Impact Of Substrate-Enriched Kitchen-Based Protein Rich

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Polymeric Enteral Diets with Enteral Glutamine

On the Surgical Gastrointestinal Patients

Summary of Ph.D. Thesis

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IMPACT OF SUBSTRATE-ENRICHED KITCHEN-BASED PROTEIN RICH POLYMERIC ENTERAL DIETS WITH ENTERAL GLUFAMINE ON THE SURGICAL GASTROINTESTINAL PATIENTS [SUMMARY]

The science and art of human nutrition focus on nourishing human life, so indispensable to provide energy to human body in order to carry out all vital physiological functions as well as to support all their physical activities. They must constantly replenish those energy needs with food to sustain physical life. All food supplies nutrients, the basic currency of nutrition, which is the chemical compounds or elements taking part in the biochemical processes in the body for energy generation. Normal functioning of the gastrointestinal tract is essential for normal digestion, nutrient absorption and egestion, from food - the biochemical processes to accomplish energy generation for the body. The digestion tract constitutes an interface between the outer environment, represented by the lumen and rest of the body. It plays an important role in the metabolism of energy and protein because of its anatomical and functional characteristics. Among its main tasks are the digestion of large molecules of foodstuffs into smaller, simpler ones that can be absorbed by the enterocytes. During this process the macromolecules lose their immunologic identity.

This marvelous gastrointestinal pathway can also impair nutritional status in a variety of situations depending on the sites, nature and extent of disease and injury which is profoundly seen inpatients suffering from GI diseases or undergoing GI surgical procedures. During diseased condition this process is affected more as there is always some degree of metabolic disturbance during any illness, however, simple may it be. The metabolic stress occurs automatically in the ill patients which is a general rule as patients rapidly shift from a 'anabolic state' of storing protein, fat and glycogen to a 'catabolic stage' of mobilising these nutrients for energy utilisation. If this process (or both) that cause protein wasting will surely increase morbidity and mortality.

Because there is no protein storage pool, proteins that serve vital roles are catabolised when the body is faced with a need for additional fuel expenditure. Subsequently the body replaces previously sacrificed protein during periods of calorie/nitrogen surfeit, thereby keeping a delicate and dynamic protein balance that maintain homeostasis in the face of environmental challenge. Many diseases can decrease protein synthesis and /or enhance protein degradation, causing negative protein balance. Even when a person becomes ill for prolonged time they shift to a hypermetabolic state and get nutritionally depleted very fast. The early nutritional intervention in such cases is primarily aimed at sustaining vital organ structure and immunofunction ameliorating the catabolic effects of critical illness and promoting recovery without causing further metabolic derangement.

Even situations when such a patient is sure to undergo surgery, peri-operative malnutrition is often associated with poor post - operative outcome. Prompt attention to nutritional status is a primary task so as to fortify the patients' for the demands of surgery. Such peri-operative nutrient deficiency correction should not only provide reserve for surgery itself but also provide reserve for post-operative period. At the same time it is also equally important to take utmost care for post-operative nutrition of the patient to withstand the likely developed stress due to post-operative complicacies and ultimate quick recovery. Starvation is followed by atrophy of the intestinal wall especially of the mucosa and similar changes occur during exclusive feeding by the parenteral route. Reversal of the atrophy is accomplished only by nutrients administered by the enteral route. New strategies for immunonutritional support include administration of special nutrients such as glutamine. Although glutamine constitutes the largest labile store of nitrogen in the body, storage is not the true fate of intracellular glutamine. Instead glutamine is an essential part of the cell: increasing evidence suggests that this aminoacid plays a crucial role in osmotic regulation of cell volume and cause phosphorylation of proteins, both of which may stimulate intracellular protein synthesis. Though glutamine is absent from the conventional regime and aimed at nutritional support deficiency can occur during periods of metabolic stress reported that clinical trials conducted in the stressed patients indicate that glutamine improved nitrogen balance, increases cellular proliferation, decrease incidence of infection and shortens hospital stay in catabolic patients.

Based on the above knowledge present study with the title "Impact of substrateenriched kitchen-based protein rich polymeric enteral diets with enteral glutamine on the surgical gastrointestinal patients" was carried between the year 2003 - 2006. This study was done based on results obtained from the survey done (Section I) with the retrospective records of the patients admitted in the ICU of the hospital named as A, B and C in order to understand the prevalence pattern of different diseased patients admitted into the hospitals. The information collected on the admitted patients of the hospitals included patients registration number, name, age, sex, diagnosis of the ailments, date of admission and date of release or expire. It may be noted that the number of patients in any hospital, during the period of observation do not reflect the total number of patients of all ICUs of the concerned hospitals but only the critically ill patients permitted to consult by the hospital as well as on the accessibility into the ICU records made available by the hospital administration. Studies conducted over 1002 patients showed that the male patients in each hospital were more than double of the females. The average age of the patients was 50.08 years among the three hospitals. Due to modern lifestyle cardiac diseases have occupied a major place in the medical world and incidentally, maximum number of 367 patients suffering exclusively of cardiac diseases were found in B and C hospitals

Even gastrointestinal diseases were identified as the second most prevalent diseases in Ahmedabad next to cardiac diseases. There were 41 different gastrointestinal complications of which calculus cholecystitis, hemorrhoids and exploratory laparotomy were common. Since, the research work on enteral feeding supplementation will exclude critically ill patients suffering from cardiac and renal complicacies, it was decided to work with the gastrointestinal patients, which was the second most prominent disease visualised by the survey of the hospitals. Moreover, gastrointestinal patients were found in varying proportion all the three hospitals surveyed.

Further study (Section II) was carried out to study the impact and efficacy between two polymeric kitchen based enteral feeds with sources of protein from soy (*EnS*) or milk (*EnM*) and compared with routine hospital diet (*EnR*). Subjects were carefully matched for their age, demographic profile and the disease they suffered from. NRI score rated 58.9 % patients as severely malnourished with a mean weight loss of >10 % UBW among 57.0 % patients. Average preoperative nutrient intake (calorie and protein) was found significantly low feeding for the three study groups as compared to their

requirements. Post-operative intake was significantly low in Eng. study whereas a significant better intake was found in EnS study group. Comparison between the Sm subcategories in the three study groups showed that Sm subcategory of EnS and EnM study groups during post-operative stage had significantly better intake of protein as compared to Sm subcategory of EnR study group. Comparison between pre-operative and post-operative intake revealed that energy intake in EnS and EnM study groups were much better in post-operative EN stage compared to pre-operative stage. Protein intake was found to be significantly higher in post-operative EN stage in EnS and EnM study groups. The incidence of feed related complications was higher in the enteral fed patients of EnR compared to patients of EnM and EnS. Impacts of diets on biochemical profile, weight loss/gain and length of stay were observed. The hemoglobin level did not alter much in all the three study groups. Comparisons between the groups showed a significant improvement in total protein and albumin in EnS and EnM study groups. Sm subcategory in general for the three study groups in general, showed improvement in total protein and albumin levels. Sm subcategory of EnS study group had significant improvement in total protein compared to subcategory of EnR study group. Overall a mean weight loss of 8.66 % was observed for EnR study group, whereas a weight gain of 3.98 % could be observed for EnS study group whereas, a weight loss of only 0.02 % could be noted for EnM study group. An average total stay up to EN stage was longer for EnR study group (22.4 days) whereas, EnS study group had shorter stay by 5.9 days.

Section III of study dealt gastrosurgical patients (n = 45) with carefully matched age, demographic profile and diseases they suffered from. The impact and efficacy between two polymeric kitchen based enteral feeds with sources of protein from soy (*GEnS*) or milk (*GEnM*) and compared with routine hospital diet (*GEnR*). The substrates of each EN diets including routine hospital diets were enriched with glutamine (0.3 gKg⁻¹ body weight). Here, NRI categorised 58.9 % of the enrolled patients as severely malnourished with an average of 35.6 % patients losing weight >10 %UBW. *Preoperative nutrient* intake in general for the study groups (*GEnR*, *GEnS*, *GEnM*) were adequate in calories but protein intake was found to be significantly low as compared to their requirements. During post-operative EN stage the calorie and protein intake by *GEnR* study groups as compared to their requirement. Further, *comparison between*

pre-operative and post-operative intake revealed that energy and protein intakes of GEnR study group was significantly low whereas, protein intake was found to be higher in GEnS and GEnM study groups. Further, subgroup analysis showed that the subcategories of the GEnR study group recorded considerably lower intakes of energy and protein by all the three subcategories. Comparisons among the study groups with respect to adequacies of post-operative intake further reflected that calorie and protein intakes were significantly higher in GEnS and GEnM study groups compared to GEnR study group. However, protein intake in Sm subcategory was found significantly higher only in GEnM study group compared to Sm subcategory of GEnR study group. The incidence of feed related complications was higher in the enteral fed patients of GEnR compared to patients of GEnM and GEnS. Impacts of diets on biochemical profile, weight loss/gain and length of stay were observed. In the post-operative stage, hemoglobin levels did not alter much in all the three study groups except GEnS. Comparisons between the groups showed a significant improvement in total protein and albumin levels in GEnS and total protein level in GEnM study groups. Sm subcategory in general for GEnS and GEnM study groups in general, showed improvement in total protein and albumin levels and Wn subcategory had improvement in albumin level. patients registered loss of weight in GEnR study group 2.34 % whereas, in case of GEnS and GEnM study groups, a significant increase in weight (GEnS: 3.87 %; GEnM: 2.56 %) was observed during discharge as compared to the weight recorded at the time of admission. In general, weight loss was noted in all the subcategories of GEnR study group. A significant longer stay upto EN was noted in GEnR study group (18.7days) with respect to total number days, by 14.5 days in GEnS and 14.4 days in GEnM study groups, respectively.

Impact of with (*GEnR*, *GEnS GEnM*) (Or) without (*EnR*, *EnS EnM*) glutamine supplementation between study groups and comparison among the groups in overall improvement in biochemical outcome clearly revealed that *higher percentage of patients in EnS study group* [TP : 52.4 %; Alb : 66.7 %] *had upward trend in total protein and albumin level but still a much better results were elicitated by patients in GEnS group* [TP: 93.3 %; Alb : 86.7 %]. *Even percent of patients with a downward trend in total protein and albumin levels were low in GEnS compared to other study groups*

Cost:

Enteral nutrition therapy is considered a costly affair in general medical practice as a part of nutrition support by most of the hospitals of Ahmedabad. On careful analysis it can be seen that patient being deprived of the good nutrition during diseased and surgical process often add an extra stay in the hospital. Moreover as basic commercial diets are not being able to afford by the common people it is beyond imagination that patients will be in a state to make use of commercial immune enhancing diets which are generally expensive. Moreover various clinical studies suggest a reduction in hospital stay and thereby reduction in cost for the patients on immunonutrition. It must be also remembered that their use should be disease specific and also based on degree of malnutrition. In the present study, we tried to do substrate enrichment with glutamine to the already tried formulas in Section II. The product was less expensive compared to the immunoenhancing formulas present in the market. The impact of the Kitchen based polymeric protein rich enteral diets and even enriched with enteral glutamine had showed a positive trend for improvement in outcomes in general, though degree of improvement varied with the quality of protein used. Thus it can be concluded that use of such formulas which can also be prepared at the kitchen at a lower cost should be considered as a regular practice. This will be benefit for the patients and hospitals with a smaller budget.

Conclusion:

Despite profound advances in anesthesia care, feeding techniques, and drug development, the catabolic response to injury still represents a metabolic phenomenon in surgical patients, which deserves the attention of clinicians and researchers. Although there is evidence that single pharmacological interventions are able to modulate protein catabolism, nitrogen losses following surgery cannot be completely suppressed and organ function promptly restored. We believe that multimodal approaches combining analgesic, anesthetic and surgical strategies with the provision of specific nutrients and anabolic agents hold great promise for not only reducing the loss of body protein, but also for accelerating recovery, shortening the length of hospitalisation, and reducing convalescence resulting in a major improvement in clinical outcome