Current Literature

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Hypocaloric Total Parenteral Nutrition: Effectiveness in Prevention of Hyperglycemia and Infectious Complications—A Randomized Clinical Trial

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ABSTRACT: *Objective:* To determine whether the frequency rate of hyperglycemia and infectious complications can be reduced by an underfeeding strategy in patients requiring total parenteral nutrition (TPN), without deleterious effects on nitrogen balance. *Design:* Prospective, randomized, controlled nonblinded trial. *Setting:* A university-affiliated teaching hospital with a dedicated TPN service. *Patients:* TPN was initiated in 40 adult patients and continued for 5 days. *Intervention:* Two different TPN feeding strategies were compared: hypocaloric feeding (1 L containing 70 g protein and 1000 kcal) and standard weight-based regimen, begun in similar amounts initially, but advanced in increments towards 25 kcal and 1.5 g protein/kg dry (or adjusted ideal) weight. *Measurements and Main Results:* We evaluated the frequency rate of hyperglycemia, average blood glucose, numbers and types of infections while receiving nutritional support, and nitrogen balance after 5 days of TPN. There were significant differences between the quantities of calories, dextrose, fat, and protein provided to the two groups. However, average blood glucose, frequency rate of hyperglycemia, and infection rates (from intra-venous catheter, pneumonia, and wound/abdominal collection) were similar in each group. The control group showed a trend towards a higher insulin requirement. Nitrogen balance, only available as a subset, was significantly more negative in the hypocaloric group. *Conclusions:* Provision of TPN to a goal of 25 kcal/kg was not associated with more hyperglycemia or infections than a deliberate underfeeding strategy. A regimen of 1.5 g/kg protein in conjunction with 25 kcal/kg did, however, provide significant nutritional benefit in terms of nitrogen balance in comparison with hypocaloric TPN. (Crit Care Med 28:3606–3611, 2000)

COMMENT: Hypocaloric high protein/low calorie parenteral nutrition (PN) has been used in obese patients to avoid overfeeding while achieving net protein anabolism.

This prospective, randomized study compared the hypocaloric *vs* standard PN effects on hyperglycemia, infection rate, and nitrogen balance. Forty adult patients were randomized to receive daily PN for 5 to 10 days as either standard (20–25 kcal/kg, amino acids 1.5 g/kg, lipids up to one-third of total calories) or hypocaloric PN (dextrose 210 g, amino acids 70 g). During the course of PN, hyperglycemia was defined as capillary glucose concentrations >220 mg/dL, and infections were defined as pneumonia, wound, abdominal, and catheter-related infections. Nitrogen balance was estimated by measuring urine urea nitrogen.

Over the study period, fewer daily average calories (14 *vs* 18 kcal/kg), dextrose (187 ± 26 *vs* 225 ± 41 g), and protein (70 ± 0.2 *vs* 89 ± 13 g) were provided in the hypocaloric than in the control group, respectively. Study findings showed no significant differences between the two groups in average blood glucose concentrations, frequency of hyperglycemia, or infection rate. Mean nitrogen balance was more negative in the hypocaloric group.

Study limitations include: (1) a small study group that may not have allowed observing any differences; (2) nitrogen balance that was measured in a subset of patients; (3) randomization bias that may have occurred as more patients in the hypocaloric group had pancreatitis and were on mechanical ventilation than in the control group; and (4) lipids that were not part of the hypocaloric regimen, which otherwise might have had additional protein-sparing effects and improved nitrogen balance.

This study failed to show the advantages of hypocaloric PN over standard PN on nitrogen balance. Only 8 patients in this study were reported as obese with a BMI ≥30. Although in other studies a positive nitrogen balance was achieved in obese hospitalized patients who received hypocaloric PN, large studies are needed to assess the safety and efficacy of hypocaloric feeding in non-obese patients. Net protein catabolism is difficult to prevent during the systemic inflammatory response in stressed hospitalized patients. To prevent PN-associated hyperglycemia and its consequences in adult patients, avoid overfeeding, provide a balanced source of energy substrates, and limit dextrose infusion rate to ≤4 mg/kg per minute with insulin administration if necessary.

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Evaluation of an Antiseptic Triple-lumen Catheter in an Intensive Care Unit

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ABSTRACT: *Objective:* To evaluate a decrease in catheter-related bloodstream infection rate in patients with antiseptic triple-lumen catheters in an intensive care unit. *Data Sources:* Retrospective review of surveillance records, patient medical records, laboratory and microbiological reports, and antibiotic administration records. *Study Selection:* Patients admitted to the intensive care unit with triple-lumen catheters. *Data Extraction:* A subset of one entry per patient was extracted from 2 years of primary bloodstream infection surveillance data. Data collection included risk factors, laboratory and microbiological data, and insertion sites and dates of all intravascular catheters present during triple-lumen catheterization. *Data Synthesis:* The catheter-related bloodstream infection rate was 5.4 and 11.3 per 1000 catheter days in antiseptic and nonantiseptic triple-lumen catheter groups, respectively ($p = .06$). By multivariate analysis using a Cox Proportional Hazards Model, the antiseptic triple-lumen

catheters were associated with a significant reduction in catheter-related bloodstream infection (p = .03). Model expansion to include intrajugular site was significant by a likelihood ratio test [2(log likelihood diff) = 4.26 P < .05 $\chi^2(1)$] *Conclusions:* The use of antiseptic triple-lumen catheters may substantially reduce catheter-related bloodstream infections in an intensive care population and may be subsequently associated with a decrease in length of stay. (Crit Care Med 28:366–370, 2000)

COMMENT: It is estimated that 5 million central venous catheters (CVCs) are placed yearly in patients in the U.S. with 2% to 19% of these patients developing a catheter related bloodstream infection (CR-BSI). Approximately 80,000 CR-BSIs occur in ICUs each year in the United States, increasing patient hospitalization/costs and with an attributed mortality ranging from 12% to 25%.

The authors of this well-designed study report that the use of an antiseptic (silver sulfadiazine/chlorhexidine) triple lumen catheter was effective at reducing the rate of CR-BSI within an ICU patient population, 5.4 per 1000 catheter days compared with nonantiseptic triple lumen devices, 11.3 per 1000 catheter days. Whereas the results did not achieve statistical significance (p = .06), the study clearly indicates that use of antiseptic CVCs decreases the risk of nosocomial bloodstream infection in the ICU high-risk patient population. A secondary finding of the study suggests that an antiseptic impregnated CVC may decrease the risk of CR-BSI at the intrajugular site, which has been traditionally associated with a higher rate of infection than the subclavian site.

Several studies have appeared in the literature supporting the use of antiseptic impregnated CVCs in high-risk patient populations. The present study found that the maximal benefit derived from use of an antiseptic impregnated device occurs between day 5 and day 14. This finding by the authors suggests the importance of identifying sentinel risk factors because not all patients are equally at risk for CR-BSI, thereby deriving minimal benefit from the use of this new (expensive) technology.

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Randomised Controlled Trial of Oral Vitamin A Supplementation in Preterm Infants to Prevent Chronic Lung Disease

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ABSTRACT: *Background:* Intramuscular supplementation with vitamin A in large doses may reduce the incidence of chronic lung disease. *Aim:* To investigate whether oral supplementation with vitamin A would reduce the incidence of chronic lung disease in a group of extremely low birthweight infants. *Methods:* Infants with birth weight <1000 g were randomized at birth to receive oral vitamin A supplementation (5000 IU/day) or placebo for 28 days. The primary outcome was oxygen dependency at 28 days of age or death. *Results:* A total of 154 infants were randomized; 77 received vitamin A (median birth weight [interquartile range] 806 [710–890] g), and 77 received placebo (median birth weight [interquartile range] 782 [662–880] g). Plasma vitamin A concentrations in the supplemented group were significantly higher at 24 hours of age but did not differ significantly at birth, 12 hours of age, 7 days, or 28 days of life. There were no significant differences in the proportion of infants who survived, required oxygen at 28 days, required oxygen at 36 weeks postmenstrual age, survived without chronic lung disease at 36 weeks, survived without significant retinopathy, or who survived without significant intraventricular haemorrhage. *Conclusions:* Oral supplementation with 5000 IU vitamin A in extremely low birthweight infants does not significantly alter the incidence of chronic lung disease. However, this dose may have been inadequate to achieve optimal serum retinol concentrations. (Arch of Dis Child Fetal Neonatal Ed 84:F9-F13, 2001).

COMMENT: Vitamin A maintains epithelial cells and has an important role in the immune system. Preterm infants have a propensity to develop chronic lung disease and studies of vitamin A supplementation in preterm infants have demonstrated a protective effect. However, all of these studies utilized intramuscular administration. The present study attempted to take a kinder approach and utilize an oral vitamin A supplement. Unfortunately, this study found no protective effect from the oral vitamin A supplementation. This is not surprising as the infants given oral vitamin A did not achieve a sustained increase in their circulating retinol levels. The knowledge to be gained from this study is *not* that vitamin A has no effect on the lungs of premature infants, but that an oral dose of 5000 IU of vitamin A is inadequate to sustain an increase in circulating retinol levels. This implies that to achieve an increase in vitamin A levels, either a larger oral dose must be tested or it must be administered systemically.

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Acute Effects of Different Nutritional Supplements on Symptoms and Functional Capacity in Patients with Chronic Obstructive Pulmonary Disease

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ABSTRACT: *Background:* Use of nutritional supplements in depleted patients with chronic obstructive pulmonary disease (COPD) requires optimization between positive effects on outcome and potential acute adverse effects on metabolism and exercise performance. *Objective:* The aim of this study was to investigate the acute effects of nutritional supplements on metabolism and exercise capacity in stable COPD patients. *Design:* In part 1, the effects of 3 different energy loads (placebo, 1046 kJ, and 2092 kJ) with a normal distribution of macronutrients were investigated in 14 COPD patients. In part 2, the effects of a fat-rich compared with a carbohydrate-rich supplement (both 1046 kJ) were studied in 11 COPD patients. The study was performed in a randomized, double-blind, crossover fashion. Metabolic and ventilatory variables were measured postprandially and during a submaximal cycle endurance exercise test. *Results:* Overall, no immediate negative effects of the supplements were found in part 1. A slight but significant postprandial increase in respiratory quotient was found after the 1046-kJ and 2092-kJ supplements compared with placebo. There was no significant difference in metabolism or exercise capacity after a fat-rich or carbohydrate-rich supplement. Surprisingly, the change in shortness of breath (postprandial compared with preprandial) was significantly greater after the fat-rich supplement. *Conclusions:* An energy load up to 2092 kJ had no adverse immediate effect in COPD patients compared with placebo. The subjects who con-

sumed the fat-rich supplement experienced more shortness of breath than did the subjects who consumed the carbohydrate-rich supplement. (Am J Clin Nut 73: 295–301, 2001)

COMMENT: Epidemiologic studies indicate that the prognosis for malnourished patients with COPD is worse than their well-nourished counterparts. The focus of nutritional care for patients with COPD is maintenance of an acceptable weight for height.[1,2] Evidence of low weight for height, despite reported calorie intake of 156% to 162% of resting energy expenditure supports the observation of increased oxygen (O_2) consumption in COPD patients.[3]

The researchers in this study examined the effects of nutrient dense supplements *vs* standard caloric supplement and high fat *vs* high carbohydrate (CHO) supplement on the acute changes in lung function. This adds another perspective to the cannon of literature regarding nutritional requirements for patients with COPD.

Study results indicated the oral supplement with an energy content of 1046 kJ is preferable when compared with an energy load of 2092 kJ. The CHO-rich supplement produced optimal effect on lung function and less shortness of breath (SOB), and the high-fat supplement was associated with a higher level of dyspnea. According to Wilson et al,[1] because COPD patients have limited ventilatory reserve, it may be expected that a high CHO diet would produce more carbon dioxide (CO_2) for each mole of O_2 consumed for energy requirements. The authors in this study found that the patients who consumed the CHO rich supplement exhibited a higher respiratory quotient due to increased carbon dioxide production instead of decreased oxygen consumption. They theorize that this may be attributed to more efficient metabolism.

The overall conclusion is that contrary to current beliefs, CHO rich supplements do not have an adverse effect on acute lung function. In fact, the authors went one step further to suggest that similar to the findings in the Sports Medicine literature, high CHO supplements are actually beneficial to lung function.

One concern, is the ability of practitioners to replicate this administration regimen under conditions of normal daily clinical practice. It is difficult or near impossible to administer supplements to a patient in 5 minutes and to get them to exercise after 30 minutes. We believe that the most important clinical finding of the study is the reduced endurance capacity exhibited by patients with decreased body mass index when given the nutrient dense formula (2092 kJ). Further research is definitely needed on appropriate nutrient requirements of COPD patients with low body mass index. It also indicates that clinicians should be cautious with nutrient dense supplementation, and should err on the side of standard caloric-balanced supplements. It is our experience that patients with COPD respond optimally to supplements or tube feedings with a balanced macronutrient profile, compared with supplements that provide excessive amount of fat or carbohydrates.

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