Evaluation of the Effectiveness of Nutrition on the Burn Patient. – Randomly Controlled Trial

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SUMMARY

Background The nutrition of the burnt patients is of major importance due to their increased metabolism. Early start nourishment plays a very important role in the result of the illness.

Objectives This study aims to estimate the role of nutrition of a burnt patient by relating the total calories received with the prices of total album in the blood serum.

Designs In order to determine the effectiveness of nutrition, two formulas were used to calculate the calories of the nourishment received by the burnt, as proposed by international bibliography. Then the two applied formulas were compared. Participants The sample constituted of 16 patients that where hospitalized in the Increased Care for Burns Unit in Greece and had 20-30% of their total body surface burned (partial or total thickness). All the patients were adults between 25 to 68 years old and the sample was randomly selected.

Methods- Results The study showed a positive cross-correlation between the calories received by the patient and the prices of total album. Using t test there was no apparent significant statistical difference, in the two administered methods of nourishment, regarding the sum of calories ($t=0,226$, $p>0,05$)

Conclusions Consequently it is not significantly important which of the two formulas are used to calculate the calories administered since they both have the same effectiveness. It is important, however, to apply a health program that will lead to the cure of the illness.

KEY WORDS : Nutrition, burn patient, Total albumins

Introduction

The metabolic reaction, to an organism's heavy illness, is generalised and independent from the type of damage that is caused- sepsis, lesion, burn or operation. Usually, it is characterized by an acceleration of the metabolism. Patients with heavy burns react with a hyper-metabolism and therefore have a direct need for calorie support. Nutritious reserves are activated in order to offer essential amino-acids, glucose and greasy acids that will cover the increased needs of the organism, resulting in proteolysis, glycolysis and lipolysis. An accelerated metabolism resumes proportional to the extent of damage and is supported by a combination of chemicals, neurogenesis and environmental stimuli (Bessey P.Q., Downey R.S., 1997). However, intense and extended stimulation of the metabolism can cause exhaustion of the metabolic reserves, disturbances in the immune system and disturbances in the function of vital organs. Therefore, if this situation remains uncontrolled it will be followed by increased morbidity and mortality. It is necessary to recognize and confront it on time (Deitch F.A. 1999, Mizock B.A. 2000, Sayeed M.M. 2000).

The right therapeutic treatment and a suitable diet of burnt patients will accelerate the cicatrization of the burnt surface and enhance survival. The initiation of nourishment must come immediately after the burn, because the gastro-intestinal system constitutes the target organ that is most affected from this shock. Considerable reduction of the

blood flow to the gastro-intestinal tube results in the derogation of this function (Peck M., Ward Q., 1997). It is known that lack of irritation of the intestinal mucous for a time interval above six hours causes atrophy and allows the passage of bacteria and toxins through the intestinal barrier. Therefore, there is an obvious need to protect the mucous and apply the nutrition. (Tayek J. 1999).

The best way to achieve this is the early beginning of enteral nutrition. Results of a study indicate that enteral nutrition was a more effective route to preserve gastric secretion and the mobility of the gastrointestinal tract. (Zhongyong C., 2007) An important issue is infusion of glutamine to burn patients, which is an great energy source to the immune cells (Xi Peng, 2006). However, recent study found that delayed nutritional support, after 24hours, did not influence the result of a burn injury in comparison to early nutritional support (Wasiak J. et al, 2006).

Indirect calorimetry is often used for the calculation of the calorie needs of patients that are in catabolism. Bibliography report's various formulas that calculate these needs, as they appear in table I. (Curreri R.W., Richmond D., Marvin J. 1974., Wolfe 1981. , Dickerson R.N., 2002). Even though it has been years since the Boston group and Curreri announced their formulas, these remain very popular until today. The Boston formula proposes that even the most serious burns do not need more calories than the double the energy that is consumed when the body is in complete calm as it is shown in the Haris - Benedict equation (Table I), (Wolfe 1981).

Materials-Methods

The present study deals with the application of these two formulas on 16 burn patients, who were hospitalized in burns units, with partial or total thickness burns on 20 - 30% of their total body surface (TBS - Total Body Surfau). They were separated in two groups, A and B. 9 individuals constituted group A where the Curreri formula was applied and 7 individuals constituted group B where the Boston formula was applied. Then, with the use of Pearson's cross-correlation factor the mean prices of total albumin in the blood serum was calculated for each patient. Then, based on the above formulas, this number was related to the number of days the nutritious diet was applied. The prices of total albumin are indicators with which nutrition can be evaluated in clinical practice.

Then by using t for control on pairs the two formulas were compared regarding their effectiveness in relation to the level of total albumin in the blood serum of patients. The data of this study are presented on Table 2. Data analysis was based on SPSS Vs 16.0 program.

Results

By using Pearson's cross-correlation factor for each sample separately we got r =0,55 for group A and r =0,668 for group B. Consequently it appears that a moderate to powerful relation exists between the prices of total albumin and the amount of calories administered to burnt patients. More precisely, positive cross-correlation appears, which means that an increase of the amount of calories leads to an increase of the total albumin in the blood

Moreover we were interested to compare the mean prices of total albumin for the two populations by using the mean numbers of samples A and B. Applying the control t for pairs it was found that means of the two populations were the same (t = 0,226 p >0,05). This means that both formulas of indirect calorimetry have the same result with regard to the sufficiency of nutrition of burnt patients. .

Furthermore from table 2 we can observe that in women the number of calories is similar for the two groups. Contrary, this dose not apply to men. According to the formula men in B group appear to need higher number of calories than the men in A For example, a burnt man from A group with 20% of his TBS (Total Body Surface) burnt needs according to the Curreri formula about 2500 calories, while a burnt man with 20% of TBS burnt needs roughly 4300 kcal based on the Boston group formula. This difference is very important if we take into account that the prices of total albumin are almost the same.

Conversation

It is generally accepted that the metabolic rate proportionally increases in a linear relation to the length of the burn. Consequently administering the right therapeutic treatment and a suitable diet is necessary. This is also proven by Pearson's cross-correlation index. However, special attention should be given in interpreting Pearson's cross-correlation index, because maintaining the total albumin level of the blood serum in normal prices may be an effect of either a calorie –nutrition program or a total health care program.

In addition, the results showed that the medium prices of total albumin of the two samples of the two populations were the same. We therefore conclude that even though there are certain differences in the number of calories of the two groups, the alimentary needs of burnt patients are covered by the Curreri formula that gives men a

considerably smaller amount of calories. This is because; the formula of the Boston team is determined by age while the formula of the Curreri team is influenced by the extent of the burn, as it is presented in table I.

Therefore, the qualitative composition of the diet is more important than the precise amount of calories granted. In addition, according to research carbohydrates should amount 45 - 55% of the total sum of calories calculated (Burk, 1980). A higher percentage of carbohydrate provision is accompanied by various side effects on the respiratory function.

The proteins required by the burnt patient for the cicatrisation of an extensive lesion, given the increased loss of nitrogen from urine, are obviously many. Specifically the needs of proteins according to Curreri and the Boston team are presented in table 3.

In addition, it has been proven that in patients with an increased protein catabolism it is beneficial to issue protein rich in amino-acids that have divaricated chains (BCAA), (Echeniqui, 1984).

Finally the total quantity of fat issued should constitute the 30 - 40% of total calories without overlooking that the diet should be enriched with electrolytes, vitamins and elements. Therefore we can conclude that the qualitative composition of the diet is more important than the precise amount of calories that will be granted.

Table 1 • Methods of estimating the calories that burnt patients need.

Method	Estimation of the administered calories (kcal/d)
Curreri et al	Adults (25 x ΣB/kgr) + (40 x % TBS)
Boston Group	2 x REE (is estimated based on the Harris – Benedict formula) Women: REE =655 + (4,3 x weight (kg)) + (4,3 x height (cm)) Men: REE = 65 + (6,2 x weight (kg)) + (12,7 x height (cm)) – (6,8 x age)
Xie et al	Energy consumption = (1000 kcal x BSA (m2) + 25 x % TBS)
	where BSA: body surface TBS: burn surface

Table 2- Data

Group A- Curreri Formula					
Gender	Age	Weight(KG)	TBS %	Kcal	Total Albumin
Θ	25	75	23	2800	5,4
Θ	38	82	25	3000	5,7
A	35	78	24	2900	6
Θ	37	65	20	2400	5,1
Θ	42	87	22	3000	4,8
Θ	45	86	27	3200	5,5
Θ	28	58	25	2400	4,8
A	29	67	20	2500	5,3
A	58	86	24	3100	6,5

Group B- Formula of the Boston group						
Gender	Age	Weight(KG)	TBS %	Kcal	Total Albumin	Height (cm)
Θ	35	76	25	2900	5,2	155
Θ	27	65	26	3000	5,8	162
Θ	50	79	24	2800	4,8	160
Θ	51	92	24	2900	5,1	158
A	68	60	20	4000	5,5	171
A	62	68	25	4000	5,6	170
A	65	72	20	4300	5,8	165
correlation Group A		0,555				
correlation Group B		0,668				

Table 3 • Estimation of the need of proteins in burn patients

Curreri	Proteins in gr/d = 3 gr x ΣB (kgr)
Boston group	Proteins in gr/d = 1,5 – 2 gr x ΣB (kgr)

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