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# LA VLCKD NELLA PREABILITAZIONE DEL PAZIENTE BARIATRICO

**CATERINA CONTE**

**UNIVERSITÀ TELEMATICA SAN RAFFAELE ROMA**

**IRCCS MULTIMEDICA, MILANO**

# PREABILITAZIONE IN CHIRURGIA

- Processo che va dalla diagnosi fino all'intervento chirurgico, comprendente **uno o più interventi preoperatori** che includono esercizio fisico, **nutrizione**, strategie psicologiche e training respiratorio.
- L'**obiettivo** della preabilitazione è migliorare la capacità funzionale e le riserve fisiologiche dei pazienti, permettendo loro di **affrontare meglio lo stress chirurgico, migliorare i risultati post-operatori e facilitare il recupero.**

- **Calo ponderale prima della chirurgia bariatrica**
- VLCKD pre-op

# Preoperative Weight Loss Before Bariatric Surgery

Peter N. Benotti, MD; Christopher D. Still, DO; G. Craig Wood, MS; Yasir Akmal, MD; Heather King, MD; Hazem El Arousy, MD; Horatiu Dancea, MD; Glenn S. Gerhard, MD; Anthony Petrick, MD; William Strodel, MD

**Hypothesis:** Preoperative weight loss reduces the frequency of surgical complications in patients undergoing bariatric surgery.

**Design:** Review of records of patients undergoing open or laparoscopic gastric bypass.

**Setting:** A comprehensive, multidisciplinary obesity treatment center at a tertiary referral center that serves central Pennsylvania.

**Patients:** A total of 881 patients undergoing open or laparoscopic gastric bypass from May 31, 2002, through February 24, 2006.

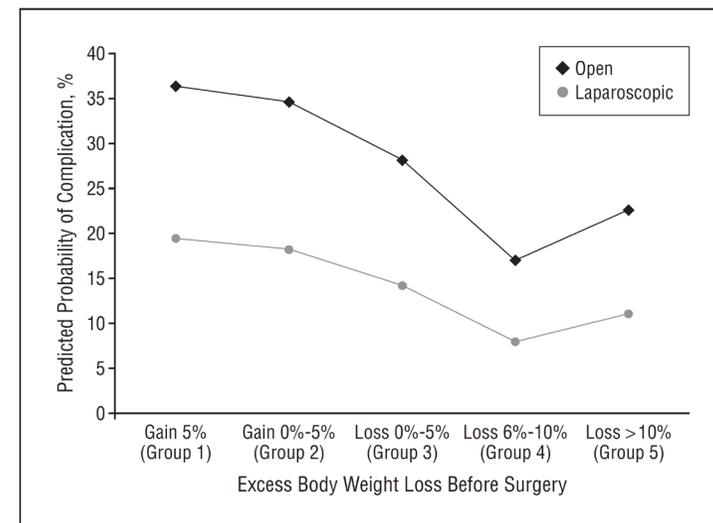
**Intervention:** All preoperative patients completed a 6-month multidisciplinary program that encouraged a 10% preoperative weight loss.

**Main Outcome Measures:** Loss of excess body weight (EBW) and total and major complication rates.

**Results:** Of the 881 patients, 592 (67.2%) lost 5% or more EBW and 423 (48.0%) lost more than 10% EBW. Patients referred for open gastric bypass (n=466) were generally older ( $P < .001$ ), had a higher body mass index ( $P < .001$ ), and were more often men ( $P < .001$ ) than those undergoing laparoscopic gastric bypass (n=415). Total and major complication rates were higher in patients undergoing open gastric bypass ( $P < .001$  and  $P = .03$ , respectively). Univariate analysis revealed that increasing preoperative weight loss is associated with reduced complication frequencies for the entire group for total complications ( $P = .004$ ) and most likely for major complications ( $P = .06$ ). Controlling for age, sex, baseline body mass index, and type of surgery in a multiple logistic regression model, increased preoperative weight loss was a predictor of reduced complications for any ( $P = .004$ ) and major ( $P = .03$ ) complications.

**Conclusion:** Preoperative weight loss is associated with fewer complications after gastric bypass surgery.

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# Calo ponderale prima della chirurgia bariatrica *outcome* perioperatori

**Table 2** Comparison of perioperative parameters in three groups of patients according to the amount of preoperative weight loss

	<b>&lt;5%</b> Group A (n=166)	<b>5-10%</b> Group B (n=239)	<b>&gt;10%</b> Group C (n=143)	<i>p</i> value <sup>a</sup>	<i>p</i> value <sup>b</sup>	<i>p</i> value <sup>c</sup>
Operative time (min, mean ± SD)	104.43±36.40	80.08±23.07	76.99±23.23	<0.001	<0.001	0.210
Conversion	4 (2.41 %)	0 (0 %)	0 (0 %)	0.028	0.009	1.000
Intraoperative complications	17 (10.24 %)	14 (5.86 %)	10 (6.99 %)	0.128	0.420	0.668
Hospital stay (days, mean ± SD)	3.33±3.22	2.10±2.77	1.87±1.44	<0.001	<0.001	0.365

<5 % (group A), >5 to 10 % (group B), and >10 % (group C)  
N=548, RYGB

# Calo ponderale prima della chirurgia bariatrica

## mortalità a 30 giorni

Table 5. Association of Percentage BMI Reduction With Intraoperative or 30-Day Postoperative Mortality

Model	OR (95% CI) by percentage BMI reduction				P for trend
	0% (n = 86 229)	>0% to <5.0% (n = 240 362)	5.0%-9.9% (n = 118 094)	≥10.0% (n = 35 390)	
Deaths, No. (%)	106 (0.1)	229 (<0.1)	129 (0.1)	47 (0.1)	NA
Model 1 <sup>a</sup>	1 [Reference]	0.73 (0.58-0.91)	0.67 (0.52-0.87)	0.65 (0.46-0.92)	.02
Model 2 <sup>b</sup>	1 [Reference]	0.76 (0.60-0.96)	0.70 (0.54-0.92)	0.58 (0.41-0.82)	.003
Model 3 <sup>c</sup>	1 [Reference]	0.75 (0.59-0.95)	0.69 (0.53-0.90)	0.57 (0.40-0.81)	.003

↓ 25%

↓ 31%

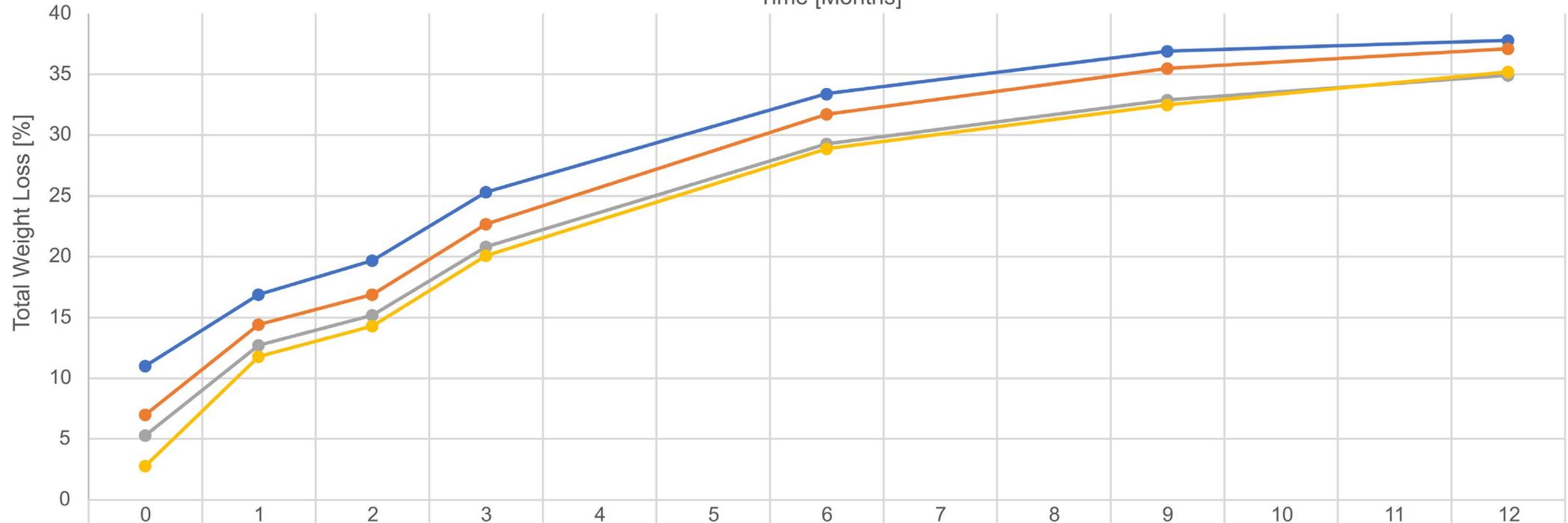
↓ 43%

# Calo ponderale prima della chirurgia bariatrica

## calo ponderale a 12 mesi

Total Weight Loss

Time [Months]



● Q4 (N)	11.0 (193)	16.9 (180)	19.7 (173)	25.3 (190)						33.4 (187)					36.9 (137)					37.8 (178)
● Q3 (N)	7.0 (194)	14.4 (183)	16.9 (160)	22.7 (188)						31.7 (188)					35.5 (129)					37.1 (181)
● Q2 (N)	5.3 (193)	12.7 (182)	15.2 (164)	20.8 (189)						29.3 (187)					32.9 (130)					34.9 (174)
● Q1 (N)	2.8 (193)	11.8 (177)	14.3 (162)	20.1 (190)						28.9 (183)					32.5 (140)					35.2 (181)
Mean (N)	6.5 (773)	14.0 (722)	16.6 (659)	22.2 (757)						30.8 (745)					34.5 (536)					36.3 (714)

# Calo ponderale prima della chirurgia bariatrica

## calo ponderale a 12 e 24 mesi

	Roux-en-Y gastric bypass		Sleeve gastrectomy	
	Odds ratio ( $\beta$ ) (95% CI)	<i>p</i> value	Odds ratio ( $\beta$ ) (95% CI)	<i>p</i> value
<b>Year 1 postoperative</b>				
Preoperative weight loss				
-5 to 0% (ref)		0.001		0.001
0-5%	1.448 (1.226-1.710)	0.001	1.320 (1.073-1.623)	0.009
5-10%	2.133 (1.643-2.769)	0.001	1.763 (1.363-2.281)	0.001
Age, years	0.990 (0.981-0.998)	0.013	0.971 (0.963-0.979)	0.001
Gender	0.436 (0.364-0.521)	0.001	0.927 (0.746-1.151)	0.491
Baseline BMI (kg/m <sup>2</sup> ) <40 (ref)		0.022		0.238
40-45	1.255 (1.049-1.502)	0.013	1.058 (0.841-1.332)	0.628
>45	1.275 (1.024-1.587)	0.030	1.219 (0.956-1.553)	0.110
Diabetes mellitus II	0.457 (0.382-0.546)	0.001	0.488 (0.383-0.621)	0.001
Musculoskeletal pain	1.354 (1.153-1.590)	0.001	0.873 (0.724-1.053)	0.155
OSAS	0.920 (0.759-1.115)	0.001	0.827 (0.653-1.047)	0.115

	Roux-en-Y gastric bypass		Sleeve gastrectomy	
	Odds ratio ( $\beta$ ) (95% CI)	<i>p</i> value	Odds ratio ( $\beta$ ) (95% CI)	<i>p</i> value
<b>Year 2 postoperative</b>				
Preoperative weight loss				
-5 to 0% (ref)		0.001		0.089
0-5%	1.252 (1.077-1.457)	0.004	1.136 (0.936-1.378)	0.198
5-10%	1.790 (1.423-2.252)	0.001	1.298 (1.027-1.641)	0.029
Age, years	0.990 (0.983-0.997)	0.008	0.976 (0.969-0.984)	0.001
Gender	0.475 (0.403-0.560)	0.001	0.883 (0.721-1.080)	0.227
Baseline BMI (kg/m <sup>2</sup> ) <40 (ref)		0.001		0.005
40-45	1.279 (1.090-1.500)	0.003	1.184 (0.958-1.465)	0.119
>45	1.579 (1.289-1.933)	0.001	1.447 (1.155-1.812)	0.001
Diabetes mellitus II	0.461 (0.392-0.542)	0.001	0.541 (0.428-0.684)	0.001
Musculoskeletal pain	1.370 (1.185-1.582)	0.001	0.903 (0.759-1.073)	0.247
OSAS	0.810 (0.682-0.963)	0.017	0.893 (0.713-1.118)	0.324

*Outcome: successful postoperative weight loss ( $\geq 25\%$  TWL)*

**PICO 15** – Nei pazienti con BMI  $\geq 30$  kg/m<sup>2</sup>, con indicazione alla chirurgia metabolico-bariatrica, la perdita di peso preoperatoria è preferibile rispetto a non perdere peso, per ridurre l'incidenza di complicanze periprocedurali?

Si suggerisce di effettuare trattamenti pre-operatori per la perdita di peso corporeo, per ridurre l'incidenza delle complicanze peri-procedurali.

*Raccomandazione debole a favore, con qualità delle prove bassa*

#### **Razionale**

La chirurgia metabolico-bariatrica, è stata sviluppata per ottenere una perdita di peso rilevante nei pazienti affetti da obesità. Tuttavia, non è priva di rischi di eventi avversi peri-procedurali che potrebbero essere, soprattutto in casi estremi di obesità, ridotti da una perdita di peso pre-operatoria; inoltre, tali interventi potrebbero anche migliorare l'efficacia della chirurgia metabolico-bariatrica<sup>71,72</sup> stessa.

Seguendo la metodologia riportata in Tabella 1, sono stati trovati 4 trial<sup>73-76</sup> che avevano come scopo quello di verificare l'impatto della perdita di peso nei pazienti candidati alla chirurgia metabolico-bariatrica; tre effettuati con dieta (uno con dieta a basso contenuto calorico per 2 settimane<sup>75</sup>, e altri 2 con modifiche dello stile di vita per 6 mesi<sup>73,74</sup>) e uno con palloncino intragastrico<sup>76</sup> (Capitolo 2, Figura 4-6) descrivi gli effetti favorevoli. Il bilancio degli effetti è reso difficile per la presenza di pochi studi, ma sembra favorevole all'intervento per quanto riguarda l'efficacia di interventi per la perdita di peso pre-operatoria sul calo ponderale post chirurgia metabolico-bariatrica. Inoltre, vi è una tendenziale riduzione dei tempi chirurgici e degli eventi avversi periprocedurali. Non esistono studi specifici di farmacoeconomia; l'intervento è verosimilmente costo-efficace se effettuato con programmi non farmacologici di modifica dello stile di vita, mentre potrebbe esserlo meno con altri tipi di intervento, quali ad esempio quelli di chirurgia endoscopica. Sulla base delle evidenze raccolte, si formula una raccomandazione debole a favore dell'intervento.

## **LINEE GUIDA DELLA SICOB SOCIETÀ ITALIANA DI CHIRURGIA DELL'OBESITÀ E DELLE MALATTIE METABOLICHE**

*La terapia chirurgica dell'obesità e delle complicanze  
associate*



**Quali strategie per ottenere un calo ponderale pre-operatorio?**

# Quali strategie per ottenere un calo ponderale pre-operatorio?

Un calo ponderale 5–10% nell'immediato periodo preoperatorio può facilitare l'intervento chirurgico e ridurre il rischio di complicanze.

La perdita di peso preoperatoria può essere ottenuta con diversi regimi:

- diete ipocaloriche (LCD) (800-1200 kcal/die),
- diete molto ipocaloriche (VLCD) (600-800 kcal/die)
- dieta ipocalorica combinata con IGB
- diete molto ipocaloriche chetogeniche (VLCKD) (600-800 kcal/die)

# Calo ponderale prima della chirurgia bariatrica – VLCD

**Table 3** Anthropometric measurements of 44 patients on a 2-week pre- and post-VLCD

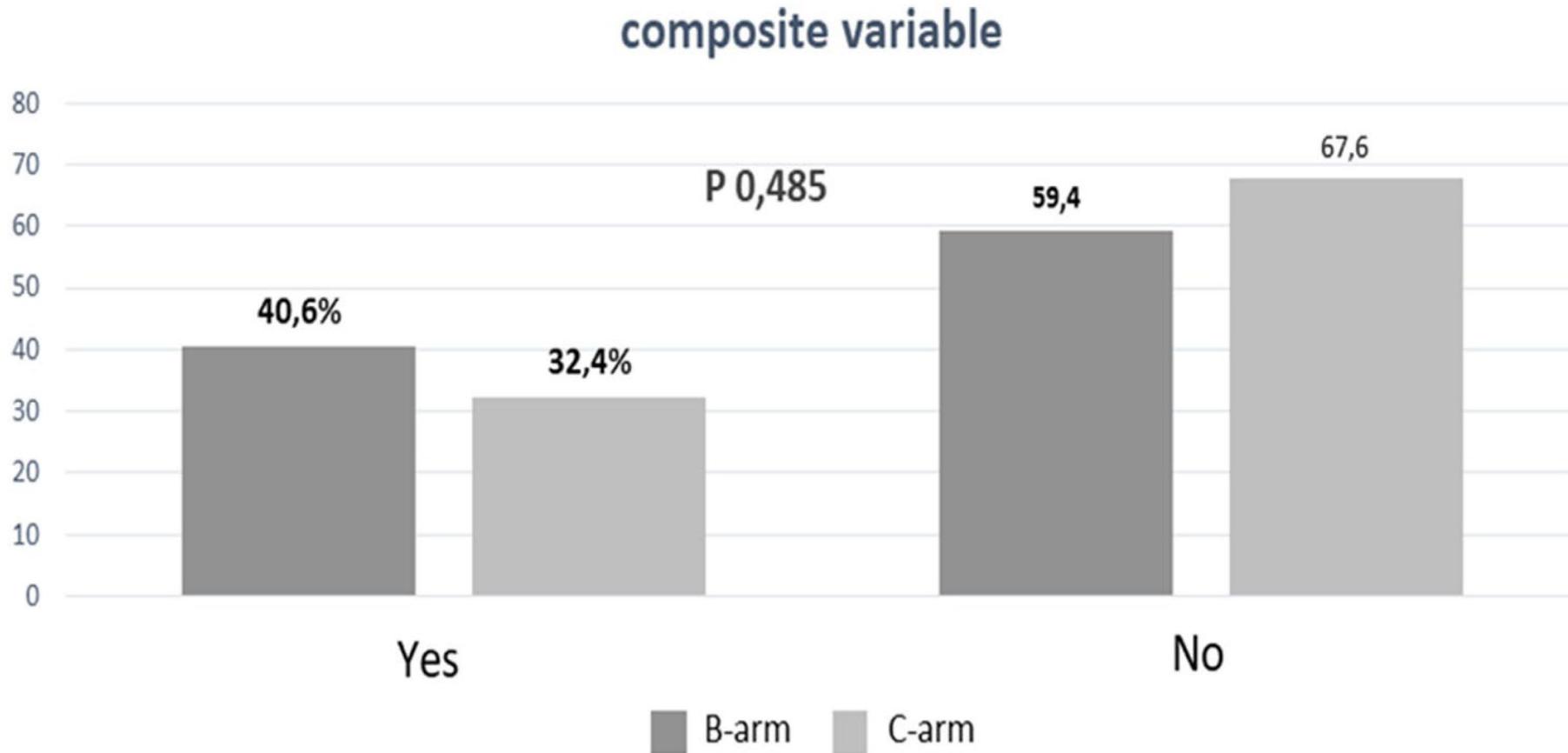
Factor <i>N</i>	Pre-VLCD 44	Post-VLCD 44	Change 44	<i>p</i>
Total FM (kg), mean (SD)	59.7 (13.1)	58.1 (12.9)	− 1.6 (1.4)	< 0.001
Arms FM (kg), mean (SD)	6.5 (1.7)	6.6 (1.8)	0.1 (0.8)	0.678
Legs FM (kg), mean (SD)	20.1 (6.5)	19.5 (6.8)	− 0.6 (1.4)	0.011
Trunk FM (kg), mean (SD)	31.8 (6.6)	30.6 (6.2)	− 1.2 (1.9)	< 0.001
Android FM (kg), mean (SD)	5.7 (1.3)	5.5 (1.2)	− 0.2 (0.3)	< 0.001
Gynoid FM (kg), mean (SD)	9.5 (2.7)	9.2 (2.7)	− 0.3 (0.6)	0.001
Total LBM (kg), mean (SD)	58.7 (11.1)	55.9 (10.4)	− 2.8 (2.2)	< 0.001
Arms LBM (g), mean (SD)	7.1 (1.8)	7.0 (1.8)	− 0.1 (0.5)	0.443
Legs LBM (g), mean (SD)	20.3 (3.9)	19.5 (3.7)	− 0.8 (1.1)	< 0.001
Trunk LBM (g), mean (SD)	27.7 (5.7)	25.8 (4.9)	− 1.9 (2.2)	< 0.001
Android LBM (g), mean (SD)	4.4 (1.1)	4.0 (0.8)	− 0.4 (0.5)	< 0.001
Gynoid LBM (g), mean (SD)	8.7 (1.8)	8.2 (1.8)	− 0.5 (0.9)	0.001
Bone mineral content (kg), mean (SD)	2.9 (0.4)	2.9 (0.4)	0.0 (0.1)	0.559
A/G ratio, mean (SD)	1.1 (0.1)	1.1 (0.1)	0.0 (0.1)	0.039
Skeletal muscle index (kg/m <sup>2</sup> ), mean (SD)	9.7 (1.4)	9.4 (1.3)	− 0.3 (0.5)	< 0.001

# Calo ponderale prima della chirurgia bariatrica - BIB

**Table 3** Patient clinical outcome after preoperative treatment

Variable	Balloon N (%)	Control N (%)	<i>p</i>
Final preoperative BMI before surgery > 50 kg/m <sup>2</sup>	2 (6.3%)	5 (14.7%)	0.260
Preoperative ASA score			
1	0	1 (2.9)	
2	20 (62.5%)	20 (28.8%)	0.761
3	9 (28.01%)	12 (35.3%)	0.535
Difficulty at intubation	3 (9.4%)	2 (5.9%)	0.668
Need for reoperation	2 (6.3%)	4 (11.8%)	0.673
Need for stay at the ICU	1 (3.1%)	2 (5.9%)	1
Weight loss > 10% before surgery	18 (56.3%)	4 (11.8%)	<0.001
	Media (SD)	Media (SD)	<i>p</i>
Time spent in the operating room (h)	2.8 (0.73)	2.8 (0.79)	0.936
Time until extubation (h)	3.3 (3.9)	3.18 (1.74)	0.685
Final weight before surgery	112.8 (16.4)	121.3 (20.5)	0.058
Final BMI before surgery	40.0 (6.2)	44.3 (5.5)	0.002
Percent of excess weight lost (%EWL)	27.14 (12.2–35.2) <sup>a</sup>	4.54 (1.4–10.07) <sup>a</sup>	<0.001
Total weight loss (KG)	16.2 (9.84)	4.7 (8.70)	<0.001
Percent of total weight lost (%TWL)	14.4 (6.1–16.4) <sup>a</sup>	2.4 (0.8–5.5) <sup>a</sup>	<0.001
BMI loss	6.04 (3.9–7.9)	1 (0–2)	<0.001

# Calo ponderale prima della chirurgia bariatrica - BIB

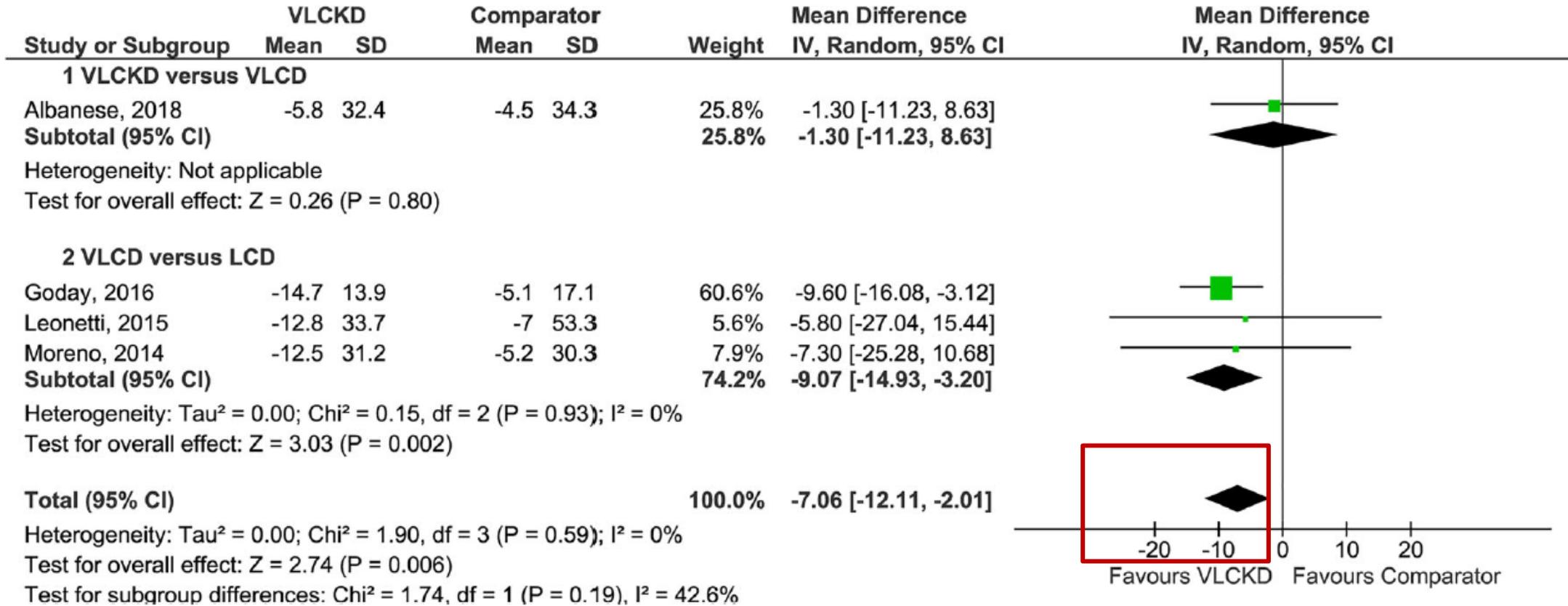


N=66;

Composite: hospital stay  $\geq 6$  days from surgery to discharge, and/or time of intensive care (ICU)  $> 48$  h, and/or reconversion to open surgery

- Calo ponderale prima della chirurgia bariatrica
- **VLCKD pre-op**

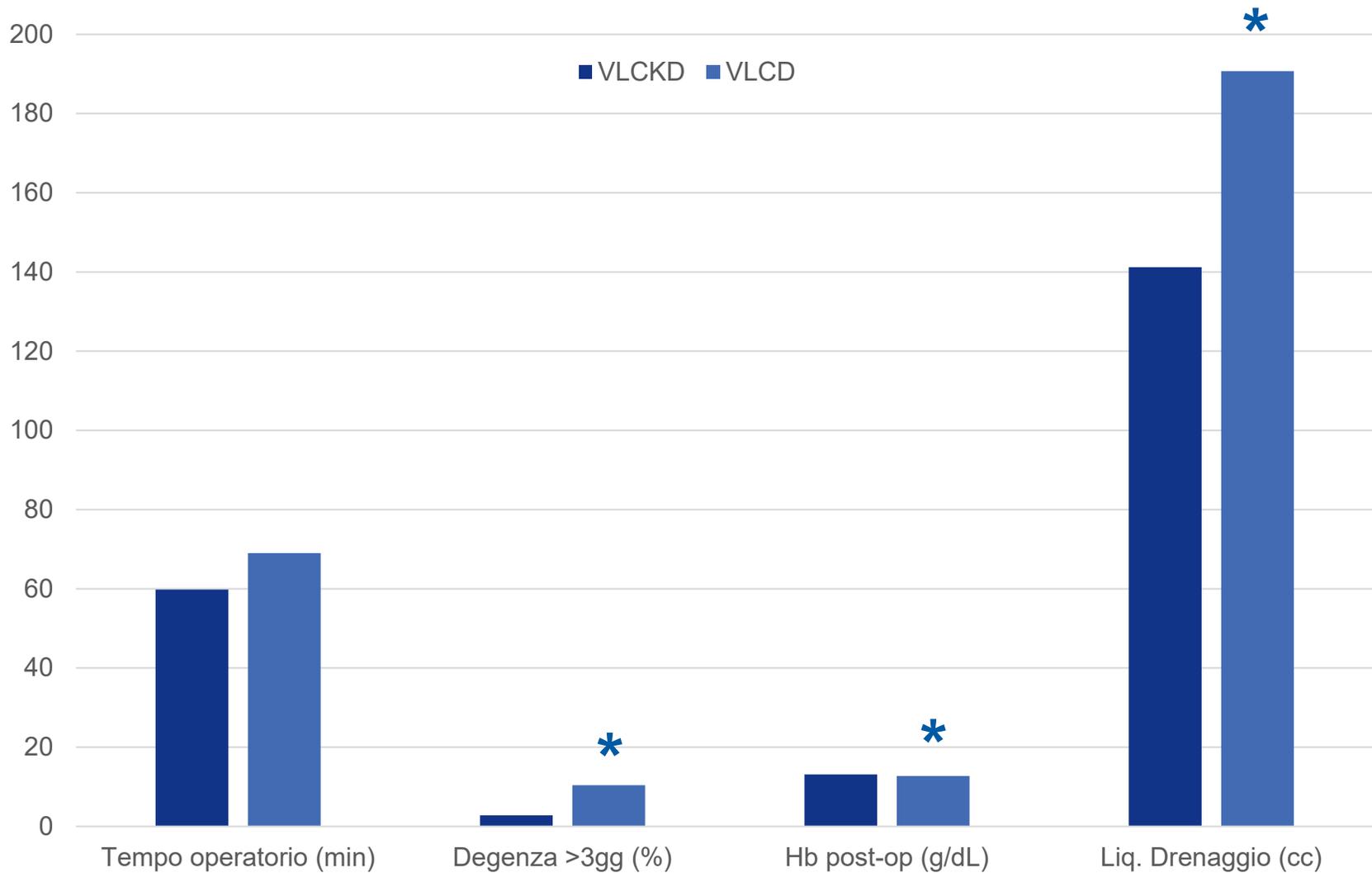
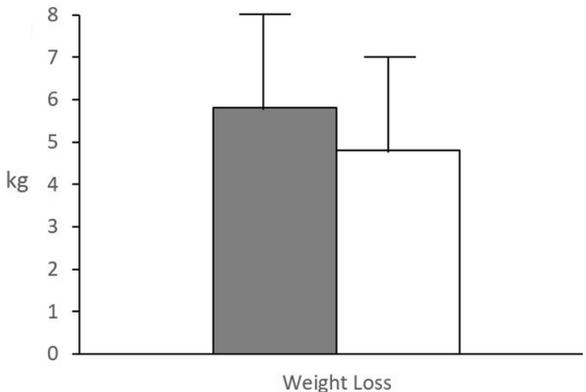
# VLCKD: calo ponderale più efficace vs. altre diete



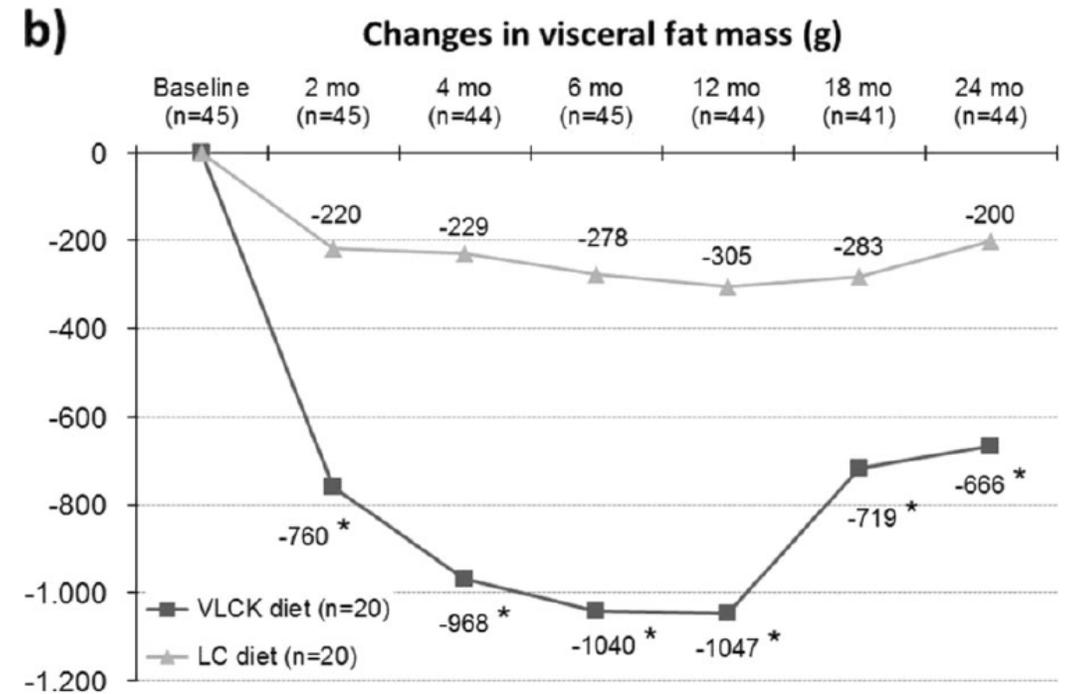
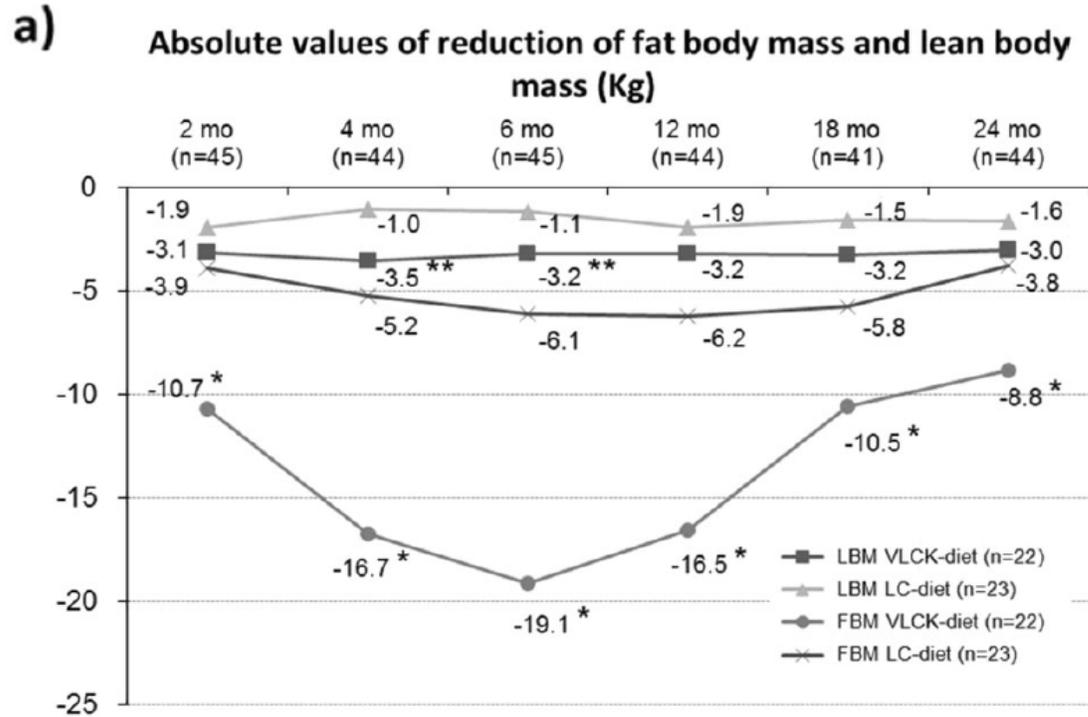
# VLCKD vs MED DIET 2 wks pre-op

Anthropometric measurements	VLCKD-SDM (n = 15)		MD (n = 15)		p value*
	I.Q-3.Q	Median	I.Q-3.Q	Median	
IBMI (kg/m <sup>2</sup> )	22.0 to 24.0	24	22.0 to 24.0	24	0.563
IBW (kg)	54.7 to 64.6	59.9	57.7 to 66.9	59.6	0.590
<b>Weight (kg)</b>					
Pre-diet	109.0 to 157.0	125.3	118.0 to 143.0	135	0.756
Post-diet	105.0 to 148.0	114	114.0 to 140.0	131	0.443
Change	- 9.0 to - 5.8	- 6.4	- 4.0 to - 3.0	- 3.3	<b>&lt; 0.001</b>
<i>Change p</i>	-	<b>&lt; 0.001<sup>§</sup></b>	-	<b>&lt; 0.001<sup>§</sup></b>	
<b>Weight loss (%)</b>	4.8 to 6.7	5.4	2.1 to 3.1	2.5	<b>&lt; 0.001</b>
<b>BMI (kg/m<sup>2</sup>)</b>					
Pre-diet	43.2 to 61.8	47.8	45.5 to 52.8	49.7	0.803
Post-diet	39.4 to 59.4	45.8	43.9 to 51.6	48.9	0.633
Change	- 3.3 to - 2.1	- 2.7	- 1.6 to - 1.0	- 1.4	<b>&lt; 0.001</b>
<i>Change p</i>	-	<b>&lt; 0.001<sup>§</sup></b>	-	<b>&lt; 0.001<sup>§</sup></b>	
<b>NRI</b>	45.3 to 46.5	46.1	46.8 to 47.3	47	<b>&lt; 0.001</b>
<b>MUAC (cm)</b>					
Pre-diet	38.0 to 47.0	42	41.0 to 47.0	43	0.505
Post-diet	34.0 to 44.0	38	40.0 to 46.0	42.5	<b>0.014</b>
Change	- 6.0 to - 2.0	- 3	- 1.0 to 0.0	- 0.5	<b>&lt; 0.001</b>
<i>Change p</i>	-	<b>&lt; 0.001<sup>§</sup></b>	-	<b>&lt; 0.001<sup>§</sup></b>	
<b>Waist circumference (cm)</b>					
Pre-diet	123.0 to 150.0	135	127.0 to 150.0	140	0.803
Post-diet	113.0 to 141.0	130	124.0 to 146.0	136	0.361
Change	- 10.0 to - 5.0	- 8	- 4.0 to - 2.0	- 3	<b>&lt; 0.001</b>
<i>Change p</i>	-	<b>&lt; 0.001<sup>§</sup></b>	-	<b>&lt; 0.001<sup>§</sup></b>	

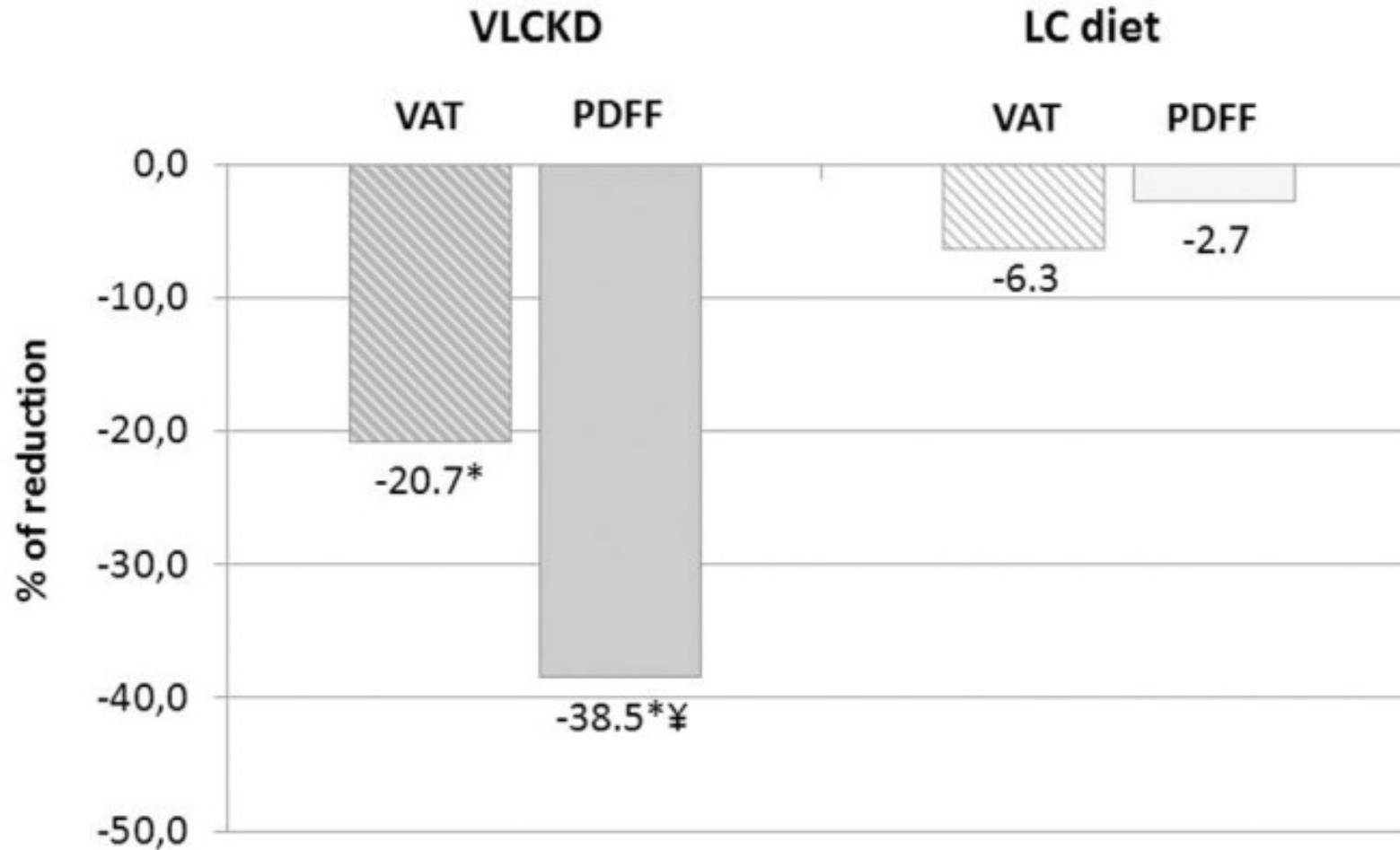
# VLCKD vs VLCD 3 wks pre-op



# VLCKD e perdita di massa grassa

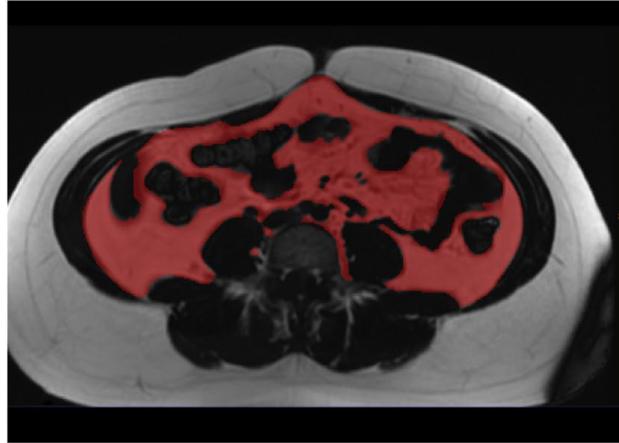


# VLCKD: riduzione grasso intraepatico

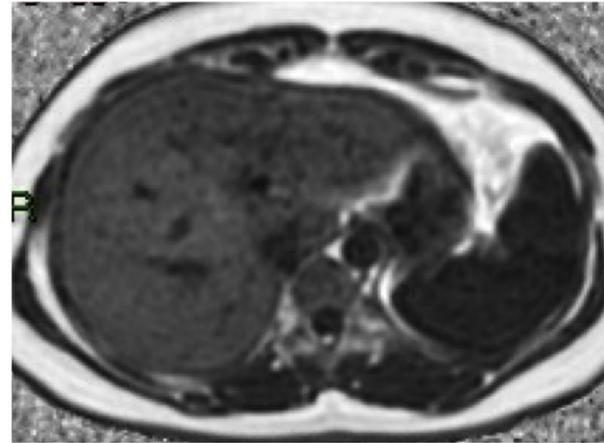


\*p<0.05, in comparison to baseline. ¥ p<0.001 in comparison to LCD group reduction.

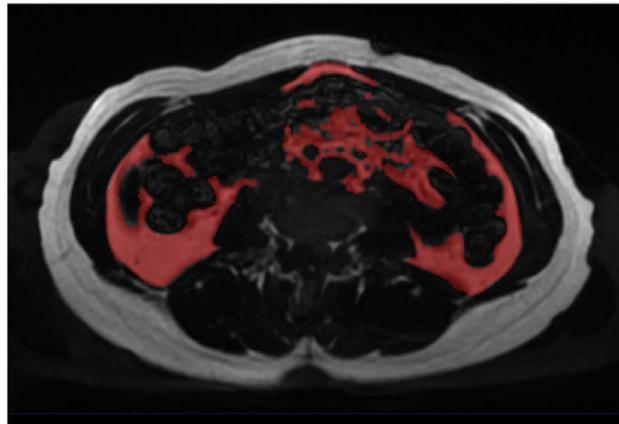
## Chirurgia bariátrica – calo ponderale preoperatorio



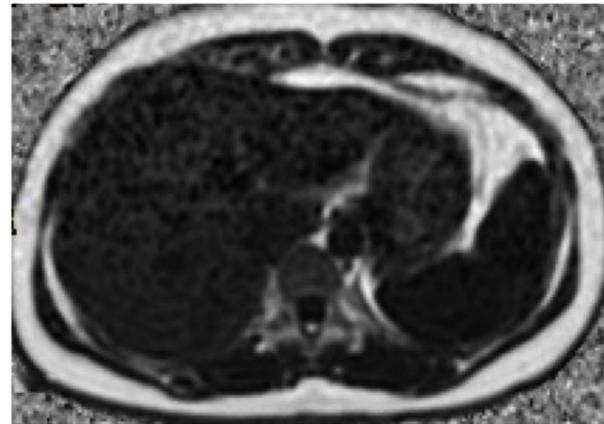
(a)



(b)

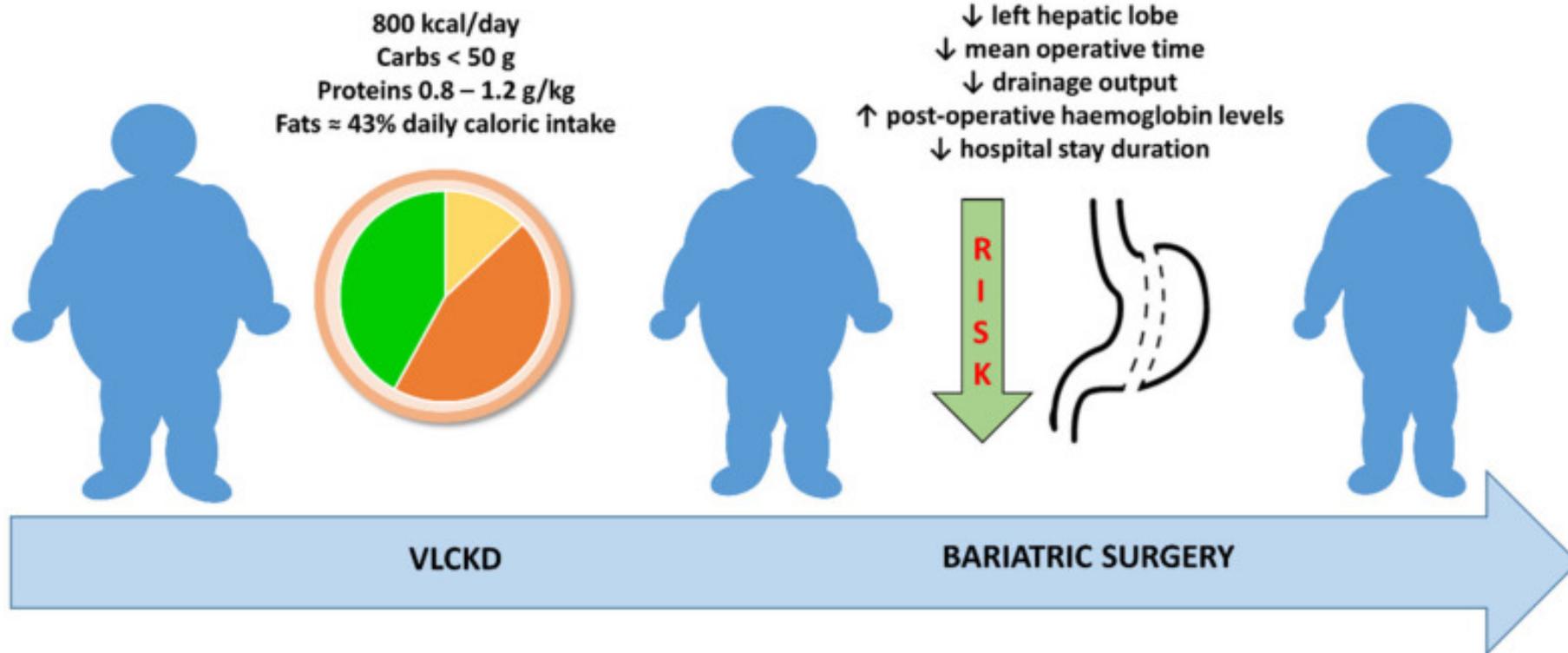


(c)



(d)

# VLCKD: pre-chirurgia bariatrica





# SICOB-endorsed national Delphi consensus on obesity treatment optimization: focus on diagnosis, pre-operative management, and weight regain/insufficient weight loss approach

Marco Antonio Zappa<sup>1</sup> · Angelo Iossa<sup>2</sup>  · Luca Busetto<sup>3</sup> · Sonja Chiappetta<sup>4</sup> · Francesco Greco<sup>5</sup> ·  
Marcello Lucchese<sup>6</sup> · Fausta Micanti<sup>7</sup> · Geltrude Mingrone<sup>8,9,10</sup> · Giuseppe Navarra<sup>11</sup> · Marco Raffaelli<sup>12</sup> · Delphi  
Expert Panel · Maurizio De Luca<sup>13</sup>

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The KOL agree with the responders to consider weight loss, at least weight maintenance, as part of the pre-operative nutritional re-assessment and a strong sign of patient's motivation.

Regarding the method to achieve pre-operative weight loss (s4,5,6), the respondents think that all the available supporting strategies to lose weight must be adopted before bariatric surgery. Pre-operative weight loss can be obtained with several regimens, such as low-calorie diets (LCD) (800–1200 kcal/day), very low-calorie diets (VLCD) (600 kcal/day), very-low-calorie ketogenic diet (VLCKD) (400/800 kcal/d) and the question of which method provides the best results in terms of weight loss and patients' compliance, tolerance and acceptance remain debatable [23, 24]. The National Institute for Health and Care Excellence (NICE) [25] recommends pharmacological treatment for weight loss maintenance in addition to a reduced calorie diet and optimal physical exercise [26–28]. A systematic review confirmed that VLCD led to a significant weight loss of 2.8 to – 14.8 kg together with liver size reduction (– 5–20% of the initial volume) [29]. A more recent study comparing the effect of VLCD, and LCD showed that VLCD was more effective in reducing total body weight [30]. VLCKD demonstrated similar VLCD weight loss results, but with a significant liver volume reduction (5.8 vs. 4.2%) [30]. The efficacy of liraglutide

A yellow rectangular sign with a black border of diagonal stripes. The text "SAFETY FIRST" is written in bold, black, sans-serif capital letters, centered on the sign.

**SAFETY  
FIRST**

# VKLCD

## Indicazioni

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## Controindicazioni

### Indications

Obesity (BMI  $\geq 30.0$  kg/m<sup>2</sup>)

Obesity with one or more comorbidities (T2DM<sup>a</sup>, locomotors system disorder, NAFLD)

Overweight (BMI = 25.0–29.9 kg/m<sup>2</sup>) with abdominal obesity (waist circumference > 102 cm in men and > 88 cm in women)

Overweight/obesity, PCOS and hypogonadism

Weight loss before bariatric surgery or in case of weight regain after bariatric surgery

Overweight/obesity and neurological/neurodegenerative disorders (Parkinson, Alzheimer, amyotrophic lateral sclerosis, epilepsy)

Overweight/obesity and pulmonary dysfunctions (OSAS, COPD, OHS, asthma)

Overweight/obesity and psoriasis

### Contraindications

Pregnancy and breastfeeding

Childhood<sup>b</sup>

Rare metabolic disorders (porphyria, carnitine deficiency, carnitine palmitoyltransferase deficiency, carnitine-acylcarnitine translocase deficiency, mitochondrial fatty acid  $\beta$ -oxidation disorders, and pyruvate carboxylase deficiency)

Type 1 diabetes, type 2 diabetes with beta cell failure or concomitant treatment with SGLT2 inhibitors

Organ failure (liver, kidney, or heart NYHA III e IV)

Recent myocardial infarction or cerebrovascular stroke

Severe psychiatric disorders

Severe eating disorders

Alcohol and substance abuse



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# Grazie