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# Effect of Partial Parenteral Versus Enteral Nutritional Therapy on Serum Indices in Multiple Trauma Patients

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## ABSTRACT

***Background**: Malnutrition is a common complication in multiple trauma patients because of the metabolic and catabolic increase and negative nitrogen balance. It may deteriorate patients' outcome. Some clinical and paraclinical parameters are used for nutritional assessment. In this study our goal was evaluation of nutritional parameters in enteral and partial parenteral methods for detecting the better method of nutritional support.*

***Material and Methods**: This prospective study had done during 30 months on 80 multiple trauma patients with $4^{th}$ to $10^{th}$ GCS (Glascow Coma Scale) at the end of the first day of admission. They divided into 2 groups randomly: we used partial parenteral nutrition in the first group (41 patients) and enteral nutrition in the second one (39 patients). We studied serum total protein, albumin, transferrin and total lymphocyte count during their first two weeks of hospitalization.*

***Results**: In the first group, they received more protein and calorie during 14 days. Serum total protein, Albumin and transferrin were more statistically significant in this group ($P<0.05$).*

***Conclusion**: In partial parenteral nutrition patients will receive more protein and calorie, and they will have more total serum protein. It seems that parenteral-enteral nutrition prepares better paraclinical nutritional parameters.* **(Tanaffos 2007; 6(4): 37-41)**

***Key words**: Enteral nutrition, Parenteral nutrition, Transferrin, Albumin, Total lymphocyte count, Total serum protein*

## INTRODUCTION

Malnutrition is a common problem in hospitalized patients. As many as 40% of adult patients are seriously malnourished on admission and two-third of all patients experience deterioration of their nutritional status during their hospital stay (1). Acute illness further exacerbates patients poor nutritional status by increasing their metabolic rate and by impairing their utilization of nutritional substrates (2). Critically ill patients frequently receive inadequate nutritional support during their ICU stay because physicians underestimate the nutritional

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needs of patients , and the initiation of nutritional therapy is often delayed (3). Metabolic status of multiple trauma patients and burn victims are the same.

Increased metabolism, catabolism, negative nitrogen balance, weight loss, muscle atrophy and impairment of gasterointestinal function may occur. Hepatic and respiratory disorders are also common (4). They are all occurring as a response to trauma and stress because of hormonal changes and acute phase responses. Today, our managements include caloric and nutritional support in addition to medical treatment. There are various markers for evaluation of nutritional status, which conclude clinical and paraclinical markers. Paraclinical markers consist of albumin, transferrin, total protein and total lymphocyte count. Clinical markers are body weight and arm circumference. Although none of them is important separately and we should consider all of them together (5).

There are three different nutritional methods in multiple trauma patients: total parenteral nutrition (TPN); enteral nutrition, and partial parenteral nutrition (PPN).

There are some advantages and disadvantages for each of them, for example, in the first days of hospitalization that the patient is unable to tolerate enteral nutrition, TPN is preferred. In contrast, enteral nutrition is cost effective and has less infection rate (6-8). Thus, it's reasonable to have the advantages of both methods with partial parenteral nutrition. On the other hand, it seems that the combination of parenteral and enteral nutrition has better results than enteral form especially in hospitals where there are no standard enteral formulas. In this study, our goal was to evaluate nutritional parameters in enteral and partial parenteral methods for detecting the better method of nutritional support.

## MATERIALS AND METHODS

This clinical trial study was done in a 30-month period on 80 multiple trauma patients from 2002 to 2005 .Our selection was based on their GCS ($4^{th}$ to $10^{th}$ GCS) at the end of the first day of admission in 3 different educational hospitals. Patient's selection was completely randomized (numerical random) and it was done parallel in 3 different hospitals. This study associated with patients` relative's informed consent as well as hospital ethic committee agreement. At first, our sample size was 86 patients with 80% power and 0.05 significance (43 patients in each group) and at last based on our exclusion criteria, we had 41 patients in group 1 and 39 patients in group 2. Our exclusion criteria were spinal cord injuries, diabetes mellitus, thyroid and renal diseases or patients who had any kind of surgery. In the first group, we used partial parenteral and in the second group, we used enteral nutrition.

They all had folly Catheter and nasogastric or orogastric tube. No patient had Albumin supplement. Individual data such as age, sex, nutritional method and GCS were all recorded. We used Harris-Benedict formula for basal energy requirements (9) and Clifton formula for caloric requirements (10). We tried to reach to calculated energy and calorie requirements in both groups. In group 1, we began TPN from central vein in the second day of admission after cardiovascular stability. Chest x-ray was used for checking of venous catheter. The solution consisted of aminoacids, 10% dextrose, intralipid, vitamins and different minerals. It included 40% fat, 42% dextrose, 18% proteins. An NG tube was used to drain gastric secretions. After 4 days, if gastric secretions were less than 100 cc during 2hrs and bowel sounds were heard, enteral nutrition by a NG or orogastric tube would begin. The consistency of solution was suitable. It prepared one kcal for every one milliliter. Each $2000^{cc}$ had 100gr tomatoes,

500gr yogurt, 60gr beef, 70gr soy, 20gr sugar, 40gr oil, and 60gr rice powder. Its osmolarity was 440 mosm/kg. Enteral nutrition made every 4 hours by experienced nurses. It was begun with 100$^{cc}$ in each meal and increased to 100$^{cc}$ each time per day. Its maximum amount was 500$^{cc}$ every 4 hour. If gastric residual volume was more than 150$^{cc}$ before each meal, there were no increases. We tried to transfer parenteral to enteral nutrition during 3 days. But according to patient tolerance parenteral nutrition continued for 7 to 9 days (mean 7.7 days). So, all patients tolerated enteral nutrition on 14$^{th}$ day of admission. In the second group, enteral nutrition began on the 3$^{rd}$ day after trauma from NG or orogastric tube (if there were bowel sounds and gastric secretions were less than 100$^{cc}$ each 2 hours). The quality and quantity of solutions in both groups were the same. During 5-7 days (mean 5.8 days), they received maximum caloric intake. In this way, we supplied 14% of total energy by proteins, 32% by fat, and 54% by carbohydrates. Total protein, albumin, transferrin were calculated with technician RA-1000 and total lymphocyte count with cell counter every week.

Blood sampling had done at 7 to 9 AM by special trained personnel. Height (in centimeter) was measured on the first day. We weighed patients on the 1$^{st}$, 7$^{th}$ and 14$^{th}$ day of admission. Our statistical analysis was based on SPSS (Ver.11) and two sample T-Test, and Mann Whitney U test. P-value<0.05 was meaningful. We showed our results as mean with or without standard deviation.

## RESULTS

Among these 80 patients, 41 patients were in partial parenteral group (group 1) and 39 patients in enteral group (group 2). There were no significant statistical differences in GCS, mean age, male to female ratio, weight and height between two groups (Table 1) (P > 0.05).

**Table1.** Individual characteristics of both groups

| Characters | | First group | Second group |
|---|---|---|---|
| Numbers | | 41 | 39 |
| GCS | | 6.19±1.40 | 6.41±1.39 |
| AGE | | 34.88±13.63 | 33.94±14.68 |
| Weight(kg) | | 67.94±7.31 | 63.52±9.6 |
| Height(cm) | | 167.15±6.54 | 166.84±5.84 |
| Sex | male | 28 | 26 |
| | female | 13 | 13 |

Mean total serum protein, in group1 was more than group 2 (Table2). (p=0.039)

**Table 2.** Comparison of serum total protein in two groups (gr/dl)

| Time / Group | First week | Second week | Mean |
|---|---|---|---|
| Group one | 3.72 | 3.66 | 3.69 |
| Group two | 3.32 | 3.21 | 3.25 |

Serum albumin level decreased gradually in both groups which was not meaningful but mean albumin level was higher in group 1 than in group 2 which was meaningful (Table 3). (P=0.041)

**Table 3.** Comparison of serum Albumin in two groups (mg/dl)

| Time / Group | First week | Second week | Mean |
|---|---|---|---|
| Group one | 3.78 | 3.45 | 3.62 |
| Group two | 3.31 | 3.22 | 3.26 |

Mean received calorie of the first group was more than group 2. Mean received calorie in group1 during 14 days was 36.07±3.5 Kcal /kg/day while in group 2 it was 30.5±5.4 5 Kcal /kg/day (p=0.013).

Mean received protein of the first group was more than group 2. Mean received protein in group 1 was 1.35±0.5 gr/kg and in group 2 was 0.48±0.18 gr/kg (p=0.001).

Total lymphocyte count was 2073±706 in the first group and 2041±594 in the second group which was not statistically significant (Table 4). (p> 0.05).

**Table 4.** Comparison of serum total lymphocyte count in two groups (mg/dl)

| Time / Group | First week | Second week | Mean |
|---|---|---|---|
| Group one | 2078 | 2212 | 2145 |
| Group two | 2112 | 2195 | 2153 |

Transferrin level in the first group (270.4±33) was more than in the second group (210.4±24.2) (Table 5). (p=0.028).

**Table 5.** Comparison of serum Transferrin in two groups (mg/dl)

| Time / Group | First week | Second week | Mean |
|---|---|---|---|
| Group one | 284 | 269 | 277 |
| Group two | 224 | 206 | 215 |

## DISCUSSION

Patients with multiple traumas are often in catabolic state which may cause multiple organs dysfunction. Malnutrition may impair the patients outcome.

Some clinical and paraclinical parameters have been used to assess nutritional status of patients (11). By using some paraclinical nutritional parameters, we tried to find the better nutritional method. Although we tried to reach to calculated energy and calorie requirements in both groups, but we failed in eternal group and patients with partial parenteral nutrition received more protein and calorie so their total protein, albumin and transferrin were significantly higher than the other group. Some other studies approved this finding too. In 2003, Datta and co-workers reported a steady level of serum protein in partial parenteral nutrition (12). Lapp et al. reported that, TPN inhibited the transferrin decrement in spinal fusion (13). Griffiths and coworkers found that with parenteral-enteral nutrition, there would be less complications in these serum elements and they preserved better (14). In Borzotta study, serum albumin were identical in both groups (enteral and partial parenteral) (15). In our trial, albumin was significantly higher in the first group. This may results from the changes in body water after trauma, long half life of albumin or the differences in the formulas of applied solutions. Generally, it is better to use standard solutions rather than non-standard ones. Non-standard solutions may vary from one hospital to the other. Mokhalalaty in 2004 found, the non standard solutions associated with greater risk of infections and they had even unpredictable formulas (16).

Total lymphocyte count had not significant difference in our study. Total lymphocyte count is one of the parameters for assessing immunological status and in few studies it has been used as a nutritional parameter for nutritional assessment (17, 18). Additionally, some factors such as severe stress, corticosteroid therapy, infections and hematological disorders can deeply influence on this parameter.

Although, we tried to use standard formula, but we used a synthetic one, which was not standard and also, we did not have nasojejunal tube. We did not infuse enteral formula eather, because we did not have special infusion pump. All the above explanations cause difficulties in giving suitable amounts of enteral nutrition factors to patients but, we should have it in mind, that in our country enteral therapies of nutrition have these problems and we are not adequately equipped for academically enteral therapies.

This study demonstrated that with partial parenteral nutrition, we prepare more protein and calorie for multiple trauma patients and it seems that the most important paraclinical nutritional factors will save better.

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