



## Argon Plasma Effect about Anastomosis was Significant to Inhibit the Weight Regained in Patients Undergoing Gastric Bypass

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### Abstract

About 40% of the population is overweight. It is estimated that there are about 80,000 deaths per year in Brazil for reasons arising from obesity. Bariatric surgery has been the most effective method for the treatment and prevention of complications caused by morbid obesity. The gastric bypass has shown good short term results in significant reduction of body weight. However, in the long run about 10 to 20% of patients tend to weight regained. This number seems to be relatively low; the reality is significantly higher when surgery is not accompanied by a long-term change in lifestyle. Thus, it was hypothesized that by applying argon plasma on the anastomosis, the weight regained is avoided. The aim of this work was to study the effect of argon plasma fulguration in the weight regained in patients undergoing gastric bypass. Of the 37 patients who underwent gastric bypass 24(75%) were female and 8(25%) were male. Considering the gastric bypass, the mean preoperative weight was 117.61 Kg. After the average weight surgery was 79.94 Kg. The mean difference of pre and post-operative weight was 37.66 kg, the difference being significant ( $p < 0.0001$ ). Regarding the use of argon, the average pre intervention weight was 94.52. The average difference pre and post intervention was 5.87 kg, with statistically significant ( $p < 0.0001$ ). There was a significant correlation between use of the ring and smaller diameter of the anastomosis at the third session ( $p = 0.019$ ). The average size of the pouch was 5. There was no statistical correlation between size of the pouch and efficacy of argon use. It was concluded that after application of argon was no significant reduction in the average weight of the patients, about 50% of patients, especially female.

**Keywords:** Bariatric surgery; Gastric bypass; Argon; Weight regained; Bariatric endoscopy

### Introduction

Several studies completed in 2014, including Ministry of Health, the Brazilian Institute of Geography and Statistics Census (IBGE) and the Household Budget Survey (HBS), show that high share of the population, about 40%, found are overweight [1,2]. One of the biggest risks of obesity are diseases related to excess weight; it is estimated that about 80,000 deaths per year in Brazil are due to diseases that were triggered by obesity tables [2-8].

Obesity is a chronic disease that reached epidemic characteristics in Brazil and the world in recent years [9,10]. According to the Brazilian Society of Metabolic and Bariatric Surgery, in 2007 about 12.1% of the population (15 million people) was obese, 3% (4 million people) carrier morbid obesity [11].

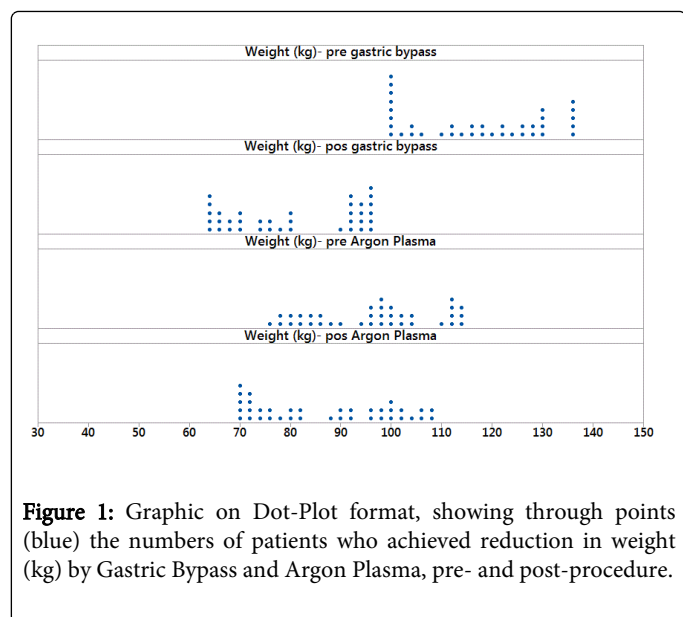
Bariatric surgery has been the most effective method for the treatment and prevention of complications caused by morbid obesity, increasing the longevity and quality of life of these patients [12]. Among the various surgical techniques gastric bypass has shown good short term results in significant reduction of body weight. However, in the long run about 10 to 20% of patients tend to have weight regain [13]. This number seems to be relatively low; the reality is significantly

higher when surgery is not accompanied by a long-term change in lifestyle.

Mechanisms that lead to weight regained is uncertain, but some factors can influence how high caloric intake, physical inactivity, metabolic, hormonal, surgical technique, gastro-gastric fistulas, loss of function of the restrictive ring when present, dilation of gastric pouch and dilation of the gastrojejunostomy [14,15].

Several methods have been proposed for reducing weight in patients with post gastric bypass regained. Among the endoscopic procedures, in order to reduce the diameter of the gastric pouch or gastrojejunostomy stand out endoluminal injection of sodium morrhuate the anastomosis, EndoCinch, StomaphyX, ROSE procedure, Overstitchda Apollo Endosurgery, CSTO clip and fulguration with argon plasma on the gastrojejunostomy [16].

Argon, an odorless, inert, non-toxic, inexpensive and easily ionizable, has been used in conventional surgeries since the 80's and in the field of endoscopy, was introduced in 1991 [17]. The fulguration with argon (Figure 1) consists of electrocoagulation method without contact to the radio frequency energy is applied to the tissue through the ionized gas via electric current, defined as plasma [16]. The depth of penetration is between 1 and 3 mm, although some studies show clearly that the higher the intensity, the greater the depth of the lesion eventually reaching the muscularis mucosa [18].



**Figure 1:** Graphic on Dot-Plot format, showing through points (blue) the numbers of patients who achieved reduction in weight (kg) by Gastric Bypass and Argon Plasma, pre- and post-procedure.

In the case of gastrojejunal anastomosis, argon application phase promotes a reduction in its diameter, leading to a "stenosis" and consequent delay in gastric emptying, early satiety and weight reduction [16]. The endoscopic point of view, information such as diameter of the anastomosis and pouch size, complications after bariatric surgery and amount of argon applications can contribute to a better indication criteria to be adopted in patients regained weight after gastric bypass.

Furthermore, the quality of life of patients with weight regained subjected to argon application can be significantly improved because the reduction in the diameter of gastrojejunostomy possibly occur weight loss. Considering the relevance of studies on the effect of argon in the weight regained in patients undergoing gastric bypass, it is appropriate to this research because Baretta et al. [14] has had good results.

The aim of this work was to study the effect of argon in the weight regained in patients undergoing gastric bypass, considering demographic, clinical, surgical and endoscopic.

### Study Design

We retrospectively studied patients with weight regained after gastric bypass and Fobbi Capella, regardless of sex and race, from the region of São Jose do Rio Preto, SP and other states in the country, submitted to an argon gas in the anastomosis. Of the 37 patients who underwent gastric bypass 24(75%) were female and 8(25%) were male. The average age of the patients before the application of argon was  $41.18 \pm 10$ , 17 years with range 24-65 years. The procedures were performed in the Digestive Endoscopy Unit of the Kaiser Clinic of São José do Rio Preto-SP, from July/2012 to November/2013. This study was approved by the Ethics Research Committee of the Portuguese Beneficent Hospital of São José do Rio Preto under the case number 836,411 of 10.17.2014. Data were obtained from the Kaiser Clinic in consultation records including demographic data (gender, age), clinical (height, weight, BMI, time after bariatric surgery, hypertension, diabetes, dyslipidemia, smoking, alcoholism and psychiatric disorders), operative (post gastric bypass complications from laparoscopic or laparotomy via presence of Silastik Ring) and

endoscopic (diameter of the anastomosis in each application session argon gas, pouch size). Exclusion criteria were patients younger than 18 years; anastomoses smaller than 10 mm; severe esophagitis and gastroesophageal gátrica fistula.

### Methodology

All tests were performed at Kaiser Clinic, with patients in least 8 hours fasting. With the patient in the left lateral decubitus, was instilled Xylocaine spray 10% followed by 50 mcg fentanyl and midazolam 5 mg EV with adequate cardiopulmonary monitoring during the test. After sedation, endoscopy was performed with Olympus CV-180 endoscope (Olympus, Tokyo, Japan) and analysis and measurement of the anastomosis with foreign body forceps Raptor (US Endoscopy Group, Inc., Mentor - Ohio, United States). The images were transferred to processor Olympus Evis Exera II coupled computational unit containing the ZScan 5 program (Goiânia, GO).

Then was held application of argon gas Argon 2 (WEM, Ribeirão Preto, Brazil) with disposable endoscopic catheter throughout circumference gastrojejuno anastomosis by 1 cm, using output of 90 W and 2 L min<sup>-1</sup>. After this procedure and recovery room, all patients were released, always with a companion. Pump inhibitor proton 40 mg was prescribed for 30 days, and fasted for 10 days sucralfam. All patients were instructed and kept in touch with doctor to report any signs or symptoms.

### Statistical Analysis

Statistical analysis Descriptive frequency measures were used. For the other comparisons we adopted t tests for continuous data and chi-square for categorical outcomes. The interference of variables in the primary endpoint (reduction of weight regained) was analyzed by means of logistic regression for categorical variables and linear regression for continuous variables. All tests adopted an alpha level of 0.05.

### Results

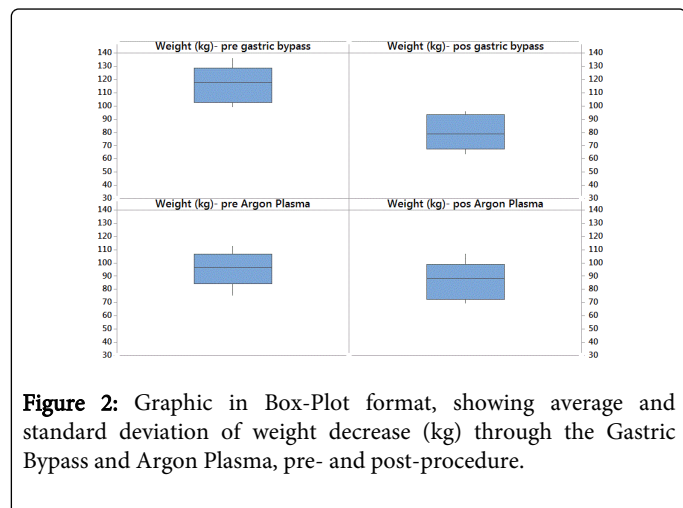
Regarding the clinical profile of patients, the most common findings included hypertension (43.75%), dyslipidemia (6.25%), diabetes (6.25%), alcohol (25%) and psychiatric disorder (31.25%) (Table 1). Considering the gastric bypass, the mean preoperative weight was  $117.61 \pm 18.45$  kg, range 83.2 to 165.2 kg), which represents the mean BMI  $42.30 \pm 4.30$  and range from 33.3 to 53.9 (Figure 1). After the surgery the average weight was  $79.94 \pm 15.91$  Kg (var: 60-121 kg). The mean difference of pre and post-operative weight was 37.66 kg, the difference being significant ( $p < 0.0001$ ) (Figures 1 and 2).

Variable	t	p	IC (95%)	
HAS	0.55	0.587	-0.31	0.53
DM	-1.01	0.322	-1.75	0.59
Dyslipidemia	-0.47	0.646	-1.02	0.64
Smoking	0.22	0.929	-1.46	1.81
Alcoholism	1.28	0.214	-0.17	0.74
Psychiatric Disorder	0.29	0.778	-0.37	0.49

Sex	1.62	0.115	-0.08	0.75
Age	2.42	0.220	0.16	2.01

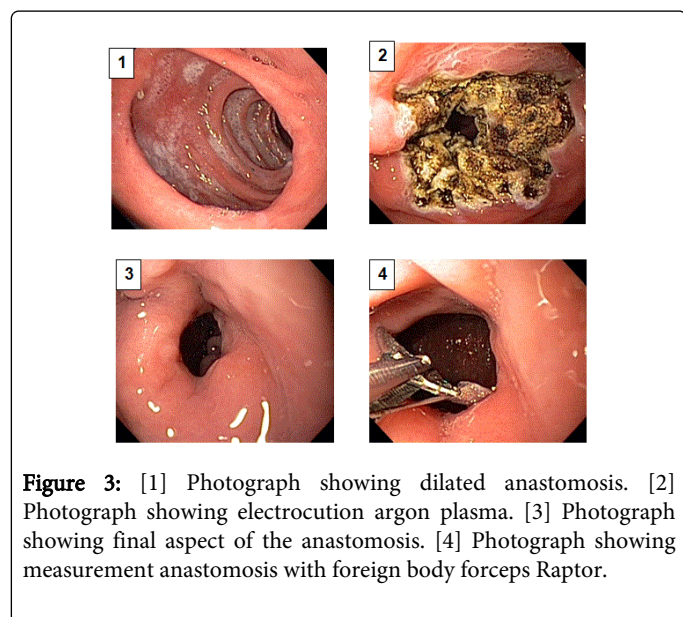
\*The dependent variable used is argon technical response, defined as a reduction of at least 50% of weight regained after bypass. SAH: Systemic Arterial Hypertension; DM: Diabetes; p: Significance; Student's t test.

**Table 1:** Logistic regression between clinical variables and results of therapy with argon\*.



**Figure 2:** Graphic in Box-Plot format, showing average and standard deviation of weight decrease (kg) through the Gastric Bypass and Argon Plasma, pre- and post-procedure.

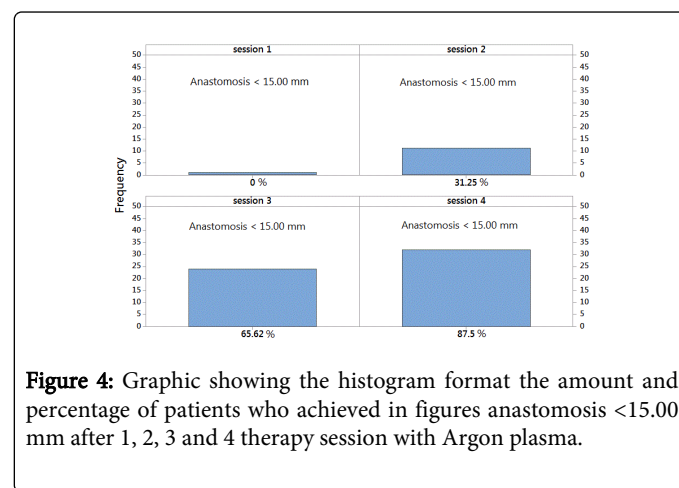
Regarding the use of argon, the average pre intervention weight was  $94.52 \pm 18.49$  kg (var: 71-130 kg) (Figure 3). This measure represented an average BMI of  $42.30 \pm 4.30$  (var: 33.3 to 53.91) (Figures 1 and 2). The mean difference in weight between post gastric bypass and pre argon periods was 14.58 kg. The post intervention with argon measurements, considering the data from the last session, show that the average weight of the patients was  $88.75 \pm 18.33$  kg (var: 62-122 Kg). The average difference pre and post intervention was 5.87 kg, with statistically significant ( $p < 0.0001$ ). Regarding the number of sessions used, we observed median of 2 sessions (var: 1-4 sessions).



**Figure 3:** [1] Photograph showing dilated anastomosis. [2] Photograph showing electrocauterization argon plasma. [3] Photograph showing final aspect of the anastomosis. [4] Photograph showing measurement anastomosis with foreign body forceps Raptor.

It is considered successful therapy with argon as the ability to reduce interference in at least 50.00% regained weight after gastric bypass, it is observed that this effect induced technique in 16 (50.00%) patients relative to Argon pre weight. It was noted that there was no correlation between clinical variables and results of therapy with argon (Figure 3). The goal of treatment with the argon reach an anastomosis was  $< 15.00$  mm and thereby achieving weight loss. In the first argon session, no patient had less anastomosis than 15 mm; the second 31.25% of patients; 65.62% in the third and fourth session 87.50% of patients. It is noteworthy also that there was no significant correlation between the number of argon sessions and technical efficiency. There was no correlation between whether or not the ring and magnitude of loss of weight pre and post use of argon.

In the correlation between use of the ring and diameter of the anastomosis, we observed a significant correlation between use of the ring and smaller diameter of the anastomosis at the third session ( $p = 0.019$ , and  $p < 0.05$ ). The average size of the pouch was  $5 \pm 0.98$  cm (var: 3-8 cm). There was no statistical correlation between size of the pouch and efficacy of argon use (Figure 4).



**Figure 4:** Graphic showing the histogram format the amount and percentage of patients who achieved in figures anastomosis  $< 15.00$  mm after 1, 2, 3 and 4 therapy session with Argon plasma.

## Discussion

In the present study, the analysis of the effect of argon in the weight regained in patients undergoing gastric bypass showed that endoscopic therapy showed satisfactory results in 50.00% of patients studied. There was a predominance of females, and the most common clinical hypertension, alcoholism and psychiatric disorder. After application of argon was no significant reduction in the average weight of the patients. Significant correlation was found between clinical and endoscopic variables and the outcome of argon and between number of sessions and diameter of the anastomosis, retaining ring and pouch size.

In this study, does not reach the weight loss goal of 50.00% of weight regained in half of the patients may be due to factors such as non-compliance of patients to return with the multidisciplinary team and clinical characteristics such as alcoholism and psychiatric disorders.

In obesity classification according to the body mass index (BMI). It is considered overweight patients with a BMI of 25-29.9 kg/m<sup>2</sup> class I obesity 30 to 34.9 kg/m<sup>2</sup>, Class II 35 to 39.5 kg/m<sup>2</sup> and class III obese or morbidly when greater than 40 kgm<sup>-2</sup> [19].

Obesity is associated with various diseases such as diabetes, hypertension, obstructive sleep apnea, cardiovascular diseases, arthropathy, cholecystolithiasis, dyslipidemia and psychiatric diseases [20]. Furthermore, this condition reduces life expectancy of 5 to 20 years [21].

The treatment of obesity may be medical, nutritional or surgical. The higher the degree of overweight, the higher is the severity of the disease [21,22]. According to the 1766/2005 and 1942/2010 ordinances of the Federal Council of Medicine (CFM), surgical treatment for morbid obesity is indicated for patients with BMI greater than 40 kg m<sup>-2</sup> or above 35 kg m<sup>-2</sup> with co-morbidities life-threatening [16].

Baretta [16] studied 30 patients undergoing treatment with argon after gastric bypass, found that a reduction in the diameter of the anastomosis and the consequent reduction of body weight. However, compared to argon success rate in the present study is not possible, since said author does not mention if the criterion was 50% loss of weight regained. In addition, endoscopic data as pouch size and presence ring analyzed here were not investigated by the author.

In the case of gastrojejunal anastomosis, argon application phase promotes a reduction in its diameter, leading to a "stenosis" and consequent delay in gastric emptying, early satiety and weight reduction [14]. In summary, despite the relatively small sample, the results may contribute to the establishment of clinical and endoscopic criteria to be adopted in patients' regained weight after gastric bypass. It is noteworthy that long-term randomized prospective studies are needed.

## Conclusion

It was concluded that after application of argon plasma was significant reduction in the average weight of the patients, about 50.00% of patients, especially female.

## Ethics Research Committee

This study was approved by the Ethics Research Committee of the Portuguese Beneficent Hospital of São José do Rio Preto under the case number 836 411 of 10.17.2014.

## Disclosure of Potential Conflicts of Interest

The authors declare that they have no conflicts of interests.

## Acknowledgement

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