

Bariatric surgery and vegan: A first case report

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ABSTRACT

Objective: Surgical weight loss is seen as an option for individuals with obesity. In this case study, it was aimed to evaluate the nutritional status of a vegan obese patient before and after bariatric surgery. **Methods:** A 26-year-old vegan obese male patient underwent sleeve gastrectomy in May 2016. He was followed up for one month preoperatively and two years postoperatively. The number of individuals adopting vegetarian/vegan lifestyle for various reasons has been increasing recently. To prevent nutrient deficiency after bariatric surgery, lifelong vitamin-mineral supplements and vitamin-minerals-rich food consumption are recommended. **Results:** A 26-year-old vegan obese male patient body mass index was 38.6kg/m² and the postoperative 2nd year body mass index was 24.1kg/m². Preoperative muscle mass was 76.2 kg, postoperative 2nd year 63 kg, preoperative body fat mass was 47.9 kg, postoperative 2nd year 9.2 kg. **Conclusions:** In this vegan case, preoperative and postoperative medical nutrition treatments were planned considering the type of surgery specific to the individual. Medical nutrition treatment is an important part of the multidisciplinary bariatric surgery process.

Keywords: Bariatric surgery, obesity, vegan

Bariatrik cerrahi ve vegan: İlk olgu sunumu

ÖZET

Amaç: Bariatrik cerrahi, obezitesi olan bireyler için bir seçenek olarak görülmektedir. Bu vakada vegan obez bir hastanın obezite cerrahisi öncesi ve sonrası beslenme durumunun değerlendirilmesi amaçlanmıştır. **Yöntem:** 26 yaşında vegan obez erkek hastaya Mayıs 2016'da tüp mide ameliyatı yapılmış, hasta ameliyatın bir ay öncesinden takibe alınmış ve ameliyat sonrası iki yıl düzenli aralılarla takip edilmiştir. Son zamanlarda çeşitli nedenlerle vejetaryen/vegan yaşam tarzını benimseyen bireylerin sayısı artmaktadır. Bariatrik cerrahi sonrası besin eksikliklerini önlemek için ömür boyu sürecek vitamin-mineral takviyeleri ve vitamin-mineral yönünden zengin besinlerin tüketimi önerilmektedir. **Bulgular:** 26 yaşında vegan obez erkek hastanın ameliyat öncesi beden kütle indeksi 38.6 kg/m² iken ameliyat sonrası 2. yıl 24.1 kg/m² 'dir. Ameliyat öncesi kas kütlesi 76.2 kg, ameliyat sonrası 2. yıl 63 kg, ameliyat öncesi vücut yağ kütlesi 47.9 kg, ameliyat sonrası 2. yıl 9.2 kg idi. **Sonuç:** Bu vegan vakada ameliyat öncesi ve ameliyat sonrası tıbbi beslenme tedavisi kişiye özel ameliyat türü dikkate alınarak planlanmıştır. Tıbbi beslenme tedavisi, multidisipliner bariatrik cerrahi sürecinin önemli bir parçasıdır.

Anahtar kelimeler: Bariatrik cerrahi, obezite, vegan

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INTRODUCTION

Vegetarians are defined as individuals who do not consume any meat types, namely red meat, poultry, and fish. Vegetarianism is classified according to the consumption status of secondary animal products. Among these, vegans are those who do not consume any type of meat and animal products. At the same time, vegans do not use animal products such as leather, silk, and wool.¹ Vegetarian diets have become more popular among adolescents and young adults.² However, there are few studies examining the nutritional status of vegans who are at risk of malnutrition.^{3,4} Determining the effects of such diets on health, it is stated that total cholesterol, low-density lipoprotein (LDL) cholesterol and glucose levels decreased significantly in vegetarian and vegan individuals. The protective effect of vegetarian and vegan diets against ischemic heart disease and cancer incidence is mentioned.⁵ On the other hand, it seems that vegetarian diets provide significant benefits in weight loss compared to non-vegetarian diets. However, these diets, as well as beneficial health effects, may cause vitamin B12, vitamin D, zinc, iron, calcium, iodine, omega-3 fatty acids and protein deficiencies.⁶ For this reason, vegans should provide a variety of vegetarian foods in their diet. It is recommended to take vitamin B12, vitamin D, riboflavin, calcium, iron, zinc, selenium, and protein supplements regularly and consume the foods rich in these vitamins and minerals.²

Obesity is one of the most important health problems in developed and developing countries. Obesity is the increase in body weight above the desired level as a result of excessive increase in the ratio of body fat to lean mass.⁷ The prevalence of overweight / obesity was found as 40% in omnivores, 29% in semi-vegetarians and vegans, and 25% in lactose-vegetarians.⁸ Patients, generally, prefer surgical weight loss intervention in obesity treatment.⁹ In the literature, data on vegetarianism and bariatric surgery

are limited. In vegetarian cases undergoing laparoscopic sleeve gastrectomy, health status and nutritional deficiencies, low iron stores, and higher pre-operative supplement use.⁶ In this case report, vegan nutrition strategies before and after bariatric surgery were discussed.

Case Report

In May 2016, a male patient who had been involved many times in weight-loss programs and gained weight back in a short time after losing weight consulted our clinic to our clinic. Informed consent was obtained from the patient. In the physical examination performed by the bariatric surgeon, the patient stated that he had acquired vegan nutrition as a philosophy in the last year due to ethical values and there was a 12 kg increase in body weight during this period. After the physician asked for laboratory tests before the operation, the patient was directed to a nutrition education. The anthropometric measurements of a 26-year-old male patient were as follows: body length 182 cm, body weight 128 kg, body mass index (BMI) 38.6 kg / m², body fat mass 47.9 kg, body muscle mass 76.2 kg. Body analysis was performed using bioimpedance analysis method. In scientific studies, it is accepted that Tanita TBF-330 has a high accuracy in showing body fat distribution.^{10,11} BMI is calculated with the formula "BMI=Body weight (kg)/height² (m²)" and evaluated in accordance with the World Health Organization (WHO) classification.¹²

The patient, who was not diagnosed with any chronic disease, was found to be suitable for Laparoscopic Sleeve Gastrectomy operation and the preparations for surgery were started. Preoperative and postoperative routine laboratory tests results have been shown Table 1.

Table 1. Preoperative and postoperative routine laboratory tests results

Test	Pre-op	Post-op 1 st month	Pre-op 6 th month	Pre-op 12 th month	Pre-op 24 th month	Reference Range
Serum Glucose Level	98 mg/dL	69 mg/dL	90 mg/dL	83 mg/dL	81 mg/dL	75-100 mg/dL
Ast	27 IU/L	19 IU/L	11 IU/L	16 IU/L	15 IU/L	10-41 IU/L
Alt	34 IU/L	28 IU/L	10 IU/L	14 IU/L	11 IU/L	10-41 IU/L
Serum Triglyceride	139 mg/dL	85 mg/dL	87 mg/dL	66 mg/dL	72 mg/dL	<150 mg/dL
Total Cholesterol	157 mg/dL	108 mg/dL	150 mg/dL	182 mg/dL	174 mg/dL	<200 mg/dL
Vitamin D	8,8 ng/mL ^a	30,8 ng/mL	28,2 ng/mL	20,4 ng/mL	20,2 ng/mL	>21 ng/mL
Total Protein	7,2 g/dL	7 g/dL	6,6 g/dL	7,5 g/dL	7,3 g/dL	6,2-8,3 g/dL
Serum Uric Acid	5,9 mg/dL	10,2 mg/dL	6,1 mg/dL	5,6 mg/dL	5,2 mg/dL	3,4-7,0 mg/dL
Serum Potassium	3,8 mmol/L	3,7 mmol/L	4,5 mmol/L	4,9 mmol/L	4,8 mmol/L	3,6-5,4 mmol/L
Serum Calcium	9 mg/dL	9,1 mg/dL	9,2 mg/dL	10,2 mg/dL	9,7 mg/dL	8,5-10,5 mg/dL
Serum Iron	60 µg/dL ^b	72 µg/dL	81 µg/dL	108 µg/dL	110 µg/dL	59-158 µg/dL
Serum Ferritin	132 ng/mL	190 ng/mL	145 ng/mL	154 ng/mL	159 ng/mL	30-400 ng/mL
Serum Zinc	70 µg/dL	89 µg/dL	66 µg/dL	82 µg/dL	81 µg/dL	70-145 µg/dL
Tsh	2,01 mIU/L	-	1,7 mIU/L	1,49 mIU/L	1,42 mIU/L	0,3-4 mIU/L
B12 vitamin	190 pg/mL ^c	355 pg/mL	220 pg/mL	258 pg/mL	249 pg/mL	197-771 pg/mL

^a vitamin D support (1 ml with an interval of 3-4 weeks (300,000 I.U.) ^b iron support (1x1-567.7 mg Iron (II)-glycine-sulfate-complex) and, ^c B12 support-IV [1000 mcg/ml-1 times] were recommended by the doctor before the operation.

Nutrition education was provided as indicated in the American Metabolic and Bariatric Surgery Association (ASMBS) guidelines. According to these guidelines, the recommended amount of protein after surgery should be at least 60 g to 1.5 g/ideal body weight and should be included in the daily consumption according to the activity level of the person. Maximum protein intake should be 2.1g / ideal body weight. The use of

concentrated sugar is limited to <15 g/day.¹³ In addition to nutrient consumption, recommended vitamin and mineral supplements are 1200 mg-1500 mg calcium citrate, at least 3000 IU vitamin D, 45-60 mg iron, 500µg vitamin B12. In addition, patient's daily water consumption should be at least 1.5 liters.^{13,14} The content of postoperative nutrition education is given in Table 2.

Table 2. The contents of postoperative nutrition education

Diet Stages	Beginning	Liquid/Food
Stage-1	Post-op 1 / 2. day	Full liquids; Carbohydrate-free, calorie-free, sugar-free, decaffeinated drinks
Stage-1 <i>Vitamin-mineral supplements were started under the supervision of a doctor.</i> <ul style="list-style-type: none"> Chewable multivitamin ^a Vitamin B12 IV 350-500 µg/day Vitamin D 3000 IU/day ^b Liquid anti-acid preparations 	Post-op 3.day [Discharge]	Full liquids: <ul style="list-style-type: none"> Sugar-free liquids (sweetener can be used) Full liquid diet: Salt added liquids (ayran) Liquids rich in vegetable protein [soy milk, almond milk] Liquids containing less than 25g of sugar Intake of at least 60g vegetable protein Protein powder (soy) - <i>not exceeding 20g protein requirement at one time</i>
Stage-2 <i>Vitamin-mineral supplements were continued under doctor control.</i> <ul style="list-style-type: none"> Chewable multivitamin ^a Vitamin B12 IV 350-500 µg/day Vitamin D 3000 IU/day ^b Liquid anti-acid preparations 	Post-op 10-14. day	Full liquid consumption should be increased <ul style="list-style-type: none"> >1200-1800 ml The liquid diet should be replaced by soft, pure protein-rich foods. Intake of at least 60g vegetable protein Protein sources of Stage-2: soy yoghurt, soy milk, green lentils Protein powder (soy) - <i>not exceeding 20g protein requirement at one time</i>
Stage-2 <i>Vitamin-mineral supplements were continued under doctor control.</i> <ul style="list-style-type: none"> Chewable multivitamin ^a Vitamin B12 IV 350-500 µg/day Vitamin D 3000 IU/day ^b Liquid anti-acid preparations 	Post-op 2- 4. week	Tolerance should be considered <ul style="list-style-type: none"> Vegetable-rich foods Well-cooked vegetables Soft or puree fruits Intake of at least 60g vegetable protein Protein sources of Stage-2: soy yoghurt, soy milk, green lentils Protein powder (soy) - <i>not exceeding 20g protein requirement at one time</i>
Stage-2 <i>Vitamin-mineral supplements have been proposed in the form of tablets under doctor supervision.</i> <ul style="list-style-type: none"> Tablet / Chewable multivitamin ^a Vitamin B12 IV 350-500 µg/day Vitamin D 3000 IU/day ^b Capsule proton pump inhibitor Allopurinol ^c 	Post-op 5. week	Protein consumption should be continued with vegetables and fruits. Salad consumption according to tolerance can be recommended after 1 month. <ul style="list-style-type: none"> Vegetable-rich foods Well-cooked vegetables Soft or puree fruits Protein intake was targeted considering 1-1.5 g protein/ideal body weight recommendation. Complex carbohydrates were included. Caffeine intake was limited (<200 mg). Protein sources of Stage-2: soy yoghurt, soy milk, green lentils Protein powder (soy) - <i>not exceeding 20g protein requirement at one time</i> Consumption of at least 6-8 glasses of water 40 minutes walking at a light pace 3 times a week is recommended.
Stage-3 <i>Daily vitamin-mineral supplementation was continued under the supervision of a doctor.</i> <ul style="list-style-type: none"> Tablet / Chewable multivitamin ^a Vitamin B12 IV 350-500 µg/day Vitamin D 3000 IU/day ^b 	Increased feeling of hunger and greater amount tolerability of food	Regular Diet - Choosing healthy solid foods <ul style="list-style-type: none"> Vegetable protein intake should be a priority. Use of protein powder (soy) for the first 3 months, provided that 20g protein is not exceeded. Post-op 1st month legumes were included in the patient's menu according to their tolerance status. Complex carbohydrates such as brown bread and bulgur were added to the diet after the third post-op month. From the 3rd postoperative month, 30 minutes of exercise were recommended 4 days a week in the first year. After the first year, 40 minutes of regular exercise was recommended at least 3 times a week.

^a Multivitamin content: 60mg Magnesium, 90mg C vit, 30mg B3 vit, 30mg E vit, 15mg Zinc, 2mg Copper, 2mg Manganese, 70 µg Selenium, 10mg B5 vit, 1.5 mg B1 vit, 1.7 mg Vitamins B2, 4 mg Vitamins B6, 160 160g K vit, 1000 Ag Vit A, 120 mg Chromium, 20 µg Vit D, 600 µg Folic acid, 600 µg Biotin, 500 µg B12 vit, 150 µg Iodine. The first year after surgery was regularly recommended by the doctor. It was recommended if necessary, after taking biochemical findings into consideration after 12 months post op.

^b Vitamin D was recommended if necessary, considering the patient's biochemical findings.

^c In the first month postoperatively, it was recommended considering biochemical and its use was discontinued according to biochemical findings in the third postoperative month.

The change in body composition of the patient before and after surgery is shown in Table 3.

Table 3. Body composition of the patient before and after surgery

	Body weight (kg)	Body Fat Mass (kg)	Body Muscle Mass (kg)	BMI (kg/m ²)
Pre-op	128	47.9	76.2	38.6
Post-op 1. month	114.9	38,8	72,4	34,7
Post-op 3. month	98,2	26,3	68,4	29,6
Post-op 6. month	85	14,9	65	25,6
Post-op 12. month	82,2	10,9	62,8	24,8
Post-op 24. month	80	9,2	63	24,1

At each bariatric dietitian follow-up, the patient's food consumption was questioned, and the daily amount of vegetable protein was calculated. 1-1.5 g protein/ideal body weight recommendation was taken into consideration, protein intake was targeted, complex carbohydrates were given after the first month after surgery. Caffeine intake was not recommended in the first month and was limited 1 month after the operation as <200 mg.

Postoperative nutrition program did not include monosaccharides. Foods, which are the main source of carbohydrates such as bread, rice, bulgur, pasta, were not included in the nutrition program until the post-op 3 months.^{13,15} The dietitian follows up schedule was planned as 7 times in the first year and twice a year after the 18th month. The patient, who is currently 80.5 kg, continues to practice nutritional principles after bariatric surgery with a vegan philosophical approach and attends annual doctor visits.

This case is a retrospective study. For this type of study formal consent is not required however consent was still obtained from the patient.

DISCUSSION

Obesity is a serious public health problem along with concomitant diseases. Medical nutrition therapy, medical treatment, physical activity, and behavioral changes play an important role in the treatment of obesity. With the development of bariatric surgical techniques in the last 10 years, surgical treatment has been brought to the agenda in addition to traditional methods in the treatment of morbidly obese patients. Bariatric surgery is considered the gold standard in the treatment of obesity as it causes long-term preventable weight loss compared to traditional treatment methods.^{16,17}

The number of individuals adopting the vegetarian lifestyle for various reasons such as cultural, religious, economic, and health is increasing. Vegetarian diets that have protective effects against obesity may not always be healthy, contrary to popular belief. Healthy vegetarian options rather than refined carbohydrates and processed foods are examples of this diet. For vegetarians with morbid obesity, bariatric surgery may be an option in the treatment of obesity.¹⁸

After all bariatric surgery methods, vitamin and mineral supplements are recommended for a period or lifetime if necessary. Clinical signs of vitamin and mineral deficiencies may take a long time to appear. Therefore, biochemical tests performed at regular intervals after surgery will reduce the risk of vitamin-mineral deficiency as a result of the nutritional status recommended by a dietitian.

Bariatric surgery methods aim to change the stomach volume. Although SG does not cause malabsorption, it affects the use of iron and vitamin B12 in the body. In the first year after SG, multivitamin and mineral supplements containing vitamin B12 and iron, regular follow-up of patients' protein consumption after each bariatric surgery method, and when necessary, supplementation with these nutrients is recommended.^{19,20} Nutritional deficiencies are a natural condition in the postoperative period and may require lifelong reinforcement. Vitamin B12 deficiency is one of the most common nutritional deficiencies in the patients undergone bariatric surgery.⁹ In addition, vegans suffer from insufficient micronutrients, especially vitamin B12, due to dietary patterns. In the Nutrinet-Sante study, 83.4% of vegan women and 69.9% of men had vitamin B12 deficiency.²¹ Vegetable-derived foods lack vitamin B12. After bariatric surgery, vitamin B12 absorption decreases due to changes in HCl production and decrease in intrinsic factor. It is very important for vegan patients to take vitamin B12 supplements routinely.⁶ In the studies performed, preoperative biochemical tests showed that iron deficiency anemia was observed in 1.5% of the patients who applied for surgery.²² Although vegetarians have low iron scores, the incidence of iron deficiency anemia is similar to non-vegetarians.⁶ While adequate iron intake may be a problem even for the individuals consuming meat, individuals who do not consume meat need to be more careful about iron intake.²³ In vegetable foods, there is both iron and non-iron which is less bioavailable compared to iron in animal foods. non-ferrous iron is also sensitive to inhibitors such as phytate, calcium and fiber.²⁴ It is recommended to consume vitamin C with food or iron supplements to increase iron absorption. In order to prevent deficiency, there is a need for multivitamin or additional supplement that provides 45-60 mg/day iron throughout life.⁶ In this case, considering the biochemical parameters, B12 supplement was recommended as IV by the doctor and other vitamins and mineral supplements were

recommended as liquid or tablets under the control of the doctor. The patient's use of support products was questioned during the regular follow-up.

Rapid weight loss causes loss of not only adipose tissue but also bone tissue. Therefore, postoperative protein supplementation is expected to have positive effects on these patients.²⁵ The protein requirement after bariatric surgery is at least 60 g protein/day or 1.1 g protein/ideal body weight. Protein-energy malnutrition may be encountered due to insufficient protein intake after surgery.^{14,26,27} Vegans, whose main protein sources in their diet are difficult to digest cereals and legumes, may need more protein. High protein foods should be given priority over foods with high carbohydrate and fat content. Patients who do not consume enough protein may need to increase protein intake by protein supplementation to maintain muscle mass.⁶ In this case, the protein content of the diet was preferred as vegetable proteins and increased by using protein powder support.

Regular postoperative follow-up, nutrition education, behavioral change therapies, physical activity and lifestyle, and adequate protein and nutrient intake are essential for the treatment of obesity.²⁸ Bariatric surgery requires a multidisciplinary teamwork. Studies emphasize the importance of dietitian monitoring in bariatric surgery. The decrease in BMI was found to be less than 5% in bariatric surgery patients who had at least 2 diets per year compared to patients who did not have dietitian interviews.²⁹ Seven dietitian interviews were conducted throughout this case in the first year. Two dietitian interviews were planned in the postoperative 18th month.

In conclusion, in this vegan case, pre- and postoperative medical nutrition treatment was planned considering the type of surgery specific to the individual. The patient was offered vitamin-mineral supplements under doctor control in accordance with biochemical tests. Dietitian follow-up and individual-specific medical nutrition treatment in bariatric surgery are important parts of this process.

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