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BODY CONTOURING IN OBESE PATIENTS AND IN PATIENTS AFTER MASSIVE WEIGHT LOSS

ABSTRACT

of a dissertation for award of the research degree of

"Doctor of Science / PhD"

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This dissertation consists of 116 pages and is illustrated with 32 figures and 11 tables.

The bibliography includes 52 foreign references.

The dissertation has been discussed and sent for defence by the Departmental Council and the Department of Surgery at the Faculty of Medicine at the Medical University in Varna, Bulgaria.

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Note: *The numbers of the tables and figures in the abstract do not correspond to those in the dissertation.*

TABLE OF CONTENTS

ABBREVIATIONS USED

MWL	Massive weight loss
BMI	Body Mass Index
CBC	Complete Blood Count
HGB	Haemoglobin
DS	Duodenal Switch
AGB	Adjustable Gastric Banding
SG	Sleeve Gastrectomy
NAC	Nipple-Areola Complex
BPD	Biliopanreatic Diversion
VBG	Vertical Banded Gastroplasty
RYGBP	Roux-en-Y Gastric Bypass
BPD/DS	Biliopanreatic Diversion with Duodenal Switch
CVD	Cardiovascular Diseases
TE	Thromboembolism
PTE	Pulmonary Thromboembolism
ASAT	Aminotransferase Aspartate
ALAT	Alanine Aminotransferase
SFS	Superficial Fascial System
SMAS	Superficial Muscle-Aponeurotic System
SAL	Suction-Assisted Liposuction
UAL	Ultrasound-Assisted Liposuction
PAL	Power-Assisted Liposuction
CS	Corticosteroids
US therapy	Ultrasound therapy

1. INTRODUCTION

Obesity is a health problem that in itself leads to an immediate health risk.

Globally, there has been a triple increase in the number of people suffering from excessive weight and obesity since 1975 to date.

The majority of the world's population live in countries where being overweight and obesity prevail over malnutrition as a cause of death.

Massive weight loss is defined as losing more than 45 kg or more than 100% of the ideal weight for a particular person.

Massive weight loss inevitably leads as a consequence to ptosis of soft tissues in different parts of the body. A predominant percentage of patients can be characterised by an existing cutaneous and subcutaneous excess, with a dominant cutaneous component, and sagging of the same in all parts of the torso – face, neck, chest, abdomen, back, posteriors, upper and lower extremities. The present soft tissue excess is not only an aesthetic but also a functional problem for patients. The complaints in these cases range from purely aesthetically determined inconvenience in the social and domestic aspect, to the inability to perform normal physical activity due to excessive ptosis mainly in the abdomen and thighs. Soft tissue ptosis is often a prerequisite for maceration and layering of infections in the area of the "extra" skin folds thus formed.

In our practice, the performance of interventions aimed at removing cutaneous and subcutaneous excesses and body contouring is observed in patients with massive weight loss after bariatric surgical interventions in 90% of cases, while in

the remaining 10% the cases of application of this type of intervention in the field of plastic, restorative and aesthetic surgery are performed in men and women who have achieved a significant reduction in their weight after a physical exercise and dietary regimen.

Surgical interventions related to body contouring after massive weight loss and obesity in their entirety are surgical procedures aimed at removing the soft tissue excess and defining the individual parts of the body, which inevitably reflects in a positive aspect and on improving the patient's quality of life both in a psychological and a socio-domestic aspect.

Historically, this type of intervention has been associated with names such as Kelly (1899) – the first attempt to remove excess skin and adipose tissue from the abdominal wall; Correa-Iturraspe and Fernandez were at the heart of the first aesthetic brachioplasty performed in 1954. In 1964, Pitanguy proposed a technique for lifting the buttocks, and in 1920, Lexer first used inverted-T, a technique used in the mammoplasty reduction procedure, which was published by his assistant Kraske in 1923 and gained popularity as the Lexer-Kraske technique. "Free Nipple Graft" is the technique that was first introduced by Lexer (1912) and Thorek (1922) and is widely used in breast modelling, especially in patients after massive weight loss. In 1964, Pitanguy performed the so-called thigh/buttock lift, which is an excision along the gluteal fold with a continuation in a horizontal direction along the medial surface of the thigh. Three French surgeons – Yves-Gerard Illouz, Pierre Fournier and Francis Otteni, were the first to perform in 1982, during a meeting of the American Society of Plastic and Reconstructive Surgeons in Honolulu, Hawaii,

presented their experience in the field of lipoaspiration. The first procedure to remove excess skin from the face and neck was performed by Eugen Holländer.

At present, minimally invasive techniques are increasingly introduced, such as radiofrequency-assisted liposuction, which, in combination with contouring, allow for simultaneous "tightening" of ptosed skin. The technique is used both in obese patients and as a final stage in order to define an already contoured area in patients with massive weight loss.

2. GOALS AND OBJECTIVES

2.1 Goal:

To prove the relationship between the method in which the reduction in body weight is achieved with the available local preoperative status and the choice of surgical technique.

2.2 OBJECTIVES:

1. To carry out a retrospective analysis of the patients with the surgical interventions performed for the period 2015 to 2021 in the Clinic of Plastic, Reconstructive and Aesthetic Surgery at the Alexandrovska EAD University Hospital according to the specified criteria

2. To summarise the data by means of statistical analysis and to indicate the deduced dependencies

3. To prepare an algorithm of behaviour for the performance of these operations

4. To prepare recommendations to avoid complications in these operations

5. To draw indicative criteria for the inclusion of patients for performing a specific type of technique in the type of surgical intervention depending on the preoperative, local and general status

3. MATERIALS AND METHODS

3.1 Materials:

The biostatistical data are based on a representative sample of patients operated on in the Clinic of Plastic, Reconstructive and Aesthetic Surgery at the Alexandrovska EAD University Hospital for the period from 2015 to 2021, inclusive.

3.2 Methods

3.2.1 Paraclinical tests

3.2.2 Medical imaging

3.2.3 Surgical methods:

- Abdominoplasty
- Brachioplasty
- Gluteoplasty
- Contouring in the chest area in patients after massive weight loss
- Upper Body Lift
- Lower Body Lift – Thigh/Buttock lift in combination with High Lateral Tension Abdominoplasty
- Thigh lift
- Facelift and lifting procedures in the neck area
- Liposuction in obese patients
- Minimally invasive radiofrequency techniques

3.2.4 Statistical methods:

- Biometric data

-Sex

-Age

-Height

-Weight

- Weight reduction period

- Reduced weight

- Method of body weight reduction

- BMI

- Laboratory parameters – HGB, coagulation status, blood sugar, total protein, albumin

- Concomitant diseases

- Surgical technique

- Postoperative conditions – inflammation, infections, wound dehiscence, necrosis, seromas, aesthetically unsatisfactory results, hypertrophic and/or dilated and/or visible cicatrixes, contour deformities, PTE, postoperative seromas, bleeding, hematomas, hypovolemic shock, perforation of a hollow abdominal organ, compartment syndrome, lidocaine toxicity, alopecia in the scar area during a facelift, deformities in the area of the earlobe during a facelift, necrosis in the area of the NAC in the case of lifting and contouring in the chest area,

deformities and complete and/or partial necrosis in the navel area in abdominoplasty techniques, thermal trauma and fibrous deformities in minimally invasive radiofrequency-assisted liposuction techniques, impaired sensory and/or motor innervation, partial alopecia in areas after radiofrequency procedures.

In this analysis, the statistical studies are based on data from 234 operations performed in the Clinic of Plastic, Reconstructive and Aesthetic Surgery at the Alexandrovska University Hospital in the period from 2015 to 2021. In practice, it can be said that the studied population represents the general population of all operations for the period.

In cases where only one characteristic of the subjects is studied, usually the set of measurements is identified with the totality of the subjects themselves, and in this way the set of the studied objects is considered as a general population. Thus, by definition, the general population consists of all the individuals who are the subject of a given study. The main aspect that distinguishes one general population from another is that all its elements correspond to a predetermined definition of belonging to this particular general population. Here we observe data from practically all operations for the period (with a few exceptions for the years 2009, 2010 and 2011). Since the set studied here consists of a finite number of elements (operations performed in the specified period), the studied size of 234 cases will be referred to as the size of the general population and it is considered in this study.

The database that was used to prepare the analysis contains 25 variables. Each variable is the result of a certain measurement. In this case, measurement is a determined rule for attributing a numerical result to the measured statistical units. The following variables are analysed:
Sex and Age of the operated person, Diagnosis, Concomitant Diseases, CBC, Coagulation, Status, Biochemistry, Total Protein, Albumin, Blood Sugar, Height, Weight, BMI, Previous Interventions, Method of Weight Loss, Preoperative Local Status, Postoperative Complications, Operative report, Laboratory Tests at Discharge, Solution to a Complication, Follow-up examination 3 postoperative day (POD), Follow-up examination 14 POD, Follow-up examination 90 POD.

Some of the variables are nominal (or qualitative): Such are the variables in which we have a certain number of categories that differ by their names, each unit of the population referring exactly to one of these categories. In this case, the variables are said to be measured on a nominal scale (category name scale). The nominal variables are involved in the analysis as factors. Such are almost all of the specified variables.

There are also interval (quantitative) variables in the database – those for which the intervals between the results can be interpreted. Moreover, they belong to the type of interval variables in which there is a zero point of measurement. Here these are age, weight, height and BMI.

There are also two variables that are ordinal. What is special about this type of variable is that only the possibility of comparing the results of different units of the population is

assumed about them, but we cannot quantify this difference. The statistical analysis procedures used here, which refer to purely ordinal variables, work with the ranks of individual statistical units instead of their natural values – such variables are only CBC and Blood Glucose.

The significance level used in all analyses is 95%. The following statistical methods were used in the data analysis:

3.2.4.1 Descriptive methods

Variational analysis of interval (quantitative) variables – mean values, standard deviation, variance, standard error of the mean.

Frequency analysis of nominal and ordinal variables – absolute values, relative frequencies in percentages, and cumulative frequencies in percentages.

Graphic representations

3.2.4.2 Hypotheses testing methods

When checking the relationship between nominal and ordinal variables, Chi-square analysis was used:

Stages of application of Chi-square analysis – solves problems of establishing relationships and dependencies between phenomena presented in a statistical table, in which cases are distributed by nominal values of the signs:

- First, we define H0 and H1:

H0: there is no relationship between the phenomena studied (null hypothesis);

H1: there is a regular connection and dependence.

Then we use the following verification method where:

- actual number (frequencies) of cases in the cells of the table;

- theoretical number (frequencies) of cases in the cells of the table, provided that there is no relationship and dependence between the phenomena studied.

Next, we determine the theoretical characteristic from the table in accordance with the parameters:

, where:

and are respectively the number of rows and columns of the table.

- A decision is made by comparing the empirical and theoretical characteristics:

when >: H0 is rejected and H1 is accepted;

when <: H0 is accepted and H1 is rejected.

Student t-distribution or T-test. It is used in normal distributions of variables and for comparing mean values for k interval (quantitative) variables:

Analysis of variance (or ANOVA *from the English ANalysis Of VAriance*) is a method used in statistics to test hypotheses for equality between more than two means. Through this hypothesis test, it is possible to assess the extent to which the influence of a given factor-cause or a group of factors-causes is statistically significant or not. Thus, analysis of variance refers

to the methods for examining relationships and dependences. This method is most suitable for use when the values of the attribute factor are presented on the weak scale (usually the nominal one), and the values of the resultant attribute are on the strong scale, i.e. they have a numerical expression.

In this case, the Tests of Between-Subjects Effects method of analysis of variance of the SPSS software was used.

Cluster Analysis – Cluster analysis is an unsupervised learning classification that aims to form natural groups based on many traits simultaneously. The goal in cluster analysis is to group n objects in k (k>1) number of groups, called clusters, using p (p>0) number of features (variables). Cluster analysis itself is a collective concept and contains a large number of different clustering procedures. The K-Means Cluster method was used here.

The following software products were used to process the data from the general population:

SPSS 20 and Q Professional.

Hypotheses

1. Surgical intervention is strongly influenced by the method of body weight reduction. One of the goals of this dissertation is to check which ones really have a significant influence and what the strength of this influence is
2. The choice of surgical intervention affects the frequency of postoperative complications

3. Based on certain preoperative factors, it is possible to create an indicative model that guides the expectations of the medical team for a possible probable diagnosis and operative report - **an immediate benefit in times of online consultations in pandemic conditions.**

For the H-0 working hypothesis, we assume that there is no dependence between the studied indicators
For H-1, we assume the presence of a statistically dependent difference P>0.05

4. RESULTS AND DISCUSSION

4.1 Inclusion criteria

Male and female patients, aged between 18 and 75 years, randomly admitted (self-referred) to the Clinic of Plastic, Reconstructive and Aesthetic Surgery at the Alexandrovska EAD University Hospital with a diagnosis: cutis laxa, meloptosis, ptosis gl.mammae bil., gynecomastia, venter propendens, cutis laxa regio brachii bil., gluteoptosis, cutis laxa regio femoris bil, lipomatosis. In the cases of the patients thus selected, surgical interventions were performed in order to contour the body, and in cases with excessive weight, liposuction techniques were performed, while in patients after massive weight reduction, techniques were performed in order to remove the corresponding soft tissue excess.

The patients underwent preoperative paraclinical tests, had consultations with a cardiologist and other types of specialists,

depending on the specific anamnestic data, and in certain cases underwent medical imaging.

This study is retrospective, cohort, with statistical reliability of P=0.05

4.2 Exclusion criteria

All distributions in which, following the verification, the null hypothesis was confirmed, were excluded from the analysis, respectively any distribution in which the absence of dependence was proven.

The primary array received **251 cases** for the specified period with surgical interventions performed in order to contour the body in case of obesity or after massive weight loss.

According to the inclusion criteria, **234 patients** were included.

Due to lack of data on key variables, **17 patients** were excluded from the study.

4.3 Data distribution and study stages

According to the definition of a learning curve and subsequent studies in the field, the following have a main influence:

1. Preoperative diagnosis
2. The method in which a reduction in body weight was achieved, in the presence of such a reduction
3. The choice of surgical technique – liposuction techniques in overweight patients, excision techniques in patients after weight reduction and present soft tissue ptosis

4. Patient results – preoperative paraclinical tests results, presence of concomitant diseases, previous surgical interventions, postoperative complications.

Referring to these basic criteria and numerous studies, which we have examined in detail in the literature review, we subjected to statistical analysis **25 factors** related to the performance of surgical interventions for the purpose of body contouring in obese patients and after massive weight loss.

The analysis is focused on the following main areas:

1. A detailed analysis of the one-dimensional variables on the basis of which the patients were included in the study
2. A detailed analysis of the relationship between the available preoperative diagnosis and the performed surgical intervention, which would be a predilection factor in building a model of behaviour in relation to the surgical schedule
3. Performing cluster analysis in order to build a model for planning the surgical intervention depending on the data provided regarding the 25 variables studied.

4.4 First stage of analysis

4.4.1 Distribution of surgical interventions by sex and age, diagnosis, concomitant diseases, paraclinical tests, method of weight reduction, preoperative local status, type of interventions performed, postoperative complications and their occurrence as early or late ones, behaviour and resolution of complications

At the beginning of the reading of the results, we indicated a distribution of patients to whom we applied surgical interventions in order to contour the body, both by sex and age.

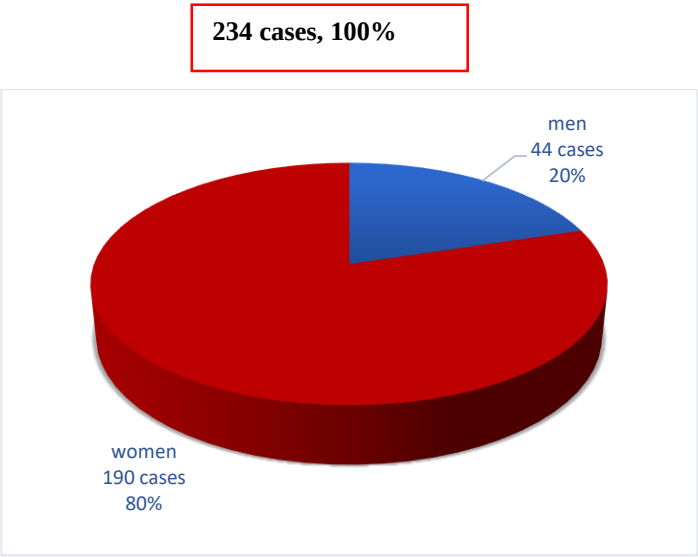


Figure 1. *Distribution of operations by sex*

It is noteworthy that there is a statistically significant difference in the sex of the patients who underwent this type of

intervention in the specified period, with women being more than 4 times more in terms of percentage.

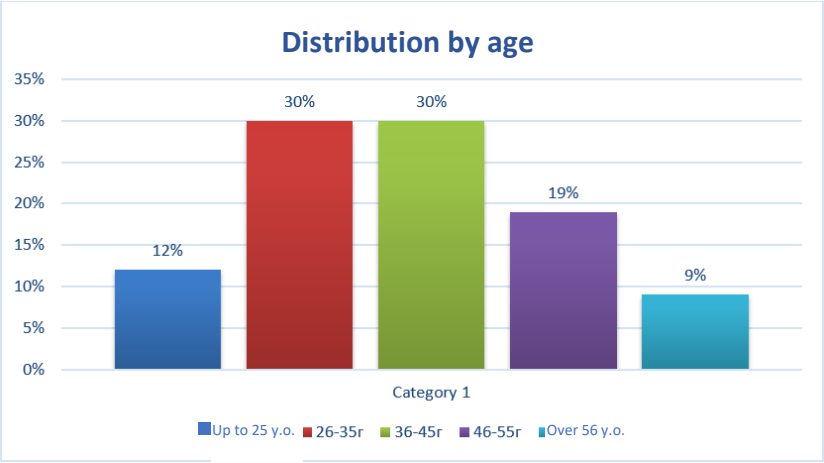


Figure 2. *Distribution by age*

	%	n
Under 25 years of age	12% ↓	28
26 – 35-year-olds	30% ↑	70
36 – 45-year-olds	30% ↑	70
46 – 55-year-olds	19%	44
56-year-olds and older	9% ↓	22
NET	100% ↑	234

Table 1. *Distribution by age*

When analysing the age distribution in the patient array subjected to analysis in the specified period of time, we come to the conclusion that we have an even distribution in terms of age, with a smaller percentage of men and women under the

age of 25 and over 56 who underwent surgical corrections in order to contour the body.

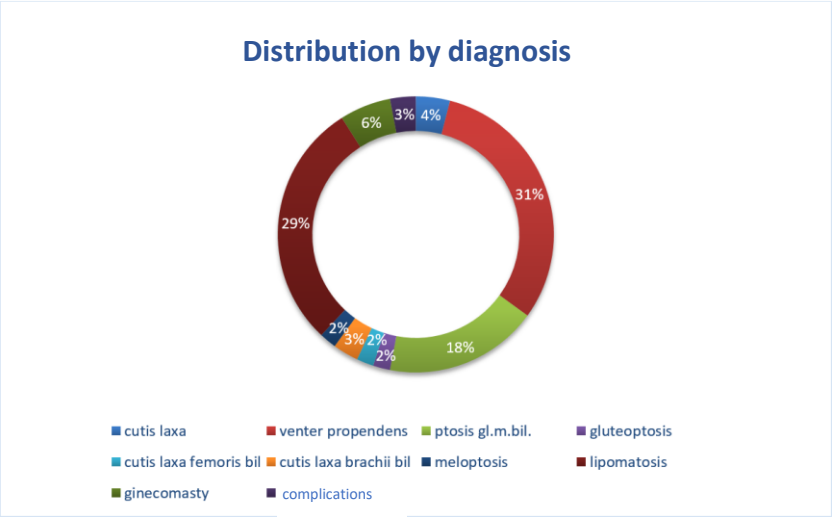


Figure 3. *Distribution of patients by diagnosis*

Diagnosis	%	n
NET	100% ↑	234
Cutis laxa.	4% ↓	10
venter propendens	31% ↑	73
Ptosis gl.m.bill	18% ↑	43
Ptosis regio glutei bil	2% ↓	4
Cutis laxa regio femoris bil	2% ↓	5
Cutis laxa regio brachii bil	3% ↓	6
Meloptosis	2% ↓	5
Lipomatosis	29% ↑	69
Gynaecomastia	6% ↓	13
Complications	3% ↓	6

Table 2. *Distribution of patients by diagnosis*

The dominant percentage of patients with venter propendens and ptosis gl.mammae bil. is impressive, who are also the main contingent of the studied array undergoing surgical interventions after weight reduction. Patients with existing lipomatosis dominate, which is a logical consequence given the presence of a group with obesity and no weight reduction.

Statistically significant is the predominance of patients with no present comorbidities who underwent body contouring interventions (Table 3) (Figure 4). A small percentage of patients with comorbidities are mostly patients after massive weight loss and predominantly in the age group of over 56-year-olds.

Diabetes mellitus	**4% ↓**	**9**
Autoimmune disease	3% ↓	7
Haematological disease	1% ↓	2
CVD	3% ↓	7
Diseases of the respiratory system	4% ↓	9
Obesity	2% ↓	5
Infectious disease	1% ↓	2
No concomitant diseases	81% ↑	189
Other	1% ↓	3
NET	100% ↑	233

Table 3. *Concomitant diseases*

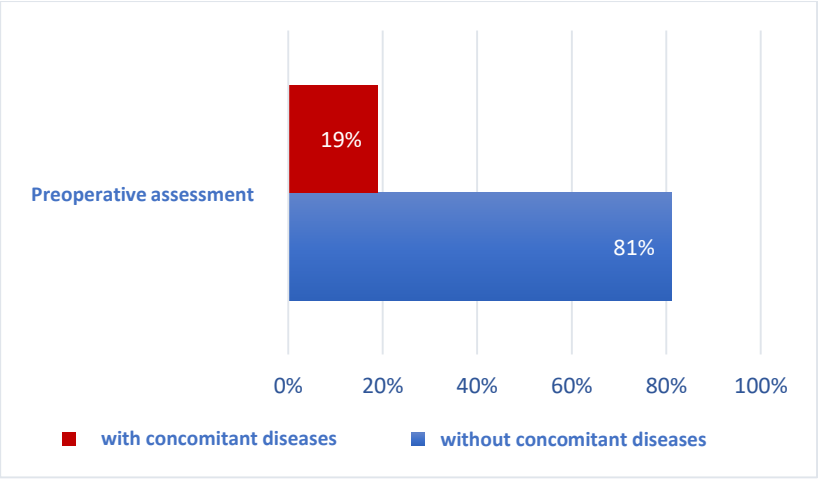


Figure 4. *Concomitant diseases*

Due to the table thus presented, the statistically insignificant percentage of deviations in the preoperative paraclinical tests could also be presented as a logical sequence:

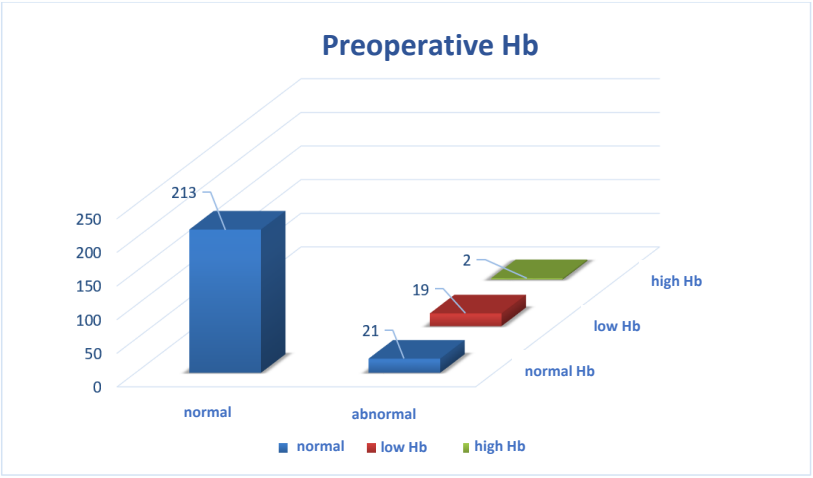


Figure 5. *Preoperative deviations in HGB values*

Only 8% of patients have reduced HGB values preoperatively (Figure 5), and in these cases patients have values below but close to the lower limit and/or a concomitant disease. Extremely low values, without a clarified noxa, are an absolute contraindication for this type of intervention in our practice. The same dependence could be indicated in the preoperative values of the available coagulation status (Figure 6), as well as indicators from the biochemical panel (Figure 7).

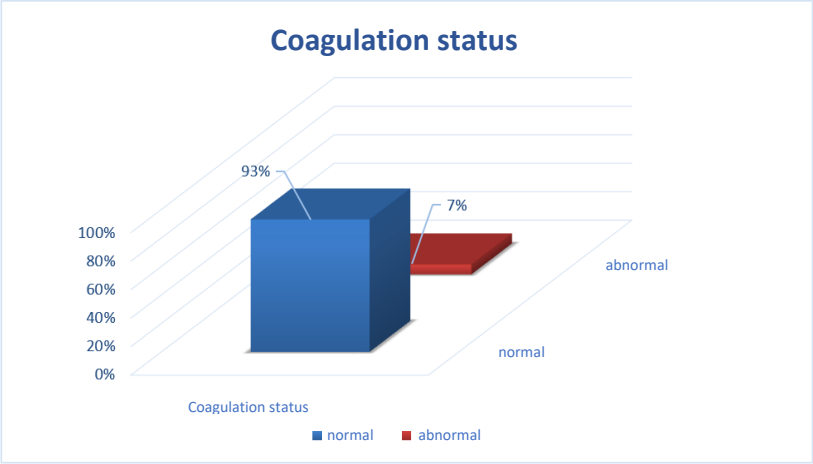


Figure 6. *Preoperative deviations in coagulation status*

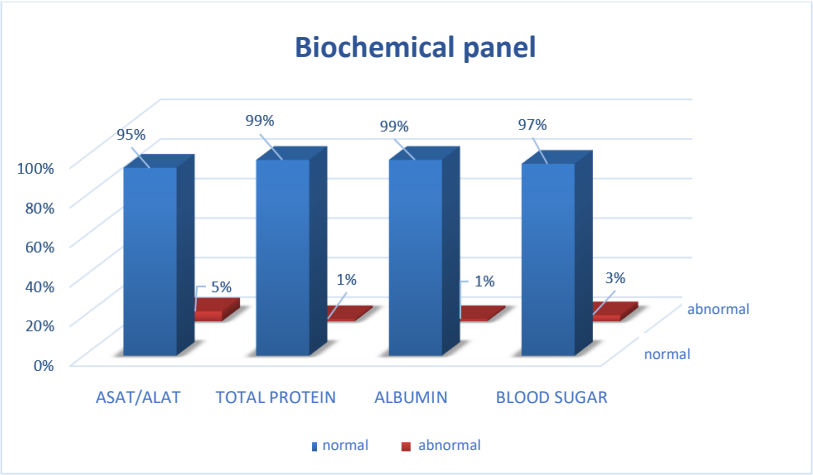


Figure 7. *Deviations in the biochemical panel*

The following tables show a behaviour strictly followed by the team in the clinic regarding the performance of surgical interventions in order to contour the body, as only in one patient we proceeded with this type of intervention despite the deviations in the preoperative values of total protein and albumin, and only in 3% of patients we performed interventions despite the increased preoperative blood sugar values. The patients in both cases are patients with values close to the reference limits for the respective indicator, and the interventions performed on them were of the type of liposuction and never of the type of excision procedures in order to remove the soft tissue excess. We followed a model of behaviour in which excisional interventions are avoided specifically in case of deviations in these indicators. For this purpose, we also referred to the dependencies described in the relevant sources from the literature review, between these

indicators and the frequency of postoperative complications related to the healing of postoperative wounds.

The selection of patients over the years thus implemented, based on the available anamnestic data on concomitant diseases and preoperative laboratory test parameters, has led to the following results in terms of the frequency of postoperative complications:

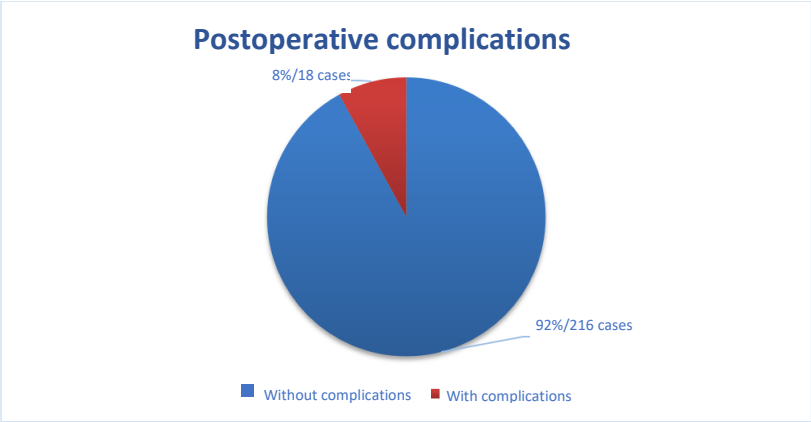


Figure 8. *Frequency of postoperative complications*

In 8% of the patients who, during the specified period of time, underwent surgical corrections for the purpose of body contouring, postoperative complications were registered, and this percentage is due to the good preoperative assessment namely regarding the above indicators.

FOLLOW-UP EXAMINATION 3 POD		
	%	**n**
without complication	98% ↑	229
wound defect	1% ↓	3
wound infection	0% ↓	0
acute haemorrhage	0% ↓	1
Haematomas	0% ↓	0
Necrosis	0% ↓	0
Seromas	0% ↓	0
hypertrophic cicatrixes and keloids	0% ↓	0
malposition of postoperative cicatrixes	0% ↓	0
contour deformities	0% ↓	0
injuries of neurovascular structures	0% ↓	0
compartment syndrome	0% ↓	0
pulmonary TE	0% ↓	0
asymmetry in the result of otherwise symmetrical areas of the body	0% ↓	0
complications related to the survival of the navel and its position	0% ↓	0
other aesthetic complications	0% ↓	0
anaesthetic complications	0% ↓	0
partial umbilical necrosis	0% ↓	1
complete umbilical necrosis	0% ↓	0
NET	100% ↑	234

Table 4. *Early postoperative complications*

Follow-up examination 14 POD		
	%	**n**
without complication	95% ↑	219
wound defect	3%	8
wound infection	0% ↓	0

acute haemorrhage	0% ↓	0
Haematomas	0% ↓	0
Necrosis	0% ↓	0
Seromas	0% ↓	0
hypertrophic cicatrixes and keloids	0% ↓	0
malposition of postoperative cicatrixes	0% ↓	0
contour deformities	0% ↓	1
injuries of neurovascular structures	0% ↓	0
compartment syndrome	0% ↓	0
pulmonary TE	0% ↓	0
asymmetry in the result of otherwise symmetrical areas of the body	1% ↓	2
complications related to the survival of the navel and its position	0% ↓	0
other aesthetic complications	0% ↓	0
anaesthetic complications	0% ↓	0
partial umbilical necrosis	0% ↓	1
complete umbilical necrosis	0% ↓	0
NET	100% ↑	231

Table 5. *Postoperative complications recorded on the 14th day*

Follow-up examination after 20 POD		
	%	**n**
without complication	99% ↑	228
wound defect	0% ↓	0
wound infection	0% ↓	0
acute haemorrhage	0% ↓	0
haematomas	0% ↓	0
necrosis	0% ↓	0
seromas	0% ↓	0

hypertrophic cicatrixes and keloids	1% ↓	3
malposition of postoperative cicatrixes	0% ↓	0
contour deformities	0% ↓	0
injuries of neurovascular structures	0% ↓	0
compartment syndrome	0% ↓	0
pulmonary TE	0% ↓	0
asymmetry in the result of otherwise symmetrical areas of the body	0% ↓	0
complications related to the survival of the navel and its position	0% ↓	0
other aesthetic complications	0% ↓	0
anaesthetic complications	0% ↓	0
partial umbilical necrosis	0% ↓	0
complete umbilical necrosis	0% ↓	0
NET	100% ↑	231

Table 6. *Incidence of postoperative complications in the late postoperative period after the 20th postoperative day*

Thus, the postoperative complications registered in Tables 4, 5 and 6 have found their definitive solution through the application of the following approaches, registered in Figure 9:

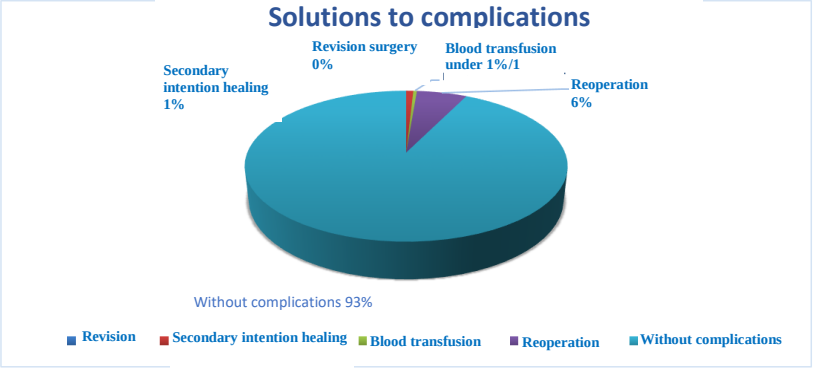


Figure 9. *Choice of a solution to the treatment of an existing complication.*

In one patient, due to acute haemorrhage, it was necessary to perform a blood transfusion. In the cases of wound defect, in two of the cases we chose a conservative approach with a secondary intention healing process. In 14 cases, it was necessary to perform reoperation – this included reoperations both for wound defects and for asymmetry in the results, malposition of the postoperative cicatrix, and partial necrosis of the navel.

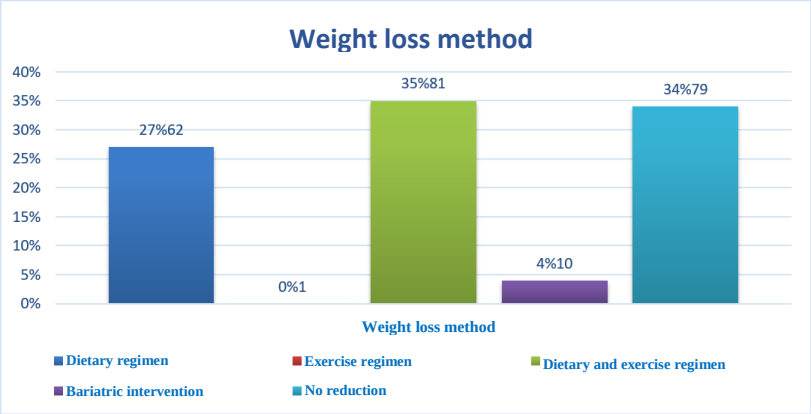


Figure 10. *Weight loss method*

The above-mentioned Figure 10 illustrates a statistically significant domination of the percentage of patients who visited the clinic during the specified period and achieved a reduction in body weight through dietary and exercise regimen or only through diet, compared to patients who had a previous bariatric intervention. About 1/3 of the patients (34% of the total) sought intervention on the occasion of excessive weight and the desire to contour the body.

Thus, the statistical data indicated in the choice of weight reduction or in the absence of such and respectively excessive weight have led to the following data regarding the type of local status with which the patients presented themselves preoperatively during the consultations (Figure 11) and respectively regarding the type of surgical interventions performed in relation to this local status (Figure 12):

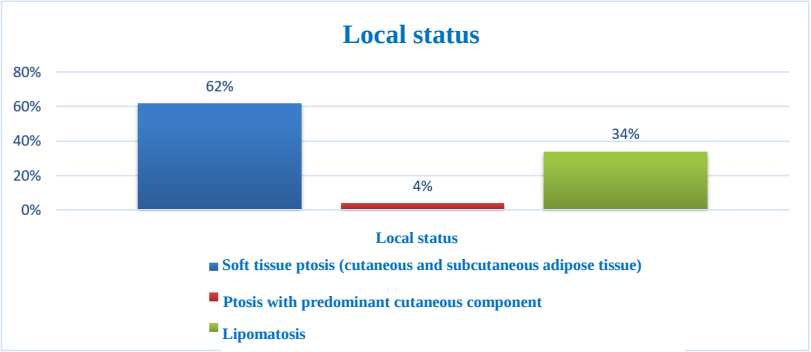


Figure 11. *Local status of patients*

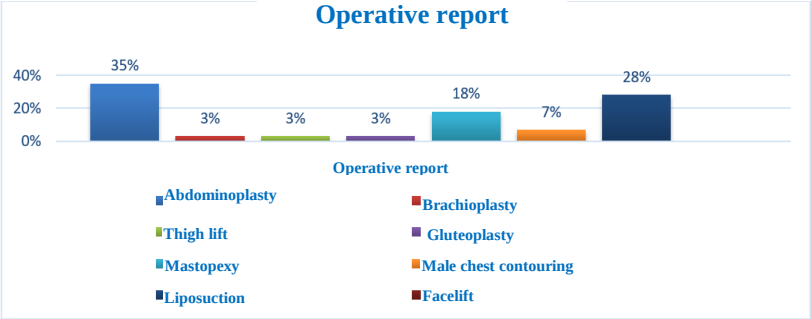


Figure 12. *Surgical interventions*

Patients with cutaneous and subcutaneous excess dominate compared to patients with cutaneous and subcutaneous excess with a predominant cutaneous component. Statistically significant in patients with weight reduction is the percentage of abdominoplasties and mastopexies performed compared to other interventions, while logically in patients with lipomatosis

liposuction interventions prevail. It is the dependence between the choice of weight loss, local status and surgical intervention and their significance in operative, economic, technological and pandemic terms that will be the subject of proof and significant contribution in the subsequent stages of the dissertation.

4.5 Second stage of analysis

4.5.1 Verification of the statistical relationship between diagnosis and operative report

The first analysis we will use is to check the dependencies between different nominal features. We will start with the relationship between the diagnosis and the operative report. For the second of the two variables, we have combined in the item "Other" all diagnoses that have less than 10 monitored cases – these are Brachioplasty, Hip Lift, Gluteoplasty, Facelift and Complications corrections. This is done in order to accumulate data that will allow correct statistical analyses.

In the Diagnosis variable, the items with less than 10 responses are Ptosis regio glutei bil, Cutis laxa regio femoris bil, Cutis laxa regio brachii bil, Meloptosis and Complications, which are also combined under the item “Other”.

As a first step of the analysis, we will check the existence of a relationship between the Diagnosis and Operative report variables. As can be seen from Table 7, here (quite expectedly, due to the fact that the preoperative diagnosis determines the choice of surgical intervention) the relationship is very strong, and in some positions it is even statistically significant at 99% confidence interval. Therefore, in the analysis below, we will use "Diagnosis" as the main comparative variable.

%	Abdominoplasty	Mastopexy	Male chest contouring	Liposuction	Other
Cutis laxa. St.p. MWL	5%	2%	18%	0%	7%
	4	1	3	0	2
			d		
Venter propendens	87%	0%	0%	2%	3%
	71	0	0	1	1
	B C D E				
Ptosis gl.m.bill	1%	93%	12%	0%	7%
	1	38	2	0	2
		A C D E	a d		d
Lipomatosis	2%	2%	12%	92%	14%
	2	1	2	60	4
				A B C E	a
Gynaecomastia	0%	0%	59%	3%	3%
	0	0	10	2	1
			A B D E		
Other	5%	2%	0%	3%	66%
	4	1	0	2	19
					A B C D
Name of column	A	B	C	D	E
Base N = 234					

Significance level: False Discovery Rate (FDR) (p=0.05) Symbol of comparison between columns: a, b, c, …, at (p=0.05), A, B, C… at significance level (p≤0.01) or confidence interval of 99%.

Table 7. *Diagnosis by Operative Report*

4.5.2 Variables in which there are significant differences between the individual items in relation to the Diagnosis variable.

Table 8 illustrates the relationship that in men with obesity and massive weight loss, gynecomastia and chest contouring surgeries are statistically significantly higher than all other diagnoses in patients of the same sex. It is noteworthy, however, that male patients diagnosed with Cutis laxa are statistically significantly higher in number and percentage compared to patients with an isolated diagnosis of a specific area of the body – venter propendens, gynecomastia, lipomatosis. In women, surgical interventions for venter propendens, ptosis gl.mammae bil dominate. and lipomatosis are predominant, and the difference between these three is a statistically insignificant value.

%	Cutis laxa. St.p. MWL	venter propendens	Ptosis gl.m.bill	Lipomatosis	Gynaecomastia	Other	Total
Male	50%	12%	5%	16%	92%	19%	19%
	5	9	2	11	12	5	44
	b C d				a B C D F		-
Female	50%	88%	95%	84%	8%	81%	81%
	5	64	41	58	1	21	190
	e	a E	A E	a E		E	-
Name of column	A	B	C	D	E	F	G

Table 8. *Diagnosis by sex*

We come to the **conclusion** that there is an inversely proportional relationship, and in men with obesity and/or after massive weight loss, the changes are mostly generalised throughout the body, unlike women, where more often the changes are in one, two or more areas, but much less often generalised. This could be due not only to the preoperative

finding, but also in certain cases it could be explained by a specific desire on the part of patients, i.e. more often female patients seek correction of a specific area, in contrast to male patients. **We could seek a correlation with the disproportionality of the changes and with a possible concomitant hormonal imbalance – most of the women in the study were of average age over 45-50 years.**

Evidence of hormonal imbalance as a reason for the disproportionality of the changes, can be the first result above, namely that statistically men most often seek correction for gynaecomastia.

%	Cutis laxa. St.p. MWL	venter propendens	Ptosis gl.m.bill	Lipomatosis	Gynaeco mastia	Other	Total
Previous plastic surgery intervention	40%	18%	12%	30%	8%	58%	25%
	4	13	5	21	1	15	59
						B C e	-
Bariatric surgery	30%	7%	2%	0%	0%	4%	4%
	3	5	1	0	0	1	10
	c D						-
Operative intervention outside the field of plastic surgery	10%	40%	35%	4%	8%	8%	22%
	1	29	15	3	1	2	51
		D f	D f				-
No previous surgical intervention	20%	36%	51%	65%	85%	31%	49%
	2	26	22	45	11	8	114
				a b f	a b f		-
Name of column	A	B	C	D	E	F	G

Table 9. *Diagnosis by Previous interventions*

The results of Table 9 show that in patients with "Previous surgical interventions outside the field of plastic surgery", the difference between patients with a preoperative diagnosis of venter propendens compared to those with lipomatosis and between those with ptosis glandulae mammae bil. compared to those with lipomatosis is statistically significant. The conclusion that can be drawn from the data presented in this way is that patients with lipomatosis are predominantly aesthetic type of patients at a young age, who rarely report the presence of a previous surgical intervention due to the absence of such, while patients with venter propendens and ptosis gl.mammae bil. are most often patients after the age of 35-40 years and/or patients after a significant reduction in weight (which will be proven in the subsequent cluster studies in the dissertation thus presented), with previous excessive weight and/or higher age group suggesting previous surgical interventions due to concomitant diseases.

%	Cutis laxa. St.p. MWL	venter propendens	Ptosis gl.m.bill	Lipomatosis	Gynaeco mastia	Other	TOTAL
Dietary regimen	0%	32%	60%	3%	31%	27%	27%
	0	23	26	2	4	7	62
		D	a b D f		D	D	-
Exercise regimen	0%	1%	0%	0%	0%	0%	0%
	0	1	0	0	0	0	1
							-
Dietary and exercise regimen	60%	58%	35%	4%	8%	54%	35%
	6	42	15	3	1	14	81
	D e	c D e	D			D e	-
Bariatric intervention	40%	5%	2%	0%	0%	4%	4%
	4	4	1	0	0	1	10
	b C D e f						-
No reduction in weight	0%	4%	2%	93%	62%	15%	34%
	0	3	1	63	8	4	79
				A B C e F	a B C f		-
Name of column	A	B	C	D	E	F	G

Table 10. *Diagnosis by Method of Weight Loss*

Based on the data from Table 10, it can be concluded that in patients who have undergone bariatric surgery, the cases with a preoperative diagnosis of cutis laxa are statistically significantly more than those with a similar method of weight reduction and isolated deformity. The conclusion could mean that the bariatric intervention is underwent mainly by overweight patients, in whom massive loss of body mass leads to an excessive cutaneous and subcutaneous excess in all areas of the body.

In overweight patients, statistically significant more than all other diagnoses are those with lipomatosis, which, drawn as a conclusion, is logical, due to the fact that isolated deformity

and/or generalised sagging of the skin is observed with frequent variations in weight, pregnancy/s, and massive weight reduction.

Based on the data from the previously presented tables, we could conclude that the method of losing weight determines the preoperative finding, which is related in terms of statistical significance to the sex and age of the patients, which in turn determines the surgical intervention. Overweight patients undergo liposuction procedures due to the presence of lipomatosis, patients with cutaneous and subcutaneous excess undergo excision and tissue lift procedures. The conclusions and proven hypotheses presented in this way will be confirmed in the subsequent cluster analyses.

4.5.3 Interval variables and the relationships between them, as well as the relationship between them and Diagnosis

We start with the relationship between Age and BMI:

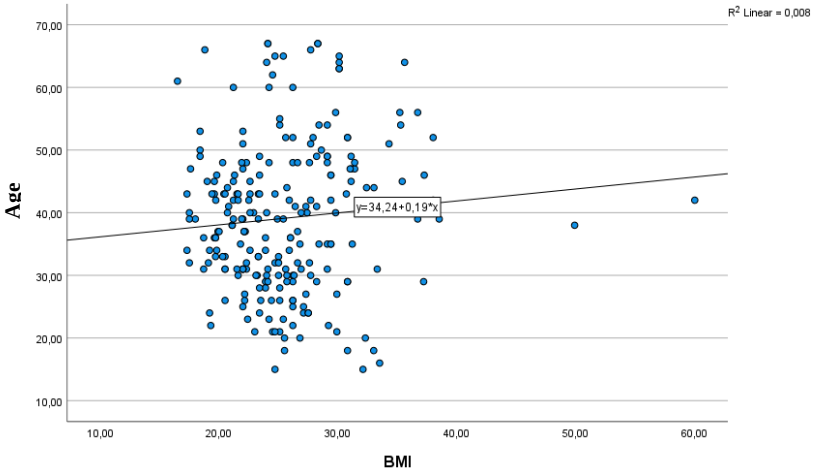


Figure 13. *Relationship between Age and BMI*

As can be seen from the graph (Fig. 13) – there is no relationship between the two variables. In linear regression, R squared is practically equal to 1 (and can occupy values from 0 to 1), which indicates a complete lack of dependence between the two variables.

Only for the sake of comparison, we also show the relationship between BMI and Body weight by means of a graph (Figure 13): here the relationship is very strong (which is expected because one variable is a derivative of the other), and R squared is 0.79.

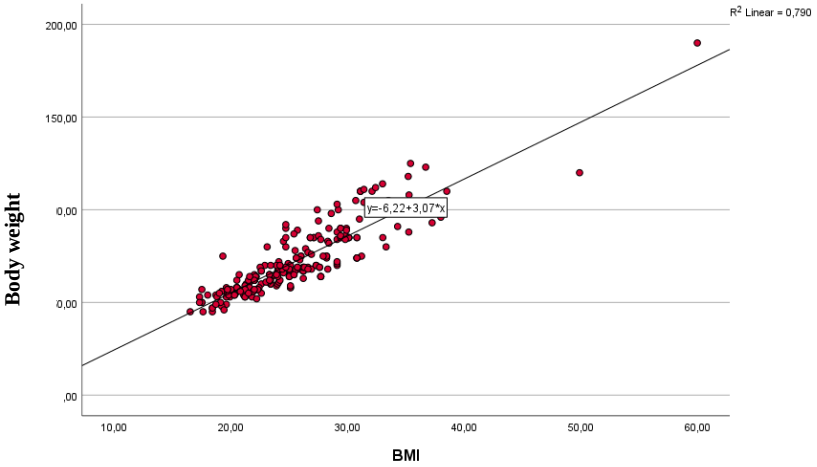


Figure 14. *Relationship between Body weight and BMI*

As a next step, we want to see the relationship of BMI with the variables Diagnosis and Operative report. To this end, we will use the Tests of Between-Subjects Effects method of the SPSS software.

Here we look at the Significance level (Sig.) – as it is relatively low – this is also an indicator that there is a relationship between the two variables. To see what the relationship is, we will present the distribution of responses graphically – using the Boxplot graph (Figure 15).

Tests of Between-Subjects Effects					
Dependent Variable: BMI					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	590,565[a]	8	73.821	2.638	.009
Intercept	39879.445	1	39879.445	1425.091	.000
Operative report	590.565	8	73.821	2.638	.009
Error	6296.352	225	27.984		
Total	159669.786	234			
Corrected Total	6886.917	233			
a. R Squared = ,086 (Adjusted R Squared = ,053)					

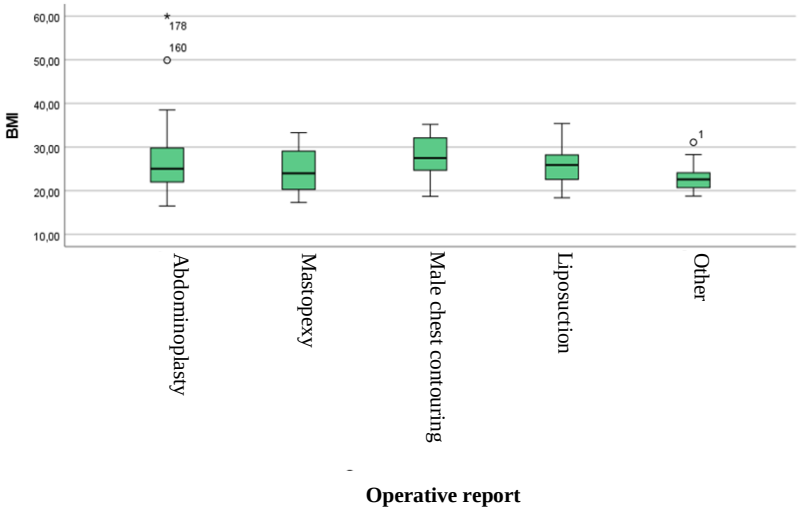


Figure 15. *Boxplot graph*

As can be seen from the graph, it can be concluded that in the item “Other” this index is relatively low (lower average compared to the other groups and less distribution of responses). In male chest contouring, it is the contrary – a relatively higher average BMI. The differences, however, as can be seen from both the graph and the analysis, are not so strong.

There is a connection between BMI and the type of surgery, but it is not significant, and the conclusion made is in absolute synchrony with the unified approach in the Clinic of Plastic, Reconstructive and Aesthetic Surgery at the Alexandrovska University Hospital EAD, that in case of a high BMI, we rather refrain from surgical intervention in order to avoid postoperative complications than show a predilection to approach one or another area of the body with a specific surgical plan due to the high index values.

We applied the same analysis to the relationship between BMI and the Diagnosis variable (Figure 14).

Tests of Between-Subjects Effects					
Dependent Variable: BMI					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	613,630[a]	9	68.181	2.435	.012
Intercept	50451.992	1	50451.992	1801.487	.000
Q1	613.630	9	68.181	2.435	.012
Error	6273.287	224	28.006		
Total	159669.786	234			
Corrected Total	6886.917	233			
a. R Squared = ,089 (Adjusted R Squared = ,053)					

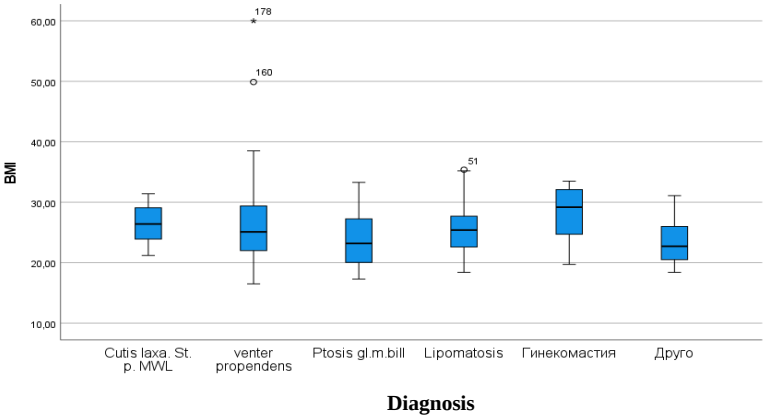


Figure 16. *relationship Again, we can register a relationship between the two variables, but again it is not very strong.*

%	Abdominoplasty	Masto pexy	Male chest contouring	Liposuction	Other	Total
no	88%	95%	94%	100%	83%	92%
	72	39	16	65	24	216
				a e		-
yes	12%	5%	6%	0%	17%	8%
	10	2	1	0	5	18
	d				d	-
Name of column	A	B	C	D	E	A

Table 11. *Operative report for postoperative complications*

Based on the data from Table 11, we could conclude that hypothesis number 2 could be rejected, although in liposuction there are no and/or are not registered complications, and they are more likely in abdominoplasty and other surgeries. The conclusion thus made is in line with the fact that the degree of complications in this type of patient depends rather on the degree of invasiveness.

4.6 Third stage of analysis

4.6.1 Cluster analysis

In order to test the last and third hypothesis, in the following pages we will consider the possibility of grouping all patients according to certain signs and we will try to form such homogeneous groups that will allow the construction of a

model that can be used as a predictive one – to be able to predict what the diagnosis, the operative report and possible postoperative complications will be based on certain characteristics of the patient. **For this purpose, we use Cluster Analysis using the K-Means Cluster method** (Table 1).

As variables that we use for the preparation of this analysis, we have selected two that do not have any dependence on each other – as already shown in the analysis above, these are BMI and the Age of the respondents.

With this approach, we pre-set the number of clusters we received. After several attempts, the optimal number of groups was reached, namely a total of five:

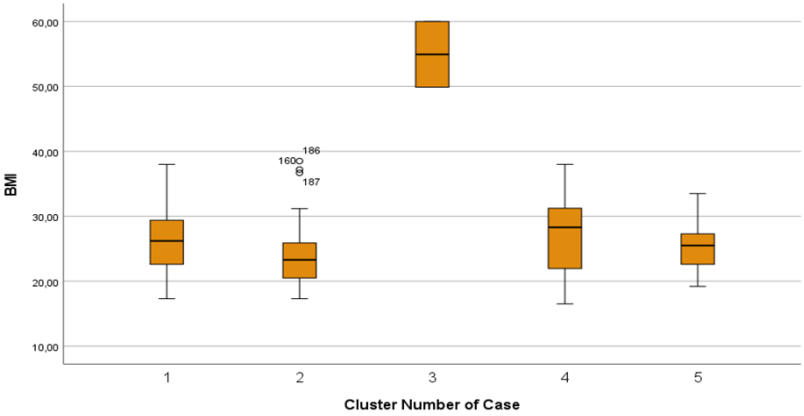
Initial Cluster Centers

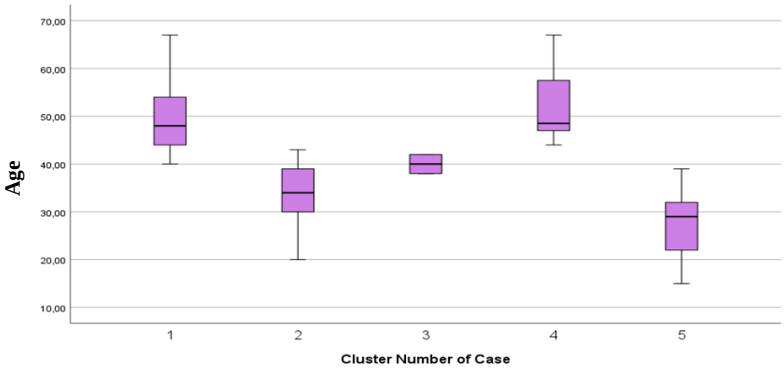
	Cluster				
	Cluster 1	**Cluster 2**	**Cluster 3**	**Cluster 4**	**Cluster 5**
BMI	35.25	25.70	60.00	28.30	33.50
Age	41.00	29.00	42.00	67.00	16.00

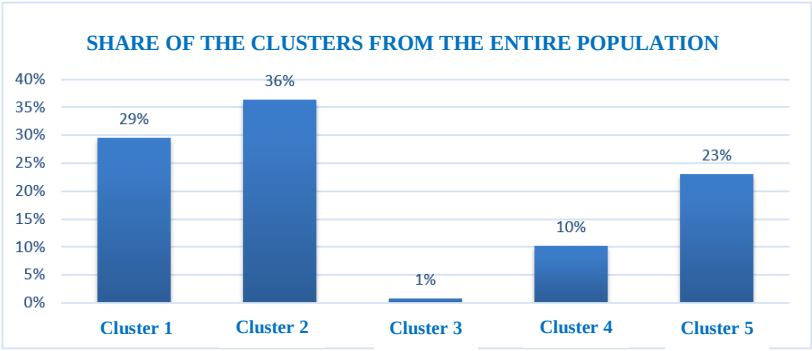
Final Cluster Centers

	Cluster				
	Cluster 1	**Cluster 2**	**Cluster 3**	**Cluster 4**	**Cluster 5**
BMI	26.44	23.72	54.95	26.93	25.59
Age	50.19	33.68	40.00	52.46	27.59

Number of Cases in each Cluster		
Cluster	**Cluster 1**	69.000
	Cluster 2	85.000
	Cluster 3	2.000
	Cluster 4	24.000
	Cluster 5	54.000
Valid		234.000
Missing		0.000







As can be seen from the analysis, the resulting 5 clusters based on these two variables can be characterised as follows:

Cluster 1: 69 people are included here. They have average BMI values, but also a relatively high average age of 50 years.

Cluster 2: This is the group with the highest relative share of all – 85 people are included here, which is more than a third of the studied population. These are people with an average age of 33-34 who have the lowest BMI compared to all other groups – 23.7.

Cluster 3: Here are only 2 cases that can be considered as exceptions due to extremely high BMI values. In general, this

cluster will not be considered in depth in further analysis, due to the few cases in it.
Cluster 4: This group includes 24 people from the studied population. The average age is high at 52.5 years, and the BMI is higher than the population average and higher than all other clusters (except for emergency Cluster 3).
Cluster 5: This group includes 54 people. The BMI value is close to the average, but this is the group with the lowest average age – 27-28 years.

We will see how the groups identified in this way behave on all variables in the database used. The idea is to produce a model with which it is possible to predict the expected diagnosis and operative report only according to different demographic and preoperative criteria.
Below we present only those variables where we observe significant statistical differences, excluding Cluster 3:

Previous interventions by Clusters					
%	Cluster 1	Cluster 2	Cluster 4	Cluster 5	Total
Previous plastic surgery	30%	26%	21%	20%	25%
	21	22	5	11	59
					-
Bariatric surgery	1%	1%	33%	0%	4%
	1	1	8	0	10
			A B E		-
Operative intervention outside the field of plastic surgery	22%	35%	13%	4%	22%
	15	30	3	2	51
	e	E			-
No previous operative intervention	46%	38%	33%	76%	49%
	32	32	8	41	114
				a B d	-
Name of column	A	B	D	E	F

Result – Cluster 4, comprising 24 people with an average BMI of 26.9 and an average age of 52.46, is statistically significantly more as a group that had undergone a previous surgical intervention – bariatric intervention. The conclusion that can be drawn is that patients with previous bariatric intervention are mostly patients around 50 years old and with a predominant BMI of 26.9, which classifies as excessive weight but not as obesity.

Method of weight loss by clusters					
%	Cluster 1	Cluster 2	Cluster 4	Cluster 5	Total
Dietary regimen	44%	20%	0%	24%	27%
	30	17	0	13	62
	b D e	d		d	-
Exercise regimen	0%	1%	0%	0%	0%
	0	1	0	0	1
					-
Dietary and exercise regimen	0%	76%	67%	0%	35%
	0	65	16	0	81
		A E	A E		-
Bariatric intervention	0%	2%	33%	0%	4%
	0	2	8	0	10
			A B E		-
No weight reduction	56%	0%	0%	76%	34%
	38	0	0	41	79
	B D			a B D	-
Name of column	A	B	D	E	F

Result – Cluster 1 includes patients who, for the purpose of weight reduction, have resorted only to a diet and are statistically significantly more than all other clusters in terms of choosing this type of weight loss. The conclusion is that the main choice as a method of weight loss in patients around 50 years old is the dietary regimen, and through it, on average, patients reach a BMI of 26.44 and from there, respectively, surgical intervention in order to correct an isolated area of the body.

Result – Bariatric interventions are statistically the main choice as a method of weight loss in cluster 4, with an average age of 52.46 and a BMI of 26.93, compared to all other clusters.
It can be concluded that Cluster 1 and Cluster 4, which include patients about 50 years of age, achieve a reduction in their weight to BMI values of about 26 /overweight/ through diet and/or bariatric intervention.

Result – Patients with no weight reduction were statistically significantly more in Cluster 5. The conclusion is that patients at a young age (27.59) approach surgical interventions in order to contour the body without any weight reduction present.

Preoperative local status by clusters					
%	**Cluster 1**	**Cluster 2**	**Cluster 4**	**Cluster 5**	**Other**
Soft tissue ptosis	44%	98%	71%	24%	62%
	30	83	17	13	145
	e	A D E	a E		-
Soft tissue ptosis with predominant cutaneous component	0%	2%	29%	0%	4%
	0	2	7	0	9
			A B E		-
Fat deposits	56%	0%	0%	76%	34%
	38	0	0	41	79
	B D			a B D	-
Name of column	A	B	D	E	F

The table thus presented shows the following results and the subsequent conclusions:

- Patients with "soft tissue ptosis" from Cluster 2 are statistically significantly more than those with the same diagnosis from the other clusters. The conclusion that can be reached is that these are patients of active age, about 33 years old, who reach normal BMI values /23.72/ through a dietary and exercise regimen, and in the cases where they look for surgical correction, it is due to "soft tissue ptosis", without an isolated cutaneous component and/or fat deposits.
- In Cluster 4, with an average age of 52.46, soft tissue ptosis with a predominant cutaneous component is statistically significantly higher than the same preoperative finding in representatives of the other clusters. In Cluster 1, with an average age of 50 years, the cases of fat deposits are statistically significantly higher compared to the same finding in representatives of Cluster 4. The conclusion is that in patients with an average age of about 50 years (Cluster 1 and Cluster 4) the main choice of body weight reduction was the dietary regimen (without accompanying exercise regimen) and/or bariatric intervention, and in the second case, soft tissue ptosis with a predominant cutaneous component, it is a mandatory finding, in contrast to the first case, in which respectively fat deposits were often observed in practice both as a consequence and as a not so satisfactory aesthetic effect from the surgical interventions applied subsequently in order to contour the body.

Based on the presented data, we can make the following model:

Cluster 1: Here are people with average BMI values, with a relatively high average age – 50 years, no weight reduction or who have lost weight only with diet, with preoperative local status – fat deposits or soft tissue ptosis;

Cluster 2: This group mainly includes people aged about 33-34 years, with low BMI, who may have undergone an operative intervention outside the field of plastic surgery, always undergo weight reduction or have lost weight only through diet, or mainly through a dietary and exercise regimen, and always have soft tissue ptosis;

Cluster 3: A very rare group of patients – the main characteristic in them is an extremely high BMI;

Cluster 4: Relatively high average age – 52.5 years, high BMI, if they have undergone bariatric surgery as a previous surgical intervention, then they are always included in this group, and may have lost weight through a dietary and exercise regimen, have either soft tissue ptosis or soft tissue ptosis with a predominant cutaneous component;

Cluster 5: This group includes mainly young people under 30 years of age, with an average BMI, almost certainly no previous surgical intervention present or only previous plastic surgery, no weight reduction or had lost weight

only through a dietary regimen and almost always had fat deposits;

Thus, it is possible to predict a probable diagnosis and operative report only by the described preoperative indicators:

Diagnosis by clusters					
%	Cluster 1	Cluster 2	Cluster 4	Cluster 5	Total
Cutis laxa. St.p. MWL	0%	7%	17%	0%	4%
	0	6	4	0	10
			a e		-
venter propendens	22%	48%	54%	4%	31%
	15	41	13	2	73
	e	A E	a E		-
Ptosis gl.m.bill	16%	26%	13%	13%	18%
	11	22	3	7	43
					-
Lipomatosis	48%	4%	0%	61%	29%
	33	3	0	33	69
	B D			B D	-
Gynaecomastia	3%	1%	0%	19%	6%
	2	1	0	10	13
				a b	-
Other	12%	14%	17%	4%	11%
	8	12	4	2	26
					-
Name of column	A	B	D	E	F

From the table thus presented and the logical sequence of the cluster dependencies described above, the following results can be deduced:

- Cluster 2, active young people at an average age of 33 years, who most often choose a combination of a dietary and exercise regimen with the aim of weight reduction, as a result of which in cases where plastic intervention is sought for the purpose of body contouring, it is aimed at removing cutaneous and subcutaneous excess as a preoperative finding, with cases of “Venter propendens” being respectively statistically significant compared to the other Clusters 1 and 5.
- Cluster 1 consists of patients at an average age of about 50 years, who choose a dietary regimen as an isolated option without a combination with an exercise regimen statistically significantly more than any other weight loss option. This leads to a preoperative finding of fat deposits and, accordingly, patients with a preoperative finding of "lipomatosis" are statistically significantly more than Clusters 2 and 4.
- Cluster 4 are again patients with an average age of about 50 years, which makes them a group similar to those of Cluster 1, but in this case these are patients who choose bariatric intervention for weight reduction, which is most often due to the inability to choose another variant associated with previous excessive weight. Logically, the preoperative finding is associated with a cutaneous and subcutaneous excess with a predominant cutaneous component, which is why here patients with "Venter

propendens" are statistically significantly more than in Cluster 5.

- Cluster 5 are patients at a young age, about 28-year-olds, most often with no or insignificant weight reduction, which is why the preoperative finding is associated with statistically significantly more patients with "lipomatosis" compared to the group of Clusters 2 and 4.

Based on the results derived, the following conclusions can be drawn:

- "Venter propendens" predominates as a diagnosis on the occasion of which correction is sought by patients (Cluster 2) with an average age of 33 years, who, through a dietary and exercise regimen, have reached an average BMI of 23.72, compared to patients aged about 50 years (Cluster 1) who have reached a BMI of 26.44 through diet, as well as in young patients (Cluster 5) with no weight reduction. And while in the second case this is understandable (due to the younger age and, accordingly, the preserved skin elasticity in Cluster 5, lipomatosis is the leading finding), the statistically significant difference in the finding in Cluster 2 and Cluster 1 can be explained as insufficient weight reduction when choosing only a dietary regimen, which leads to insufficient soft tissue ptosis and respectively a leading preoperative finding – lipomatosis.
- In Cluster 4, which, despite its similarity in age characteristics and average BMI values with Cluster 1, patients again demonstrate a leading diagnosis of "venter propendens", which can be explained by the fact that the choice of surgical intervention – "bariatric intervention" – led to massive weight loss, unlike Cluster 1.

- Cluster 5 consists of young people, and Cluster 1 of people with an average age of 50 years, and despite the different choice of weight reduction, they demonstrate a leading diagnosis of "lipomatosis", in cases that are statistically significant both in terms of number and percentage.

4.7 Derivation of an algorithm of behaviour in operational and organisational aspects based on anamnestic and physical data

Operative report by clusters					
%	Cluster 1	Cluster 2	Cluster 4	Cluster 5	Total
Abdominoplasty	25%	54%	63%	4%	35%
	17	46	15	2	82
	e	A E	a E		-
Mastopexy	16%	25%	8%	13%	18%
	11	21	2	7	41
					-
Male chest contouring	4%	4%	4%	19%	7%
	3	3	1	10	17
				b	-
Liposuction	45%	1%	0%	61%	28%
	31	1	0	33	65
	B D			B D	-
Other	10%	16%	25%	4%	12%
	7	14	6	2	29
			e		-
Name of column	A	B	D	E	F

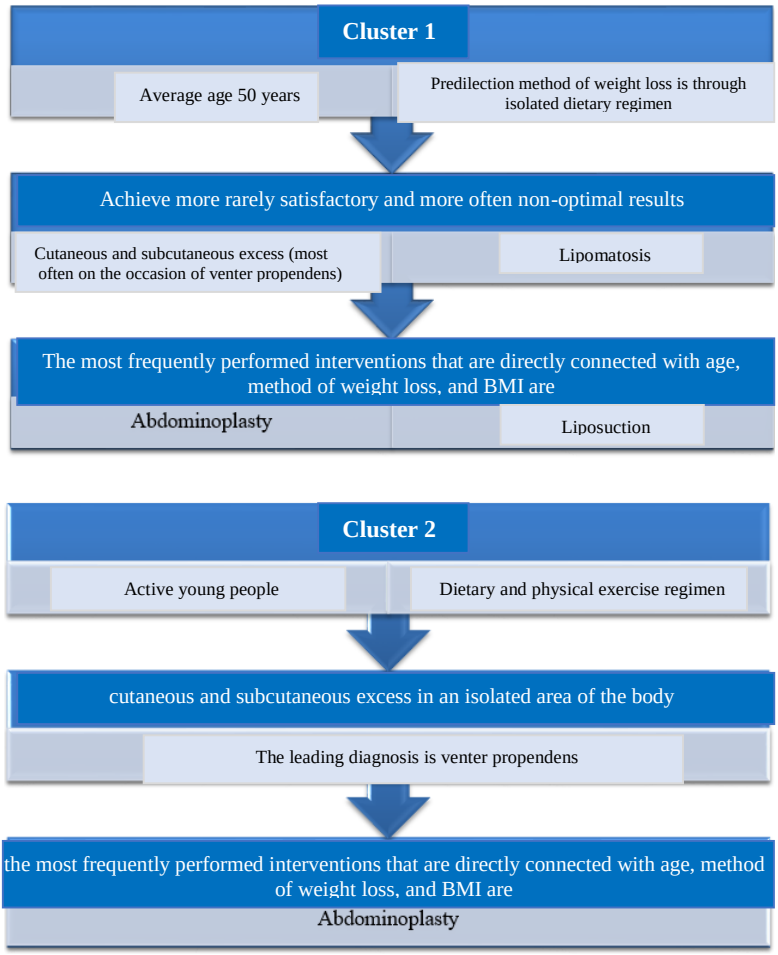
Based on the last table and all the results and conclusions made above, the following indicative model can be summarised to guide the expectations of the medical team for a probable diagnosis and operative report – an immediate benefit in times of online consultations and pandemic conditions:

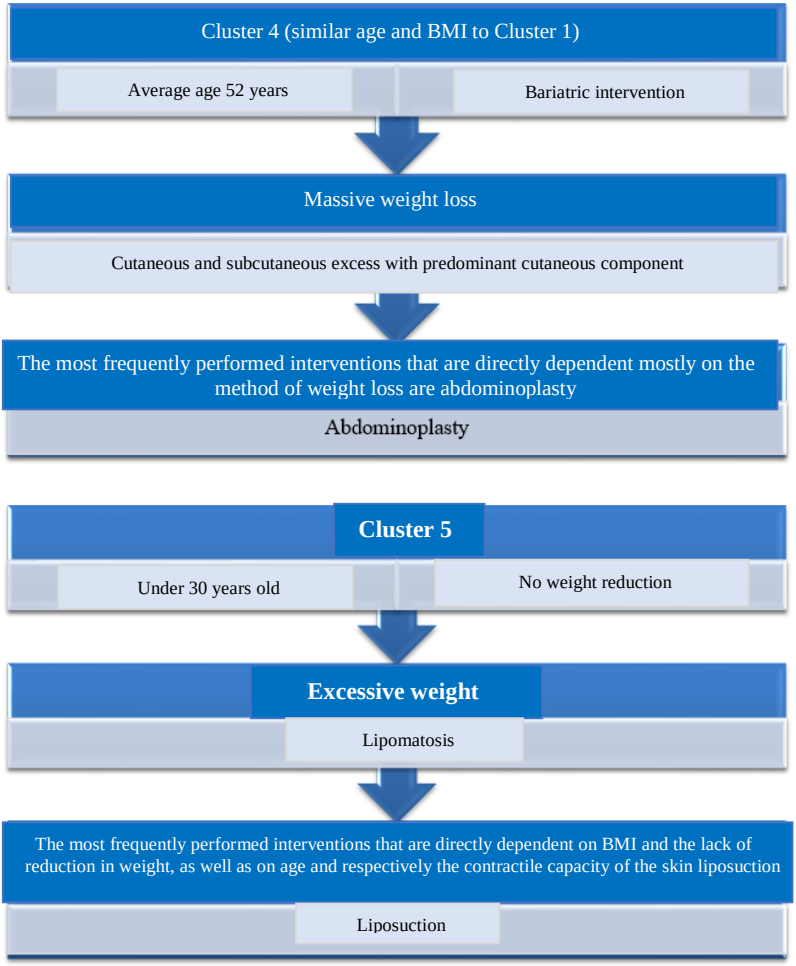
- Cluster 2, active young people, with a choice of a dietary and exercise regimen, leading to cutaneous and subcutaneous excess in different parts of the body (statistically significant especially in the abdominal area), demonstrate a preliminary diagnosis of venter proipendens, which is why the intervention "abdominoplasty" is statistically significant compared to Cluster 1 and Cluster 5. Respectively, representatives of Cluster 2 are most likely to undergo an abdominoplasty surgery, which is directly related to their age, BMI, and method of weight loss.
- Cluster 1 includes patients with an average age of 50 years who choose an isolated dietary regimen as a method of weight loss, which in most cases leads to an unsatisfactory end result, and thence this type of patients demonstrate as a finding fat deposits, respectively "lipomatosis" I statistically significantly more than Cluster 2 and 4, undergo liposuction for the purpose of contouring. Cluster 1 are most likely to undergo a surgical correction through abdominoplasty, which is directly related to their age, BMI, and method of weight loss.
- Cluster 4 includes patients of similar BMI and age to Cluster 1, but in them the leading aspect in the preoperative finding, namely the presence of a cutaneous

and subcutaneous excess with a predominant cutaneous component, is the method of weight loss – bariatric intervention. This choice leads to massive weight loss, dominant cutaneous excess in all areas of the body and the most common first choice of surgical intervention – abdominoplasty for venter propendens (analogous to Cluster 2).

- Cluster 5 are young patients under the age of 30 who have no weight reduction and due to obesity demonstrate a leading diagnosis of lipomatosis and respectively liposuction as a leading choice in the surgical technique.

Figure 32. *Algorithm for forecasting surgical interventions*





The algorithm thus prepared contributes to the precise preoperative preparation both in relation to the specific case and in terms of the surgical schedule for the day, as well as to the choice of a medical institution, especially in times of online consultations and pandemic conditions.

5. CONCLUSIONS

1. Patients who undergo an excision procedure for the purpose of body contouring are mostly patients after weight loss or massive weight loss, while patients who undergo body contouring procedures using liposuction techniques are mostly young patients with no comorbidities and previous surgical interventions

2. The adequate preoperative assessment in terms of both laboratory parameters and concomitant diseases is associated with a statistically significant low risk of postoperative complications.

3. There is an inversely proportional relationship, and in men with obesity and/or after massive weight loss, the changes are mostly generalised throughout the body, unlike women, where more often the changes are in one, two or more areas, but much less often generalised. This could be due both to the preoperative finding, but also in certain cases it could be explained by a specific desire on the part of the patient, i.e. more often female patients seek correction of a specific area in contrast to male patients. We could seek a correlation with the disproportionality of the changes and with a possible concomitant hormonal imbalance – most of the women in the study were over the average age of 45-50 years. Evidence of hormonal imbalance as a reason for the disproportionality of the changes may also be the fact that statistically men most often seek correction for gynaecomastia.

4. The choice of weight loss method is statistically significantly related to the age of the patients

5. The preoperative finding is statistically significantly related to the sex of patients

6. The choice of weight loss method predetermines the local status

7. The local status determines the choice of operative technique

8. The frequency of complications is not directly related to preoperative BMI, as high BMI values are the reason for refusal of surgical intervention

9. The frequency of complications depends on the degree of invasiveness

10. There is a direct correlation and logical sequence in preoperative planning and surgical performance between sex, age, BMI, method of weight loss and local status, and hence the choice of surgical technique

11. Compliance with this predilection algorithm leads to a low rate of postoperative complications

6. CONTRIBUTIONS

1. For the first time in Bulgaria, a predictive model has been derived, on the basis of which we could orient ourselves in the choice of a technique only by age, sex, BMI and method of weight loss,

2. For the first time in Bulgaria, an algorithm is indicated, whose adoption in the aspect of the choice of technique in accordance with the available local status minimises postoperative complications

3. For the first time, an algorithm is indicated, through which, with limited opportunities for in vivo consultations, the type of surgical intervention can be predicted through online telemedicine, and hence the duration, surgical schedule for the day, the necessary base – public or private practice, for adequate results

4. For the first time in Bulgaria, an algorithm has been developed that has an immediate economic benefit for the respective clinic and structure in terms of planning the surgical schedule for the day

5. For the first time in Bulgaria, an algorithm has been developed that has immediate benefits in pandemic conditions for the provision of medical services.

7. LIST OF PUBLICATIONS RELATED TO THE DISSERTATION

1. Publications in journals with impact factor

1. **Sharkov E**, Todorov R, Yonkov A, Simeonov D, Stefanov M - Patient with Linear Scleroderma "En Coup De Sabre" – Nano Lipofilling Followed by Hair Transplantation - Advances in Bioengineering & Biomedical Science Research (ISSN: 2640-4133) 2021, V(4):29-32 (Impact factor – 0.729)

7.2. Publications in international and Bulgarian journals

1. Romansky R, **Sharkov E**, Komitski S – Unusual pattern of partial failure of preexpanded free parascapular flap for neck reconstruction – International Journal of Burns and Trauma (ISSN 2160-2026) 2018; 8(5):114-116

2. **Sharkov E**, Romanski R, Tonev A – Clinical case of a patient with "Bat Wing" type of cutaneous and subcutaneous excess in the armpit area – Khirurgiia journal, issue 1, 2017, pp 11-15

3. **Sharkov E**, Komitski S, Romanski R – Clinical case of a patient after massive weight loss – Khirurgiia journal, issue 3, 2018, pp 137 – 143