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Cost-effectiveness study of preoperative weight loss in extreme obesity, what is the best therapeutic option?

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Abstract:

Extreme obesity patients who are candidates to bariatric surgery benefit from optimization prior to the intervention since preoperative weight loss implies a reduction in surgical risk. The bariatric surgery program began at the Central University Hospital of Asturias (HUCA) in 2003 and has undergone modifications in the optimization method over time. Initially we used different types of intragastric balloon (BIG) to finally opt for the very low-calorie diet (VLCD) motivated by the optimal results with nutritional supplements in the preoperative preparation. The objective is to analyze the cost-effectiveness ratio (CE) taking weight loss as a measure of effectiveness and carrying out an individualized calculation of the cost per patient and procedure. VLCD gets similar weight loss, with a lower total cost therefore with a better CE and an absence of complications, opting in our environment for its use as the first option in the optimization of the patient with extreme obesity.

Keywords:

- Intragastric balloon
- Very low-calorie diet
- Preoperative weight lost
- Cost-effectiveness

Introduction

Obesity has become one of the main public health problems, tripling its prevalence in the last 30 years. In Asturias, the prevalence of obesity in adults is 25.7% and overweight 41.1% (1), figures above the average in Spain (21.6 and 39.3% respectively). Bariatric surgery has proven to be the most effective treatment (2) for morbid obesity, both in weight loss and in the resolution of comorbidities and their long-term maintenance.

There is consensus in the literature that preoperative optimization through weight loss is correlated with a decrease in liver size and its fragility during mobilization, reduces intra-abdominal fat (3,4), which improves the surgical field, vision intraoperative and therefore facilitates surgery (5,6).

We can talk about different options to achieve preoperative weight loss (7-9), but there are hardly any studies that have delved into cost analysis (10). The objective is to analyse the CE relationship of the different optimization methods used in our center throughout the development of the bariatric surgery program.

Methods

The bariatric surgery program began at HUCA in October 2003. To date we have performed more than 800 operations, mainly gastric bypass. According to our protocol, patients with a body mass index (BMI) greater than 60 kg / m2 or greater than 50 kg / m2 with associated comorbidities are optimized during the 3 months prior to surgery to try to obtain a loss of weight that reduces operative morbidity. The balloon model that we used until 2015 was the Bioenterics® Balloon (BIB), its placement was performed in the operating room by the endoscopist with income. Thereafter we began to use the Obalon ™ (OB), which is placed on an outpatient basis in the radiology room where the patient swallows

the capsule that is inflate with nitrogen once its correct position is verified. In Table 1 we can see summarized the main differences between both balls. As of 2019, we decided to change to a preparation with a very low-calorie diet (VLCD), maximum 800 kcal / day, allowing only the intake of liquids and accompanied by a supply of oral hyper protein supplements 4 times a day during the 3 months preceding surgery, as well as follow-up by the Endocrinology service.

	BIB	OB
VOLUME	600cc	250cc
CONTENT	Physiological serum and methylene blue	Nitrogen
PLACEMENT	Endoscopy and sedation	Swallowing in radiology room
INCOME	Yes	No
2ND BALL CHANCE	No	Yes
STAY TIME	4 months	3 months
UNIT PRICE IN HUCA	1683 €	968€

Table 1. Main differences between the types of intragastric balloon used in the study (10).
BIB: Bioenterics Intragastric Balloon®.
OB: Obalon ™. HUCA: Central University Hospital of Asturias.

We carried out an observational, descriptive, longitudinal, and retrospective study on our prospective database. The objective is to analyse the CE relationship, taking weight loss as a measure of effectiveness, and carrying out an individualized and meticulous calculation of the cost per patient and episode, since the classical analytical DRG accounting method does not include outpatient procedures. This CE index indicates that the best therapeutic option is the one with the lowest ratio. We performed the comparison between quantitative variables using ANOVA and Kruskal-Wallis (if they did not meet normality criteria) and later we applied post-hoc tests to identify the differences between the 3 optimization methods.

Results

During the first period, 49 BIB-type balloons were placed, in two cases withdrawn due to intolerance, of the 47 patients under study, the mean age when placing the device was 44.4 (+/- 10.6) years, with a mean BMI 61.4 (+/- 5.5) kg / m2, the median hospital stay was 3 days and the mean days of balloon placement 128.6 (+/- 15.3), with a mean total cost 3001.8 (+/- 177.9) €. The mean time spent in the surgical area was 53.2 (+/- 20.2) minutes. 7/47 patients (14.8%) presented complications with BIG, the most frequent being vomiting and, in one case, pneumonia. The mean of PSP 24.8 (+/- 9.7) and PEIMCP 26 (+/- 10.2) with their respective indices, CE PSP 145.56 (+/- 88.84), CE PEIMCP 138, 7 (+/- 82.7).

In the second period, the OB type balloon was placed in 26 patients, in 3 patients a second balloon was necessary due to insufficient weight loss, however, there was no early withdrawal. At the time of placement, the mean age was 44.5 (+/- 10.6) years, the mean BMI 59.5 (+/- 3.8) kg / m2. The procedure was performed on an outpatient basis with a median of 30 minutes in the radiology room, with a mean of days of placement of 93.5 (+/- 13.4) and a mean total cost of 1462.5 (+/- 317.3) €. The average of kg lost 18.6 (+/- 9.1), and average percentages of PSP 18.5 (+/- 7.9) and PEIMCP 18.5 (+/- 8.9). The CE ratio was 95.14 (+/- 55.20) for CE PSP and 111.7 (+/- 110.4) for CE PEIMCP.

In 2019, we started the preparation with VLCD in 7 patients, without abandoning the treatment, with good tolerance and outpatient management, including 3 check-ups in the Endocrine office. At the beginning of the diet, the mean age was 40.8 (+/- 7.5) years, with a mean BMI 57.6 (+/- 2.7) kg / m2, they obtained a mean weight loss of 21.6 (+/- 7.1) kg, with an average treatment time in days of 93 (+/- 33.2) and an average total cost of € 1236.01 (+/- 327.59). The mean of PSP 22.2 (+/- 8.3) and PEIMCP 21.3 (+/- 8.1) and with good CE, PSP 86.38 (+/- 83.49) and PEIMCP 77.1 indices (+/- 81.6) respectively.

We compared the 3 groups (Table 2). Statistical analysis does not show differences between the mean age or BMI of the patients at the time of initiation of optimization. On the other hand, if we find statistical differences ($p < 0.05$) between BIB and OB, in favour of the latter, in terms of weight loss in kg, treatment time in days, total average cost per patient, the PSP, PEIMCP, as well as both CE indices. In contrast, in favour of VLCD we only found significance in both CE ratios in relation to BIB and not to OB. It can also be seen that the total cost is lower without being statistically relevant.

	BIB	OB	VLCD	
PATIENTS	47	26	7	
MEAN AGE (YEARS)	44,4 (+/-10,6)	44,5(+/-10,6)	40,8(+/-7,5)	n.s
IMC PRE-TRATA-MIENTO (KG/M2)	61,4(+/-5.5)	59,5(+/-3,8)	57,6(+/-2,7)	n.s
PRE-TREAT-MENT BMI (KG / M2)	24,5(+/-4,5)	18,6(+/-9,1)	21,6(+/-7,1)	P<0.05 BIB-OB
WEIGHT LOSS (KG)	128,6 (+/- 15,3)	93,5(+/-13,4)	93(+/-33,2)	P<0.05 BIB-OB
TREATMENT TIME (Days)	3001,8 (+/-177,9)	1462,5 (+/-317,3)	1236,01 (+/-327,59)	P<0.05 BIB-OB
TOTAL COST PER PATIENT (€)	24,8(+/-9,7)	18,5(+/-7,9)	22.2(+/-8,3)	P<0.05 BIB-OB
PSP (%)	26(+/-10,2)	18,5(+/-8,9)	21,3(+/-8,1)	P<0.05 BIB-OB
PEIMCP (%)	145,56 (+/-88,84)	95,14 (+/-55,20)	86,38(+/-83,49)	P<0.05 BIB-OB P<0.05 BIB-VLCD
CE PSP	138,7 (+/-82,7)	111,7(+/-110,4)	77,1(+/-81,6)	P<0.05 BIB-OB P<0.05 BIB-VLCD
CE PEIMCP	138,7 (+/-82,7)	111,7(+/-110,4)	77,1(+/-81,6)	P<0.05 BIB-OB P<0.05 BIB-VLCD

Table 2. Differences between the therapeutic options in optimizing patients with extreme obesity.
BIB: Bioenterics Intragastric Balloon®. OB: Obalon ™. VLCD: very low-calorie diet. BMI = Body mass index. PSP = Percentage of overweight lost. PEIMCP = Percentage of excess BMI lost. CE: cost-effectiveness.

Discussion

The optimization of patients for any type of surgery is increasingly proven. There are multiple options to achieve preoperative weight loss to reduce the morbidity and mortality associated with the surgical procedure, however, there are hardly any studies that delve into the costs.

With the exchange of the balloon, we achieved similar results in weight loss, a reduction in costs, which implied an improvement in cost-effectiveness, dispensing with an endoscopy in the operating room and hospital admission (10). Subsequently, with the very low-calorie diet, we achieve the same advantages in costs and CE index, adding good tolerance, without complications or contraindications and with motivation and a modification of habits that can be favourable in the postoperative period.

Conclusion

After studying the different preoperative weight loss options at our center, we opted for the use of VLCD as the first option in optimizing the patient with extreme obesity. We are aware that it is necessary to increase the sample size for a better analysis in addition to being necessary more prospective randomized studies for greater reliability of the results.

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