



Research Letter

Vitamin B12 supplementation orally and intramuscularly in people with obesity undergoing gastric bypass



ARTICLE INFO

Keywords:

Vitamin B12

Obesity

Gastric bypass

Methylmalonic acid

ABSTRACT

Purpose: Although bariatric surgery can facilitate weight loss and improve many diseases, it impairs the absorption of many vitamins and micronutrients. Vitamin B12 is important for these patients and should be controlled and supplemented postoperatively. The aim of this paper is to compare serum vitamin B12 levels in two forms of supplementation (oral vs. intramuscular) for 6 months after gastric bypass.

Methods: In a prospective controlled cohort study, people with obesity patients undergoing gastric bypass received vitamin B12 supplementation either orally or intramuscularly. The patients were followed for 6 months, receiving serial doses of vitamin B12 and methylmalonic acid assessment at 6 months.

Results: A total of 53 patients were divided into two homogeneous groups: an oral group ($n = 24$) and an intramuscular group ($n = 29$). Serum vitamin B12 was measured preoperatively and postoperatively at 1, 2, 3, and 6 months. Serum methylmalonic acid was measured at 6 months. At each point, the serum vitamin B12 level remained within reference values in both groups, although it was higher in the oral group ($p < 0.001$). Methylmalonic acid also remained within reference values in both groups, with no significant differences.

Conclusion: Despite the anatomical and functional alterations that impair vitamin B12 absorption after gastric bypass, oral vitamin B12 supplementation was as effective as intramuscular in this population.

© 2021 Asia Oceania Association for the Study of Obesity. Published by Elsevier Ltd. All rights reserved.

Introduction

There is clinical evidence to support oral vitamin B12 replacement, despite the intrinsic factor deficiency that occurs after gastric bypass. However, few prospective studies have compared intramuscular and oral supplementation after bariatric surgery [1]. Besides its discomfort, intramuscular application also involves risks and complications at the application site, such as bruising and abscesses, and another person must apply it. These limitations lead some patients to discontinue this important supplement [1–3].

Subjects

We compared serum vitamin B12 values in patients who received B-complex vitamins intramuscularly with those of patients who received it orally.

Material and methods

Participants

This experiment included people with obesity who underwent gastric bypass surgery for obesity treatment at a tertiary reference center. We included patients aged 20 to 60 years whose baseline postoperative serum vitamin B12 level was ≥ 350 pg/dL. In this procedure the stomach is stapled to create a gastric pouch of

approximately 50 ml and a deviation is made in the small intestine. The length of the alimentary limb was standardized at 150 cm, and the biliopancreatic limb ranged from 60 cm to 100 cm.

Intervention

All patients who underwent gastric bypass between September 2017 and September 2018 were prescribed vitamin B12 in the form of B-complex multivitamins (5000 mcg cyanocobalamin, 100 mg thiamine, and 100 mg pyridoxine). Upon inclusion, patients were allowed to select injectable or oral supplementation. Multivitamin supplementation began 30 days postoperatively. Patients who opted for the oral route were given one tablet daily; those whose serum vitamin B12 level was < 350 pg/mL before supplementation were treated with an intramuscular injection of B12 and excluded from the study. The control group consisted of patients who opted for supplemental injection. They were prescribed a once-a-month deep intramuscular injection of B-complex vitamins (5000 mcg vitamin B12, 100 mg thiamine, and 100 mg pyridoxine).

It was determined that if patient serum vitamin B12 levels fell below 350 pg/mL at any given time, they were to be treated with an intramuscular injection of B12 and excluded from the study, although this did not occur.

Table 1
Sample characteristics and preoperative laboratory tests.

	Oral B12 (n = 24)	Intramuscular B12 (n = 29)	p
Sample characteristics			
Age (years)	39.4 ± 10.4	36.3 ± 9.1	0.258*
Sex (female)	18 (75%)	20 (69%)	0.858**
Race (white)	24 (100)	28 (96.6%)	0.999**
BMI (kg/m ²)	41.3 ± 5.3	43.9 ± 12.6	0.354*
Preoperative laboratory tests			
B12 (pg/mL)	454.1 ± 190.3	419.2 ± 164.2	0.477*
Albumin (g/dL)	4.29 ± 0.28	4.30 ± 0.27	0.949*
Creatinine (mg/dL)	0.85 ± 0.17	0.82 ± 0.16	0.543*
Hematocrit (%)	41.8 ± 3.40	42.1 ± 3.70	0.724*
Hemoglobin (g/dL)	13.8 ± 1.10	14.0 ± 1.50	0.621*

* Student's *t*-test, mean ± standard deviation.

** Chi-square test or Fisher's exact test.

Table 2
Comparison of oral and intramuscular application of vitamin B12 preoperatively and at 1, 2, 3 and 6 months.*

	Oral	Intramuscular	p
Preoperative B12	454.1 ± 190.3	419.2 ± 164.2	0.477
B12 1 month	689.4 ± 245.5	712.9 ± 369.7	0.791
B12 2 months	1418.2 ± 621.4	555.8 ± 203.9	<0.001
B12 3 months	1464.1 ± 536.7	511.5 ± 276.5	<0.001
B12 6 months	1484.5 ± 563.5	633.4 ± 587.4	<0.001

* Student's *t*-test.

Data

The analyzed laboratory parameters were: serum albumin, serum vitamin B12, creatinine, hematocrit, hemoglobin, and methylmalonic acid (MMA) (at 6 months postoperatively). In the intramuscular group, blood samples to determine serum vitamin B12 levels were collected one week after injection, whereas supplementation in the oral group was not discontinued for collection. The assessed periods were: preoperative and 1, 2, 3, and 6 months postoperatively.

Ethics

This study was approved by the institutional research ethics committee, #71581317.1.0000.5336, and each patient gave written informed consent to participate.

Results

A total of 53 patients were included in the study, divided into two groups: the oral supplementation group (*n* = 24) and the intramuscular group (*n* = 29). Table 1 describes the sample's characteristics. The groups were homogeneous in all evaluated characteristics.

The mean preoperative serum vitamin B12 levels were homogeneous between the groups, as were the other tests we evaluated (Table 1). Small bowel limb lengths was homogeneous between groups (*p* = 0.999).

Serum vitamin B12 levels were similar preoperatively and 1 month postoperatively (*p* = 0.477 and *p* = 0.791, respectively). However, after supplementation began (1 month), serum vitamin B12 levels were higher in the oral group than the intramuscular group (*p* < 0.001) (Table 2).

Serum MMA levels were within reference values (0.08 to 0.56) in all patients. Although the variation was greater in the oral group, there was no statistically significant difference compared to the intramuscular group (Fig. 1).

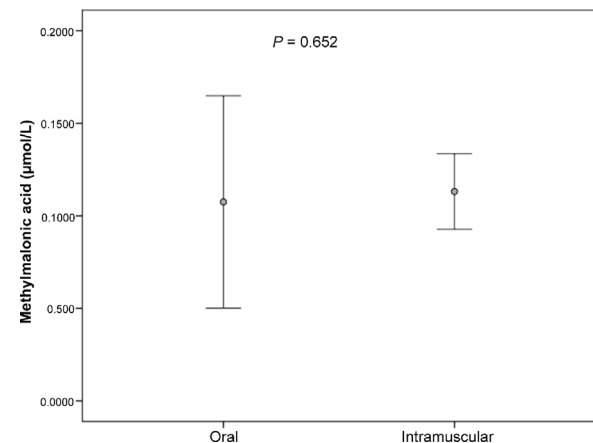


Fig. 1. Serum methylmalonic acid levels in oral B12 group vs. intramuscular B12 group.

Discussion

Few studies have compared the oral and intramuscular routes of vitamin B12 supplementation after gastric bypass. In 2011 Kim et al. [4] published the results of a prospective study in patients undergoing total gastrectomy for gastric cancer. Serum vitamin B12 levels were normalized in both groups at 1, 2 and 3 months, and the mean serum vitamin B12 levels in the oral group remained higher after 3 months.

In 2017, Smelt et al. [1] published a systematic review of different vitamin B12 supplementation regimens after bariatric surgery. The conclusion of this systematic review was that oral supplementation at high doses (>350 μg/day) could replace the intramuscular route.

In 2018, Schijns et al. [5] published the only randomized controlled trial comparing oral and intramuscular vitamin B12 supplementation after gastric bypass. Serum vitamin B12 levels were analyzed every 2 months and serum MMA levels were measured before treatment and after 6 months. At the end of 6 months, all patients had normal serum vitamin B12 levels, with no statistically significant difference between values at all time points. Serum MMA levels decreased significantly (*p* < 0.001) compared to baseline levels, and there was no difference between the oral and intramuscular groups at 6 months (*p* = 0.53). We found similar results in our study, although our sample, doses, and therapeutic regimens differed. Despite the similar results, we did find differences between the oral and intramuscular groups, with higher vitamin B12 values in the oral group (*p* < 0.001). In both groups, vitamin B12 levels, as well as MMA levels, were within the reference values.

Our study has some limitations. Although eating habits could have slightly influenced postoperative vitamin B12 levels, dietary habits were not assessed in this study.

In conclusion, oral vitamin B12 supplementation was just as effective as intramuscular injection in the present sample.

Ethics approval

This research was approved by the institutional research ethics committee (case 2.230.709) and registered with the Ministry of Health (Plataforma Brasil) (number 71581317.1.0000.5336). All patients provided written informed consent to participate.

Funding

This work was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001.

Conflicts of interest

The authors declare that they have no conflict of interest.

Acknowledgements

This work was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – Brasil (CAPES) – Finance Code 001.

References

- [1] Smelt HJ, Pouwels S, Smulders JF. Different supplementation regimes to treat perioperative vitamin B12 deficiencies in bariatric surgery: a systematic review. *Obes Surg* 2017;27:254–62, <http://dx.doi.org/10.1007/s11695-016-2449-9>.
- [2] Majumder S, Soriano J, Cruz AL, et al. Vitamin B12 deficiency in patients undergoing bariatric surgery: preventive strategies and key recommendations. *Surg Obes Relat Dis* 2013;9:1013–9, <http://dx.doi.org/10.1016/j.soard.2013.04.017>.
- [3] Butler CC, Vidal-Alaball J, Cannings-John R, et al. Oral vitamin B12 versus intramuscular vitamin B12 for vitamin B12 deficiency: a systematic review of randomized controlled trials. *Fam Pract* 2006;23:279–85, <http://dx.doi.org/10.1093/fampra/cml008>.
- [4] Kim HI, Hyung WJ, Song KJ, et al. Oral vitamin B12 replacement: an effective treatment for vitamin B12 deficiency after total gastrectomy in gastric cancer patients. *Ann Surg Oncol* 2011;18:3711–7, <http://dx.doi.org/10.1245/s10434-011-1764-6>.
- [5] Schijns W, Homan J, van der Meer L, et al. Efficacy of oral compared with intramuscular vitamin B-12 supplementation after Roux-en-Y gastric bypass: a randomized controlled trial. *Am J Clin Nutr* 2018;108:6–12, <http://dx.doi.org/10.1093/ajcn/nqy072>.

Rafael Jacques Ramos (MD, PhD)^{a,b}

Cláudio Corá Mottin (MD, PhD)^{a,b}

Leticia Biscaino Alves (MD, PhD)^{a,b}

^a Center for Obesity and Metabolic Syndrome (COM),
Hospital São Lucas, Av. Ipiranga, 6690, 90619-900
Porto Alegre, RS, Brazil

^b Graduate Program in Medicine and Health Sciences,
PUCRS, Porto Alegre, RS, Brazil

Carolina Mattana Mulazzani (MD)
PUCRS, School of Medicine, Porto Alegre, RS, Brazil

Alexandre Vontobel Padoin (MD, PhD)^{a,b,*}

^a Center for Obesity and Metabolic Syndrome (COM),
Hospital São Lucas, Av. Ipiranga, 6690, 90619-900
Porto Alegre, RS, Brazil

^b Graduate Program in Medicine and Health Sciences,
PUCRS, Porto Alegre, RS, Brazil

* Corresponding author at: Centro Clínico da
PUCRS, Av. Ipiranga, 6690/801, ZIP 90610-000
Porto Alegre, RS, Brazil.

E-mail address: alexandre.padoin@pucrs.br
(A.V. Padoin)

3 February 2021

5 February 2021