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Original article

Clinical impact of Mediterranean-enriched-protein diet on liver size, visceral fat, fat mass, and fat-free mass in patients undergoing sleeve gastrectomy

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Abstract

Background: Weight loss before laparoscopic sleeve gastrectomy (LSG) is desirable because it can reduce visceral fat and liver size thereby facilitating the surgical procedure. Preoperative very-low-energy diets have been demonstrated to decrease weight, visceral fat, and liver size. However, no studies have been conducted using the Mediterranean-protein-enriched diet (MPED) or on the amount of preoperative weight loss attributed to the loss of fat-free mass (FFM).

Objectives: To evaluate the effect of the MPED on weight, visceral fat, liver size, fat mass (FM), and FFM in obese patients undergoing LSG.

Setting: University Hospital, Italy.

Materials and Methods: Obese male patients (n = 37) with a mean body mass index (BMI) of 45.2 kg/m^2 scheduled for LSG underwent an 8-week preoperative MPED. Their weight, visceral fat, body composition, liver size, and biochemical and metabolic patterns were measured before and after the diet. Patient compliance was assessed by the presence of ketonuria and weight loss. Qualitative methods (5-point Likert questionnaire) were used to measure diet acceptability and side effects.

Results: We observed highly significant decreases in weight, liver size, visceral fat, and FM; however, there was no significant reduction in FFM. All tested patients showed a high frequency of acceptability and compliance in following the diet, and no secondary effects were observed.

Conclusion: Based on our findings, we were able to support the hypothesis that MPED might be associated with significant reductions in weight loss, FM, and liver size without a significant loss of FFM. (Surg Obes Relat Dis 2015;▮:00–00.) © 2015 American Society for Metabolic and Bariatric Surgery. All rights reserved.

Keywords: Mediterranean diet; Preoperative diet; Liver size; Fat-free mass; Laparoscopic sleeve gastrectomy; Bioelectrical impedance analysis; Nutritional assessment

Introduction

Sleeve gastrectomy (SG) is one of the most commonly performed bariatric surgical procedures [1]. Currently, most SGs are performed laparoscopically [2]. However, high weight and visceral fat associated with an enlarged liver (especially the left lobe) may complicate the technical

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aspects of this surgery [3,4]. Several studies concerning preoperative diets, such as meal replacement diets [5–10], intragastric balloons [11], pharmacologic therapy [12,13], or home ingredients [14], have reported decreased weight and/or liver size. However, to our knowledge, no studies have been performed regarding the preoperative Mediterranean diet, a type of eating pattern that promotes lifelong good health and has beneficial effects on the prevalence and progression of metabolic syndrome [15]. Furthermore, the amount of preoperative weight loss attributed to the loss of fat-free mass (FFM) has not been clarified in previous studies. Maintaining adequate FFM is an important consideration when making dietary intake recommendations for weight loss because muscles play a central role in whole-body protein metabolism [16]. Additionally, a significant decrease in FFM may negatively affect the resting metabolic rate [17] and impede further weight loss by down-regulating metabolic processes in overweight and obese individuals.

Our study aimed to evaluate the effects of an 8-week Mediterranean-protein-enriched diet (MPED) on weight, visceral fat, liver size, fat mass (FM), and FFM in obese patients undergoing laparoscopic sleeve gastrectomy (LSG).

Materials and methods

Patient selection

This was a descriptive prospective cohort study involving a convenient gender-biased sample. Thirty-seven obese men (mean BMI, 45.2 kg/m^2) who were scheduled for LSG were included. Only obese men were included for the following reasons: to reduce hormonal interference on body composition measurements (i.e., changes in hydration status related to menstrual cycle or menopausal conditions) and to reduce the variability of visceral fat measurements (not fully applicable to women, who typically do not have central obesity).

The inclusion criteria for this study were as follows: age 25–65 years; married, living at home with their parents, or living in a stable relationship with a female sexual partner for at least 1 year; and BMI $\geq$ 40 kg/m^2. The exclusion criteria were as follows: (1) difficulties or major inconveniences in changing their dietary habits (i.e., living and working away from home); (2) inability to comply with the MPED for religious reasons or due to the presence of chewing or swallowing disorders; (3) digestive and/or inflammatory bowel diseases (i.e., Crohn disease, ulcerative colitis). Every included patient signed an informed consent form before enrolling in the study.

Assessment of patient dietary habits and development of the MPED

One week before starting MPED, each candidate was counseled individually about the diet that he would be expected to follow for 8 weeks. Each candidate was then asked to complete a 7-day food diary to better understand his dietary habits. To ensure that all 37 included patients consumed a similar diet, we developed 4 MEPD meal plans: plan 1 (days 1–14), plan 2 (days 15–28), plan 3 (days 29–42), and plan 4 (days 43–56) using only sources of fruits, vegetables, pasta, milk products and ingredients reported in Table 1. MPED food plans were developed using Nutrigeo 8 software (Progeo, Ascoli Piceno, Italy) by assigning a specific quantity to individual foods. As shown in Table 1, each food plan (1200 kcal/d) consisted of 141 g carbohydrates (45%), 35 g fats (25%), and 80 g protein (30%). The diet was completed with 2 L of low-sodium water/d and 30 g of fiber.

Dietary assessment methods: 3-day estimated food records and 72-hour recalls

Dietary assessments were primarily performed using questionnaires (3-day estimated food records and 72-hour recalls). The details regarding the sequence of questionnaire administration are shown in Fig. 1. To measure nutritional intake and obtain a broad idea regarding the diets during a typical week, all participants had to complete a dietary record for 3 consecutive days (Sunday to Tuesday; breakfast to bedtime) and a daily food diary to record any deviations from their prescribed diet.

A trained nutritionist conducted secondary assessments by administering a 72-hour recall questionnaire in which

Table 1
MEPD food plans: food and ingredients used, energy, macronutrient distribution

Parameter	Grams (g)	KCal/d	%KCal
Kcal/d		1200	
Carbohydrate	141	564	45%
Fat	35	315	25%
Protein	80	320	30%

FRUIT
Apples, oranges, grapefruit, tangerine, pears, apricots, cherries, strawberries, raspberries, blackberries, peaches, prunes, watermelon, cranberries, apple juice.

VEGETABLES
All lettuces, spinach, cucumbers, fresh corn, broccoli, pepper, mushrooms, onions, asparagus, cauliflower, eggplant, tomatoes, zucchini, green and yellow string beans, raw carrots, cabbage, rapini, peas.

BREAD AND PASTRIES
None.

PASTA
All pasta, whole or multigrain, made from any nonrefined grains.

MILK PRODUCTS
From cows, sheep, soy, rice, oats, cheese 35% fat or less, yogurts.

HERBS AND SPICIES
Anise, basil, bay, capers, cardamom, cinnamon, chervil, garlic, onion.

MEAT AND FISH
Chicken, turkey, herring, tuna, salmon, mackerel, sardine, trout, bluefish, swordfish, oysters, shrimps, flatfish, lobster, clams, scallop, snapper, octopus.