

# Diet to the Rescue: Cessation of Pharmacotherapy After Initiation of Exclusive Enteral Nutrition (EEN) Followed by Strict and Liberalized Specific Carbohydrate Diet (SCD) in Crohn's Disease

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## Case Presentation and Evolution

A 15-year-old male initially complained of chronic diarrhea for 4 months, mild mid-abdominal pain, and occasional rectal bleeding. Over time, the pain worsened, accompanied by the development of tenosus and weight loss, despite good appetite. His family history was negative.

On physical examination, the patient was well appearing despite a body mass index (BMI) of 16.56 kg/m<sup>2</sup>. All systems were unremarkable, including abdominal examination, except for the presence of perianal skin tags. Routine laboratory analysis revealed anemia (hemoglobin 12.8 g/dL) and elevated positive inflammatory markers (erythrocyte sedimentation rate (ESR) 39 mm/h; C-reactive protein (C-RP) 3.8 mg/L; fecal calprotectin 1563.6 mcg/g), and a low inverse inflammatory marker albumin (2.6 g/dL). He underwent endoscopy and colonoscopy that revealed 2 small nodules at the antrum, multiple perianal skin tags, and scattered ulcers from the transverse colon to the rectum. Biopsies showed

inflammation throughout the terminal ileum, cecum, descending colon, and rectum, suggestive of ileocolonic Crohn's disease (CD). He was started on oral prednisone (1 mg/kg/day) and methotrexate (15 mg weekly); with pharmacotherapy, symptoms resolved, and the patient was able to wean off steroids completely over the next few months accompanied by weight gain.

Nevertheless, despite resolution of clinical symptoms, his inflammatory markers remained mildly elevated (ESR 15 mm/h and fecal calprotectin 372 mcg/g), indicative of ongoing inflammation. The patient was started on six weeks of exclusive enteral nutrition (EEN). At the end of this period, there was a slight elevation of calprotectin; an abdominal MRI showed ileitis. He was restarted on EEN for 2 weeks. At this point, he was referred to our center for a second opinion.

We started the patient on the specific carbohydrate diet (SCD) (Table 1). After 2 months of decreasing levels of fecal calprotectin, he was able to stop methotrexate. After six months on the SCD diet, he began to liberalize, using one non-SCD meal of his choice per week. Inflammatory markers have remained stable (Fig. 1).

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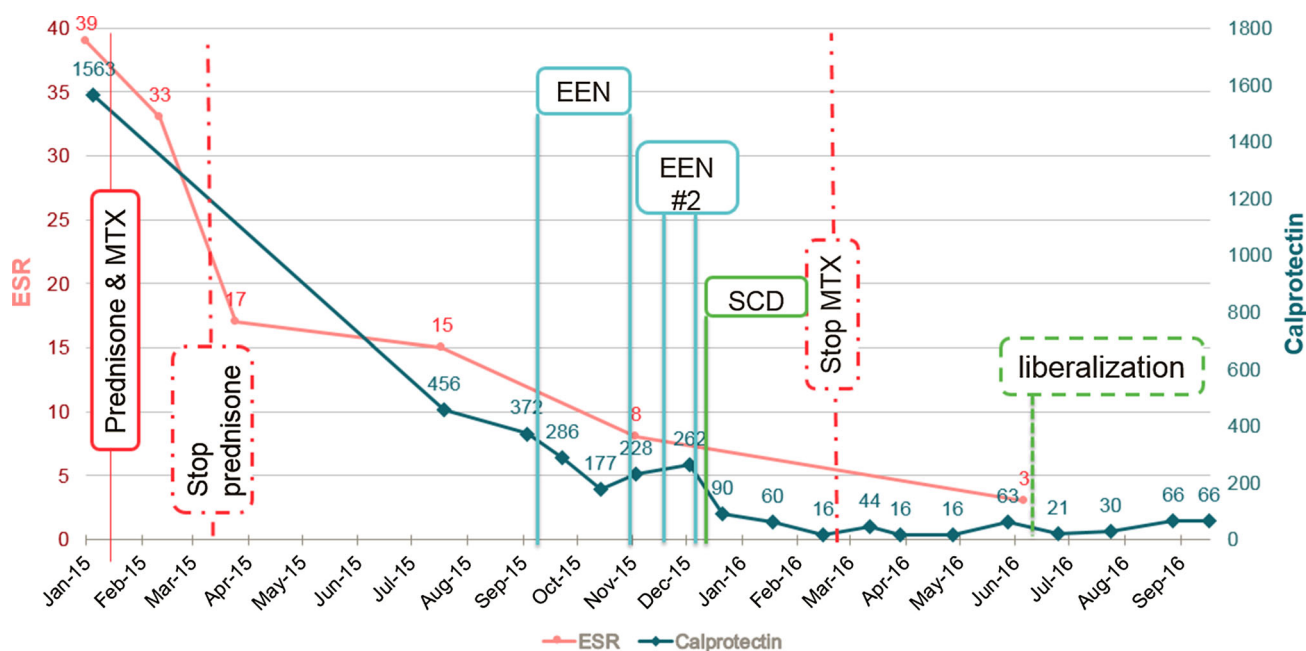
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## Discussion

Nutritional therapy for IBD is categorized as a holistic approach to treatment. Leveraging the anti-inflammatory benefits of certain foods is an attractive option to patients motivated to avoid medication side effects, especially for children with IBD who face a lifetime of medications. Furthermore, patients with IBD who do not receive specific nutrition support often have inadequate nutritional intake [1]. Further, the "Western" diet, which is high in animal fat and protein but low in fruit and vegetables, may cause

**Table 1** Foods in the specific carbohydrate diet

Allowed	Unallowable
All fresh meats, fish, shellfish	Packaged, deli, preserved meats
Most vegetables	Potatoes, corn, starchy vegetables. Tapioca starch, cornstarch
Most fruits	Canned fruits, green bananas, plantains and young coconut
All fats and oils, including butter	
Cheeses (aged >30 days)	Cream, ricotta, mozzarella, other soft un-aged cheeses
Lactose free yogurt	Milk, store-bought yogurt
Honey	All other sweeteners (cane sugar, artificial sweeteners, agave, maple syrups)
Legumes (soaked) (lentils & most beans)	Grains (wheat, rye, oats, rice, buckwheat, quinoa) Bean sprouts, fava beans, garbanzo beans, soy beans
Nuts: Almonds, pecans, hazelnuts, walnuts, cashews, chestnuts, peanuts, Brazil nuts	Candied, salted, or flavored nuts
Drinks: weak tea/coffee, water, mineral water, club soda, dry wine, gin, scotch, bourbon, vodka	Instant coffee, fruit juices, milk, soda, sweet wines, flavored liqueurs, brandy, sherry, beer



**Fig. 1** Evolution of serum and fecal inflammatory markers following corticosteroid/methotrexate induction of clinical remission, followed by EEN, SCD, and mild diet liberalization

dysbiosis, potentiating the inflammatory burden of IBD [15].

The use of a strict, formula-only diet in the form of EEN is effective in inducing remission in CD [2, 3] normalizing inflammatory markers and associated with clinical remission rates of >80% of subjects irrespective of disease phenotype [3]. Indeed, EEN is the only recommended first-line therapy in children with CD in Europe [4, 5]. Yet, clinical trials report that although effective in pediatric and

adult CD patients, EEN is not effective for patients with ulcerative colitis (UC). Likewise, compliance with the diet can be a major issue, with cost of formula, lack of insurance coverage, and social stigmatization cited as potential barriers [2, 6–8].

Another nutritional therapy, SCD restricts complex carbohydrates that may inflame the intestinal mucosa. Originally used by Dr. Sidney Haas in the early 1950s to treat celiac disease, SCD was popularized by Elaine

Gottschall, MSc, author of the book “Breaking the Vicious Cycle.” In this book, she describes a “vicious cycle” that starts with small intestinal mucosal injury leading to carbohydrate malabsorption and in turn to bacterial overgrowth, increased bacterial by-products, and chronic diarrhea, all which worsen small intestinal mucosal injury. The hypothesis underlying the SCD is that restriction of complex carbohydrates arrests the cycle [9].

A retrospective chart review by Suskind et al. [10] of seven patients with active CD without concurrent medications first showed full symptom resolution after 3 months on the diet. Laboratory markers, such as hematocrit, C-RP, albumin, and calprotectin all improved or normalized. In addition, the abbreviated pediatric Crohn’s disease activity index (PCDAI) Scores dropped to zero after 3 months and were maintained at that level for patients who continued the diet for 18 months.

As a follow-up to the Suskind study, Cohen et al. [11] published a prospective study reporting on ten patients with active CD (defined as PCDAI  $\geq$  15) for 12 weeks on the SCD. Their subjects were given the option to continue on the diet for a total of 52 weeks, reporting that nine of ten patients completed the 12-week follow-up on the diet, and seven completed the full 52 weeks. During the study, there were no changes or additions to medications; four were continued with immunomodulators, one with aminosaliculates, and one with budesonide. All patients’ symptoms improve over the initial 12-week protocol, with six achieving clinical remission (PCDAI < 10). Six of the seven patients, who followed the diet for the full 52 weeks, sustained remission.

Finally, Burgis et al. [12] reported sustained remission after diet liberalization from strict observance of the SCD. This retrospective study included 11 patients with CD who began the diet at either time of diagnosis or flare. Two groups were identified: One group was treated with diet alone or in combination with antibiotics or aminosaliculates; the second group had brief corticosteroid use or stable thiopurine dosing. Patients were followed for one year and decided at their own preference to liberalize their diet by adding an unallowable ingredient to their daily diet or periodically an unallowable meal. Mean time spent on the strict diet was 7.7 months, though three patients chose to be on strict diet during the entire study period. Improvements in hemoglobin, albumin, and ESR were observed in all patients. After mild liberalization, growth and laboratory markers were favorably maintained.

In contrast to the pediatric experience, evidence of success with the SCD in adult CD patients is less robust. Kakodkar et al. [13] published a case series of 50 adult patients that reported that the diet was effective, especially for patients with colonic or ileocolonic CD. Nonetheless, the series, which included patients maintained on several

anti-inflammatory medications, relied on survey data. Khandalavala et al. [14] also reported experience with the SCD in a single case of an adult patient with severe UC who had failed conventional therapy but found symptom improvement within 3 months, clinical remission after one year, and resolution of pancolitis on colonoscopy two years later. Though these results are promising, more prospective, large-scale and controlled investigations on the efficacy of the SCD in adult patients with IBD are needed.

In conclusion, nutrition is an important therapeutic option in IBD. Both EEN and SCD have shown some efficacy in the induction and maintenance of remission in pediatric patients with IBD. This case demonstrates that, when strictly followed, the SCD may be a therapeutic pathway to achieve remission and permit medication withdrawal in some patients, while it can maintain disease control with mild diet liberalization. Traditionally, medical management of IBD has been centered around pharmacotherapies. As anecdotal evidence on the efficacy of dietary therapies increases, alternative treatment strategies such as SCD will need evidence-based rigor [15] and longitudinal comparative-effectiveness data. In particular, sound prospective studies are necessary to investigate the underlying mechanism of action for therapeutic benefit in maintaining CD remission on SCD therapy after medication withdrawal or diet liberalization.

## Key Messages

- Nutritional therapy effectively induces and maintains remission in children with Crohn’s Disease.
- EEN and SCD may maintain remission in children even after mild diet liberalization.
- Further studies are necessary to determine the efficacy of SCD and liberalization in adult patients.

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