Nutrition 30 (2014) 1301–1305

Contents lists available at ScienceDirect

Nutrition

journal homepage: www.nutritionjrnl.com

Applied nutritional investigation

Long-term medical complications after malabsorptive procedures: Effects of a late clinical nutritional intervention

Lidia Santarpia M.D., Ph.D. [a,*], Ilenia Grandone M.D. [a], Lucia Alfonsi M.D. [a], Maurizio Sodo M.D. [b], Franco Contaldo M.D. [a], Fabrizio Pasanisi M.D., Ph.D. [a]

[a] Interuniversity Research Center for Obesity and Eating Disorder CISRO, Department of Clinical Medicine and Surgery, Naples, Italy
[b] Department of Public Health, Pre and Post Transplant Surgery, Federico II University Hospital, Naples, Italy

ARTICLE INFO

Article history:
Received 26 August 2013
Accepted 16 March 2014

Keywords:
Bariatric surgery
Malabsorption
Nutritional supplements
Follow-up

ABSTRACT

Objective: The growing prevalence of severe obesity, combined with the failure of conservative treatments, has led to a significant spread of bariatric surgical procedures. The aim of this study was to emphasize the need of adequate presurgery patient selection and close follow-up after malabsorptive procedures for bariatric surgery.
Methods: The study retrospectively evaluated 25 (20 F, 5 M; mean age 43 ± 13 y) obese patients (mean weight before intervention 134 ± 30.7 kg, body mass index 50.7 ± 10.1 kg/m^2) attending our outpatient clinical nutrition unit for severe malabsorption and secondary malnutrition after surgical intervention that had been performed outside the regional area.
Results: All patients received personalized dietetic indications; in 12 of 25 (48%) cases integrated by oral protein supplements and in 5 of 25 (20%) by medium chain triglycerides. According to screening exams, patients were prescribed oral/parenteral iron, vitamins A, B group, D, and folate supplementation. In 14 of 25 (56%) patients, parenteral hydration and in 4 of 25 (16%), long-term parenteral nutrition was required. Five patients required hospitalization for severely complicated protein–energy malnutrition.
Conclusion: Nutritional deficiencies are common after malabsorptive procedures for bariatric surgery; these can be present or latent before surgery, frequently going unrecognized and/or inadequately treated particularly when patients are not strictly followed up by the operating center. Despite the adequate—even intensive—intervention, clinical nutritional status moderately improved in all patients.

Introduction

Obesity is an epidemic disease not only in Western "developed" countries but also in "developing societies" all over the world. In United States, expected prevalence of obesity is about 35.5% with more than 5% having a body mass index (BMI) > 40 kg/m^2 (grade 3 obesity) [1].

In Europe, the prevalence of obesity has increased three times in the past 20 y. In Italy one-third of the adult population is expected to be overweight, one-tenth frankly obese, and up to 500,000 individuals are expected to be severely obese with a BMI >40 kg/m^2 [2]. The growing prevalence of severe obesity combined with the absence of effective conservative treatments and the concomitant development of laparoscopic bariatric surgery, has led to a significant increase in the number of procedures performed each year in most Western countries [3]. Bariatric surgery has been proven to produce effective and sustainable weight loss that, in turn, results in a significant reduction of medical complications and improved quality of life [4]. Malabsorptive interventions, in particular jejunoileal bypass and biliopancreatic diversion, can cause chronic uncontrolled malabsorption, eventually worsened by inadequate nutrient supplementation [5]. These procedures alter intestinal motility, absorptive, digestive, and neuroendocrine functions. Reduced biliary salt enterohepatic circulation contributes to malabsorption of lipid and liposoluble vitamins. Increased intestinal transit contributes to protein–energy malnutrition (PEM). "Blind loop

The authors declare no sources of funding for this study. LS designed and wrote the study. IG conceived the study, and assembled and analyzed data, LA contributed to data collection. MS contributed to data collection and interpreted the data. FC and FP revised the manuscript and approved its final version. The authors declare no conflict of interest.

* Corresponding author. Tel.: +39 081 746 2333; fax: +39 081 546 6152.
E-mail address: Lidia.santarpia@unina.it (L. Santarpia).

0899-9007/$ - see front matter © 2014 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.nut.2014.03.011

syndrome" with intestinal content stasis can cause bacterial overgrowth and worsening of malabsorption [6].

According to surgical procedures, all obese patients require, among others, accurate clinical nutritional evaluation and dietary advice before surgery, as well as postsurgery lifelong, careful follow-up, as recommended by recent guidelines [7,8].

This retrospective study evaluated 25 obese patients not adequately followed up after bariatric procedures and referred by their medical practitioner to the Clinical Nutrition Unit at Federico II University Hospital in Naples for severe nutritional deficiency symptoms and/or secondary malnutrition.

This case series aimed to emphasize the need of more adequate patient nutritional evaluation before bariatric surgery and closer follow-up after malabsorptive procedures.

Materials and methods

Patients

Twenty-five patients consecutively referred by the general practitioner to the outpatient Clinical Nutrition Unit between 2002 and 2010, for PEM secondary to malabsorptive bariatric surgery were retrospectively evaluated. All patients had undergone surgery in an extraregional bariatric center.

In this study, the first visit (A) and the follow-up visit after 6-mo therapy (B) were considered for the analysis of clinical and biochemical data, to assess baseline conditions at admission, and to evaluate the efficacy of nutritional intervention.

Methods

At entry to the outpatient unit, the following data were collected:

- Case history and clinical exam with particular attention to nutritional status.
- Interview with a dietitian to evaluate current dietetic habits and give adequate dietetic indications.
- Blood samples collected for routine biochemistry, serum vitamins (B_{12}, folate, A, D, and E), micronutrients (iron, copper, zinc, magnesium), and serum hormones (thyroid-stimulating hormones, parathyroid hormone, thyroxin) evaluation.
- Bioelectrical impedance analysis for body composition evaluation and indirect calorimetry for resting metabolic rate (RMR) measurement.

Information on body weight changes (before and after bariatric surgery) and possible clinical (metabolic, cardiovascular, endocrine, etc.) complications of obesity before and after malabsorptive procedures were collected from clinical records and patients' case histories.

Information on postsurgery weight loss at 1, 5 and 10 y, where possible, and the presence or absence of an adequate presurgical evaluation and a postsurgical follow-up also were collected.

Following baseline data collection and clinical evaluation, careful dietetic advice was provided and vitamins and micronutrients (orally or parenterally), oral nutritional supplements and, when necessary, parenteral nutritional support were prescribed.

Outpatient clinic follow-up with variable frequency (weekly to every 3 mo) was scheduled according to patients' clinical conditions.

Statistical analysis

All data were collected in a database for statistical analysis.

The data were analyzed with the Statistical Package of Social Science (SPSS version 14.0 for Windows, Chicago, IL, USA). Results are expressed as mean ± SD unless otherwise stated. The *t* test and the analysis of variance with the Tukey's post hoc test were used to assess differences of continuous variables where appropriate. Differences were considered significant when $P < 0.05$.

Results

Twenty-five patients (20 F, 5 M), mean age 43.0 ± 12.8 y (min 22, max 78) were examined.

All patients had undergone malabsorptive bariatric surgery, in particular 15 (60%) patients (4 M, 12 F) underwent biliopancreatic diversion (BPD) between 1984 and 2004; 6 (24%) (6 F) had bilio-intestinal bypass (BB) between 2001 and 2005; and 4 (16%) (1 M, 3 F) underwent jejunoileal bypass, 3 according to Scopinaro et al. [9] between 1988 and 1992 and 1 according to Doldi et al. [10] in 2004.

Mean body weight and BMI before intervention were 134.0 ± 30.7 kg (median 130, min 85, max 230) and 50.7 ± 10.1 kg/m^2 (median 50.3, min 35, max 84), respectively.

Before surgery, 10 of the 25 patients had dyslipidemia, 5 had type 2 diabetes, 16 had liver steathosis, and 13 were diagnosed with arterial hypertension.

One year after surgery, mean body weight was 92.5 ± 31.1 kg (median 90, min 46, max 200), with a mean weight loss of 41.5 ± 18.7 kg (median 37, min 0, max 72) and BMI 34.8 ± 10.4 kg/m^2 (median 32.5, min 18.4, max 73.0) with mean BMI unit loss of 15.8 ± 7.4 (median 14.1, min 0 max 28.7). The percent weight loss at 1 y was 31.2% ± 13.5% of initial body weight (median 29.1, min 1, max 60.3).

Five years after surgery, the patients had lost 57.7 ± 24.6 kg (median 49, min 29, max 133); 42% ± 9.9% (median 42.9, min 27.3, max 58.0) of initial body weight; weight being 76.3 ± 15 kg (median 78, min 45, max 110), BMI 28.8 ± 4.7 kg/m^2 (median 27.7, min 20.3 max 39.0).

Ten years after surgery (data available for 17 patients) body weight was 78.2 ± 23.1 kg (median 77, min 38, max 120), BMI 30.1 ± 8.5 kg/m^2 (median 29.3, min 18.6, max 49.3), with a global weight loss of 53.1 ± 25.4 kg (median 51.2 min 15, max 110), a mean percent loss rate of 39.8% ± 9.9% (median 39.6, min 14.0, max 63.2) of initial body weight.

The time lasted from malabsorptive surgery to referral to our unit ranged 2 to 21 y (mean 9 ± 5 y).

The case history revealed that 14 of the 25 (56%) patients had not performed appropriate nutritional follow up after bariatric intervention; 11 (44%) received inadequate controls.

Table 1 shows the main clinical symptoms reported by the patients at entry (A) and at the visit after 6 mo therapy (B). At visit A, hypotension (blood pressure <110/70 mm Hg), mild to severe asthenia, hemeralopia, and chronic diarrhea (abundant and semi-liquid evacuations at least three to four times/d) were the most frequent symptoms. As far as diarrhea, five patients (31%) had more than five daily evacuations. Clinically evident dehydration (dry tongue and skin) was frequently reported as well as edema of the legs and neuromuscular (cramps, paresthesia, tingling) symptoms, whereas tachycardia and bradycardia were less frequent. At visit B, after dietetic intervention and cyclical intestinal disinfection with metronidazole or rifaximin (1 wk/mo) followed by assumption of probiotics for the following 3 wk, all patients reported reduced stools (maximum two to three evacuations daily) with increased consistency. Dehydration, edema of the legs, neuromuscular symptoms, and

Table 1
Main clinical symptoms in 25 severely obese patients surgically treated: Before (A) and after (B) nutritional intervention

Symptoms	Visit A n (%)	Visit B n (%)
Hypotension	19 (76)	15 (60)
Asthenia	18 (72)	4 (16)
Diarrhea	16 (64)	0
Hemeralopia	16 (64)	10 (40)
Dehydration	14 (56)	0
Edema of the leg	8 (32)	0
Tachycardia	6 (24)	1 (4)
Neuromuscular symptoms (cramps, paresthesia, tingling)	4 (16)	0
Bradycardia	2 (8)	0