

The role of glutamine supplemented total parenteral nutrition (TPN) in severe acute pancreatitis

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Abstract. – OBJECTIVE: To evaluate the role of glutamine-supplemented total parenteral nutrition (TPN) in severe acute pancreatitis.

PATIENTS AND METHODS: Forty-seven patients with severe acute pancreatitis were admitted to Huaihe Hospital, China, over a period of one year (July 2013 to June 2014) were randomly divided into two therapeutic groups. Patients in group 1 (24 patients in total) and group 2 (23 patient in total) were treated with glutamine-supplemented TPN and standard TPN respectively. Patients were assessed for nutritional parameters, the prevalence of complications, mortality, length of hospital stay (LOS) and length of TPN.

RESULTS: The majority of patients were male in both groups (62.5% in group 1 and 60.9% in group 2) and the average age was similar (39.13 ± 4.46 years in group 1 and 40 ± 3.96 years in group 2). The major causative factor was also similar in both groups, i.e. gall stones. The prevalence of complications in the group 2 was much higher (47.85%) than those in the group 1 (25%). The mortality rate for group 1 and 2 were 4.2% (1/24) and 17.4% (4/23), respectively. The length of hospital stay in the group 2 (23.08 ± 2.02 days) was longer than those of the group 1 (20.33 ± 2.40 days). The length of TPN was also longer in the group 2 (16.47 ± 2.72 days) than those of the group 1 (10.56 ± 2.21 days). Glutamine was also associated with significant increase in serum albumin level.

CONCLUSIONS: Glutamine-supplemented TPN can reduce the mortality and the occurrence of complications, shorten the length of stay and improve the nutritional status of the patients with severe acute pancreatitis.

Key Words:

Pancreatitis, Glutamine, Total parenteral nutrition, Serum albumin level.

Introduction

Acute pancreatitis (AP) is defined as an acute inflammatory process of the pancreas, with vari-

able involvement of other regional tissues or remote organ systems^{1,2}. Most patients develop mild complications and are treated effectively. However, 10%-20% patients have a rapidly progressive inflammatory response associated with prolonged length of hospital stay and significant morbidity and mortality. The mortality rate in severe pancreatitis is 10%-30%. Mortality in pancreatitis has a bimodal distribution.

Mortality during early period i.e. within 2 weeks mostly due to multi-organ dysfunction syndrome (MODS) where as mortality after 2 weeks known as the late period is often caused by septic complications³.

Although the impact of the nutritional status on outcome in patients with severe AP has not been fully elucidated it is probable that severe malnutrition will adversely affect the outcomes similar to other critical diseases⁴. Malnutrition is known to occur in 50-80% of chronic alcoholics and alcohol is a major etiological factor in acute pancreatitis⁵. Morbid obesity is also associated with poorer prognosis⁶.

The management of AP frequently includes parenteral nutrition, but conditionally essential amino acids such as glutamine are not included in conventional TPN. This study was conducted to determine whether the inclusion of glutamine has a beneficial effect in patients with AP receiving TPN.

Patients and Methods

This was a prospective descriptive study of patients admitted with AP at Huaihe Hospital China between July 2013 to June 2014. Patients were randomly divided into two therapeutic groups. Patients in group 1 (24 patients in total) and group 2 (23 patients in total) were treated with

glutamine supplemented TPN and standard TPN respectively. Patients were assessed for nutritional parameters, the prevalence of complications, mortality, length of hospital stay (LOS) and length of TPN.

Inclusion Criteria

All patients with acute pancreatitis who required TPN. The diagnosis of AP was based on the presence of two of the following three features: (1) abdominal pain a characteristic of AP, (2) serum amylase and/or lipase ≥ 3 times the upper limit of normal, and (3) characteristic findings of AP on the abdominal CT scan.

Exclusion criteria- Patients without next of kin to consent for the study were excluded from the study.

Statistical Analysis

All the statistical analyses were performed using Statistical Package for Social Sciences (SPSS Inc., Chicago, IL, USA). Data was presented as mean \pm SD and proportions as appropriate. Continuous data was presented as mean \pm SD. Categorical values were evaluated using chi-square or Fisher’s exact test. p -value < 0.05 was considered statistically significant.

Results

Clinical-Epidemiological Observations

We studied 47 patients with acute pancreatitis during the above period. Characteristics of the both groups are depicted in Table I.

Complications: Overall rate of complication was 25% in the study group and 47% in the control group but the difference was not statistically significant ($p = 0.10$) (Figure 1).

Mortality: 1 death in the study group and 4 deaths in control occurred, no statistical difference ($p = 0.142$) (Figure 2).

Duration of hospital stay was significantly lower in the group with glutamine TPN compared with that of the control group (p -value of 0.020) (Table II).

Adverse events in both arms are depicted in Table III.

Results show that the majority of the patients were male in both groups (62.5% in group 1 vs. 60.9% in group 2) (no significant statistical difference) and the average age of presentation was similar (39.13 ± 4.46 years in group 1 vs. 40 ± 3.96 years in group 2) (no significant statistical difference, $p = 0.8$). The major causative factor was also similar in both groups i.e. gall stones. The incidence of complications in group 2 was much higher (47.85%) than those in group 1 (25%) but this difference was not statistically significant, $p = 0.5$. Mortality rates for group 1 and 2 were 4.2% (1/24) and 17.4% (4/23) respectively and without any significant statistical difference, $p = 0.5$. The length of hospital stay in the group 2 (23.08 ± 2.02 days) was longer than that of group 1 (20.33 ± 2.40 days) ($p = 0.03$). The length of TPN was also longer in the group 2 (16.47 ± 2.72 days) than those of group 1 (10.56 ± 2.21 days) ($p = 0.05$).

Discussion

Glutamine is an amino acid rich in the plasma and intracellular free amino acid pool⁷. It is essential for a wide variety of physiologic processes, in particular, the growth and function of en-

Table I. Characteristics of the patients.

	Group-I Study group N = 24	Group-II Control group N = 23	<i>p</i> -value
Age	40 \pm 3.96	39.13 \pm 4.46	0.405
Sex			0.29
Male	15 (62.5)	14 (60.9)	
Female	9 (37.5)	9 (39.1)	
Height	160.1 \pm 8.5	162.3 \pm 9.4	0.28
Weight	61.4 \pm 15.0	54.4 \pm 12.2	0.030
BMI	27.3 \pm 3.2	26.1 \pm 3.9	0.358
Etiology: gall stone, alcohol	15 (65.2%)	16 (66.7%)	
	6 (26.1%)	6 (25%)	
BISAP score	> 3	> 3	

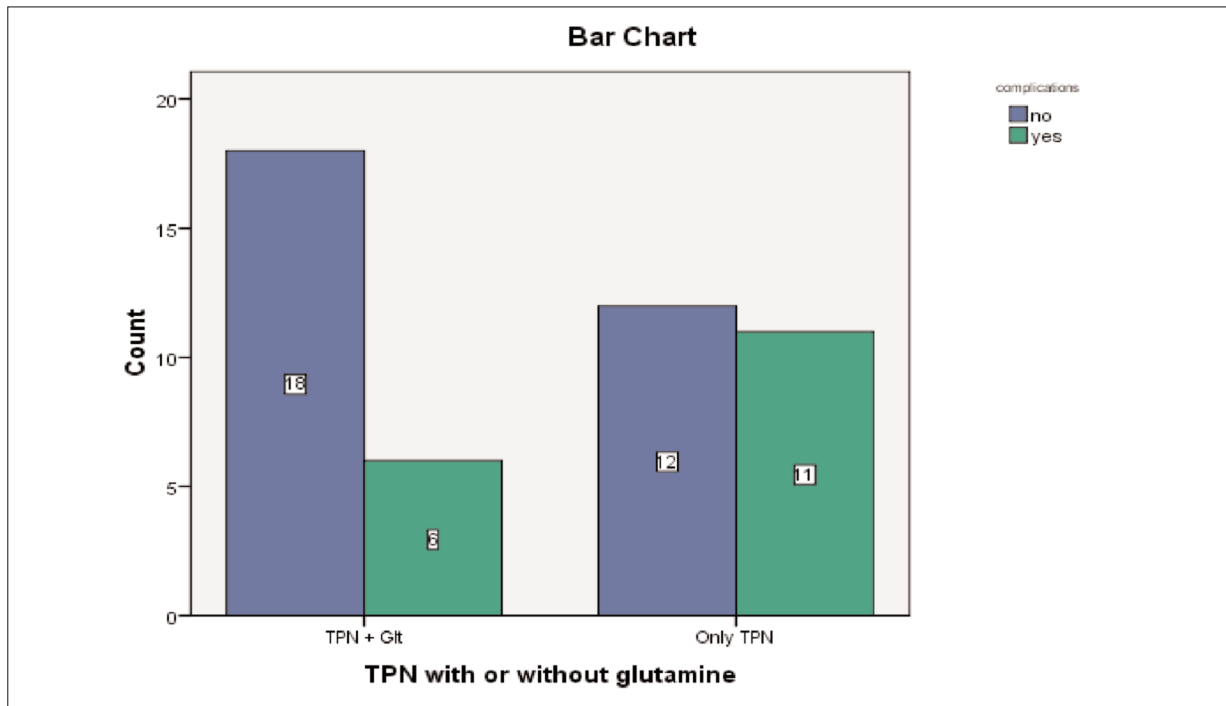


Figure 1. Overall rates of complications for both groups.

teric mucosae and immune cells including lymphocytes and macrophages^{8,9}.

Zhao et al¹⁰ observed that compared to TPN, the combined therapy of EN (enteral nutrition) and PN (parenteral nutrition) could improve the

nutrition status and moderate the acute phase response. Moreover, the integrity of enteric mucosa and immune function were protected more effectively in the treatment group than in the control group. On the other hand, EN did not simulate

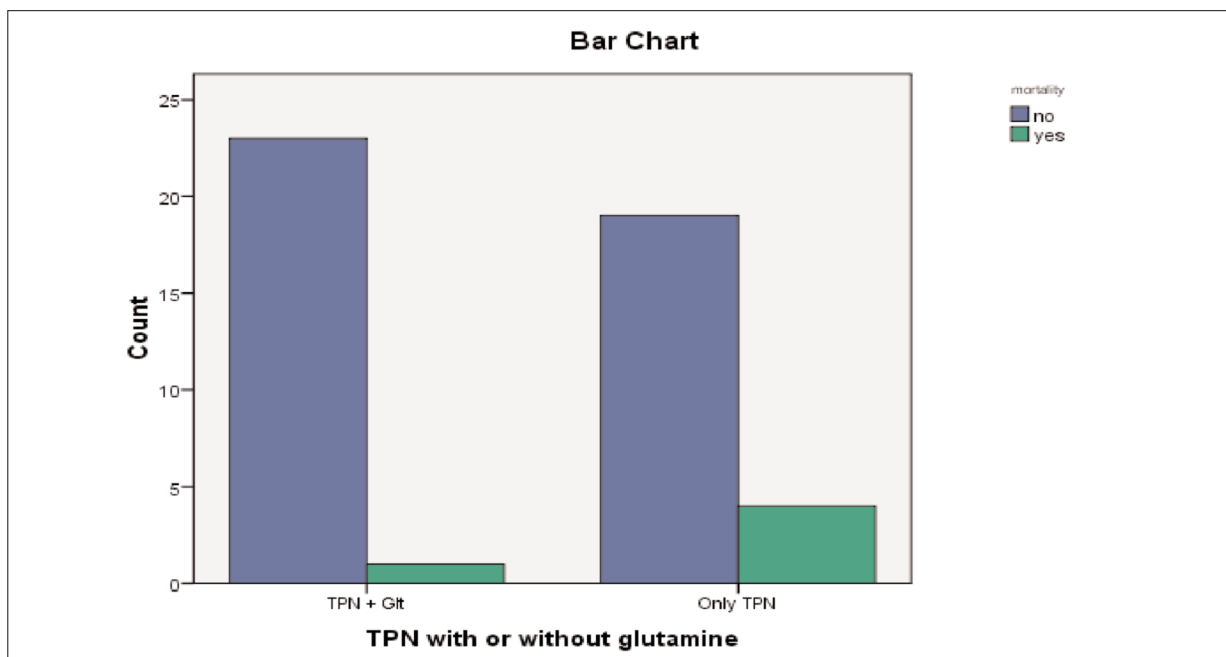


Figure 2. Mortality for both groups.

Table II. Duration of hospital stay.

Length of stay	Study group	Control group	<i>p</i> -value
ICU	11.5 (± 2.0) ^d	15.2 (± 2.0) ^d	0.021
Hospital	20 (± 2.4) ^d	23 (± 2.03) ^d	0.0208

Table III. Adverse events in both arms.

Adverse event	Study group N = 24	Control group N = 23	<i>p</i> -value
Pneumonia	3	5	0.020
Septic shock	1	5	0.0208
Renal failure	4	7	0.12
Deranged LFT	10	14	0.26
Hypertriglyceridemia	7	11	0.04
Hyperglycemia	4	5	0.38

the excretion of the pancreas and avoided exaggerating the inflammation of the pancreas. Thus, appropriate application of PN and EN appears to be more effective for patients with SAP (severe acute pancreatitis).

Pearce et al¹¹ reported that after 3 days of feeding, in the study group with glutamine-supplemented TPN, 2/15 (13%) of patients had reduced their CRP by 40 mg/L or more. In the control group 6/16 (38%) of patients had reduced their CRP by this amount. This difference was found to be near the statistical significant limit (*p* = 0.220).

Asrani et al¹² did a meta-analysis and twelve RCT that enrolled a total of 505 patients with acute pancreatitis were included in the final analysis. They reported overall, glutamine supplementation resulted in a significantly reduced risk of mortality (RR 0.30; 95% CI, 0.15 to 0.60; *p* < 0.001) and total infectious complications (RR 0.58; 95% CI, 0.39 to 0.87; *p* = 0.009) but not length of hospital stay (MD -1.35; 95% CI, -3.25 to 0.56, *p* = 0.17). In the subgroup analyses, only patients who received parenteral nutrition and those who received glutamine in combination with other immunonutrients demonstrated a statistically significant benefit in terms of all the studied outcomes.

Our study too confirms that glutamine-supplemented TPN has a better outcome in SAP.

Conclusions

Immunonutrients like glutamine and ω-3 FAs added to parenteral formulas can improve prognoses in patients with acute pancreatitis. Mortali-

ties for glutamine-supplemented nutrition was 4.2% (1/24) as compared with another group 17.4% (4/23). The length of hospital stay in the non-glutamine group (23.08 ± 2.02 days) was longer than glutamine group 1 (20.33 ± 2.40 days). The length of TPN was also longer in group 2 (16.47 ± 2.72 days) than those of group 1 (10.56 ± 2.21 days). Glutamine was also associated with significant increase in serum albumin level. So to conclude glutamine-supplemented TPN can reduce the mortality and the occurrence of complications, shorten the length of stay and improve the nutritional status of the patients with severe acute pancreatitis.

Conflict of Interest

The Authors declare that there are no conflicts of interest.

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