

EFFECTS OF BARIATRIC SURGERY ON THE METABOLIC SYNDROME

Efeitos da cirurgia bariátrica sobre a síndrome metabólica

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ABSTRACT - Background - Morbid obesity is a state of insulin resistance associated with excess of visceral fat, which is involved in the development of metabolic syndrome. In obesity, conservative therapies promote improvement of the metabolic syndrome, but weight regain is common. The Roux-en-Y gastric bypass results in weight loss, more significant and sustained, besides promoting improvement of the metabolic syndrome, that is a risk factor for development of systemic atherosclerotic disease. **Aim** - To demonstrate that bariatric surgery promotes the reversal of the metabolic syndrome. **Methods** - The study included 74 obese patients underwent to Roux-en-Y gastric bypass by laparoscopy. Were evaluated with weight measurement, waist circumference, body mass index, blood pressure and blood glucose levels, triglycerides, total cholesterol and HDL fraction, preoperative and over six months after operation. To compare means it was used the non-parametric Friedman test and the Wilcoxon test, level of significance $p < 0.05$. **Results** - There were 52 women and 22 men with mean age of 34.6 years. The range of follow-up was six months. The average body mass index preoperatively was 42 and six months after operation was 29.6. It was confirmed a statistically significant difference between the moments in all the quantitative variables analyzed. **Conclusion** - It can be inferred that bariatric surgery is an effective method of weight loss and normalization of parameters used in the diagnosis of metabolic syndrome.

HEADINGS - Obesity, Metabolic syndrome, Diabetes mellitus, Bariatric surgery.

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DESCRITORES - Obesidade. Síndrome metabólica. Diabetes mellitus. Cirurgia bariátrica.

RESUMO - Racional - A obesidade mórbida é um estado de resistência à insulina associado ao excesso de gordura visceral, condições que contribuem para o desenvolvimento da síndrome metabólica. Na obesidade, os tratamentos conservadores promovem melhora da síndrome metabólica, mas a recuperação de peso é frequente. A derivação gástrica em Y-de-Roux resulta em perda de peso, mais significativa e sustentada, além de promover melhora da síndrome metabólica, que é condição de risco para o desenvolvimento de doença aterosclerótica sistêmica. **Objetivo** - Demonstrar que a cirurgia bariátrica promove a reversão da síndrome metabólica. **Métodos** - O estudo foi realizado com 74 pacientes obesos, submetidos a derivação gástrica em Y-de-Roux por videolaparoscopia. Foram avaliados por meio de dados antropométricos e laboratoriais, com a aferição do peso, circunferência abdominal, índice de massa corporal, pressão arterial sistêmica e a dosagem de glicemia, triglicérides, colesterol total e sua fração HDL, no pré-operatório e ao longo de seis meses após a operação. Para comparação de médias foi utilizado o teste não paramétrico de Friedman e, quando necessário, o teste de Wilcoxon, considerando nível de significância valor de $p < 0,05$. **Resultados** - Houve 52 mulheres e 22 homens, com a média de idade de 34,6 anos. O intervalo de seguimento foi de seis meses. A média do índice de massa corporal no pré-operatório era de 42 e após seis meses foi de 29,6. Demonstrou-se diferença estatisticamente significativa entre os momentos, quanto a todas as variáveis quantitativas analisadas. **Conclusão** - Pôde-se inferir que a cirurgia bariátrica é meio eficaz de perda de peso e normalização precoce das alterações antropométricas e laboratoriais utilizadas no diagnóstico da síndrome metabólica.

INTRODUCTION

In recent years, morbid obesity has emerged as a serious threat to public health⁸. The World Health Organization acknowledged the existence of an epidemic obesity in most developed and developing countries¹². Obesity is associated with multiple comorbidities, which result in increased morbidity and mortality, as prime example of the metabolic syndrome (MS).

It is modern disease, as a result of inappropriate diet and sedentary lifestyle. The increased morbidity is mediated primarily by insulin resistance, diabetes, hypertension and dyslipidemia. Morbid obesity is a state of insulin resistance, where there is always excess visceral fat. The presence of insulin resistance and visceral adiposity contributes to the prevalence of MS in almost all patients with morbid obesity². It is a condition of risk for the development of systemic atherosclerotic disease, especially coronary heart disease, and is related to the development of type 2 diabetes¹¹.

The treatment of MS can be directed to its various manifestations, using specific pharmacological approaches for each of its components. Another treatment option is focused on the pathophysiology, ie in adiposity and insulin resistance. Conservative treatments, non-drug therapies such as diet therapy and exercise, reduce visceral obesity and insulin resistance, with many benefits on the clinical manifestations of MS⁶. Similarly, the pharmacological treatment of insulin resistance with drugs sensitizing action of insulin, positively affects various manifestations of MS.

In morbid obese patients, conservative treatments have proven effective in promoting improvement of MS, however, there is no maintenance of weight loss in almost all individuals¹⁰. Bariatric surgery has proved effective in causing significant loss and sustained weight loss in morbidly obese patients.

This study aims to demonstrate the progressive improvement of the components of metabolic syndrome associated with morbid obesity, through the comparison of anthropometric data and laboratory over six months after the completion of Roux-en-Y gastric bypass.

METHODS

Longitudinal, prospective, interventional study, whose inclusion criteria were patients with morbid obesity with metabolic syndrome. Was performed by a team of bariatric surgery of the Hospital Complex Edmundo Vasconcelos, São Paulo, Brazil. Patients were informed about the research objectives and

subsequently signed a consent form in accordance with the approval by the Ethics in Research of the hospital, under the number 0027.0.256.000-10.

All patients were followed priority in the hospital for a period exceeding 24 months, with failed attempts in clinical treatment. For surgical approach was used to Resolution No. 196/GM of February 29, 2000, from the Ministry of Health, which defined according to consensus established by the Brazilian Society for Bariatric Surgery/SBCB the clinical indications for performing bariatric surgery (major obese patients), lasting more than two years, with Body Mass Index - BMI above 40 kg/m² and resistant to conservative treatments (diet, psychotherapy, medication, exercise) performed continuously for at least two years and obese patients with BMI above 35 kg/m², patients with chronic disease (diabetes, hypertension, arthropathy, herniated disc, sleep apnea) whose clinical situation is aggravated by obesity. Patients who fit the criteria above, had confirmed the appointment of bariatric surgery, should also present no specific endocrine diseases, absence of mental disorders (alcoholism, drug addiction and others), lack of physical/clinical contraindication to large operations (cirrhosis, heart disease, lung disease, chronic renal failure and others).

All patients underwent the same preoperative evaluation. Were done plasma levels of total cholesterol, HDL, triglycerides and blood glucose. Was also measure, for comparison, anthropometric data: height, weight, body mass index (BMI), waist circumference and blood pressure, a month before the operation, considered time zero (T0) of the study.

The minimum age for inclusion was 18 years and maximum 60. Morbidly obese patients included were those who had criteria to be included on the diagnosis of MS. They needed to have two or more of the following criteria: increased waist circumference in men > 101 cm and that in women > 87 cm; TGL high, >150 mg/dL, HDL cholesterol decreased, in man <than 40 mg/dL in women and <50 mg/dL, high blood pressure >130/85 mmHg and elevated fasting glucose > 100 mg/dL.

All studied patients underwent gastric bypass in Roux-en-Y. Was used the technique Fobi-Capella, with the construction of a gastric pouch using a calibrated probe Fouchet 12 mm; then a gastroenterostomy (alimentary) was done with 100 cm and finally one enterobiliary also of 100 cm, using laparoscopic linear staplers. Upon completion of all operations was tested with methylene blue, to detect possible perforations.

The outpatient follow-up occurred with the first visit seven days after the date of discharge, and then monthly. The laboratory tests (fasting glucose, total cholesterol and HDL, triglycerides), measurement of

anthropometric data (weight, height, BMI and waist circumference) and blood pressure were established for the preoperative, 1, 3 and 6 months after the operation, in order to compare the four moments of time in all variables.

Results were presented considering mean and standard deviation. Friedman and Wilcoxon non parametricum test was used with significance level of $p < 0.05$.

RESULTS

Were evaluated 74 obese patients with MS, who underwent surgical treatment from February 1, 2010 to July 30, 2010. There were more females 70.3% (52). The mean age was 34.74 years, the minimum 20 years and maximum 58 years.

The procedure was performed by the same surgical team and the laparoscopic approach was possible in all cases. There was no case of conversion to open technique, and the average operation time of two hours. Patients were on average three days in hospital. No complications occurred postoperatively. Tables and figures of quantitative variables are presented. In all moments of evaluation there was statistical difference between the studied periods.

Table 1 shows that there was a gradual reduction of weight values over time, since the average initial (T0) was 115.5 pounds and at six months after the operation (T6) it reached 80.7 pounds.

TABLE 1 – Comparison of moments of time for weight

Weight	T0	T1	T3	T6
Average	115,5	103,5	92,3	80,7
Median	112,4	102,5	90,0	79,6
Standard deviation	20,5	18,7	17,4	15,8
Q1	102,3	92,2	81,0	70,8
Q3	127,3	114,0	101,5	87,1
N	74	69	65	56
IC	4,7	4,4	4,2	4,1
p-value	<0,001			

There was a reduction of BMI values over time, since the initial average (T0) was 42 and (T6) reached 29.6, confirming the statistical difference between the moments in BMI (Table 2).

TABLE 2 – Comparison of moments of time for BMI

BMI	T0	T1	T3	T6
Average	42,0	37,7	33,6	29,6
Median	41,3	37,1	32,7	28,7
Standard deviation	4,6	4,7	4,7	4,1
Q1	38,6	34,6	30,3	26,4
Q3	44,4	40,5	36,3	32,5
N	73	69	65	56
IC	1,1	1,1	1,1	1,1
p-value	<0,001			

Blood glucose averages, as well as the triglycerides, at T1 were below the value considered diagnostic criteria of MS.

Was used the Friedman test to compare the times for the variables HDL and waist circumference, separately by sex. There was a significant difference between times for waist circumference, both men and women, showing a gradual decrease it over time. The mean waist circumference for men in T6 (99.1 cm) was considered normal in the diagnostic criteria for MS, showing a significant fall months after the operation. However, regarding the variable HDL, it was concluded that the operation did not promote its elevation over time; so, this criterion for diagnosis of MS does not change with bariatric surgery.

Finally, was categorized the value of BMI according to WHO classification. Was compared the times for the distribution of relative frequency (percentage), where was used the test of equality of two proportions. The comparison of percentages between the periods was performed on each level of response. As an example, was analyzed the degree of obesity III, where T0 has 63.0% of patients at T6 and this percentage reached 1.8%, and this reduction was considered statistically significant.

DISCUSSION

Since the National Health defined the criteria for application of bariatric surgery rates of morbidity and mortality associated with surgery, felt considerably due to the use of laparoscopy, development of perioperative care and a better understanding of obesity^{7,9}.

The various types of operation have different results with 68.2% loss for the bypass of the duodenum, which was used in this study (Fobi-Capella).

Today, bariatric surgery is a potent weapon in the treatment of morbid obesity and comorbidities that surround this disease. It is known that the duodenal and jejunal bypass done in bariatric surgery, gradually reduces the fasting blood glucose and improves insulin resistance. Currently, bariatric surgery has also become known as metabolic surgery, the evidence suggests that several studies have shown in relation to effective treatment of diabetes mellitus and cure of MS. The reduction of the caloric-lipidic intake improves insulin sensitivity and lipid malabsorption in 40%; this are the main mechanisms for improving lipid reduction¹. Decrease of hyperinsulinemia and insulin resistance, reduction of sympathetic hyperactivation as a result of reduced levels of leptin and reduced intra-abdominal hypertension, chronic feature of obesity, are the main mechanisms related to the reduction or improvement in blood pressure⁵. The cure of MS after

the operation was described as possible, secondary to improvement of insulin sensitivity¹¹. The gastric bypass have been associated with prevention of 99 to 100% of cases of glucose intolerance to diabetes, in the medium-term follow-up³.

The reversal of MS and its manifestations should lead to increase life expectancy, since the majority of deaths are related to cardiovascular events, being SM is a risk condition for macrovascular disease. Therefore the reduction in mortality with the operation is partly mediated by the reversal of MS in operated patients⁴. Thus, MS can be considered a surgical condition associated with obesity.

CONCLUSION

Bariatric surgery is an effective way of losing weight, and duodenal-jejunal bypass done can directly control the SM. Considering the current diagnostic criteria, there is reversal or cure of SM in almost all patients after bariatric surgery.

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