
**Dietary Treatment of Lymphedema by Restriction
of Long-Chain Triglycerides**

P. Soria, M.D.
A. Cuesta, M.D.
H. Romero, M.D., M.Sc.
E. J. Martínez, M.D.*
and A. Sastre, M.D., Ph.D.

MADRID, SPAIN

ABSTRACT

Two patients suffering from idiopathic unilateral lower limb lymphedema were treated with a diet in which long-chain triglycerides (LCT) were drastically restricted. From the beginning of the treatment, a distinct improvement was observed in both patients, with reduction of the affected limb perimeters, decrease of edema tension, and decrease of skin turgescence. Patient A underwent weight loss, and the reduction of the diameter of the affected limb was greater than that in the nonaffected limb. In patient B, whose weight remained stable during the study, the diameter of the affected limb underwent a remarkable diminution, while no changes were detected in the nonaffected limb.

To the authors' knowledge, this is the first report of dietary treatment of idiopathic lymphedema, these being preliminary results of an ongoing study in a group of patients suffering from lymphedema treated with a low LCT diet.

From the Department of Nutrition and Dietetics and the *Department of Endocrinology, Hospital Ramón y Cajal, Madrid, Spain

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Introduction

The lymphatic system embodies capillaries and vessels whose flow is parallel and tributary to the venous system. Besides its roles in immunity and as a collector of the interstitial fluid, the lymphatic system also collects from the intestinal lumen those components that, owing to their lack of solubility and/or high molecular weight, cannot be directly transferred to the mesenteric blood capillaries.

The composition of lymph in different lymphatic territories is varied. In the limbs, lymph composition is dependent on the characteristics of the interstitial fluid, which contains chiefly water and electrolytes, with scarce proteins. Farther up on its way to the thoracic duct, it receives the contribution from the intestinal lymphatic system, whose content is rich in fat, which is absorbed from the jejunal lumen.

The lymph flow direction is determined by intravascular and extravascular oncotic and hydrostatic pressure. When intraluminal pressure is higher than interstitial pressure, extravasation occurs, leading to lymphedema formation. Table I summarizes the etiologic classification of lymphedemas.

Occasionally, lymph accumulation leads to serious impairment of mechanical function of the limbs, owing to the volume of lymph accumulated in them. This situation, when prolonged over time, may increase the edema pressure far enough to compromise the venous, or even the arterial, blood flow.

To date, for patients suffering from lymphedema, only a palliative treatment is available.

It consists of a combination of the measures listed in Table II.¹⁻³

Patients and Methods

Two women, thirty and forty-three years old, respectively, suffering from idiopathic unilateral lymphedema of the lower right limb, are presented. In both cases the disease had a sudden onset at thirteen and eighteen years of age, respectively. Before dietary treatment was started, both women were receiving physiotherapy.

The diagnosis was confirmed by isotopic lymphographic scans. Chest x-rays, conventional ECG, and renal function tests were done to exclude cardiac and/or renal dysfunction as a cause of the edema.

Measurements of thigh circumference, at the midpoint between the upper edge of the patella and the upper anterior iliac spina, were taken at the beginning and four months after the initiation of the diet, by means of a metric tape.

For the dietary treatment, all edibles like fatty meat, fatty cheese, fatty fish, butter, oils, dried fruits, and other foods containing significant amounts of long-chain triglycerides (LCT) were withheld from the diet. Midchain triglycerides (MCT) oil was chosen as the alternative fat source. The energy supplied by MCT oil was 12% of the total caloric intake and 58% of the total dietary fat intake.

Patient B was given an isocaloric diet, while patient A received a hypocaloric diet, since she was overweight at the beginning of the study.

Table I

Etiologic Classification of Lymphedemas

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| <p>A. Idiopathic (unknown etiology)</p> <p>B. Secondary to</p> <ol style="list-style-type: none"> 1. Surgery, after complete or partial resection of lymphatic nodules such as in tumoral surgery 2. Inflammation <p>C. Congenital, when a region of the body lacks lymphatic vessels and/or nodules total or partially.</p> |
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Table II

Treatment of Lymphedema

- | |
|---|
| <p>A. Physiotherapy techniques, eg, lymphatic drainage and pressure therapy</p> <p>B. Pharmacologic support</p> <p>C. Regular exercise</p> <p>D. Surgical procedures, only in especially severe cases</p> |
|---|

In order to ensure the required daily allowances of the essential fatty acids—linoleic and linolenic acids—the diet was supplemented with 5 mL of raw sunflower oil. Also, a mineral and polyvitamin supplement was administered daily to both patients in order to avoid any dietary deficiency of liposoluble vitamins and trace elements.

The global energy profile of the diets is expressed in Table III, which also shows the fractioning of triglycerides as proportions of the total dietary fat.

Monthly analytical and clinical follow-up controls were undertaken in order to ensure that no deficiencies of any of the nutrients were present. Routine blood counts and plasma biochemical analysis; total plasma iron and iron saturation; total and short-lived proteins; vitamins A, E, B₁₂ and folic acid; and copper, zinc, and magnesium were measured.

Results

Patient A, who underwent a weight loss of 11 kg during the four months in which the hypocaloric, low LCT diet was given, had a reduction in the perimeters of both thighs (Table IV).

Patient B had a reduction in the perimeters of

the affected limb, without any changes in the unaffected limb and without weight loss (Table IV).

The values for all the blood parameters above specified were normal during the treatment in both patients.

Discussion

When lymphedema is predominantly lymphatic (ie, it has a high chylomicron content), its biochemical analysis yields a high proportion in long-chain triglycerides, for they constitute 90% of the fat content of an ordinary Western diet. Therefore, if the amount of LCT in the lymph is altered, this could also modify the quality and quantity of the leaking interstitial fluid.³

LCT are triglycerides formed by fatty acids whose chains are more than 14 carbon atoms in length. LCT cannot be directly incorporated to the portal stream owing to their high molecular weight; thus, they are carried to the blood stream through the lymphatic system. Therefore, the dietary intake of LCT can be expected to be a much more important determinant of the lymph volume and composition than other dietary fats, which can be readily uptaken into the portal blood stream.

It has been previously suggested that, by re-

Table III

*A: Global Energetic Profile of the Diet;
B: Triglycerides in the Diet as Fractions of the Total Dietary Fat*

A	
Proteins	22% of the total caloric intake
Carbohydrates	58%
Fat	20%
B	
Monounsaturated	0.67%
Polyunsaturated	0.11%
Saturated	1.5%
MCT	57.72%

MCT=midchain triglycerides.

Table IV
Measurements of the Lymphedema Patients Treated with LCT Restricted Diet

Patient	A	B
Age (years)	30	43
Weight loss (kg)	11	0
Affected limb initial perimeter (cm)	74	68
Affected limb final perimeter (cm)	67	65
Perimeter reduction (cm)	7	3
Unaffected limb initial perimeter (cm)	60	48
Unaffected limb final perimeter (cm)	55	48
Perimeter reduction (cm)	5	0

ducing the amount of LCT in the diets of patients with lymphedema, lymph composition could be altered in a fashion that would modify the composition and volume of the edema.⁴ With this purpose, we devised a diet in which most of the total fat was given as MCT.

MCT contain saturated fatty acids with a carbon chain length of 6 to 12 carbon atoms. They are much more water-soluble than LCT and more easily split by the pancreatic lipase into midchain free fatty acids. Instead of being reesterified in the jejunal epithelium cells, these midchain fatty acids obtained from hydrolysis of MCT are transported bound to albumin through the portal circulation, which has a much faster flow rate than the lymphatic system.

When devising diets with the formerly described lipids profile we came across several difficulties:

1. The poor palatability of diets with such a low fat content could seriously decrease the patient's dietary compliance. However, in cases of severe lymphedema, the patients are strongly motivated to comply strictly with the diet when they notice an almost immediate improvement of their condition.
2. There is a limit in the amount of energy that can be supplied as MCT, for it is not advisable to surpass the amount of 2 mL/kg/day.
3. A drastic reduction in the fat content of the diet may lead to several nutritional deficiencies, especially liposoluble vitamins and essential fatty

acids (linoleic and linolenic). Therefore, these diets should be supplemented with these nutrients.

The reduction of the thigh perimeter achieved by this dietary treatment in patients suffering from lymphedema cannot be attributed only to weight loss, though this could be suspected owing to the considerable weight loss that patient A underwent. However, patient B did not undergo any weight changes or reduction of her unaffected limb perimeters, while the perimeter of her affected limb did decrease.

Conclusion

The results we have obtained so far suggest that an effective dietary treatment for patients suffering from lymphedema is possible. A positive response to this treatment has to be assessed, not only according to the clinical and analytical parameters obtained one way or another, but also according to the subjective well-being reported by the patients. It would be interesting to continue this work in order to assess the possibility of standardizing a dietary treatment for those patients who show a positive response to it.

P. Soria, M.D.
 Nutrition and Dietetics Unit
 Hospital Ramón y Cajal
 Carretera de Colmenar Km. 9.100
 28034 Madrid, Spain

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