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SUCCESSFUL NUTRITIONAL INTERVENTION ON SEVERE BURNS PATIENT - A CASE REPORT (CHEMICAL BLAST INJURY) (FOLLOW-UP FOR MORE THAN ONE YEAR)

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Abstract— Major burns lead to a hyper metabolic state that is more severe than any other disease or injury. Major burns increase the metabolic requirements of the body and due to severe catabolism can lead to severe loss of body weight, muscle loss, increased risk of infection, protein loss and mortality. Therefore, Careful nutritional assessment, adequate and timely provision of medical nutrition therapy is an essential component to meet the nutritional requirements in critically ill burn patient to reduce infection, recovery, long-term results and clinical outcomes. This case study focuses on aggressive nutritional care of adults with major burns.

***Index Terms*— Chemical burns, Total body surface area, Metabolism, Malnutrition, Medical nutritional therapy.**

I. INTRODUCTION

A burn is an injury to skin, or other tissues, caused by heat, cold, electricity, chemicals, friction, or ionizing radiation. Burning is the major cause of disability and deformation. Worldwide burn is found as very general and unique cause of suicide and homicide. Major burns lead to a hyper metabolic state that is more severe than any other disease or injury. Major burns increase the metabolic requirements of the body and due to severe catabolism can lead to severe loss of body weight, muscle loss,

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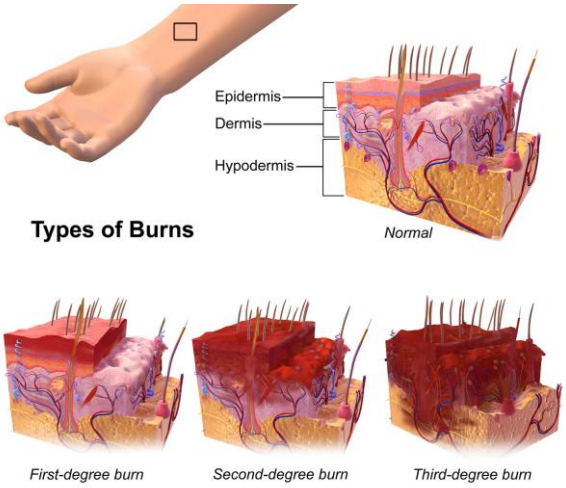
increased risk of infection, protein loss and mortality. Major burn patients are first of all critically ill. By default general ICU recommendations apply.



- **Mild: 10%**
- **Moderate: 10-30%**
- **Severe: >30%**
- **Hospitalization for > 10% of body surface area**

To calculate the percentage of burns, doctors typically use the Rule of Nines for adults and the Lend-Browder chart for children. The gastrointestinal tract is particularly at risk during the early burn resuscitation phase due to the major stress resulting from burn injuries and from the treatment required to maintain life. The fluid resuscitation causes generalized edema, including in the gut, contributing to the development of a paralytic ileus in case the gastrointestinal tract is not used early on. Patients with severe burn injuries develop an important and prolonged hyper-metabolic response, grossly proportional to the severity of the injury. Metabolic rates may exceed depending on factors that include total body surface area (TBSA) injured, body mass, age, and time injury.

The Curreri Formula is a commonly used method for estimating energy needs in burn patients, especially those with significant burns. The energy requirements after major burns are significantly increased above basal resting energy expenditure. Patients with major burns appear to be as sensitive to overfeeding as other critically ill patients. The goals of nutrition support are to maintain and improve organ function and prevent protein-calorie malnutrition. The composition of the nutritional supplement is also important. The major energy source for burn patients should be carbohydrates. Glucose is the preferred fuel for healing wounds. The major complication of carbohydrates feeding under stress is glucose intolerance. Aggressive control of hyperglycemia is emerging as a critically important aspect of optimal patient care.

Glutamine is an amino-acid becoming conditionally essential for burn patients. Glutamine supplementation in burned adult improved glutamine levels, promoted protein synthesis, improved wound healing, and shortened hospital stay. Arginine is also important in post-burn metabolism. Arginine stimulates T-lymphocytes, enhances natural killer cell function, and stimulates synthesis of nitric oxide, which is important is resistance to infection. Lipids are an excellent source of calories at 9 k cal/g. Essential fatty acid linoleic acid provides important components for cellular membranes and for prostaglandin synthesis. Another important fatty acid is the omega-3 fatty acid. This fatty acid is important the immune response and in tube-feeding tolerance. Lipids such as fish oil containing a high proportion of omega-3 fatty acids are metabolized without elaborating pro-inflammatory compounds. Diet high in omega-3 fatty acids have been associated with improved immune response, possible improved outcomes and may reduce problems with hyperglycemia.

Patients with major burns have increased micro-nutrients requirements (i.e. trace elements and vitamins) due to their hyper-metabolic response, to their wound healing requirements and to the important cutaneous exudative losses which characterize burns with open wounds. Nutritional and metabolic problems related to burn injury require the early implementation of complementary strategies. Nutritional therapy in severe burns has evidence-based specificity that contribute to improve clinical outcomes.

II. LITERARURE

Anne-Françoise Rousseau a , Marie-Reine Losser b , Carole Ichai c , Mette M. Berger d* (17 February 2013) conducted the study on an nutrition therapy in major burns (ESPEN endorsed recommendations). Nutrition therapy is a cornerstone of burn care from the early resuscitation phase until the end of rehabilitation. A group of burn specialists used the GRADE methodology (Grade of Recommendation, Assessment, Development and Evaluation) to evaluate human burn clinical trials between 1979 and 2011. The resulting recommendations, strong suggestions or suggestions were then rated by the non-burn specialized experts according to their agreement (strong, moderate or weak). Eight major recommendations were made. Strong recommendations were made regarding, 1) early enteral feeding, 2) the elevated

protein requirements (1.5e2 g/kg in adults, 3 g/kg in children), 3) the limitation of glucose delivery to a maximum of 55% of energy and 5 mg/kg/h associated with moderate blood glucose (target 8 mmol/l) control by means of continuous infusion, 4) to associated trace element and vitamin substitution early on, and 5) to use non-nutritional strategies to attenuate hyper-metabolism by pharmacological (propranolol, oxandrolone) and physical tools (early surgery and thermo-neutral room) during the first weeks after injury. Suggestion were made in absence of indirect calorimetry, to use of the Toronto equation for energy requirement determination (risk of overfeeding), and to maintain fat administration 30% of total energy delivery. The nutritional therapy in major burns has evidence-based specificities that contribute to improve clinical outcome.

Audra Clark , Jonathan Imran , Tarik Madni , Steven E. Wolf (17 April 2017) conducted the study on an nutrition and metabolism in burns patient. Severe burn causes significant metabolic derangements that make nutritional support uniquely important and challenging for burned patients. Burn injury causes a persistent and prolonged hyper-metabolic state and increased catabolism that results in increased muscle wasting and cachexia. Metabolic rates of burn patients can surpass twice normal, and failure to fulfill these energy requirements causes impaired wound healing, organ dysfunction, and susceptibility to infection. Adequate assessment and provision of nutritional needs is imperative to care for these patients. There is no consensus regarding the optimal timing, route, amount, and composition of nutritional support for burn patients, but most clinicians advocate for early enteral nutrition with high-carbohydrate formulas. Nutritional support must be individualized, monitored, and adjusted throughout recovery. Further investigation is needed regarding optimal nutritional support and accurate nutritional endpoints and goals.

Seolbin Kim (Feb 05, 2025) was conducted a study on nutritional management in severe burn patients a case report. Patients with severe burns frequently experience inadequate nutrition due to hyper-metabolism and its associated complications, substantially increasing the risk of malnutrition. This case report describes the nutritional intervention for a 54-year-old male patient admitted with total body surface area burns of 42.4%, including 15% third-degree burns caused by flames. It highlights the importance of active nutritional support and continuous monitoring

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during the management of complex burn cases. Upon admission, the patient's nutritional intake was restricted due to fluid resuscitation, frequent surgeries requiring fasting, renal dysfunction, and gastrointestinal complications. Nutritional requirements were calculated using the Harris-Benedict and Toronto equations; however, it was difficult to meet the targeted nutritional demands during the initial Nutrition Support Team (NST) consultation due to renal dysfunction and hemodynamic instability. Subsequent efforts, including oral nutritional supplements and adjunctive Parentral nutrition, were implemented; however, multi-factorial issues, such as systemic deterioration and complications, further exacerbated the patient's nutritional status. As a result, the patient experienced a 15% reduction in his usual body weight, decreasing from 100 kg to 85 kg. This case underscores the vital role of proactive NST involvement and ongoing nutritional intervention in the management of patients with severe burns and complex complications.

Materials	
ANTHROPOMETRIC DATA	
Weight	**46 kg (On admission)**

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Height	**165 cms**
BMI	**16.9kg/m^2**
Ideal body weight (Formula: Height in m^2*22)	**60 kg**

Yong Suk Cho was conducted a study on Nutrition therapy in major burns (August 30, 2014). Major burns lead to a hyper-metabolic response that is more dramatic than that observed in any other disease or injury. In addition, major burns increase the metabolic demands of the body and can lead to severe loss of body weight and increased risk of mortality. The hyper-metabolic response is accompanied by severe catabolism and a loss of lean body mass and by a progressive decline of host defenses, which results in impairment of the immunological response. The protective functions of intact skin are lost, leading to increased risk of infection and protein loss. Therefore, adequate and timely provision of nutritional support is an essential component of care of the critically ill burn patient. Nutrition therapy is also important in burn care from the early resuscitation phase until the end of rehabilitation. Careful assessment of the nutritional state of the burn patient is also important to reducing infection, recovery time, and long-term results. Nutritional therapy in severe burns has evidence-based specificities that contribute to improve clinical outcomes.

III. CASE REPORT:

A 26-year-old male with a BMI of 16.9kg/m^2 (underweight) was admitted to the hospital with burns. On admission his weight was 46 kg and nutritional status was poor. He had soft tissue injury with burns over right side of jaw with exposure of underlying bones over right elbow.

He was evaluated and diagnosed at almost 12% of the total skin surface (TBSA), and 2nd-3rd degree burns and admitted for fracture, debridement and skin grafting, resulting from chemical burns, which was supported in a non-intensive care unit.

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Oral diet and high-calorie, high-protein nutritional supplements were initiated. Then carefully monitored. For burn patient body weight is the most important parameter which is adequacy of nutritional status support can be seen in the increasing body weight firstly patient was in 12% burnt, due to diet and medicine prescribed almost 70% of burn seemed to be recovered. The patient gradually became active and was able to talk.

IV. RESULTS AND DISCUSSIONS

The caloric requirements are assessed generally on premise of Curreri formula which reached 1630 k cal and 90 g protein per day. And Fluid requirement was 3000 ml day. Patient started with oral liquid diet with ONS and further changed to high-protein high-calorie soft diet with ONS and L-glutamine supplement, reached 1100 k cal and 65 g of protein initially. Slowly total protein level increased. Patient's burnt area slowly recovered.

CURRERI FORMULA

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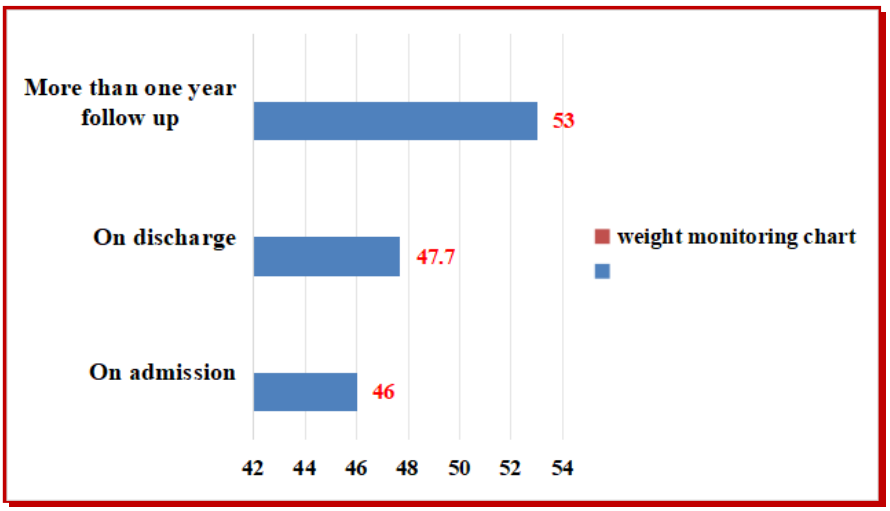
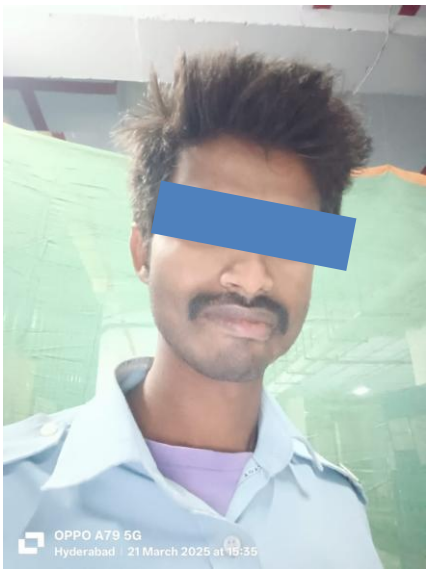
Formula for energy: (25 * body weight (kg) + 40 * % TBSA	**25*46+40*12**
Formula for protein: (IBW * 1.2g -2g)	**60*1.5g /kg IBW**
Formula for fluids: (4ml * IBW * % of burns)	**4*60*12**

Nutritional support led to gradual weight gain, improvement and stabilization of metabolic parameters. Overall 15 days hospital stay patient could reach 1480 k cal and 90 g of protein and he felt good and want to go home. Patient was discharged. He is very active and responsive. At discharged he weighed 47.7 kg and was tolerating oral nutrition well. More than one year of follow-up period, his weight gained to 53 kg and BMI improved to 19.48 kg/m2.

RDA	
Total Energy	**1630 Kcal /day**
Total Protein	**90g/day**
Total fluids	**2880ml/day**
Total Carbohydrates	**205g/day**
Total Fat	**35g/day**

WEIGHT MONITORING GRAPH





Last year picture **Recent picture**

V. CONCLUSION

Successful appraisal and the management can advance injury healing and decline mortality rate. The degrees of minerals were kept up with by food. Early initiation of oral or enteral nutrition support and frequency of biochemical and weight monitoring were largely in compliance with practice guidelines and to ensure that patients with

burns can meet the demands of their increased metabolic rate and energy expenditure, adequate nutritional support is necessary.

VI. REFERENCES

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