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Original article

Long-term multiple intragastric balloon treatment—a new strategy to treat morbid obese patients refusing surgery: Prospective 6-year follow-up study

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Abstract

Background: Morbid obesity is an increasing health problem. Dietary intervention often fails in the medium to long term, and surgery is the gold standard. Intragastric balloon is a valuable treatment in the short–term, and multiple balloon treatment has been shown to be effective in the medium term. The aim of this study was to investigate the efficacy of multiple balloon treatment in the long-term (6 years) in terms of weight loss, influence on co-morbidities, and quality of life in patients refusing surgery.

Methods: Eighty-three patients with body mass index (BMI) >40, good candidates for surgery but refusing it, were enrolled in a clinical treatment protocol involving multiple intragastric balloon placement. After removing the first balloon, a second balloon was placed when the patients had regained $\geq 50\%$ of the weight loss achieved with previous balloon. Weight, co-morbidities parameters, and quality of life test were recorded during a follow-up of 72 months.

Results: All patients experienced a second balloon placement; 22.2% had a third device placed and 1 patient had a fourth device placed. At 76 months follow-up, mean BMI was 37.6 kg/m^2 ($P < .001$); weight cycling periods were observed. Significant difference was recorded in the presence of co-morbidities at baseline (80% of the patients) and follow-up (30%) ($P = .02$). Quality of life test in the follow-up indicated better scores than those at baseline ($P < . .001$).

Conclusion: Despite the weight cycling, in patients refusing surgery, multiple intragastric balloon is the recommended treatment, allowing the patients to achieve a good weight loss, better control of co-morbidities, and better quality of life than at baseline. (Surg Obes Relat Dis 2014;10:307–312.)

Keywords: Intragastric balloon; BIB; Multiple treatment; Co-morbidities; Quality of life; Weight cycling

Obesity is currently one of the most common public health problems. Recent studies show that more than one third of adults in the United States [1] and more than one-fifth of adults in Europe are already obese [2,3].

Although lifestyle modifications, including diet and exercise, are the stronghold of therapy, these approaches often fail in the medium to long term [4]. Bariatric surgery is considered the gold standard in morbid obesity treatment, but most patients refuse surgical treatment, despite the

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knowledge that obesity increases the risk of hypertension, dyslipidemia, type 2 diabetes, heart disease, sleep apnea, and respiratory problems and is also associated with increases in all-cause mortality [5].

The only alternative to diet failure and to bariatric surgery is the intragastric balloon and other endoluminal devices that are still under study and not yet available.

Intragastric balloon is a temporary endoscopic nonsurgical obesity treatment; it is totally reversible and can be repeated several times [6–10]. It is a temporary treatment, and in almost all morbid obese patients, the weight loss is followed by subsequent weight regain [11–14]. Several authors have reported a successful weight loss in the short-term, but only a few studies have investigated the long-term results after removal [6,13]. One study with 2.5 years follow-up [14] showed that after balloon removal and in the absence of adequate accompanying measures, most patients regain weight. The efficacy of the intragastric balloon, however, also has been reported for "multiple" treatment: in a recent prospective study on 100 patients, the authors stated that a second intragastric balloon can be positioned without difficulties, achieving good results with continuous weight loss. On a group of morbid obese patients refusing surgery, this study investigates the efficacy of multiple balloon treatment in the long-term, in terms of weight loss, safety, influence on obesity-related co-morbidities, and quality of life.

Methods

Patients with a body mass index (BMI) of ≥ 40 kg/m^2, in whom conservative obesity therapy had failed, and who refused any surgical therapy were recruited from the prospective database of our institution. All of them refused surgical treatment and were willing to be treated by intragastric balloon. After removing the first balloon, a second balloon was placed when the patients had regained $\geq 50\%$ of the weight loss achieved with previous balloon. The same weight regain strategy was used for the other sequential balloons. After the first Bioenterics Intragastric Balloon (BIB) (Allergan Inc., Irvine, CA, USA) removal, patients were encouraged to maintain the weight by physical exercise, diet, and if needed, psychological support. A specific low-calories diet was given to all by a dietician interested in bariatric surgery and intragastric balloons.

Patients who had recently lost 5% or more of their weight or were taking medications that cause weight gain or prevent weight loss (e.g., glucocorticoids or second-generation antipsychotic medications) were excluded. Routine preoperative tests included a complete laboratory workup, upper gastrointestinal tract endoscopy, and nocturnal oxymetry. During BIB treatment, patients were visited in the outpatient clinic to assess their progress in losing weight and to evaluate any adverse side effects and change in co-morbidities; also the quality of life test was submitted and the score recorded. This treatment was approved by the local ethics committee, and a specifically created informed consent was signed by all patients. The study was not registered, because at the beginning of this protocol treatment, it was not considered as a matter of results publication. After the treatment of >80 patients, the authors prepared the results for publication. The present study is a retrospective review of a prospectively collected database.

Primary outcome was the efficacy of the treatment. Weight outcome was evaluated in terms of BMI and percentage excess weight loss. Safety was the second outcome, carried out by recording minor (balloon rupture, esophagitis, uncontrolled vomiting, and balloon intolerance) and major (ulcer, perforation, and death) complication rate. For the evaluation of the balloon influence on co-morbidities, noninsulin dependent diabetes mellitus (NIDDM), hypertension (HTN), and obstructive sleeping apnea syndrome (OSAS) were considered. Resolution of a given co-morbidity was defined as its complete disappearance with no residual treatment. Improvement was defined as either better control of the condition with the same medication or equivalent or better control with reduced medication. Worsening was defined as worse control and/or increased medication or the development of a co-morbidity that had not existed before.

NIDDM

All patients were assessed for diabetic status at baseline as per the 2007 American Diabetes Association guidelines, as follows: fasting blood glucose ≥ 126 mg/dL or 2-hour blood glucose ≥ 200 mg/dL after an oral-glucose-tolerance test [15]. Patients were considered to have progressed to diabetes if their blood glucose was ≥ 126 mg/dL under fasting conditions during ≥ 2 consecutive measurements and/or ≥ 200 mg/dL at 2 hour after an oral-glucose-tolerance test.

HTN

Blood pressure (BP) was measured using standardized mercury sphygmomanometer with the subject in the supine position, the arm at the level of the heart, and after 5 minutes rest. HTN was defined as systolic BP ≥ 140 mm Hg and/or diastolic BP ≥ 90 mm Hg and/or use of antihypertensive medication. Blood pressure control was defined as systolic blood pressure <140 mm Hg and Diastolic Blood pressure (DBP) <90 mm Hg.

OSAS

Obstructive sleep apnea was diagnosed by Epworth Sleepiness Scale (ESS) score [16] and polysomnography and measured by the apnea-hypopnea index (AHI). An AHI of >5 events per hour was diagnosed as OSAS. OSAS severity was stratified according to AHI score: <5 events/hour was designated as normal, 5 to 14 events/hour as mild

OSAS, 15 to 30 events/hour as moderate OSA, and >30 events/hour as severe OSA [17].

Quality of life evaluation

The evaluation of the quality of life was carried out by the "Quality Metric's Short Form (SF-12) Health Survey," a shorter version of the SF-36 Health Survey composed by 12 questions to measure functional health and well-being from the patient's point of view. The SF-12 includes 8 concepts: physical functioning, role of functioning physical, body pain, general health, vitality, social functioning, role of emotional functioning, and mental health. Results were expressed in terms of 2 meta-scores: the Physical Component Summary (*P*CS) and the Mental Component Summary (MCS). To calculate the PCS and MCS scores, test items were scored and normalized in a specific algorithm.

Balloon placement and removal: postplacement pharmacologic treatment

Placements were carried out under propofol sedation administered by an anesthetist with an interest in bariatric surgery [18]. The BIB System was used in all patients. Balloons were inflated using 500 mL of saline. The procedure was performed under endoscopic direct vision. Balloons were removed after 6 months under the same sedation, in the endoscopic unit, using dedicated devices.

On the first postplacement day, intravenous saline (30–35 mL/kg/d) with omeprazole (20 mg/d) ondansetron (8 mg/d) and butylscopolamine bromide (20 mg 2 times per day) were given to all patients. On the second day, if the patients were able to tolerate fluids, they were discharged with the following therapy: omeprazole (20 mg/d) and antiemetics (if required).

Statistical analysis

Statistical analysis was performed using Stata version 11.2 (Stata Corporation, College Station, TX). Categorical data were compared using the χ^2 test; continuous data were compared using *t* test, with CI of 95%. *P* values <.05 were considered statistically significant.

Results

Eighty-three patients (19 male and 64 female, mean age 37.4 years, mean BMI 43.74 kg/m^2) were recruited. In a period of 72 months, all patients experienced a second balloon placement, after a mean interval of 12 months (range 1–55); eighteen of them (22.2%) had a third device placed, and 1 (1.2%) had a fourth device placed. After a mean interval of 47.7 months (range 12–72), 18 patients (22.2%) requested bariatric surgery (2 laparoscopic gastric banding, 6 laparoscopic gastric bypass, 10 laparoscopic sleeve gastrectomy) and were excluded from the follow-up analysis. Three patients (4.1%) were lost at follow-up. Final follow-up analysis was performed on 62 patients (74.7% on total group, 95.4% excluding patients underwent surgery).

Weight loss

After the first balloon treatment, a significant weight loss was achieved ($P < .001$), with mean BMI loss of 7.8 kg/m^2 (initial BMI 43.7 kg/m^2, removal BMI 35.9 kg/m^2). At second BIB placement, mean BMI was 37.9 kg/m^2, and at the end of second BIB treatment, mean BMI was 34.8 kg/m^2 (P = not significant). At 76 months follow-up, mean BMI was 37.6 kg/m^2 ($P < .001$) (Fig 1).

Safety

During the second balloon period, duration of symptoms was longer than that during the first balloon placement; nausea, vomiting, and epigastric pain were experienced for a mean of 4 days, compared with a mean of 2.5 days at first BIB. All symptoms were well controlled by medical treatment. No major complication (ulcer, perforation, and death) were reported. For minor complication, only 1 patient (1.4%) experienced early balloon removal for balloon intolerance; no balloon rupture, esophagitis, or uncontrolled vomiting were recorded.

Co-morbidities control

There was no difference between first BIB removal and the second ($P = .7$), but significant difference was recorded between the presence of co-morbidities at baseline (80% of

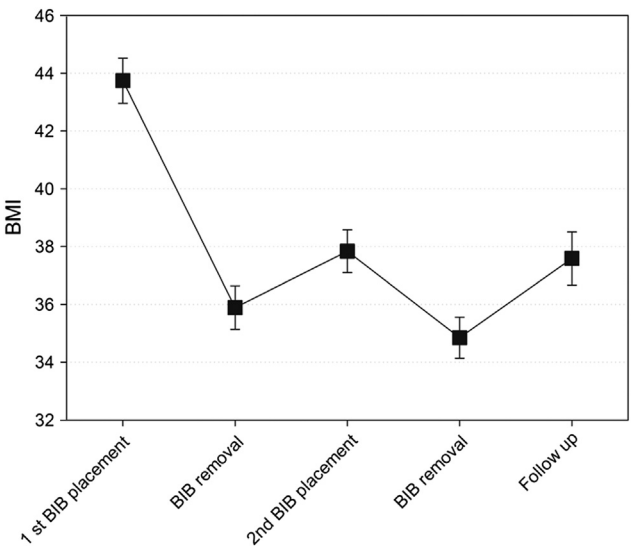

Fig. 1. Overall BMI changes by balloons placement and removal events. Weight loss in term of BMI from baseline (1st balloon placement) to 1st balloon removal, 2nd balloon placement (mean 18 months), 2nd balloon removal (mean 25 months), and 76 months (follow-up). Third and fourth balloon results are not shown. BMI = body mass index; BIB = Bioenterics Intragastric Balloon. The results are expressed as mean values with standard error of the mean.

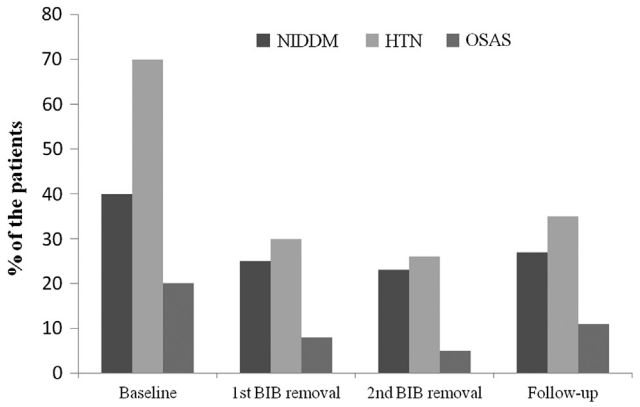

Fig. 2. Co-morbidities control during the different steps of the study. The values express the percentage of the mentioned co-morbidity present (unchanged from baseline) at the specific timing. NIDDM = noninsulin dependent diabetes mellitus; HTN = hypertension; OSAS = obstructive sleep apnea syndrome; BIB = Bioenterics Intragastric Balloon.

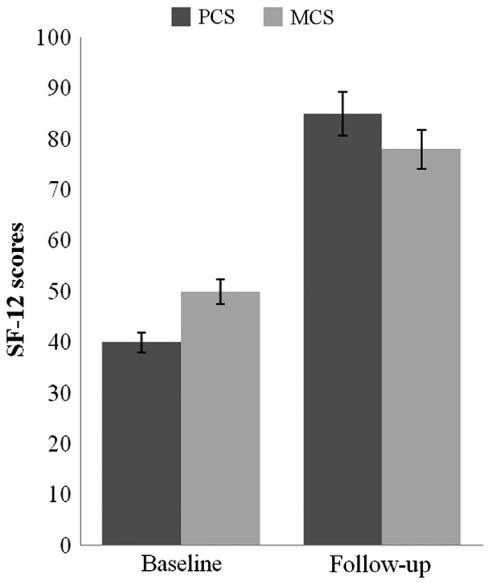

Fig. 3. Mean values of quality of life scores in the 2 summary components of the Quality Metric's Short Form (SF-12) Health Survey, the Physical Component Summary (PCS), and the Mental Component Summary (MCS) at the baseline and after 6 year of BIB (Bioenterics Intragastric Balloon) treatments. The results are expressed as mean values with standard error of the mean.

the patients with at least 1 co-morbidity) and follow-up (30% of the patients with at least 1 co-morbidity) ($P = .02$). Details of co-morbidities outcome is shown in Fig. 2; the percentage of co-morbidities resolved/improved at follow-up was 73% of diabetes, 65% of HTN, 89% of OSAS. No worsened co-morbidities were present. One female patient experienced the resolution of her fertility problem ("sine causa" infertility), only by losing weight [19].

Quality of life

At the follow-up, the 2 summary measures (physical and mental summaries, PSC and MCS) of SF-12 corresponded to significantly better scores than those at baseline ($P < .001$) (Fig. 3). Considering the overall score, almost 14% of the patients at baseline had poor or very poor quality of life (QoL), but at follow-up, no patients had such low scores.

Discussion

Current nonsurgical treatment programs for obese individuals are not very effective over the long-term, leading to the common perception that patients who successfully lose weight will regain it all within 5 years [20]. The results of a review on long-term weight loss maintenance after a very-low energy diet indicates that obese individuals maintained weight loss of 3.0 kg, representing a reduced weight of about 3.2% below initial weight [21].

Dumonceau et al. [22] reported a 5-year weight loss study comparing single versus repeated placement of intragastric balloon; they report a temporary effect up to 3 years follow-up. Balloon treatment did not decrease recourse to bariatric surgery.

The close follow-up of the present study drastically reduced the drop-out rate (3 patients); one strength of this study is the final follow-up rate (74.7% of the total group and 95.4% excluding patients who underwent surgery). All patients experienced a good weight loss. Co-morbidities at this weight were less severe and better controlled. Also quality of life was better than baseline.

In patients refusing surgery, multiple BIB treatment can be considered a useful tool to control weight gain, to better control co-morbidities, and to achieve a better quality of life. Although a cost analysis of this long-term approach was not performed, it can be inferred that this strategy is more expensive in the long-term than diet alone; moreover, the total annual BIB costs could be compensated by the reduction in long-term pharmacologic therapies of co-morbidities, as per results. The present study, however, focused on patients who had experienced long-term diet failure and refused surgery. From this point of view, although more expensive, this is the only possible strategy allowing patients to achieve long-term success.

In a recent review, Holzapfel and Hauner state that after losing weight it is difficult to maintain the new weight and continuation of the program cannot prevent a moderate weight increase in the follow-up year. Regarding the reasons, the complex regulatory system of the body is "to defend its weight," but for weight maintenance, a lifelong change of lifestyle seems to be of critical importance [23].

Losing weight and regaining it, known as "weight cycling" or "yo-yo dieting", is well-known by patients, and a mathematic model has been presented for the dynamics of human weight cycling [24]. This pattern of alternating phases of dieting and relapse has been the subject of several studies suggesting that increased risks of morbidity and mortality may be associated with fluctuations in weight [25,26]. On the

other hand, weight loss improves all obesity related co-morbidities and improves life expectation. Yo-yo dieting may be better than not dieting at all. The results of the present study after 6 years showed a mean BMI of 6.1 kg/m^2 less than at baseline, despite the weight cycling.

In parallel with physical co-morbidities, obesity causes psychosocial disability and deteriorates quality of life [27]. In the Swedish Obese Subjects study, the QoL was worse in the severely obese than in patients with chronic diseases [28]. Surgeons have used weight loss and weight-related scores as the main postoperative outcome, although the improvement of multiple conditions should be considered, including quality of life parameters [29]. From the patient perspective, QoL is the most important outcome of the weight-reducing procedure, and in recent years, the interest in measuring QoL has dramatically increased [30].

In our experience, patients reaching a lower BMI than at baseline by the yo-yo dieting achieved a good control on co-morbidities and a better quality of life score.

In total, 22.2% of patients finally underwent bariatric surgery. We can infer that multiple failed BIB treatment helps patients to really perceive their obesity problem and may lead to a decision for a bariatric surgery option previously refused.

Conclusion

Intragastric balloon treatment, even repeated in the long-term, does not solve obesity. Nevertheless, multiple BIB treatment allows for long-term obesity control, enabling the patient to achieve a lower body mass index, co-morbidities control, and an improved quality of life. Surgery is the gold standard of morbid obesity, but in patients refusing surgical approaches, considering the failure of dieting in the long-term, multiple BIB is currently the recommended treatment.

Disclosures

The authors have no commercial associations that might be a conflict of interest in relation to this article.

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