after discharge, respectively (Figure 1, Table 1). No adverse or unanticipated events related to the PBD or sulfasalazine were observed over the course of treatment.

**DISCUSSION**

Based on our clinical experience, we recommend experiencing PBD through educational hospitalization.\textsuperscript{15} About two-thirds of such patients experienced improvement of symptoms and/or laboratory data.\textsuperscript{15} The present case was atypical UC in some respects: absence of bloody stool and minimal systemic abnormalities including elevated CRP levels. The latter is categorized as moderate in severity\textsuperscript{20} despite her normal daily activity. The rectal-sparing type of UC like the present case is observed at a frequency of 9.5% in adults and at 15% in children.\textsuperscript{22,23} In the present case, normal stool was observed for the first time in nearly 5 years just a few days after start of hospitalization. Elevated CRP before and on admission also normalized after 1 week of PBD. The dramatic effects of PBD were seen in this case. She was impressed with normalization of stool and she appreciated the importance of diet. This appreciation seems to have led to a high PBDS at follow-up. However, it was insufficient to achieve endoscopic remission. It was uncertain whether the duration of PBD during hospitalization (19 days) was too short to induce endoscopic remission or medication was needed for induction of endoscopic remission. At follow-up, CRP was elevated on 3 successive occasions and softening of stool appeared. We judged that induction of remission was impossible with the

![Figure 2](https://example.com/figure2.png)

**Figure 2.** Colonoscopy images before admission (A), before discharge from educational hospitalization (B), and after 5 months on sulfasalazine (C). Diffuse inflammation is observed in images A and B, while vascular patterns indicating colonoscopic remission are clearly observed in image C.
PBD alone. Subsequent administration of sulfasalazine resulted in stable relief of symptoms, normalization of laboratory data, and endoscopic remission (Figure 1).

Currently, medication is universally provided for patients with UC and lifelong medication is recommended for relapse prevention. PBD first followed by medication if needed, ie, stepwise treatment, avoids unnecessary medication in a subset of UC patients. In this way, remission was achieved without medication in about one-third of mild cases. Although our modality is new in UC, the principle of the stepwise treatment is the same for all medicine: medication is administered when restoration of lifestyle is insufficient in treatment of disease. Educational hospitalization to expose patients to the PBD extends beyond UC to other chronic diseases. Because the mild form is most frequent among three severities (mild, moderate, severe) ranging from 37% to 65% in UC, avoiding medication in a subset of mild UC will greatly save healthcare costs. At the moment, we do not know how to discriminate in advance between patients who need sole PBD and those who need medication as well. Further research is needed.

**Table 1. Chronological change of plant-based diet score**

<table>
<thead>
<tr>
<th>Food groups</th>
<th>PBDS scoring</th>
<th>PBDS measured score in the present case</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency of consumption</td>
<td>Base (before hospitalization)</td>
</tr>
<tr>
<td></td>
<td>Daily</td>
<td>3-5 times per week</td>
</tr>
<tr>
<td>Vegetables</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Fruits</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Pulses</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Potatoes/starches</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Rice</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Miso soup</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Green tea</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Yoghurt (plain)</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Meat</td>
<td>-5</td>
<td>-3</td>
</tr>
<tr>
<td>Minced or processed meat</td>
<td>-5</td>
<td>-3</td>
</tr>
<tr>
<td>Cheese/butter/margarine</td>
<td>-5</td>
<td>-3</td>
</tr>
<tr>
<td>Sweets/ice cream/milkshake</td>
<td>-5</td>
<td>-3</td>
</tr>
<tr>
<td>Soft drinks (cola/carbonated beverages/juice)</td>
<td>-5</td>
<td>-3</td>
</tr>
<tr>
<td>Alcohol</td>
<td>-5</td>
<td>-3</td>
</tr>
<tr>
<td>Bread</td>
<td>-5</td>
<td>-3</td>
</tr>
<tr>
<td>Fish</td>
<td>-2</td>
<td>-1</td>
</tr>
<tr>
<td>PBDS</td>
<td>8</td>
<td>35</td>
</tr>
</tbody>
</table>

* Green tea is recommended to drink at home but is not provided as a drink at the hospital.

PBDS = plant-based diet score; SVD = semi-vegetarian diet.

**CONCLUSION**

We regard IBD as a lifestyle disease mainly mediated by a westernized diet. We developed PBD to counter the westernized diet. Replacement of an omnivorous diet with PBD was undertaken through (educational) hospitalization. PBD can induce remission without medication in about one-third of mild UC cases. However, the critical role of diet is not widely appreciated. Medication is provided when induction of remission is not achieved solely with PBD, ie, stepwise treatment. We described such a case in this report. Our stepwise treatment makes the shift from one-size-fits-all medication toward medication to the right patient. This modality will surely contribute not only to patient health but also to saving of healthcare costs.

**Disclosure Statement**

The authors have no conflicts of interest to disclose.

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Authors’ Contributions
Mitsro Chiba, MD, PhD, designed and conducted the study and wrote the manuscript. Tsuyotoshi Tsuji, MD, PhD, Hideo Ohno, MD, and Masafumi Komatsu, MD, PhD, contributed to the acquisition and interpretation of data and revision of the paper. All authors approved the final version of the manuscript for submission.

References