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Effect of oral olive oil on healing of 10–20% total body surface area burn wounds in hospitalized patients

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ABSTRACT

The purpose of this study was to evaluate the effect of consumption of oral olive oil on clinical outcomes and wound healing of thermally injured patients with hospital stays. One hundred patients (mean age; 33.34 ± 7 years) with 10–20% total body surface area, deep second degree and more burn wounds were randomized to receive either oral olive oil or sunflower oil as the oil in their diet. Patients were evaluated daily for occurrence of wound infection, sepsis and healing of the grafted skin. Also the duration of hospitalization and admission to the intensive care unit were compared in two groups. Results showed that there was no significant difference between the olive oil group and the control group in percent of TBSA involvement (14.28 ± 0.53 vs. 13.02 ± 0.48 , $P = 0.7$), albumin concentration (3.25 ± 0.5 vs. 3.13 ± 0.5 , $P = 0.5$) and mean calorie intake (2034 ± 216.9 kcal vs. 2118 ± 192.1 kcal, $P = 0.2$). We found a significant difference in the duration of wound healing (7.2 ± 0.5 vs. 8.7 ± 0.5 , $P = 0.04$) and duration of hospitalization (7.4 ± 0.5 vs. 8.9 ± 0.4 , $P = 0.05$) in the olive oil group versus the control group. We did not find any difference in ICU admission, wound infection and occurrence of sepsis between two groups. This study showed that an oral diet provided with olive oil in patients with burn may accelerate wound healing and decrease the duration of hospitalization.

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1. Introduction

Nutritional support is one of the most important cornerstones in the management of patients with burns. Adequate nutrition can reduce mortality and complications, optimize wound

healing and minimize the deleterious effects of the exaggerated hypermetabolic response [1].

In addition to the increased needs in calorie requirement of burned patients, the composition of proteins, carbohydrates and fats in their diet is important. Glucose is the preferred substrate for wound healing and should be the major source

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of calories in burned patients [2]. Provision of protein in dose of 1.5–2.0 g/kg/day, approximately 20–25% of calories per day, will provide a balanced between synthesis and breakdown of tissues [3]. Lipids are an important dietary component as they contain the essential fatty acids and serve as carriers of lipid-soluble vitamins but it has been demonstrated that nutritional support with more than 15% of calories from lipids, impairs immune function in moderate to severe burned patients [4]. Studies have shown that composition of fat is another important factor on the process of wound healing and improving immune response in burned patients [5]. A few studies have assessed the effects of fish oil in patients with burn but there is still a controversy about its use [6–8]. Some animal studies have shown the different effects of the oleic acid on wound healing process [9,10]. To the best of our knowledge, there have not been any studies showing the effects of oral olive oil on burn wound healing. Therefore, we selected hospitalized patients with 10–20% total body surface area (TBSA) burn wounds to evaluate these effects.

2. Experimental methods

One hundred thermally injured patients who were hospitalized in a burn care university hospital were included in this randomized study from September 2012 to December 2013. The study protocol was approved by the responsible ethic committee, and informed consent was obtained from each patient or their legal guardian. Inclusion criteria included being on oral diet, aged between 13 and 59 years, having deep second degree wounds and more with 10–20% TBSA. Patients had to be enrolled within 12 h of developing these criteria. Pregnant or lactating patients and patients with pre-existing pathologies such as cancer and organ dysfunction were not included in the study. The patients were randomized to control and study groups. All patients received similar wound-care treatment, including wound excision, skin-grafting and antibiotic therapy. Pain was managed with intravenous morphine especially during therapeutic procedures. Oral nutrition in all patients was started within 24 h of admission. Daily energy requirement was calculated with the Curreri formula for each patient. Composition of macronutrients of diet was 20% for protein, 60% for carbohydrates and 20% for lipids. The type of oil in the diet was olive oil in study group and sunflower oil in control group. A complete analysis of dietary fat composition is outlined in Table 1. During the study period, foods were prepared in the hospital kitchen under the supervision of a student with a Master of Science degree in nutrition. For both groups, foods were prepared from non-fat or very low fat content ingredients. Additional olive oil or sunflower oil was added to the salad by M.S. student/supervisor to make sure that the total fat content would be 20%. Daily energy intake of food groups including vegetables, fruits, lean meat, grains and skim dairies was recorded for each patient and analyzed by nutritionist 4 software. All patients received the same dose of Multivitamin-Mineral as the routine of the burn department. As a hospital rule, patients were not permitted to consume foods from outside the hospital. Diet intervention was continued in all patients until they discharged from hospital with complete healing of burn

Table 1 – Fatty acid composition of diets (1000 kcal).

Nutrient	Study group (g)	Control group (g)
Total fat	22.51	22.51
Saturated	5.779	6.624
Monounsaturated	14.73	5.258
Oleic acid	14.29	4.932
Polyunsaturated	1.97	10.59
Linoleic acid	1.78	6.236
Linolenic acid	0.199	2.02
Ecosapentanoic acid	0	0
Docosahexanoic acid	0.017	0.017
Cholesterol	82.33	82.33

wounds and donor sites. Patients were evaluated daily for occurrence of wound infection, sepsis and healing of grafted and ungrafted wounds, including the donor sites, as determined by the surgeon. Complete graft healing was considered when graft-take was more than 90% of the graft size. The duration of hospitalization and admission to intensive care unit were also compared in both groups.

All statistical analyses were performed with SPSS version 18 (SPSS Inc., Chicago, IL, USA). Demographic data and baseline values and outcome measures were compared with student's t-test or Mann-Whitney for all continuous variables. Results are reported as mean \pm SD. A value of $P \leq 0.05$ was considered statistically significant.

3. Results

A total of 104 thermal burned subjects were included in the study. Two patients in the study group because of intolerance to olive oil odor and two patients in control group because of early discharge were excluded from the study. Therefore a total of 50 patients in olive oil group and 50 patients in control group completed the study. The mean age of subjects was 33.34 ± 7 years. Baseline characteristics of subjects are shown in Table 2. There was no significant difference between olive oil group and control group regarding the serum albumin level and total amount of calorie intake during the entire study period (Table 3). Of the total grafting candidate patients, 52.8% was in the control group and 40% in the olive oil group ($P = 0.2$). None of our patients showed graft rejection. There was no occurrence of wound infection or sepsis in two groups. Mortality was not seen in two groups. Only two patients from control group were admitted to ICU during therapy and there

Table 2 – Baseline characteristics of the subjects (mean \pm SD).

	Olive oil group (n = 50)	Control group (n = 50)	P value
Age	32.16 \pm 7.6	34.52 \pm 6.4	0.2
Sex%			1
Male	76	76	
Female	24	24	
TBSA% ^a	14.28 \pm 0.53	13.02 \pm 0.48	0.7
ABSI ^b	3.25 \pm 0.86	3.29 \pm 0.83	0.8

^a Total body surface area.

^b Abbreviated Burn Severity Index.

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