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Research Article

Effects of perioperative parenteral nutrition on wound healing and hospital stay in surgical patients: a randomized controlled study

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ABSTRACT

Background: The present randomized controlled study was carried out over a period of one year to observe the effects of perioperative parenteral nutrition on wound healing and hospital stay.
Methods: Hundred patients, admitted in Department of surgery, Government Medical Srinagar were divided into two groups of 50 each. Group A (Study group) and group B (Control group). Group A patients were given perioperative parenteral nutritional support whereas patients in control group received no perioperatve parenteral nutritional support.
Results: Complications like wound infections, sepsis, abscess formation, anastomotic leak and wound dehiscence were considerably less in the study group. The time period to resolve complications and overall hospital stay was also less in the study group.
Conclusions: Parenteral perioperative nutritional support has a definite role in the management of selected surgical patients. It reduces the septic or non-septic complication and over all post-operative hospital stay. It should be included in the management of surgical patients if affordable.

Keywords: Hospital stay, Morbidity, Mortality, Parenteral nutrition, Wound dehiscence, Wound infection

INTRODUCTION

Food is main concern of mankind, starting from the time of conception and extending through the entire life of individual. It supplies energy for growth, physical activity and other metabolic needs. Adequate nutrition is essential for health and management of disease. The great advantage in looking at malnutrition as a problem in human ecology is that, it allows for a variety of approaches towards prevention. The scientific aspects of nutrition are of interest not only to physiologist and physician, but also have great impact on the outcome of surgical patient.

Before the popularization of parenteral nutrition, however the science of medicine was unable to prevent the fatalities from malnutrition. Patients unable to take enterable nutrition would succumb to this very primitive condition, malnutrition; despite the availability of a variety of modern surgical techniques, instruments and drugs. In surgical practice malnutrition is common, being present before or occurring after operation in about fifty percent of patients.

Simple starvation does not quickly lead to death but, induces a gradual metabolic adaptation. Most patients undergoing elective surgical operations withstand the brief period of catabolism and starvation without undergoing drastic changes in the body. Maintaining

adequate nutritional regimen may be of critical importance in managing a critically ill surgical patient with preexisting weight loss and depleted energy reserve. The selection of patients who require perioperative parenteral nutritional support, partial or complete, has become increasingly important as constraints on hospitalization and management resource escalate. The ability to provide nutritional support to stressed patients and to attenuate the nitrogen loses in catabolic states is an important adjuvant to surgical care of these patients. Specialized nutritional support can be given parenterally, supplemented via peripheral vein or by central venous route.

Aims and objectives of study

1. To correct nutritional status of patients of coming for major surgery and assessing its role in preventing post-operative complications in the form of wound infection, abscess formation, wound dehiscence, anastomotic leak.

2. To compare the results of randomized study with a group of patients who did not receive the parenteral nutritional support.

3. To make an assessment as to the role of nutritional support in surgical patients regarding their hospital stay.

4. To assess the role of nutritional support in decreasing the morbidity and mortality in surgical patients.

METHODS

The present randomized controlled study was conducted on hundred patients, fifty patients as study group and fifty patients as control group, admitted for major surgical interventions in the department of general surgery over a period of one year. Perioperative parenteral nutritional support was given to all patients in the study group. No such parenteral nutritional support was received by patients in the control group. In all patients admitted for the study, a detailed history was taken besides complete nutritional assessment was made 24 hours of admission. The measurements included anthropometrics, weight, height and body mass index was calculated. For the selection patients, the eligibility criteria included weight loss more than 10% over ideal or usual body weight, body mass index <18.8 for males and <18.4 for females, Triceps skin fold thickness <10 mm in males and <13 mm in females, mid arm circumference < 25 cm in males and <23 cm in females. Biochemical criteria included total serum proteins < 6.5 gm/dl, serum albumin <3.5 gm/dl and lymphocyte count <1500/cmm of blood. Parenteral nutritional support preoperative, postoperative or combined, technically and medically feasible with no contraindication in delay of surgery was given to patients included in the study group. Patients included in the control group received no parenteral nutritional support except daily fluid requirement, blood transfusion, vitamin K which ever was found necessary during perioperative period.

For each patient, basal energy expenditure was determined using formula from Harris-Benidict Standard.

For males: 66.47 + 13.75 (weight) + 5.0 (height) - 6.76 (age) Kcal/day.

For females: 65.51 + 9.56 (weight) + 1.85 (height) - 4.68 (age) Kcal /day.

Patients received adequate nutritional support >35 Kcal/day, Proteins >1.5 gm/kg/day preoperatively and was continued post operatively till the patient was on full oral diet. The non-protein caloric support was adjusted to the degree of stress and ranged.

RESULTS

The present study was conducted on 100 patients who were admitted for various major surgical procedures and divided into two groups of 50 each. One group served as control group which received no parenteral nutritional support except normal fluid requirement and blood transfusion whichever was necessary. The study group was put on parenteral nutrition. The base line demographic characteristics of the two groups were compared in terms of age, sex, nutritional status and laboratory parameters including total serum protein, albumin and lymphocyte count with no statistically significant difference at base line (P>0.05).

Complications observed included septic as well as non-septic complications. The former group included wound infection, sepsis, abscess formation and septicemia. Non septic complications included: anastomotic leak, wound infection, dehiscence, acute respiratory distress syndrome and acute renal failure.

In study group total 24 complications occurred in 8 patients out of which 2 were in the form of phlebitis, 5 were wound infections, 7 were sepsis /abscess formation, 1 septicemia, 3 anastomotic leak, 4 wound dehiscence, 1 acute respiratory distress syndrome and 1 acute renal failure.

There were no complications related directly to parenteral nutritional support and no electrolyte or liver function abnormalities occurred. Infusion of solution was well tolerated.

In control group 40 total complications occurred in 15 patients. Out of which 2 were in the form of phlebitis, 9 wound infections, 12 sepsis and abscess formation, 2 septicemia, 6 anastomotic leaks, 8 wound dehiscences, and 1 acute respiratory distress syndrome.

There were three deaths in the study group. One patient died of acute renal failure on the 11th post-operative day following exploratory laparotomy with right hemicolectomy for carcinoma of ascending colon.

Second patient died of septicemia on 25th post-operative day of resection and anastomosis of fecal fistula. Third patient died of acute respiratory syndrome who was a case of corrosive poisoning with multiple upper gastrointestinal fistulas. Patient died on 14th post-operative day of revision surgery.

Mean hospital stay in the control group was 20 ± 11 days with maximum hospital stay of 60 days and minimum of 10 days.

In control group 3 deaths occurred. One patient died of acute respiratory distress syndrome on 10 post-operative day following laparotomy with pancreato duodenectomy for carcinoma head of pancreas. Second patient, who had multiple large gut fistulas, died of septicaemia. Third patient also died of septicemia, the patient had intestinal tuberculosis with multiple fistulas.

The patient died on 15th post-operative day following closure of fistula.

In the control group mean hospital stay was 26.52 ± 13.78 days, maximum hospital stay was 76 days and minimum stay was 10 days. A comparison between study and control group was done for post-operative nutritional status, complications, hospital stay and mortality. The mean change in weight in study group was (-) 0.22 kg where as in the control group it was observed to be (-) 2.24 kg from preoperative weight, the difference was statistically insignificant (P>0.05).

Complications: There was significant clinical improvement in the nutritional status of all patients in the study group. There was improved wound healing and maintenance of body weight in absence of peripheral edema or hyponatremia as compared to control group. Complications occurred in 8 (16%) patients in study group as compared to 15 (30%) patients in control group. There were 24 complications in the study group as compared to 40 complication in the control group and the difference was statistically highly significant (P<0.05). The number of septic complications in the study group was 13 as compared to 23 in the control group and the difference was statistically significant (P<0.05).The total number of non-septic complications in the study group was 11 as compared to 17 in the control group but it was not statistically significant (P>0.05).

Comparing individual complications between the two groups, wound infection occurred in 5 patients in the study group as compared to 9 patients in the control group. Sepsis and abscess formation was seen in 7 patients in the study group as compared to 12 patients in the control group. Anastomotic leak was seen in 3 patients in the study group as compared to 6 in the control group. Wound dehiscence was observed in 4 in the study group as compared to 8 in the control group. Septicemia occurred in 1 patient in the study group as compared to two patients in the control group. Although the rate of non-septic complications was higher in the study group as compared to control group, the difference was not statistically significant.

Three deaths were observed in each group. Mean hospital stay in the study group was 20 ± 11 days as compared to 26.52 ± 13.78 days in the control group and the difference was statistically significant (P<0.05).

DISCUSSION

Evolution of parenteral nutritional support in surgical patients has taken a long flight. The major breakthrough came in 1968, when Dudrick[1] and his colleagues developed intravenous hyperalimentation at the University of Pennsylvania. Improvement in nutrient solutions, equipment and techniques of administration has made parenteral nutritional support technically feasible and relatively safe in immunologically compromised patients. The rationale for the effectiveness of perioperative parenteral nutritional support includes several assumptions. The use of such perioperative treatment requires evidence that protein calorie malnutrition can be accurately defined in the clinical setting and that such malnutrition leads to increased morbidity and mortality or decreased efficacy of therapy.

Studley[2] (1936) and Rhoads and Alexander (1950)[3] made some pioneering observations relating malnutrition with poor surgical outcome. They introduced the concept that some post-operative complications may be related to prior malnutrition and malnourished patients could not cope up with post-operative complications, particularly infection as effectively as well nourished. Seltzer et al. (1982),[4] reported weight loss of more than 4.5 kg as a predictor of high surgical mortality. Mughal and Muguid (1987)[5] are also of the same opinion.

In the present study all patients had a weight loss of more than 10% of the body weight from expected standard weight, but the mortality was same (6%) in each group. Thus the observations made in our present study were discordant with the results of earlier studies,[4,5] possibly because of small sample size in our study.

Ballantone et al. (1988)[6] observed same mortality as in the present study. Similar results have been reported in several other studies by Fan et al. (1989),[7] Figueras et al. (1988),[8] and Veterans Affairs (1991).[9]

Numerous studies have documented the feasibility and safety of perioperative parenteral nutritional support as an adjunct to surgical treatment of diseases, head and neck (Law et al. 1973),[10] esophagus (Conti et al. 1977),[11] stomach and pancreatico-biliary system (Deitil 1978).[12]

They demonstrated improved nutritional status in total parenteral nutritional support treated patients and low morbidity and mortality as compared to controls.

In the present study we observed significant subjective improvement in the parenteral nutritional support treated group as compared to control group. Although the patients in the study group did not gain weight but preoperative weight was maintained as compared to control group in which weight loss was statistically significant. Complications occurred in 16% of patients in the study group as compared to 30% of patients in the control group and the difference was statistically significant.

Neumann et al. (1975)[13] and Yamada et al. (1983)[14] while evaluating the role of parenteral nutrition in gastric surgery observed that perioperative parenteral nutrition is associated with less infectious complications. In our study, 13 septic complications occurred in the form of wound infection, sepsis/abscess formation and septicemia as compared to 23 in the control group and the difference was statistically significant. Our observations were also consistent with those reported by Mullen et al. (1979)[15] in a series of 145 patients where 50 were taken as study group and 95 served as control group. Our observations were also concordant with those made by Williams et al. (1976),[16] Hotler and Fischer (1977),[17] Bellantone et al. (1988)[18] and Muller et al. (1982)[19]

Sandstrom et al (1993),[20] in a series of 300 patients treated with post-operative parenteral nutritional support for 14 days, with lipids as chief source of energy observed no difference in the mortality rate in these patients. Similar results were observed by Freund et al (1979).[21] Collins et al. (1978),[22] in his study of parenteral nutritional support on colorectal surgery patients observed a significantly better wound healing, less anastomotic leaks and shorter length of hospital stay in study group than in control group.

In accordance with the above study, in our study rate of complications was considerably less in the study group. Wound infection was seem in (5 verses 9), wound dehiscence (4 verses 8), anastomotic leak (3 verses). Mean hospital stay in the study group patients was 20 ± 11 days as compared to 26 ± 13 days in the control group patients and the difference was statistically significant.

A meta-analysis of 26 randomized controlled studies by Heyland et al. 1998)[23] involving 2211 patients revealed that the complication rate was more in control group of patients than the study group, however the mortality was same. Our results are in accordance with the above study.

Similar results were also observed by Freund et al. (1979),[21] Woolfson and smith (1989),[24] however the hospital stay was short as compared to the present study. Von Meyenfeldt et al. (1992)[25] in his study observed length of hospital stay more in the study group compared to control group (36 ± 17 verses 32 ± 22).

CONCLUSION

The present randomized controlled study was conducted on 100 patients, 50 patients as study group and 50 as control group, admitted for major surgical procedures. In the study group parenteral nutritional support was given whereas no such support was provided to the patients in control group. At the end of study following conclusions were drawn:

1. There was significant subjective clinical improvement in the nutritional status of patients in the study group. Although patients did not gain weight but the preoperative weight was maintained. In the control group there was significant weight loss from the preoperative weight.

2. Complications occurred in the both groups of patients in the form of septic as well as non-septic complications. However they occurred considerably less in the study group as compared to control group. More-ever the time period for a complication to resolve was less in the study group as compared to control group. All complications including wound infection, sepsis, abscess formation, anastomotic leak and wound dehiscence was considerably less in the study group than control group.

3. Overall length of hospital stay was also less in the study group than controls.

4. Although mortality was same in the two groups of patients, the overall well-being of patients was worth consideration in the study group.

5. From the present study it seems reasonably clear that on admission a group of high risk patients can be identified and correction of malnutrition by adequate parenteral nutritional support is effective in reducing morbidity in a heterogeneous group of patients.

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