

Role of perioperative parenteral nutrition in severely malnourished patients with Crohn's disease

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Abstract

AIM: To evaluate the effect of perioperative parenteral nutrition on serum immunoglobulin, weight change, and post-operative outcome in severely malnourished patients with Crohn's disease.

METHODS: Thirty-two severely malnourished patients with Crohn's disease who had undergone surgery in our hospital were reviewed. Sixteen patients who received perioperative parenteral nutrition were enrolled in the study group, and the other 16 patients who did not receive parenteral nutrition were enrolled in the control group. Serum immunoglobulin, body mass index (BMI), liver function, weight change, and postoperative complications were evaluated.

RESULTS: Serum IgM levels elevated 1 wk before surgery in both groups, and decreased to normal value (from 139 ± 41 to 105 ± 29 mg/dL, $P = 0.04$) 4 wk after operation in the study group, while no significant changes was noted in the control group (from 133 ± 16 to 129 ± 13 mg/dL, $P = 0.34$). There were no significant changes in concentrations of IgG and IgA. The BMI of the study group increased from 13.9 ± 0.6 to 15.3 ± 0.7 kg/m² ($P = 0.02$) with no significant change in the control group (14.1 ± 0.7 and 14.5 ± 0.5 , respectively, $P = 0.81$). The percentage of resuming work was higher in the study group than in the control group.

CONCLUSION: Perioperative parenteral nutrition possibly ameliorates the humoral immunity, reverses malnutrition, and facilitates rehabilitation.

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Key words: Parenteral nutrition; Malnourished patients;

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INTRODUCTION

Most cases of Crohn's disease are complicated by malnutrition and require surgical intervention. Surgery is needed for complications such as perforation, complete bowel obstruction, etc.^[1,2].

The effectiveness of parenteral nutrition used alone or in combination with other therapeutics in Crohn's disease patients has been recently reported by clinical trial^[1]. However, little is known about the effect of perioperative parenteral nutrition on severely malnourished patients with Crohn's disease.

It was reported that Crohn's disease is caused by excessive immune reactivity in the gut wall^[2]. Studies have shown that in active Crohn's disease peripheral B cells are activated as indicated by an increased expression of lymphocyte-activated antigens and by the enhanced *in vitro* spontaneous immunoglobulin production^[3]. Immunoglobulin change in the severely malnourished patients receiving perioperative parenteral nutrition *in vivo* is still unclear.

In the present study, the serum immunoglobulin and outcome (weight changes, postoperative complications, and rate of work resumption after 6 mo) in severely malnourished patients with Crohn's disease were evaluated after they were given perioperative parenteral nutrition.

MATERIALS AND METHODS

Patients

Thirty-two patients with Crohn's disease who had undergone surgery were enrolled in the study. All of them were severely malnourished with their body mass indexes (BMI) being less than 15.0 kg/m². Sixteen patients entered the study group who received perioperative parenteral nutrition. The other 16 patients who did not receive perioperative parenteral nutrition entered the control group. All had different kinds of bowel surgery for intestinal obstruction and received perioperative parenteral nutrition after 3 wk. The clinical characteristics of the two groups are shown in Table 1. The study group received bowel resection procedures and began to receive perioperative parenteral

nutrition 1 wk before the operation and continued for 2 wk from the next day after surgery. The parenteral nutrition formula was as follows: Crystal amino acid (18 s) was used to provide nitrogen: 0.2 g/kg per d; energy: 30 kcal/kg per d; fat: 40%; glucose: 60%. Patients in the study group received parenteral nutrition through a central venous catheter with the dosages increased over 48 h to a daily goal. Patients in the control group received 5-d intravenous transfusions containing energy 20 kcal/kg per d, normal water, and diet containing the same amount of energy as used in the study group. Average intraoperative blood transfusion was 400 mL in the two groups, which also did not receive steroids 2 wk before and after surgery. All the patients were monitored for complications.

Table 1 Clinical characteristics of two groups before parenteral nutrition

Group	Non-malnutrition group	Malnutrition group	P
Patients	16	16	
Age (yr)	28 (20-73)	30 (18-71)	0.47
Sex (M/F)	9/7	10/6	0.60
Localization			
Small bowel	5	6	0.59
Colon	5	3	0.28
Ileocolic	6	7	0.61
Medication			
Corticosteroid	No	No	
Sulfasalazine	7/16	6/16	0.61
Former body weight (%)	92.6±5.3	77.9±6.1	0.03

Serum parameters

Blood samples were drawn before breakfast in the morning and at beginning and end of the study, centrifuged and stored at -20 °C before assay.

Serum IgM, IgG, and IgA values were quantitated by ELISA (Sigma, USA)^[4].

Liver function and bilirubin levels were also assayed (BD, USA).

Weight change

Body height and weight were recorded; BMI was then calculated at the beginning and end of the study^[5].

Follow-up

All the patients were followed up for 6 mo on work resumption after they were discharged from the hospital.

Statistical analysis

The results were expressed as mean±SD. Statistical analyses

were performed with the analysis of variance or Student's *t*-test or χ^2 test. $P < 0.05$ was considered statistically significant.

RESULTS

Crohn's disease was confirmed in all patients by pathological examination of the surgical samples.

IgM levels elevated before surgery in both groups (control group: 133±16 mg/dL; study group: 139±41 mg/dL; normal value: 110±35 mg/dL; $P = 0.04$), and decreased to normal value (105±29 mg/dL, $P = 0.02$) 3 wk after surgery in the study group with no significant changes in the control group (129±13 mg/dL, $P = 0.34$). There were no significant changes in concentrations of IgG and IgA ($P = 0.20-0.57$, Table 2).

The BMI increased from 13.9±0.6 to 15.3±0.7 kg/m² ($P = 0.02$) in the study group and had no significant change in the control group (14.1±0.7 and 14.5±0.5, respectively, $P = 0.81$).

The overall complication rates of both groups were similar (control group: 7 cases, 26.5%; study group: 6 cases, 27.3%; $P = 0.86$). Serum total bilirubin level (mainly indirect bilirubin) was slightly elevated in each group near the end of parenteral nutrition. These results are shown in Table 3.

Table 3 Complications observed during perioperative parenteral nutrition

Type of complications	Non-malnutrition group	Malnutrition group
Infectious		
Pneumonia	2 (<i>Pneumococcus</i>)	1 (<i>Pneumococcus</i>)
Bacteremia	1 (<i>Escherichia coli</i>)	0
Abdominal Abscess	1 (<i>Enterococcus</i>)	1 (<i>E.coli</i>)
Noninfectious		
Anastomotic leak	1	1
Wound dehiscence	1	2
Liver cholestasis	1 (Tbil = 1.6 mg/dL)	1 (Tbil = 1.4 mg/dL)
Catheter-related	0	0
Total	7	6

DISCUSSION

It was reported that significant B-cell activity is present in Crohn's disease patients and is accompanied with an increase or decrease in immunoglobulin production related to an augmented B-cell clone size, which subsequently induces the humoral immunological action toward the bowel wall^[6,7]. However, there are different opinions as to which immunoglobulin is subjected to change^[6]. Our study identified the change of IgM.

IgM is the only immunoglobulin that mainly exists in

Table 2 Levels of immunoglobulin before and after parenteral nutrition (mean±SD)

Immunoglobulins	Normal value (mg/dL)	Non-malnutrition group		Malnutrition group	
		Before PN	After PN	Before PN	After PN
IgA	203±50	195±42	218±53	201±38	215±41
IgM	110±35	133±16 ¹	129±13	139±41 ²	105±29 ³
IgG	1 210±300	1 160±280	1 250±210	1 305±185	1 409±213

PN, parenteral nutrition. ¹ $P = 0.04$ vs normal value. ² $P = 0.04$ vs normal value. ³ $P = 0.02$ vs before PN.

the circulatory system and not in the tissue. IgG, however, exists in both blood and tissue. Therefore, the change in the concentration of serum IgM instead of IgG represents the total amount of its kind.

In the present study, serum IgM levels rose before surgery in both groups and decreased in the malnourished group after perioperative parenteral nutrition (we excluded the data of the patients complicated by infection to obviate its influence on the results) demonstrates that perioperative parenteral nutrition can ameliorate the humoral immunity of the severely malnourished patients. But the role of circulating B cells and cytokines such as IL-2, TNF- γ , and IL-4 needs to be clarified.

The main effects of parenteral nutrition on humoral immunity may be due to its ability to repair the bowel wall and promote recovery of the disease by avoiding the stimulation of food^[8,9], reduce the energy supply for the bacterial proliferation can reduce the antigen load^[10], and improve the nutritional status. Our study showed that perioperative parenteral nutrition was efficacious in ameliorating malnutrition without increasing the rate of catheter-related complications. This is beneficial for the repair of lesions, thus attenuating the immune reaction as the anabolism increases^[11].

Parenteral nutrition can lead to liver cholestasis, has decreased with reduced energy supply and adequate use of fat emulsions^[12,13]. In the present study, one patient had a mild elevation of serum bilirubin (predominantly indirect bilirubin) in each group, which decreased after the patients took a small amount of parenteral nutrition.

In the present study, the 6-mo follow-up showed that the rate of resuming work was higher in the perioperative parenteral nutrition group than in the control group, suggesting that perioperative parenteral nutrition support has a long-lasting effect on recovery, possibly due to the amelioration of immunity^[14].

In conclusion, perioperative parenteral nutrition possibly ameliorates the humoral immunity, reverses malnutrition, and facilitates rehabilitation.

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