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Biliopancreatic diversion requires multiple vitamin and micronutrient adjustments within 2 years of surgery

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Abstract

Background: Malabsorptive bariatric procedures require multiple vitamin supplements, especially regarding fat-soluble vitamins. The exact amount required to maintain normal serum concentrations is still largely unknown. Based on the initial postoperative prescription, we assessed the number of adjustments and the amount of vitamins/micronutrients to normalize the biological markers 2 years after the biliopancreatic diversion with duodenal switch (BPD/DS).

Methods: A total of 112 consecutive patients had a laparoscopic BPD/DS between February 2007 and November 2010 for a body mass index of 53.1 ± 5.9 kg/m² at a private hospital. Complete blood checks with vitamin status were obtained at each of the 3-month interval visits during the 1st postoperative year as well as twice during the 2nd year.

Results: Initially, all of the patients were prescribed daily 25,000 International units (IU) of vitamin A, 1000 mg of calcium, multivitamins, and 1900 IU of vitamin D3. Significant adjustments were necessary 3.6 ± 1.1 times during this period. A total of 80% of the patients required added vitamin A, vitamin D, as well as calcium, zinc, and iron. After 2 years, $\geq 20\%$ of patients exhibited vitamin A and iron deficiency with low prealbumin or micropenic anemia. Seventy percent had vitamin D deficiency and 50% secondary hyperparathyroidism.

Conclusion: The initial prescription was insufficient to cover the requirements after BPD/DS. At least 3000 mg of calcium with 7000 IU of vitamin D, 50,000 IU of vitamin A, 40 mg of zinc, and 200 mg of iron must be prescribed to start with. The trend toward a decrease in 25 OH vitamin D and hyperparathyroidism remains difficult to control although it can result from increased bone turnover during the early postoperative period. (Surg Obes Relat Dis 2014;■:00–00.) © 2014 American Society for Metabolic and Bariatric Surgery. All rights reserved.

Keywords:

Biliopancreatic diversion; Malabsorption; Vitamins

Biliopancreatic diversion (BPD) with duodenal switch (BPD/DS) or without DS is known to lead to multiple vitamin deficiencies if not supplemented accordingly. Because of the short common channel where bile salts

and food mixes, fat-soluble vitamin serum concentrations usually rapidly decrease postoperatively. Exclusion of the jejunum from the alimentary tract also results in poor iron, copper, and zinc absorption. Despite existing recommendations [1], the exact amount of vitamins and micronutrients to ensure a correct supplementation is usually unknown and can be variable among individuals. In addition, there is a frequent gap between the supplementation regimen prescribed and what is effectively consumed by the patients

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over time [2]. The purpose of this study was to retrospectively analyze the mean amount of vitamins that should be taken after BPD/DS.

Methods

A total of 112 consecutive patients (14 men), who had a BPD/DS between February 2007 and November 2010 with a minimum of 2 years follow-up were retrospectively reviewed with respect to vitamin and micronutrients prescriptions as well as serum vitamin charts. Eligible patients were assessed in accordance to the French Haute Autorité de Santé guidelines. Preoperative nutritional assessment was conducted in partnership with the nutritionists at the university hospital. After the preoperative blood check-up, existing deficiencies were treated. Patients usually received 100,000 IU vitamin D3 monthly and other vitamins as required. Normalization of the vitamin and micronutrient status was, however, not required for clearing patients for surgery. The same surgeon performed all of the surgeries at a private hospital affiliated to the university medical center in the preoperative assessment and follow-up. BPD/DS was performed laparoscopically using a standardized technique previously described [3]. For each patient the common channel was measured at 100 cm with an alimentary limb of 150 cm resulting in a small bowel length of 250 cm in contact with the food. The sleeve gastrectomy was fashioned over a 50Fr bougie with an estimated volume of 120–150 cc. The preoperative body mass index (BMI) was 53.1 ± 5.9 kg/m² and patients were aged 40 ± 11 years. After discharge from the hospital each patient was initially prescribed daily: 25,000 international units (IU) of vitamin A, 1000 mg calcium carbonate, 1900 IU vitamin D3 (800 IU in association with calcium and 100,000 IU drinkable/3 mo), and 1 tablet multivitamins (Table 1). Clinical examinations and blood tests were scheduled every 3 months during the 1st year and at 18 months and 2 years after surgery. The goal at each visit was to maintain the vitamin and micronutrient serum concentrations within normal range. Table 2 describes the content as well as the normal values of the routine blood test. The full test routinely included red and white cell count, platelets, phosphorus, liver function test, thyroid hormones, cholesterol, and triglycerides. Serum copper was measured once a year. Vitamins A, B9, B12, D (25 OH D2 + D3), parathormone (PTH), prealbumin, albumin, hemoglobin, iron, ferritin, and zinc were considered 1 of the most relevant parameters to study. Comparison was made to preoperative values whenever available. Based on the initial postoperative prescription, we assessed the number of adjustments and the amount of vitamins/micronutrients necessary to normalize the biological markers 2 years after the surgery. The latter time point was chosen as the beginning of a plateau after the postoperative weight loss period. At each visit, if required, prescription adjustments were made according to the

Table 1
Daily multivitamin content

	Content	Unit
Vitamin A	4000	IU
Vitamin B1	1.6	mg
Vitamin B2	1.8	mg
Vitamin B6	2.6	mg
Vitamin B12	4	µg
Vitamin C	100	mg
Vitamin D3	500	IU
Vitamin E	15	mg
Vitamin B5	10	mg
Vitamin B8	.2	mg
Zinc	.8	mg
Vitamin PP	19	mg
Calcium	125	mg
Ferrous Iron	60	mg
Copper	1	mg
Manganese	1	mg
Magnesium	100	mg
Phosphorus	125	mg
Vitamin B9	.8	mg

IU = international units

vitamins effectively taken by the patient irrespective of the previous prescription. Results were expressed as mean values \pm standard deviation. X² test was used with $P < .05$ as a significant result.

Results

All 112 patients except for the 3 lost to follow-up had a complete biological chart 2 years after surgery. Within 2 years from surgery, 5 ± 1.1 visits were completed including complete blood check. 3.6 ± 1.1 significant adjustments of the prescription were required. Up to 2 years after their surgery, at least 80% of the patients needed an increase in the daily dosage of vitamin A, vitamin D, calcium, iron, and zinc (Table 3). Vitamin A, vitamin D, and calcium had

Table 2
Normal value range for biological parameters in biliopancreatic diversion with duodenal switch

	Low	High	Unit
Vitamin A	366	546	µg/L
Vitamin B1	67	200	nmol/L
Serum vitamin B9	10.4	42.4	nmol/L
Red cell vitamin B9	590	2300	nmol/L
Vitamin B12	191	664	ng/L
Vitamin D (25 OH) D2+D3	75	200	nmol/l
Parathormone	15	65	pg/L
Albumin	35	55	g/L
Prealbumin	.20	.34	g/L
Ferritin	10	204	µg/L
Hemoglobin	11.5	16	g/dL
Iron	50	160	µg/dL
Calcium	90	105	mg/L
Zinc	590	1440	µg/L
Selenium	60	120	µg/L

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