

# COMPARATIVE STUDY OF FIVE DIFFERENT SURGICAL TECHNIQUES FOR THE TREATMENT OF MORBID OBESITY USING BAROS

Comparação de cinco técnicas para o tratamento cirúrgico da obesidade mórbida com o BAROS

João Batista **MARCHESINI**, Jean Ricardo **NICARETA**

From Clínica Marchesini (Marchesini Clinic) and Hospital de Clínicas da Universidade Federal do Paraná (Clinic Hospital, Federal University of Paraná State), Curitiba, Paraná, Brazil.

**ABSTRACT – Background:** The obesity is an universal disease of epidemic proportions and in a growing prevalence. It is one of the main public health problems and it will be inexorably the largest problem of the developing world. The morbid obesity is associated to serious diseases, reducing the life perspective, increasing the morbidity and mortality. Several strategies of losing weight were proposed; however, the bariatric surgeries are today the most effective treatment for this disease. The BAROS is the most simple, practical and efficient method to evaluate the results in the bariatric surgeries. **Aim:** To compare five surgical techniques for the treatment of morbid obesity using BAROS. **Method:** The sample is constituted of 102 patients submitted to Fobi-Capella (23 patients), Scopinaro (21 patients), duodenal switch (20 patients), vertical banded gastroplasty of Mason (15 patients) and the adjustable gastric band (23 patients), evaluated 12 months after the surgeries using BAROS. **Results:** The analysis of the final result of BAROS for the classification demonstrated that good, very good and excellent results were obtained in 100% of the patients in the group of duodenal switch; 91,3% in Fobi-Capella; 85,7% in Scopinaro; 60% in Mason; and 56,5% in adjustable gastric band. The final result of BAROS for the total score demonstrated that the group of duodenal switch obtained 6,3 points; the Fobi-Capella 5,1 points; the Scopinaro 4,8 points; the Mason 3,0 points; and the adjustable gastric band 2,9 points ( $p < 0,0001$ ). **Conclusion:** The duodenal switch is the best technique for the surgical treatment of the morbid obesity, in the following 12 months post-surgical clinical procedures, according to BAROS.

**HEADINGS** - Morbid obesity. Bariatric surgery. Methods.

## Correspondence:

João Batista Marchesini  
E-mail: jbmarchesini@hotmail.com

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**DESCRITORES** - Obesidade mórbida. Cirurgia bariátrica. Métodos.

**RESUMO – Racional:** A obesidade é doença universal de proporções epidêmicas e com prevalência crescente. É um dos principais problemas de saúde pública da sociedade moderna e inexoravelmente será o maior problema do mundo desenvolvido. Numerosas estratégias para emagrecer foram propostas nas últimas décadas; porém, as operações bariátricas constituem, hoje, no tratamento mais eficaz desta doença. Inúmeros métodos são usados para avaliar as operações bariátricas, mas o BAROS (Bariatric Analysis and Reporting Outcome System) é o mais simples, prático e eficiente para avaliar os resultados das operações bariátricas. **Objetivo:** Comparar cinco técnicas operatórias para o tratamento da obesidade mórbida utilizando o BAROS e identificar qual delas é mais efetiva. **Métodos:** A amostra consistiu de 102 pacientes submetidos a um dos procedimentos: derivação gastrojejunal de Fobi-Capella (23 pacientes), derivação biliopancreática de Scopinaro (21 pacientes), derivação biliopancreática com duodenal switch (20 pacientes), gastroplastia vertical com banda de Mason (15 pacientes) e banda gástrica ajustável (23 pacientes). Foram avaliados 12 meses após as operações utilizando o BAROS. **Resultados:** Resultado bom, muito bom e excelente foi obtido em 100% dos pacientes no grupo duodenal switch; 91,3% no Fobi-Capella; 85,7% no Scopinaro; 60% no Mason; e 56,5% no banda. A análise do resultado final do BAROS pela pontuação total demonstra que o grupo duodenal switch obteve 6,3 pontos; o Fobi-Capella 5,1 pontos; o Scopinaro 4,8 pontos; o Mason 3,0 pontos e o banda 2,9 pontos ( $p < 0,0001$ ). **Conclusão:** A derivação biliopancreática com duodenal switch é a melhor técnica para o tratamento cirúrgico da obesidade mórbida, no seguimento clínico pós-operatório de 12 meses, segundo o BAROS.

## INTRODUCTION

Oria and Moorehead introduced BAROS (Bariatric Analysis and Reporting Outcome System) to assess and standardize reports on bariatric surgeries<sup>21</sup>. It comprises assessment of five areas: weight loss, life quality, co-morbidity, complications and redoing surgery. BAROS may also be used to compare results of different surgery techniques carried out by different surgeons.

Through using BAROS<sup>21</sup>, the present work aims at comparing five surgery techniques to treat morbid obesity aiming at identifying which among them is the most effective after a 12-month post-surgical clinical procedure follow-up.

## METHODS

The present descriptive and historical study assessed 102 patients at Clínica Marchesini (Marchesini Clinic) in Curitiba, State of Paraná in Brazil, who have undergone bariatric surgeries using five different techniques and with an over 12-month post-surgical clinical procedure follow-up. The patients were assembled in five groups, as follows: Fobi-Capella gastric bypass (23 patients); Scopinaro biliopancreatic diversion (21 patients); duodenal switch biliopancreatic diversion (20 patients); adjustable gastric band (23 patients); and Mason vertical banded gastroplasty (15 patients). All the

patients were assessed by using BAROS<sup>21</sup>.

To carry out statistic analysis the study used Variance Analysis (Anova), Kruskal-Wallis Non-Parametric Test, Fisher Exact Test and Qui-square test. It was also used a significance level inferior to 5% ( $p < 0.05$ ).

## RESULTS

The study sample comprised 102 patients being 63.7% of women and age group average 41.2. The post-surgery average body mass index (BMI) was 43.2 kg/m<sup>2</sup>; average Mason vertical banded gastroplasty technique 45.8 kg/m<sup>2</sup>; Fobi-Capella gastric bypass 45.3 kg/m<sup>2</sup>; Scopinaro biliopancreatic diversion 45 kg/m<sup>2</sup>; duodenal switch biliopancreatic diversion 43.4 kg/m<sup>2</sup>; and adjustable gastric band 37.6 kg/m<sup>2</sup>.

Post-surgery outcomes showed overweight percentage decrease, as follows: duodenal switch biliopancreatic diversion (83.3%), Fobi-Capella gastric bypass (66.7%), Scopinaro biliopancreatic diversion (58.7%), Mason vertical banded gastroplasty (49.6%) and adjustable gastric band (36.6%).

Table 1 shows overweight variation between pre and post-surgery comparing the five study techniques. The greatest loss was observed in the duodenal switch biliopancreatic diversion group.

Pre-surgery main co-morbidity were the following: systemic arterial hypertension (75.0%), arthralgia (47.1%), esophagitis (44.3%), dyslipidemia (35.3%), electrocardiogram alterations (32.8%), hiatus hernia (29.5%), lower limb varicose veins (29.5%), sleep apnea (25.0%), diabetes mellitus type 2 (19.1%), arthrosis (14.7%), dyspnea (11.5%) and gastroesophageal reflux (11.5%).

Post-surgery clinical condition score assessment shows that 56.9% of the patients achieved a solution to one (+ 2 points) or all (+ 3 points) co-morbidities. The duodenal switch biliopancreatic diversion group achieved the best result and the adjustable gastric band had the worst result (Table 2).

Table 3 shows life quality results according to the Moorehead-Ardelt questionnaire<sup>21</sup>. The Fobi-Capella gastric bypass group achieved the best result.

Main complications observed were the following: vomit (72), nausea (32), hair loss (30), vitamin, mineral and protein deficiency (25), anemia (21), incisional hernia (15), depression (10), seroma (6), suture dehiscence (4), surgery wound infection (7), peptic ulcer complication (3), anastomosis stenosis (3), gastrogastic fistula (2), respiratory insufficiency (3), and nervous anorexia (2).

The Fobi-Capella gastric bypass group showed the highest rate of significant complications and the adjustable gastric band group showed the highest rate of insignificant complications (Table 4).

It was necessary to redo three surgeries in patients belonging to the Scopinaro biliopancreatic diversion group, three in the duodenal switch biliopancreatic diversion group and one in the adjustable gastric band group.

The study group analysis using BAROS showed the duodenal switch biliopancreatic diversion group achieved the highest final score average and good, very good and excellent highest rates followed by the Fobi-Capella gastric bypass, Scopinaro biliopancreatic diversion, Mason vertical banded gastroplasty and adjustable gastric band groups (Tables 5 e 6).

Group comparison shows that duodenal switch biliopancreatic diversion result is significantly better ( $p < 0,0001$ ) than the other technique results (Table 6B).

## DISCUSSION

In the present study, weight loss is similar to that described in a meta-analysis where it was observed higher

weight loss in the duodenal switch biliopancreatic diversion group followed by the Scopinaro biliopancreatic diversion, gastrojejunal diversion, vertical gastroplasty with band and adjustable gastric band groups<sup>6</sup>. But, differently from the meta-analysis, the present study showed that only the duodenal switch biliopancreatic diversion group was able to bring BMI average to the overweight category and the near as possible to the normal weight, that's to say 26.3 kg/m<sup>2</sup>.

Through the bibliographic references on the alterations of post-bariatric surgery clinical conditions, it is possible to estimate that Scopinaro biliopancreatic diversion and duodenal switch biliopancreatic diversion are the techniques with the highest disease solution rates. On the other hand, the gastrojejunal diversion shows intermediate results concerning improvement of co-morbidities, and the vertical gastroplasty with band and the adjustable gastric band show the co-morbidity solution lowest rates<sup>7,8,9,17,18,19,22,24,25,27,29</sup>, what is similar to the present study findings.

In literature, few papers use Moorehead-Ardelt life quality questionnaire to assess more than one technique and none show life quality within the post-surgery 12-month follow-up. The only existing paper comparing the three techniques aforementioned showed that patients undergoing gastric band surgery followed by gastric bypass and Mason vertical banded gastroplasty had their life quality improved<sup>13</sup>, differently from what is shown by the present paper findings.

Complication rates identified herein are similar to those described in the relevant literature<sup>3,5,11,14,16,20,24,26</sup>.

In the present study, duodenal switch biliopancreatic diversion and Scopinaro biliopancreatic diversion showed the highest surgery redoing rates, differently from what was found in the literature review where vertical banded gastroplasty and adjustable gastric band showed the highest surgery redoing rates and biopancreatic diversions showed the lowest rates<sup>2,3,4,10,11,12,15,16,19,27,28</sup>.

Concerning weight loss, when comparing three different BAROS techniques there were no differences between them; however, the best results were observed using Fobi gastrojejunal diversion followed by vertical banded gastroplasty and adjustable gastric band. Co-morbidities improvement was similar in the three techniques. Life quality assessment found that patient well-being showed more improvement after adjustable gastric band than after the other two techniques, but such difference was not statistically significant. However, the laparoscopic procedure seems to give more satisfaction to the patient, even when weight loss is not as significant as it is in other techniques<sup>1</sup>.

A study<sup>13</sup> which used BAROS to compare vertical banded gastroplasty, Y-de-Roux gastrojejunal diversion and adjustable gastric band showed that 75% of the patient life quality and health conditions improved significantly when compared to the control group that did not undergo surgery. The three aforementioned techniques showed similar results concerning medical conditions, but weight loss was significantly higher in the gastrojejunal diversion. Regarding weight loss, the Y-de-Roux diversion was superior to the purely restrictive procedures and a little superior concerning life quality and co-morbidities. The study inferred that when using BAROS the Y-de-Roux gastrojejunal diversion was superior to the vertical banded gastroplasty and adjustable gastric band. Thus, the results are consonant to those obtained in the present study.

BAROS assessment of 386 patients who underwent Molina gastric band surgery with adjustable silicone ring (Kuzmak), vertical gastroplasty with silastic ring and biliopancreatic diversion shows patients outgoing biliopancreatic diversion achieved the best results among all the techniques<sup>30</sup>.

When BAROS was used to compare 93 patients, it showed that Y-de-Roux gastrojejunal diversion results were superior to vertical banded gastroplasty, mainly because weight loss was superior and easier in gastrojejunal diversion

**TABLE 1 – Overweight loss percent in the study groups classified by score**

%WLP <sup>(1)</sup>	Fobi-Capella		Scopinaro		Duodenal switch		Band		Mason		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Weight gain	-	-	-	-	-	-	01	4,4	-	-	01	1,0
00 - 024	-	-	-	-	-	-	06	26,1	04	26,7	10	9,8
25 - 049	04	17,4	08	38,1	-	-	09	39,1	04	26,7	25	24,5
50 - 074	11	47,8	09	42,9	05	25,0	05	21,7	04	26,6	34	33,3
75 - 100	08	34,8	04	19,0	15	75,0	02	8,7	03	20,0	32	31,4
TOTAL	23	100,0	21	100,0	20	100,0	23	100,0	15	100,0	102	100,0

%WLP=weight (overweight) loss percentage

**TABLE 2 – Clinical conditions in the 12-month post-surgery follow-up in the study groups classified through score**

Clinical conditions <sup>(1)</sup>	Fobi-Capella		Scopinaro		D. switch		Band		Mason		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Worsened <sup>(2)</sup>	-	-	01	4,8	-	-	-	-	01	6,7	02	1,9
Unchanged <sup>(3)</sup>	09	39,1	03	14,3	01	5,0	14	60,9	08	53,3	35	34,3
Improved <sup>(4)</sup>	03	13,1	-	-	01	5,0	02	8,7	01	6,7	07	6,9
One solved <sup>(5)</sup>	01	4,3	05	23,8	03	15,0	04	17,4	02	13,3	15	14,7
All solved <sup>(6)</sup>	10	43,5	12	57,1	15	75,0	03	13,0	03	20,0	43	42,2
Total	23	100,0	21	100,0	20	100,0	23	100,0	15	100,0	102	100,0

**TABLE 3 - Life quality questionnaire results in the study groups classified through scores**

Life Quality*	Fobi-Capella		Scopinaro		Duodenal switch		Band		Mason		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Highly decreased	-	-	01	4,8	-	-	-	-	-	-	01	1,0
Decreased	01	4,4	-	-	01	5,0	-	-	01	6,7	03	3,0
Unchanged	01	4,3	02	9,5	03	15,0	06	26,1	02	13,3	14	13,7
Improved	11	47,8	11	52,4	10	50,0	13	56,5	10	66,7	55	53,9
Highly improved	10	43,5	07	33,3	06	30,0	04	17,4	02	13,3	29	28,4
TOTAL	23	100,0	21	100,0	20	100,0	23	100,0	15	100,0	102	100,0

\* Not significant

**TABLE 4 – Complications in the groups classified through scores**

Complications*	Fobi-Capella		Scopinaro		Duodenal switch		Band		Mason		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
No complications	02	8,7	05	23,8	06	30,0	02	8,7	01	6,7	16	15,7
Significant	10	43,5	08	38,1	05	25,0	01	4,3	05	33,3	29	28,4
Insignificant	11	47,8	08	38,1	09	45,0	20	87,0	09	60,0	57	55,9
TOTAL	23	100,0	21	100,0	20	100,0	23	100,0	15	100,0	102	100,0

\* Not significant

**TABLE 5 – BAROS research protocol final classification of the assessed study groups**

Outcomes*	Fobi-Capella		Scopinaro		Duodenal switch		Band		Mason		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Insufficient	-	-	01	4,8	-	-	02	8,7	01	6,7	04	3,9
Acceptable	02	8,7	02	9,5	-	-	08	34,8	05	33,3	17	16,7
Good	06	26,1	05	23,8	05	25,0	06	26,1	02	13,3	24	23,5
Very good	09	39,1	10	47,6	07	35,0	04	17,4	07	46,7	37	36,3
Excellent	06	26,1	03	14,3	08	40,0	03	13,0	-	-	20	19,6
TOTAL	23	100,0	21	100,0	20	100,0	23	100,0	15	100,0	102	100,0

\* Not significant

**TABLE 6 – A) Descriptive statistics of total score of BAROS research protocol in the study groups; B) comparative analysis of the BAROS research protocol in the study groups**

A						
Data	n	Average	Standard-Diversion	Minimum	Maximum	Median
Total geral	102	4,5	<sup>(1)</sup> 2,4	-2,0	8,8	4,8
Fobi-Capella	23	5,1	<sup>(1)</sup> 1,9	0,6	8,1	5,0
Scopinaro	21	4,8	<sup>(1)</sup> 2,3	-2,0	8,0	5,6
Duodenal Switch	20	6,3	1,7	2,3	8,8	-
Banda	23	2,9	<sup>(1)</sup> 2,3	-0,7	7,6	2,3
Mason	15	3,0	<sup>(1)</sup> 2,3	-2,0	7,0	2,8
B						
Data	p <sup>(1)</sup> value				Significance	
Grand Total	< 0,0001				significativo	
Fobi-Capella x Scopinaro x Duodenal switch	0,029				significativo	
Fobi-Capella x Scopinaro	0,990				não significativo	
Banda x Mason	0,654				não significativo	

<sup>(1)</sup> Very high standard deviation, recommended using the median; <sup>(2)</sup> Kruskal-Wallis

than in the vertical banded gastroplasty. Therefore, that is the reason why authors use gastrojejunal diversion as a standard procedure and use gastroplasty only in selected cases<sup>23</sup>. Such result is similar to that described in the present study.

Few papers use BAROS and most of them show incomplete results concerning pre and post-surgery BMI and overweight percentage reduction. In addition, post-surgery follow-up period of time is not homogeneous, what makes it difficult to compare different techniques. Presently, reports on bariatric surgery results are not standardized, thus hampering deeper studies of issues such as co-morbidities and life quality. Literature does not have any study comparing the five techniques used with BAROS.

It is very important to carry out further studies using BAROS to compare surgery results. BAROS is not perfect, it has failures in its conception and several criteria should be assessed and updated. Presently, however, is the only existing tool which permits global comparison of different technique results. Its upgrading is fundamental to improve the ability to measure the results of different surgeons, patients and surgery techniques, thus contributing to the bariatric surgery development.

Although there are some differences concerning life quality, weight loss, clinical conditions, complications, redone-surgeries, BAROS results and research method variations, the present study results are similar to those described in the relevant literature.

## CONCLUSION

According to BAROS assessment of the post-surgery 12-month follow-up, biliopancreatic diversion is the best technique to treat morbid obesity.

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