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Brief Communication

Changes of Serum 25OH-vitaminD Level in Patients with Morbid Obesity after Sleeve Gastrectomy in Iranian Population

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Abstract

Background: Patients who undergo sleeve gastrectomy are at risk for micronutrient deficiencies. The aim of this study was to investigate the changes of serum 25OH-vitaminD level in patients with morbid obesity after sleeve gastrectomy.

Methods: This retrospective study consisted of 952 patients (682 female and 270 male) who underwent sleeve gastrectomy by a surgical team in Ghadir Mother and Child subspecialized Hospital. Serum levels of 25OH-vitaminD before and three months after the surgery was evaluated.

Results: the results indicated that the mean of serum 25OH-vitaminD level in women ranged from 15.65±1.2 ng/ml to 24.6±1.98 ng/ml (P value=0.05) and in men from 15.65±1.2 ng/ml to 26.72±2.33 ng/ml (P value=0.02).

Conclusions: Our findings shows that regular follow-up after sleeve gastrectomy contributed to improve vitamin D deficiency after 3 months in patients with morbid obesity undergoing sleeve gastrectomy, which indicate that good follow-up after surgery, can lead to improving the level vitamin D serum.

Keywords: Sleeve gastrectomy; 25OH-vitaminD; Obesity

Introduction

The prevalence of obesity in developed and developing countries is increasing and is associated with serious complications such as diabetes and cardiovascular diseases (1-4). There are various criteria for defining extreme obesity; perhaps the most accepted one is having 100 pounds (45 kg) of extra weight on the body's optimal weight (5). They also determine obesity based on the BMI definitions. The obesity complications include coronary artery disease, hypertension, sleep apnea, hypercoagulopathy, gallstones, GERD, decreased self-esteem, and depression (5, 6).

Every year, 2.8 million people die in the world, due to obesity or overweight (6). The approaches to treat obesity include diet, increased physical activity, and sometimes the use of medications (2). One of the methods of treating obesity in patients who do not respond appropriately to the other weight loss methods is bariatric surgery, for those with morbid obesity and its complications (2). Sleeve gastrectomy (SG) is a restrictive bariatric procedure for treating obesity disorder by removing about 85% of the stomach that limits the food intake. These patients may be directed to different nutritional deficiencies (3, 7).

In these surgeries, failure to monitor the important nutrients may result in malnutrition (8). Various studies have been conducted on the effects of sleeve gastrectomy surgery on malnutrition, although comparing its results with other methods of bariatric surgery is more acceptable (9). Previous studies have shown the effect of sleeve gastrectomy surgery on the malnutrition of micronutrients (10). Bariatric surgical patients are at risk for developing a variety of nutritional deficiencies postoperatively. Certain bariatric procedures may lead to alterations in vitamin D metabolism and calcium absorption (11, 12). These changes may lead to disorders in bone homeostasis, placing patients at risk of developing osteopenia and osteoporosis (13). This study was conducted to investigate the changes of serum 25OH-vitamin D level in obese patients after sleeve gastrectomy in the Iranian population.

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Methods

This retrospective study was performed without a control group and consisted of 952 patients with morbid obesity who underwent sleeve gastrectomy by a surgical team in Ghadir Mother and Child subspecialized Hospital. The indication of the surgery was patients with BMI above 40kg/m2 or BMI between 35-40 kg/m2 with risk factors such as diabetes type 2 ,hypertension, reflux disorder,sleep apnea and joint pain . Before and three months after the surgery, blood samples were taken to evaluate the serum levels of 25OH-vitamin D. Vitamin D status was defined according to the Endocrine Society's latest guidelines for vitamin D levels (deficiency 19.9 ng/ml; insufficiency 20–29.9 ng/mL; sufficiency ≥30 ng/mL) (25). The blood samples were placed in the Selectra machine and centrifuged to separate their serum.

All the Patients received multivitamins and vitamin D supplements with the following specifications, except in the test range. After surgery, vitamin D supplements (50,000 IU) were prescribed one pearl/week for 8 weeks, followed by one pearl/month. All the patients' information was analyzed by using the SPSS software. The Dependent-sample t-test was used to determine the differences between the groups. A p-value less than 0.05 was considered statistically significant.

Results

In this study, 952 patients underwent sleeve gastrectomy; 682 (71.6%) patients were female and 270 (28.3%) were male. The mean ± SD age of the patients was 38.3±10.87 years and the mean ± SD weight of the patients was 140.81±18.96 kg. (Male: 149.32±17.76 and female: 132.28±17.13). The BMI mean was 46.51±11.23kg/m2 (male: 44.84±14.85kg/m2 and female: 48.16±15.24 kg/m2) in our 952 patient study population, 267 (28.04%) were diabetic and 161 (16.9%) were hypertensive patients. Serum levels of 25OH-vitamin D before and three months after the surgery was evaluated. The results of this study show that before sleeve gastrectomy 5.3 % of women had vitamin D deficiency and 84.5 % of women had insufficient amounts of 25OH-vitamin D and 9.2% of women had sufficient amounts of 25OH-vitamin D, and also the level of 25OH-vitamin D for men before sleeve gastrectomy was 3.9% and 87.1% and 9%, respectively (Table 1). In this study, the results indicated that the mean of serum 25OH-vitamin D level in women ranged from 15.65±1.2 ng/ml to 24.6±1.98 ng/ml (P value=0.05) and in men from 15.65±1.2 ng/ml to 26.72±2.33 ng/ml (P value=0.02), (table 2).

Thirty patients were entered into final analysis. As seen in table 1, seven patients were male (23.3%); in addition, the mean age of the patient was 38.97 ± 11.8 years. The mean body mass index was 45.58 ± 5.4 and 33.77 ± 5.7 kg/m² before and after LSG respectively which was significantly different (P=0.0001). The mean EF was 57.33 ± 2.85 and 58.33 ± 2.73 percent before and after the surgical procedure respectively. The mean EF was significantly higher in the post-operative (P=0.034).

In the exploration of the diastolic function, 10 patients had grade 1 of diastolic dysfunction who 6 of them became normal after LSG. Furthermore, 8 patients had grade 2 of diastolic dysfunction that 2 of them were in normal status

after surgery (Table 2). It was concluded LSG has a significant effect on the diastolic function (P=0.008).

In the field of valvular heart disease, 17 patients had valvular heart diseases including mitral stenosis, mitral regurgitation, aortic stenosis and aortic regurgitation before surgery that two of them (11.8%) were treated after surgery (Table 2). In fact, LSG had a sifnificant effect on the valvular heart disease (P=0.001).

As shown in Table 3, the EPF and LV mass index had no significant difference (P > 0.05); however, the LV mass (P=0.002) was significantly improved after LSG.

Table 1: The percentage of serum levels of 25OH-vitaminD in Male and Female before sleeve gastrectomy

Gender	Vitamin D cut-off levels	Female	Male
	Less than 10	3.9	5.3
10 to 30		87.1	84.5
30 to 100		9	9.2

Table 2: Results Dependent-sample t-test of changes in the serum levels of 25OH-vitaminD after sleeve gastrectomy

Gender	25OH-vitaminD (ng/ml)			
Treatment	Pre-operation mean± SE		Post-operation mean± SE	P-value
Male	13.9±2.1	24.6±1.98	**0.02**	
Female	15.65±1.2	26.72±2.33	**0.05**	

Discussion

In this study serum 25OH-vitamin D level had significant changes in patients with morbid obesity after sleeve gastrectomy. Obesity is a predictor of 25OH-vitamin D deficiency; our results confirm that regular follow-up after sleeve gastrectomy has improved vitamin D levels, which is similar to the result of other studies (22). The vitamin D status in the general population is affected by many factors including reduced skin synthesis, decreased bioavailability of vitamin D, and acquired and heritable disorders of vitamin D metabolism and responsiveness (14). Some of these mechanisms may contribute to vitamin D deficiency in obese patients. it has been shown that the prevalence of vitamin D deficiency was high before the surgery and decreased significantly with routine supplementation after the surgery (22).

One hypothesis showed a trend of obese patients to receive less sunlight exposure (15). The importance of sunlight exposure for providing vitamin D requirements has been well proved. Additionally, clothing has been shown to have a significant effect on the production of vitamin D in the skin (16). One potential explanation for our findings regarding vitamin D would be that obese persons may spend less time outside and cover their skin with more clothing when they are in the sun. Goldner et al. showed that the increase in vitamin D deficiency in the obese group persisted after controlling for sunlight exposure (17). Another reason suggests that reduced bioavailability of vitamin D in obese patients is due to sequestration of the fat-soluble vitamin in adipose tissue (18). The findings of our study support this hypothesis. Patients who were vitamin D deficient preoperatively had a significantly higher preoperative BMI than those who were vitamin D replete upon initial assessment. Like other studies, we also found a significant inverse correlation between preoperative vitamin D levels and BMI (19,20).

Sufficient sunlight, vitamin D sources, skin color, and age can affect vitamin D levels. The main source of vitamin D absorption is sunlight, and to a lesser extent can be received from dietary sources (16). Bariatric patients suffer from an additional risk of having malnutrition as a result of their surgery. Thus, those with severe postoperative vitamin D malabsorption may need to take oral doses as high as 50,000 IU vitamin D 1 to 3 times weekly up to daily (21). Dietary sources of vitamin D include oily fish, eggs, meat, fortified cereals and fat spreads, and nutritional supplements. For the prevention of deficiency, eating a diet abundant in vitamin D will help. The national diet and nutrition survey shows that adults from the UK aged 19–64 have an average daily intake of 42% of the RNI from diet and supplements (23). This is advised to routinely take a supplement to provide normal vitamin D status, especially during the autumn and winter months for the general population (24). Therefore daily vitamin D intake is associated with higher improvement in serum vitamin D status and dietitians have to accurately discuss the features affecting the low vitamin D status in obesity.

Conclusion

Our findings suggest that regular follow-up after sleeve gastrectomy contributed to improve vitamin D deficiency after 3 months in obese patients undergoing sleeve gastrectomy, which shows routine follow-up after surgery can lead to improving the level of serum vitamin D.

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