University "Ovidius" Constanta
Faculty of Medicine

PhD THESIS
ABSTRACT

Comparative evolution of patients operated on for obesity according to the technique used

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Content

I. Current status of the problem

Special thanks

To Professor Dr. Vasile Sârbu for all his support over the years of the study, Prof. Dr. Fabrice Corbisier, Chief of Surgical Clinic 'Grand Hospital of Charleroi' for letting us to include in this paper patients operated in his clinic, and to Professor Univ. Dr. Nicolae Angelescu Professor Univ. Dr. Mircea Beuran, Professor Univ. Dr. Petru Bordei, Professor Univ. Dr Octavian Unc, for all the help and all the interesting discussions held with them. Thanks also to the staff of the Faculty of Medicine, Constanta and Administration, which proved very helpful.

Keywords:

Obesity, morbid obesity, bariatric surgery, gastric band, adjustable gastric banding, gastric sleeve, longitudinal gastrectomy, gastric bypass, co-morbidities, hypertension, type II diabetes, dyslipidemia, metabolic syndrome, IMC, BMI, laparoscopic gastric

bypass, laparoscopic band, gastric fistula, stenosis, slippage, erosion, weight loss, depression, quality of life.
PhD thesis entitled **'Comparative evolution of the patients operated on for obesity according to the technique used'** shows an interesting and actual topics, morbid obesity becoming more and more common in the population, reaching worldwide epidemic character (1).

The thesis is divided into a general part, **'the current state of the problem'**, which deals with issues of ***ontogeny, anatomy and physiology of the stomach and small intestine,*** being helpful in understanding the mechanisms of obesity later on, and also contain a whole chapter for ***etiology, pathogenesis and co-morbidities*** due to obesity.

The last chapter of the first part presents aspects such '***treatment of obesity'***, incuding ***nonpharmacologic, pharmacological and surgical treatment***, the latter being described thoroughly, each surgical technique being presented with advantages and disadvantages.

The personal part of this thesis includes a ***retrospective study*** of a group of ***184 patients,*** operated in ***two University Clinics*** using the most worldwide known three bariatric surgeries. Patient characteristics were recorded prospectively, as they came to control pre and post-surgery.

The ***main objective*** of this paper is to analyze the ***weight loss for each lot***, to make a ***comparison between the groups in terms of weight loss curve*** and analyze the impact of bariatric surgery on ***diabetes, hypertension, hyperlipemia, sleep apnea, and not at least of the quality of life.***

I. Current status of the problem (the general part) :

1. **Introduction** - shows the importance of understanding that unfortunately, obesity becomes an worldwide epidemic disease (1) , humanity increasingly spending more and more to treat patients presenting various co-morbidities due to weight excess (100 billion USD / year) (1).

2. Ontogenesis of the stomach and small intestine - shows classical information about the forming the stomach and small intestine from the primitive gut tube (***arhenteron***), a better understanding of this stage of fetal development leading to a better understanding of the anatomy and physiology of each intestinal part. (4,5,9) .

3. Anatomy of the stomach and small intestine - a very important chapter , which deals extensively with basic anatomical concepts, the vases and the nerves of the stomach and small intestine (5,7,8,9,11,13,14) .

4. Physiology of gastric and intestinal digestion - a chapter in which are widely presented classical notions of physiology of the gastric and intestinal digestion, the understanding of which is of a great help in the correct understanding of the surgical

treatment of morbid obesity. So, are treated in detail exocrine and endocrine functions of the stomach and digestion in the small intestine, digestion and absorption of the carbohydrates , lipids , proteins, vitamins , minerals , water and electrolytes. This chapter is of great help to a better understanding of the basic principles of bariatric surgery (2,10,12,16,19) .

5.Obesity - a separate chapter in which are presented: ***definition of obesity, methods of measurement (BMI body mass index), physiological regulation of energy balance, the role of genetic factors and the environment in the etiology of obesity and concepts of the pathogenesis of obesity***. Because lately bariatric surgery becomes important mainly because of the ***associated co-morbidities***, we've described co-morbidities such as insulin resistance and DZ, the effects of obesity over the reproductive system, cardiovascular system, bones, joints, and the association between obesity and some cancers (3,10,15,20,27,32,33,34).

6. Treatment of obesity - this chapter is an overview of all methods of treatment of obesity , from the ***nonpharmacological*** one (***nutrition and diet , and the role of an active life, behavioral changes*** that are required in maintaining a low weight, even after bariatric surgery) to the ***pharmacological*** , where are presented the FDA approved drugs to treat obesity. An exhaustive presentation is made for the surgical treatment of obesity, were are described the most important surgical procedures that have been used over the time. So, ***malabsorbtive and restrictive*** procedures are described and presented in detail, and also, we presented the criteria for selecting obese patients for surgery (55,57,73,74,88,92,100) .

II. The Personal Research:

This work was done in collaboration with ***Professor Dr. Vasile Sârbu, General Surgery, Emergency Hospital, Constanta, Romania and Dr. Fabrice Corbisier, General Surgery, "Grand Hospital of Charleroi", Belgium***. By the courtesy of this two professors, I was able to includ in the paper cases that were seen and operated in these two clinics between ***2006 and 2008.***

We have included in the paper, a number of ***184 obese patients*** seen in this period and operated by the three surgical methods that were used in this two clinics constantly - ***gastric band (82 patients), vertical gastrectomy (54 patients) and gastric bypass (48 patients).***

1. Among them the percentage ***of women was 78.82% (134 women)*** and of ***men - 21.18% (50 men***). All data were ***prospectively entered into a database*** and ***analyzed retrospectively***. The database incuded: ***age, sex, height and weight in kg***., based on which we've calculated ***BMI before surgery, after surgery at 1 month, 1 year, 2 years***

and 4 years after surgery, comorbidities that patients had before surgery , and after surgery at ***2 and 4 years*** , complications of bariatric surgery procedures , both intraoperative and postoperative, the number of gastric band adjustments, surgical re-interventions, changes in lifestyle and quality of life.

2. Our patients had to meet the following ***selection criteria*** : age bigger than 18 years, BMI ≥ 35 kg / m² with one or more co-morbidities due to obesity, or BMI ≥ 40 kg / m² without other co-morbidities , all of them being carefully checked before by an endocrinologist to rule out other endocrine related obesity disease (such as hypothyroidism), patients should not have any mental related problems and to have realistic expectations, to not have a history of substance abuse / alcohol / drugs , to prove that they've tried before various other non-surgical weight loss methods without having a positive and lasting effect.

3. ***Sex distribution of our patients did not show a statistically significant difference-*** comparing the data of our study with those already in the literature, there was a slight balancing of the relationship between women and men, while keeping balance tilted towards women. This can be explained by the fact that obesity is seen primarily in terms of aesthetics, women being still the most affected by this issue. Currently, we can noticed that we begin to finally understand that obesity affects the population in terms of health , being directly involved in the development of multiple co-morbidities, and, in many existing studies we can see recently a slight trend toward standardization of report women / men turning to this treatment method.

4. Analyzing our groups in terms of ***age, the youngest patient was 18 and the oldest, 65 years , averaging between 30 and 40 years***. There is no statistically significant difference between age groups, the standard deviation for the three groups being between 9.33 for those who have turned to gastric bypass and 11,30 for those with gastric sleeve . The mean age of patients in our groups is consistent with the mean age found in literature.

5. In our groups, the patients with the ***highest weight were operated by gastric bypass*** . ***The average weight*** of all patients is around 113 kg., with a minimum of those operated by sleeve (average 108 kg with a standard deviation of 23 kg.) and a maximum in patients with gastric bypass surgery (average 113.43 kg. with a standard deviation of 29 kg.) . The initial weight was between: 94 kg. and 140 kg . for those with gastric band, 77 kg. and 166 kg . for those with gastric sleeve, 70 kg. and 202 kg. for those with gastric bypass . Usually, the ***decision*** regarding the type of surgery was taken with the patient after a ***proper information, being discussed about the risk and complication of every one of the procedure in a multidisciplinary team consisting of a surgeon, endocrinologist , psychologist, nutritionist*** . There was no statistically significant difference when the mean initial weight. ***We can notice that in general , patients with the highest weight turned to gastric bypass or gastric sleeve .***

6. Analyzing the ***BMI variation by age, we found that unfortunately, patients with the highest BMI that underwent a bariatric procedure, were mainly those under 20 years.*** Therefore, their distribution by age groups was as follows: under 20 years , we had 11 patients with an average baseline BMI of 44.26 kg./m², 21 - 30 years old, 49 patients

with a BMI of 42.02 kg./ m², 31-40 years, 77 patients with a BMI of 40.99 kg./ m², 41-50 years , 30 patients with a BMI of 42.92 kg./ m², 51-60 years, 13 patients with a BMI of 41.04 kg./m² and over 60 years old, 4 patients with a BMI of 40.23 kg./ m². ***Unfortunately, the only conclusion we can draw from this is that there is a growing number of young people suffering from obesity.***

7. Next, it's described the surgical techniques of ***gastric band, gastric sleeve and gastric by-pass***. In the case of our patients that underwent a gastric band procedure, to avoid ***lateral slippage***, we've closed the space between the great curvature and the left diaphragmatic pillar with two sutures between the greater curvature gastric and left diaphragmatic pillar. To avoid **'anterior slippage'**, the gastric band was secured by two sutures between the small gastric curvature and right diaphragmatic pillar above the gastric band and bellow. To avoid **"posterior slippage"** was used the already standardized method of **"pars flaccida"**. Before leaving the hospital, all the patients received a visit from a nutritionist, being taught how to deal with this new situation. They were taught how to introduce foods slowly, how to eat, and what to expect next. Each of them received written instructions regarding the new diet and the gradual introduction of food.

8. Before surgery, each patient is usually seen between ***4-6 months in advance***, and at this point is discussed exactly what type of surgery more suitable, including risks and complications, and benefits. The patient must understand very well that ***bariatric surgery is only a tool, the most important part being the compliance and capacity of the patient to keep an appropriate lifestyle*** to ensure a lasting and satisfactory results. Usualy, 2 weeks prior to surgery, the patient is asked to keep a '***shrinking liver diet',*** in order to facilitate surgery. It is a good exercise for keeping the post-operative diet. Each patient before discharge, receives a visit of a nutritionist, received a leaflet with the diet that he/she must follow. After week 4, he/she can increase slightly the consistency of the food. After week 7 post-operative, the patient should be able to gradually introduce solid food. From the beginning, the patient is informed that should take ***dietary supplements, vitamins, for the rest of his/her life.***

9. As it is pointed out in this paper many times, ***postoperative results are based in part on the patient's ability to follow a diet and a lifestyle that is usually quite different from what he is used with, throughout life.*** Effects of bariatric surgery, are very much influenced by ***behavioral changes*** of the patients. So, usually, the patient receive the following recommendations: to eat three small meals/day, to eat from smaller plates, may have some healthy snacks between meals, such as fruits or a small yogurt, to avoid so called ' small eatings' throughout the day, this usually leading to an increased intake of calories, to call whenever he feel that he needs help from the support groups or dietician.

10. Analyzing ***BMI at 2 years after surgery***, the group of patients who had ***the most important weight loss, was the group with gastric bypass***, with a decrease of approximately 14 kg/m2 on average. This was due probably to the combination of both mechanism, malabsobtive and restrictive. After surgery, patients were usually monitored at 1 month, 3 months and 1 year, and yearly after that, and in betweens seen whenever he

needs. All the patients are advised to participated to the ***regular meetings of the group,*** where they met with the surgeon, nutritionist and psychologist. For the patients with gastric band, the first adjustment was made at 1 month, and depending on patient need after. Only one patient was dissatisfied with the postoperative outcome, and it was the patient who usually didn't participate to the group meetings. The difference between BMI at baseline and 2 years, was: 14.23 kg /m² in patients with gastric bypass, 13.62 kg /m² in patients with gastric sleeve and 11.11 kg /m² patients with gastric band. Our data are also supported by the literature, ***the best results being obtained in the case of the patients with gastric bypass,*** but we have to mention that this is the surgery with the highest risks and complications, ***followed by the gastric sleeve and gastric band.***

11. Analyzing the ***difference in BMI by gender, at 2 years, the BMI of men was initially slightly higher than that of women,*** this small difference preserving at 2 years postoperatively, with ***no statistical significant value***. The BMI decreased by 12.76 kg /m² in women and 12.44 kg /m² in men, with no statistically significant difference.

12. Analyzing the ***evolution of BMI by age***, the following results were obtained: for those under 20 years, BMI = 30.42 kg /m², 21-30 years, BMI = 29.07 kg /m², 31-40 years, BMI = 28.76 kg /m², 41-50 years, BMI = 28.99 kg /m², 51-60 years, BMI = 30.25 kg /m² and over 60 years, BMI = 29.61 kg /m². Thus, the patients group who had a ***better evolution of weight loss curve*** in the first 2 years after surgery, regardless of type, was the group **51-60 years**, followed by those **under 20 years**, those **between 21 to 30 years.**

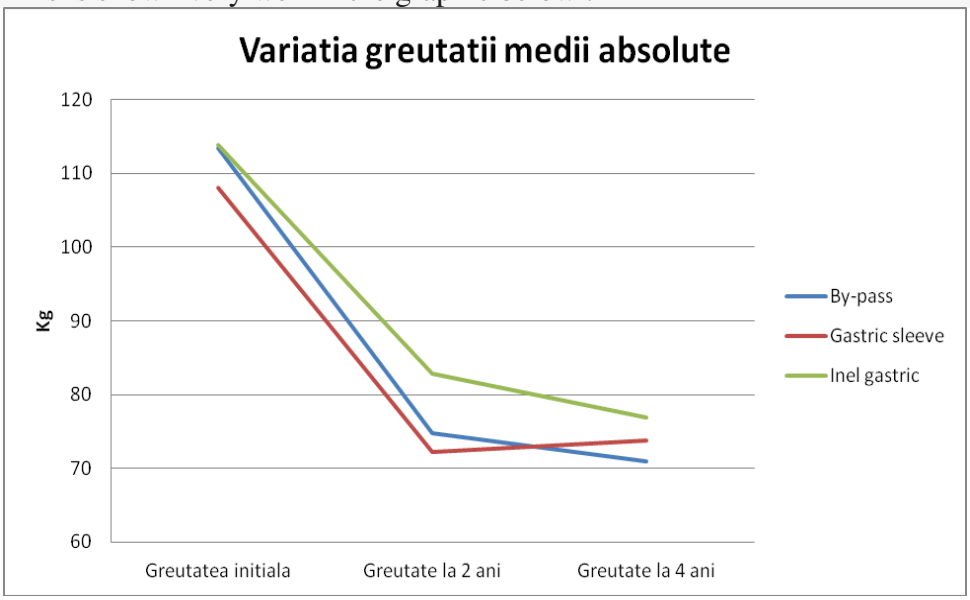
13. At ***4 years after surgery***, weight loss curve between 2 and 4 years was similar among all groups of patients, recording about the same weight loss regardless of the technique used. ***A difference in the rhythm of loosing weight was recorded in the first 2 years after surgery, remaining similar in between year2 and 4, with a small exception in the case of the patients with gastric sleeve surgery that towards the end year 4 of observation, they've recorded a slight increase in weight***. Thus, 4 years after surgery, BMI according to the technique used was of 26.64 kg / m² in patients with gastric bypass, 28.64 kg / m² in patients with gastric sleeve and 28.18 kg / m² in the gastric band. There has been such a difference of 15.7 kg / m² in those with gastric bypass, 13.02 kg / m² in those with gastric sleeve and 13.31 kg / m² in case of gastric band. We notice so that the ***best results that have been preserved over time were in the case of gastric bypass patients, follow by at about the same place by the gastric band and gastric sleeve patients***. In our groups, we've noticed a slightly increase in weight for the gastric sleeve patients, towards the end of four years .

14. Evolution of ***BMI by sex , 4 years after bariatric surgery*** , reported the following results: in women, the difference baseline BMI- BMI at 4 years was 13.92 kg /m², while in men, the difference in baseline BMI - BMI at 4 years was 13.64 kg /m². Note that there is ***no statistically significant difference***, although the women in our group had a slightly more favorable trend than the men, although they had a slightly higher baseline BMI than women.

15. ***Evolution of BMI according to the type of the bariatric procedure used***, recorded the following results: patients with gastric bypass surgery, had an initial BMI of 42.34

kg/m², a BMI at 2 years post -operatively of 28.11 kg/m² and 26.64 kg/m² at 4 years after, the gastric sleeve surgery patients had a mean baseline BMI of 41.66 kg/m², 28.64 kg/m² at 2 years, 28.04 kg/m² 4 years and those with gastric band surgery , an initial BMI of 41.76kg/m² , at 2 years of 29.10 kg/m² and at 4 years of 27.91 kg/m² . Unlike weight loss recorded in the first 2 years after surgery, the decreasing in the BMI between year 2 and 4 was recorded much slower. ***After a first rapid weight loss recorded in the first 2 years, patients continued to lose weight, but more slowly***. A small difference is observed in our group of patients operated with gastric sleeve. ***Towards the end of the 4 years after surgery, there was unfortunately a slight increase in weight. Patients with gastric bypass achieved the best results in time, followed by those with gastric band and gastric sleeve, achieving a statistically significant difference between our groups of patients, between 2 and 4 years after surgical intervention .***

This is shown very well in the graphic below :



16. We've also analyzed the ***percentage of the weight loss at 2 years after surgery, being calculated as the difference between initial weight and weight after two years, transforming the kg. in percentage considering the ideal weight of each patient***. Ideal weight was considered using the ***Metropolitan Life Insurance table*** presented in the paper in the beginning of the thesis. We've achieved a ***statistically significant difference between the group with gastric bypass and the other 2 groups***. Gastric bypass patients had a more pronounced decrease in weight in the first two years than those with gastric sleeve or gastric band, the difference that persist at 4 years postoperatively , although the pace of losing weight was slow than in the first 2 years .

17. In absolute weight, the weight loss, recorded the following variables: the group of patients with gastric bypass: 2 years achieved an average decrease of 38.62kg . with a standard deviation of 19.26 kg., showing a slow but steady weight loss absolute during the 4 years ;in the group of patients with gastric sleeve, in two years, the average absolute

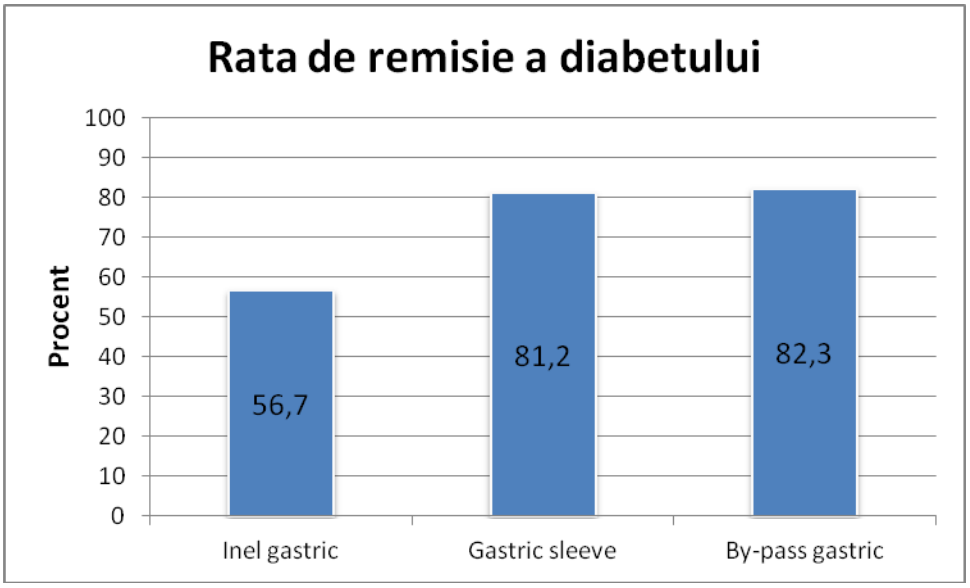
weight loss was 35.76kg with standard deviation of 14.77 kg. and in the group of patients with gastric band, 2 years after surgical intervention recorded the smallest decrease in absolute weight - 31.12 kg , with a standard deviation of 10.54 kg. Towards the end of four years of study, the decreasing in absolute weight remained slightly higher in patients with gastric bypass, followed by those with the gastric band and gastric sleeve surgery. ***We have a statistically significant difference between the groups of patients, the best results being of patients with gastric bypass, followed by those with gastric sleeve and the gastric band*** .

18. A very important aspect of this type of surgery, is the ***pre -/and post-operative care*** . The patient must be well informed and ***highly motivated***, understanding that bariatric surgery is primarily a surgery whose outcome is largely influenced by the change in the patient's life, and the changing patterns must be of a long-term. Also, the patient must understand at the same time the risks and complications specific to this type of surgery, and to be prepared for a ***lifetime battle*** against the extraweight, bariatric surgery helping him, but the most important part in the battle belonging to the patient. After surgery, all patients were enrolled in a ***supportive group*** who had monthly meetings, attended by the surgeon, together with a nutritionist, a psychologist. These meetings have been attended by family members also, being well known the importance of the existence of a family supportive help. After the body weight stabilized, was taken into account the possibility of ***having reconstructive surgery.***

19. ***Follow -up*** after surgery was achieved in the first year usually 3 times, at ***1 month postoperatively, between 2-3 months post-operatively and at 1 year.*** Subsequently, follow-up was done ***yearly,*** and at the patient's request . Every time the patient was seen, the data were entered into a standardized database, aiming at weight loss, the result of blood tests including blood sugar , blood pressure, dietary habits, changing the quality of life .

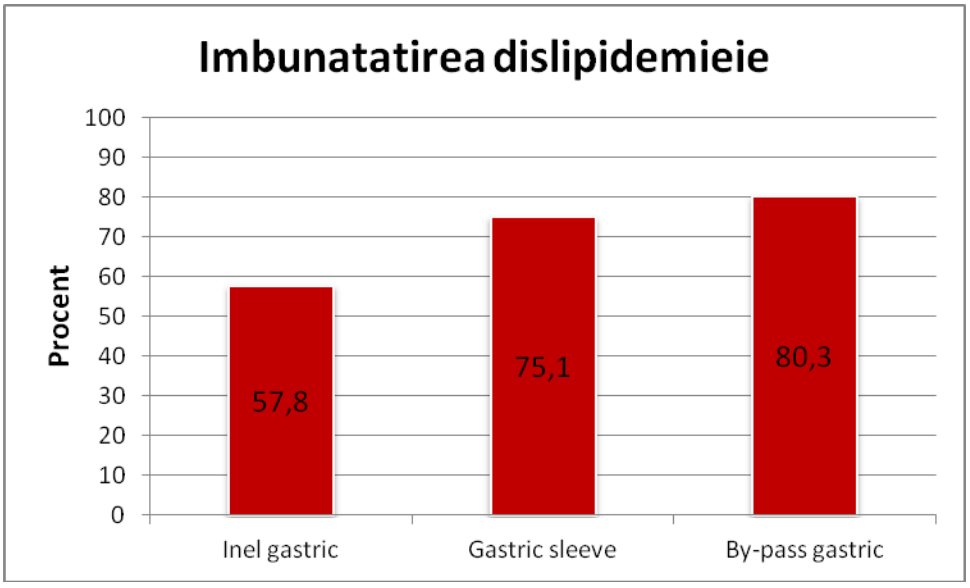
20. A very important aspect of bariatric surgery, is ***the impact it has on associated co-morbidities***. We've analyzed our groups in terms of the evolution of these co-morbidities as well. ***It is well known that the relative risk of suffering a premature death increases by almost 100% when BMI increases from 19kg / m² to 32 kg / m². Has been shown that being overweight or obese is responsible for 80% of cases of type II diabetes, 35% of cases of cardiac ischemia and 55% of cases of hypertension, in Europe, causing more than 1 million deaths year.***

21. Bariatric surgery is an effective and sustained therapy of ***type 2 diabetes***. In our groups, the best remission rates are achieved by, in descending order, as follows: ***gastric bypass, gastric sleeve and gastric band.***



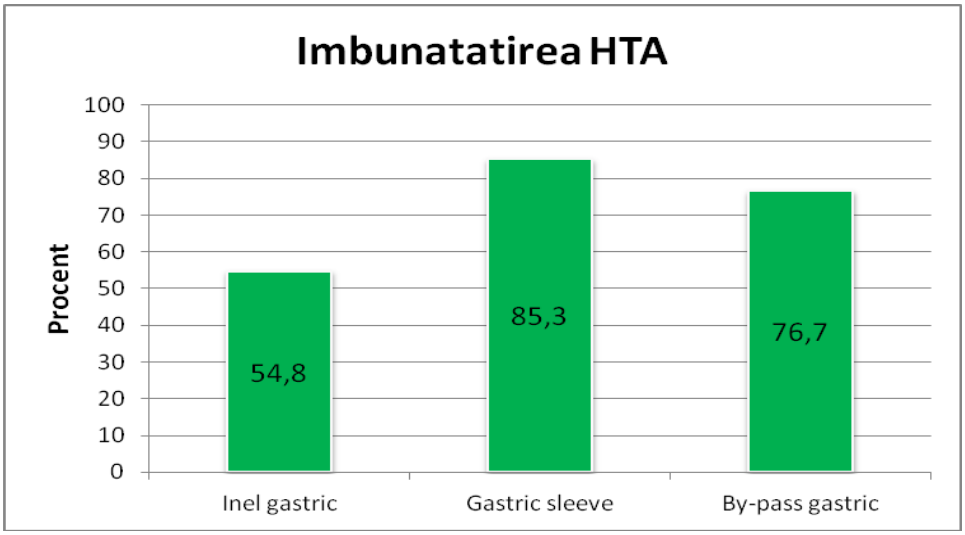
Thus, the II diabetes remission rate was for the patients with gastric band of 56.7%, for the patients with gastric sleeve of 81.2%, and 82.3% in the case of patients with gastric bypass (the best rate remission).

22. Another particularly positive results is seen in ***modifying blood lipid levels***. The exact mechanism by which bariatric surgery influence the level of the lipids in the blood is still unclear. However, the sharp decrease in TG observed primarily after restrictive procedures is mainly due to weight loss, reducing insulin resistance, thereby decreasing triglyceride production in the liver. So, bariatric surgery improves the levels of the lipids, decreasing the need of medication and reducing the risk of developing atherosclerosis.

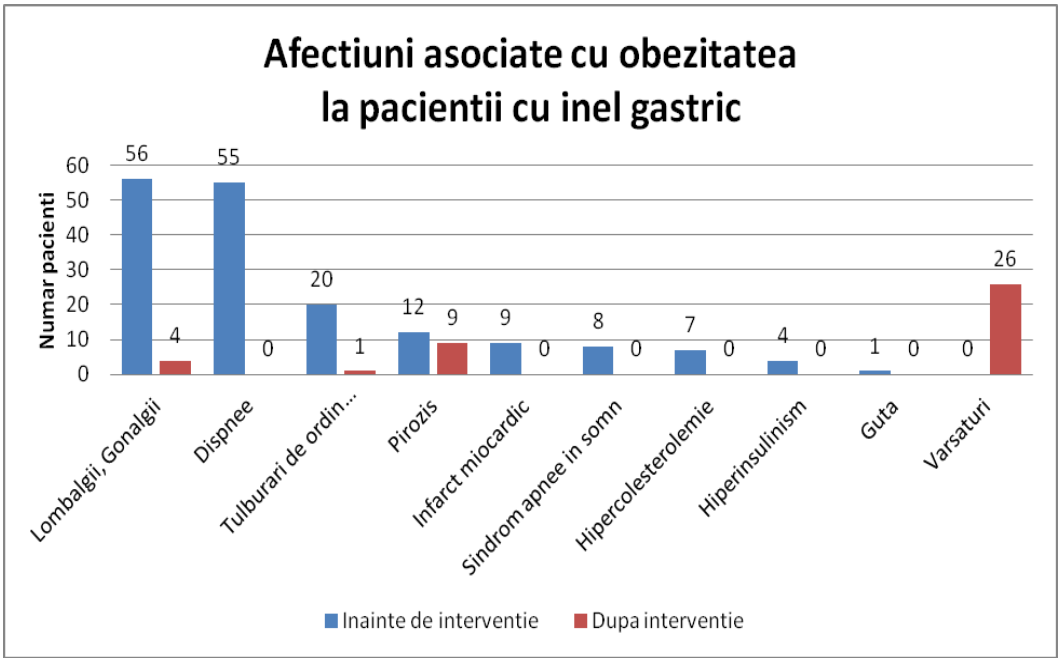


For our patients, we've obtained the following results: 57.8% of patients with gastric band, 75.1% of patients with gastric sleeve and 80.3% of patients with gastric bypass had a significant improvement. Our data are also supported by data by the literature.

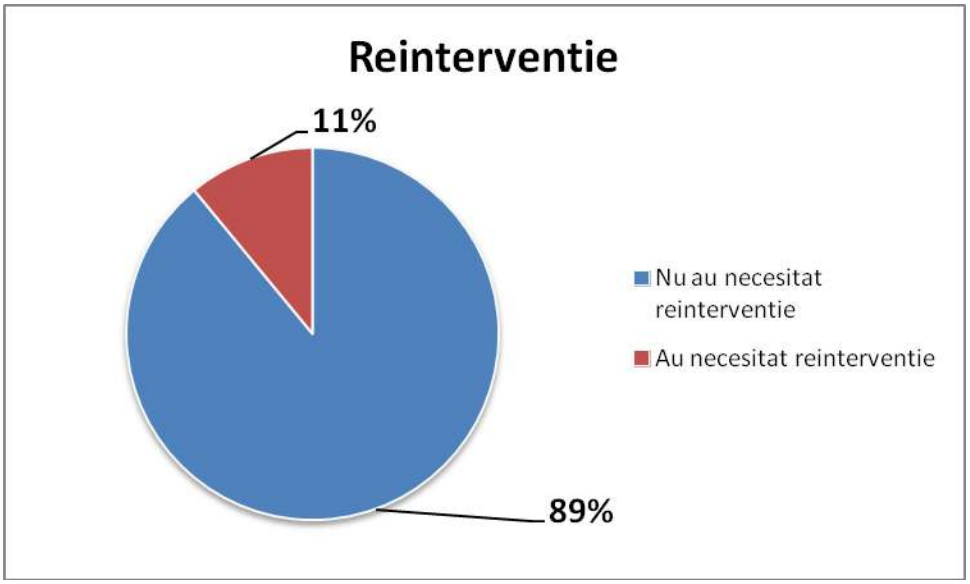
23. ***Hypertension*** is often present in obese patients. Losing in weight leads to a decrease in blood pressure, reducing the amount of antihypertensive medication necessary to maintain a normal blood pressure. In our study, higher resolution rate of 85% was met in the cases treated by gastric sleeve, 76.6% with gastric bypass and only 54.8% with gastric bands.



24 . We've also analyzed the evolution of co-morbidities 4 years after the surgery.Thus, in patients with gastric band, they obtained the following results; our patients had 100% associated co-morbidities . Of gastric band patients, 56 were suffering from back pain, 82 from joint pain caused by excess weight, of these, 4 years after the procedure, only 4 patients (7.14 %) still suffering of the pain, but much improved, 55 patients suffered from dyspnea before surgery, reported at the end of four years its complete disappearance (0 %), 20 patients suffering from psychological disorders due to increased weight and social interaction, mostly depression, only one single patient (5%) at the end of four years still complaining of this symptom. All the problems were closely monitored and counseled by a psychiatrist; 9 of the 82 patients underwent a myocardial infarction. At the end of 4 years of follow -up, no patient has had no other cardiac event; 8 of the 82 patients suffering from sleep apnea, none exceeding greatness with this problem postoperatively; 7 patients with hypercholesterolemia, 4 with insulinism and one with gout, none after 4 years never blamed these problems. There were some side effects : although none of the patients accused vomiting preoperatively, they occurred in 26 of them, at the end of 4 years of follow -up . Despite the troubles largely controlled by drug therapy, said they were pleased with the weight loss and the improving in quality of life.

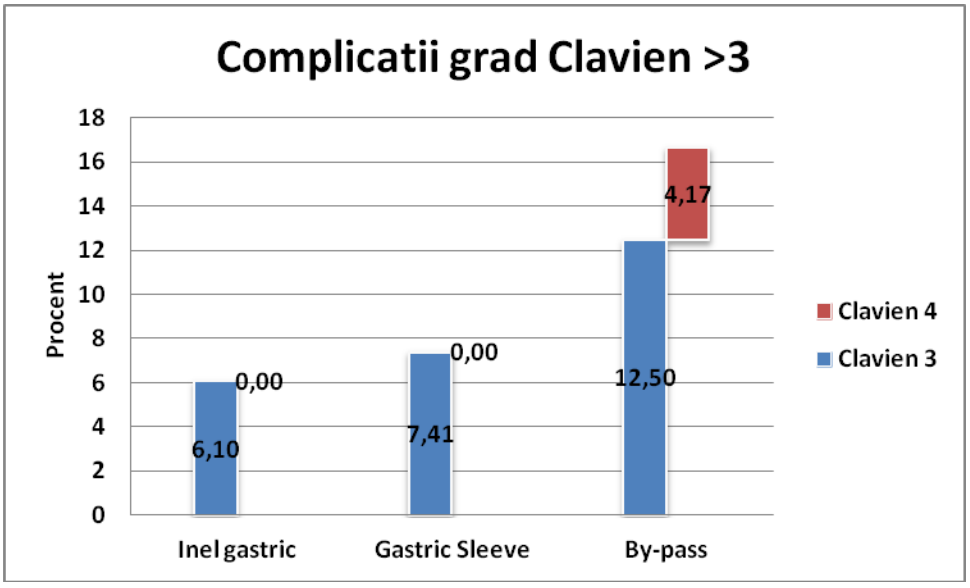


25. ***Surgical reintervention*** in patients with gastric band represented a percentage of 11%, a percentage that falls in the results of the literature.



In our case, surgical reintervention were due to the following reasons: 1 patient underwent the phenomenon of ' slippage ' gastric (1.21 %), 1 patient had a change to by-pass after 1 year because of the lack of effective weight loss (1.21 %), 6 patients had reinterventions due to displacement of the port access (7.31 %) and 1 patient presented a tubing problem(1.21 %).

26. In our groups of patients, the overall number of patients who required reoperation surgery , were represented by: for patients ***with gastric band, 5 cases (slip, fracture of the tubing, erosion or migration, dilation of the esophagus, stoma obstruction); for patients with gastric sleeve, 4 cases (fistula , fistula chronic gastro-oesophageal reflux, gastric pouch dilatation) and for gastric bypass patients , 6 cases (fistula, anastomotic strictures, internal hernias, ulcers at the anastomotic site, dumping syndrome, gallstones kidney***). Only ***2*** patients required ***postoperative dialysis*** due to the development of acute renal failure. In our groups, ***postoperative mortality was 0 %*** .



27. Nutritional deficiencies that occurred during the 4 years of postoperative follow-up, although patients were advised to use vitamin and mineral supplements were usually easily correctable, and were in patients with gastric ring (6 cases) (representing a rate of 7.3 %): mild deficits of iron, vitamin B12 , folate , in patients with gastric sleeve (6 cases) (representing a rate of 11.1 %) moderate deficiencies of vitamin B12 , folate , Ca, Vit. D , Zn, Cu, Fe , and in patients with bypass (10 cases) (representing a rate of 20.8 %) moderate deficits Vit . B1 , B12 , folate , vitamin D , Ca, Fe , Zn, Cu.

Conclusions:

1. Obesity has an increasing prevalence unfortunately reaching epidemic proportions. With the increasing number of obese people grows the material resources that we allocate to prevent complications associated with obesity, which, as we have seen in the present work can be from psychological problems, mental and physical fatigue, to cardiovascular problems , orthopedic , respiratory .

2. Amongst the causes that are incriminated today in increasingly raised number of obese people ,are involved lifestyle changes, daily stress, increasingly higher occurrence of fast-foods , all of which influence negatively the health of population.

3 . Obesity and associated co-morbidities respond very well to bariatric surgery . the presence of the co-morbidities is becoming today the main reason for having this type of surgery. As I noted in this paper, according to data from the literature, co-morbidities such as diabetes mellitus,
hypertension, metabolic syndrome , and various related joint pain or psychological disorders are much improved , if not cured by this treatment .

4 Bariatric surgery is the most effective treatment in the long term. Along with understanding the association between obesity and health problems such as diabetes, cardiovascular disease , metabolic syndrome , the number of patients who benefit from bariatric surgery is increasingly higher.

5. Unlike other types of surgery, bariatric surgery involves the patient in getting positive results, being considered largely a behavioral surgery, as it stands in our work. Depending on the will and determination of the patient, weight loss achieved in the first phase, can maintain or even improve, or conversely, the patient may relapse, gaining weight.

6. Patient information is very important. In order to achive long-term positive results, patients should be well informed and fully understand the changes that have occurred in their body, to strictly comply with the new rules of nutrition and the physical activity program . Their lifestyle must change completely with no deviations, the entire succes of this surgery depending on the lifetime chances .

7. The team working and preoperative decision, as we have seen in this paper, should be taken by a group consisting of the surgeon, a nurse specialized in this type of surgery, a dietitian, a psychologist and an endocrinologist .

8. At the beginings, preoperatively, all patients were seen by a multidisciplinary team, between 4 and 6 months in advance. They were given all the necessary information detailed knowledge of each surgical procedure, of the risks and complications, explaining to them that in the first place bariatric surgery is a tool in their hands , long-term outcomes depending on how they use it.

9. Postoperative follow-up our patients was usually done at 1 month, between 2 and 3 months and 1 year after surgery, then yearly, or whenever needed, recording each time the evolution, of weight variation, the associated co-morbidities and biophysical parameters (blood pressure , blood sugar , lipididemie).

10. Comparing the three used methods, according to the results obtained, by recording the differences in terms of weight loss at 2 years after surgical intervention, 4 years after surgical intervention (baseline BMI at 2 years and 4 years postoperatively , the variation of absolute weight loss , weight average), we've found a better evolution of patients who were operated on by- gastric bypass in terms of associated co-morbidities resolution.

11 . In general, in our groups, patients with high BMI were operated by gastric bypass, usually, the decision to opt for a particular surgical procedure, belonged equally to both the patient and the multidisciplinary team, being a patient centered decision.

12 . The best results in terms of weight loss, at 4 years postoperatively, were obtained in tha case of the patients with gastric bypass, gastric sleeve, followed by those with gastric band.

13 . There is a more pronounced decrease in weight in the first 2 years after surgery, than in the next two years, remaining still different between the three bariatric procedures. For patients with gastric sleeve, though we've noticed a slight increase in weight in the curve range between 2 and 4 years postoperatively, the mechanisms are not fully known . We can not say 100 % that regaining in weight is exclusively due to the surgical procedure, however there is always a behavioral component that influences the results of this type of surgery .

14. The risks associated with each type of surgery was exemplified in the present work, first place being held by those with gastric by-pass, followed by those with gastric sleeve, the last place belonging to those with gastric band. When the surgeon and the patient take the decision to opt for surgical treatment of obesity, we must be sure that the patient understands exactly the risks associated with, and he has to know exactly that is a lifetime chance in behaviour.

15. Co- morbidities such as diabetes mellitus, hypertension, metabolic syndrome, psychological disorders due to obesity, joint pain, are much improved by weight loss achived with bariatric surgery, increasing the life expectancy of the patient, and lowering costs of treating these health problems over time.

16. The co-morbidities associated with obesity has become the principal reason to recommend this type of surgery, patients becoming increasingly aware of the danger that obesity means, and understanding the role of bariatric surgery as the starting point in their lifelong struggle with extra weight, the most important aspect of a positive result being the motivational intensity of the patient.

Bariatric surgery is a surgery that earn the place among the other types of surgeries, being mostly a behavioral surgery. With the increasing number of patients suffering from obesity, increasingly more patients addresses to this type of treatment, weight loss obtained being associated with a marked reduction of co- morbidities due to obesity , thus lowering long -term costs of treating such patients.

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