Med. J. Cairo Univ., Vol. 91, No. 1, March: 157-172, 2023
www.medicaljournalofcairouniversity.net

Effect of Body Contouring after Massive Weight Loss Due to Bariatric Surgery on Quality of Life and Body Image: A Systematic Review

AHMED M. SABRY, M.D.*; MOHAMED E. EBID, M.Sc.**; AMIRA H. SABRY, M.D.***; HELMY SOLIMAN, M.D.***; MOUSTAFA H. ELHELW, M.D.***; MAURICE F. KHALIL, M.D.*** and HAITHAM M. ELMALEH, M.D.*

The Department of General Surgery, Faculty of Medicine, Ain Shams University, Department of Plastic Surgery**, Al-Mataria Teaching Hospital and Department of Plastic Surgery***, Faculty of Medicine, Ain Shams University*

Abstract

Background: Massive weight loss occurs in post-bariatric surgery patients, and the extra skin that results can create both practical issues and extreme unhappiness with appearance. All these corollaries, including body image, could be improved with the removal of extra skin. There are currently few studies examining this population's body image and quality of life in relation to weight.

Aim of Study: Determination of whether body contouring surgeries following massive weight loss in post bariatric surgery patients improves quality of life and body image or not by conducting a systematic review literature.

Patients and Methods: This study was conducted in the Faculty of Medicine, Ain Shams University from October 2021 to July 2022. Preliminary searches were conducted to identify relevant sources and optimize the search strategy. subsequently, the investigators conducted a systemic search of the following on line databases: (1) PubMed (PM) (which is a free search engine operated by the National Library of Medicine, United States), (2) Web of Science (WOS) (a subscription-based interdisciplinary data base published by Clarivate Analytics) and (3) Scopus (Elsevier's abstract and citation database). The search items revolved around two main concepts: The exposure of interest (body contouring surgeries following bariatric surgeries), the outcome (quality of life, body image).

Results: A total of 17 studies were included assessing response rate showing significant heterogeneity between studies with I^2 (inconsistency) 94.97% and 95% CI for I2 93.22-96.26. 7 studies were included assessing Life change weight loss (wl) showing significant heterogeneity between studies with I^2 (inconsistency) 93.56% and 95% CI for I^2 89.17-96.17. 18 studies were included assessing satisfaction showing significant heterogeneity between studies with I^2 (inconsistency) 98.25% and 95% CI for I^2 97.85-98.58. 5 studies were included assessing complications showing significant heterogeneity between studies with I^2 (inconsistency) 82.15% and 95% CI for I^2 5 8.89-92.25. 4 studies were included assessing Weight changes showing insignificant heterogeneity between studies with I^2 (inconsistency) 0% and 95% CI 1.611 to 2.086.

Conclusion: The evidence in this review strongly supports the potential long-term advantages of body contouring surgery for certain patients who have undergone bariatric surgery and lost a significant amount of weight. The current review also showed that BCS in postbariatric patients leads to statistically significant improvements in a number of QOL indicators.

Key Words: *Body contouring – Massive weight loss – Bariatric surgery – Quality of life – Body image.*

Correspondence to: Dr. Dr. Mohamed E. Ebid,
E-Mail: Mohamedelsayed15819@gmail.com

Introduction

FOR people who are extremely obese, bariatric surgery continues to be the best option for weight loss. For that goal, laparoscopic gastric bypass has been performed regularly, and currently laparoscopic sleeve gastrectomy is also frequently performed. A reduction in excess body weight of at least 50% is considered a massive weight loss. As more people undergo bariatric surgery, many people who have lost a lot of weight are left with the unattractive side effects of loose and superfluous skin, which cause uneven contours **[1]**.

A known sequence of weight-loss operations is the onset of drooping skin. Rapid weight reduction causes a quick shift in body mass index (BMI), which decreases skin tone and prevents the excess soft tissue from retracting, leaving redundant skin **[2]**.

There is no connection between excess skin and a patient's contentment with their look. Unexpectedly, as they lose more weight, morbidly obese patients report feeling less happy with their body image (BI). The most crucial elements of patient satisfaction following aesthetic surgery are quality of life (QOL) and biological index (BI) **[3]**.

It has been demonstrated that surgical weight loss has various advantages for BI and function. The patient's BI and Quality of Life are anticipated to improve as a result of the drastic weight loss (QOL). Only a small percentage of people whose BI has significantly changed undertake body shaping procedures. However, this can be the result of patients still feeling self-conscious and unattractive, which contributes to their body image dissatisfaction (BID). Additionally, opinions differ on whether body sculpting surgery is a necessary follow-up procedure after bariatric surgery or merely a little additional procedure following weight loss **[4]**.

Material and Methods

This study was conducted in the Faculty of Medicine, Ain Shams University from October 2021 to July 2022.

Ethical approval:

The Research Ethics Committee at the College of Medicine at Ain Shams University received the study protocol, which was exempted from ethical review because it did not involve any experiments on animals or laboratory operations.

Search strategy:

Preliminary searches were conducted to identify relevant sources and optimize the search strategy. subsequently, the investigators conducted a systemic search of the following on line databases: (1) PubMed (PM) (which is a free search engine operated by the National Library of Medicine, United States), (2) Web of Science (WOS) (a subscription-based interdisciplinary data base published by Clarivate Analytics) and (3) Scopus (Elsevier's abstract and citation database).

Both Web of Science, and Scopus were accessed through the Egyptian Knowledge Bank (EKB) in addition to the fore-mentioned databases, Egyptian Universities Libraries Consortium (EULC) were also searched in order to identify other relevant local unpublished records such as these, dissertations, or studies that were published in unindexed journals.

To find any additional records that matched the review's predetermined eligibility criteria, reference lists of all eligible records were manually searched. No temporal constraints were imposed across any databases, and only papers written in English were considered eligible.

Search items:

The search items revolved around two main concepts: The exposure of interest (body contouring surgeries following bariatric surgeries), the outcome (quality of life, body image).

Search items for the first concept (body contouring surgeries, bariatric surgery):

Aesthetic procedures include mammoplasty, brachioplasty, laparoscopic sleeve gastrectomy, laparoscopic gastric banding, gastric bypass, laparoscopic sleeve gastrectomy, and abdominoplasty.

Search items for the second concept (quality of life, body image):

Quality of life, body image, wellbeing, psychological, functional, satisfaction.

Both free-text words and controlled vocabulary were used in the search strategy. Different combination of the afore-mentioned search items were used and optimized for each database. The search was last run-on the 25 th of February 2022, and all records were imported to End Note and checked for Duplicates.

Screening and study-selection:

The elimination of duplicates was done by importing the retrieved citations into End Note X7. Then, unique citations were imported into an Excel sheet and reviewed by two impartial reviewers; records were reviewed in two steps: Full-text retrieval and evaluation in the second, and title/ abstract screening in the first. Only primary research was included, whereas all other types of publications were excluded (including reviews, commentaries, editorials, etc.). General eligibility criteria are listed in the following table:

Table (1): Inclusion and Exclusion criteria of the studies.

Inclusion criteria	Exclusion criteria
1- Observation studies (cross-sectional, case-control, retrospective cohort, prospective cohort).	1- Case reports and case series.
2- Studies of post bariatric massive weight loss patients	2- Editorials and commentaries.
3- Studies assessing quality of life And body image.	3- Secondary literature sources (such as books or reviews).
4- Studies reported in the English language	4- Self reported cases.
5- Studies that were published till May 2021.	5- Studies where body contouring types are not described in terms.
	6- Studies not assessing quality of life and body image.
	7- Studies that were published before 2010.

Data extraction:

Data were tallied in predesigned forms using information taken from qualifying records. The extracted data included: Author name/date, study design, country, study setting, sample size, mean age, bariatric surgeries, life change weight loss, body contouring surgeries, BMI before body contouring, EWL (excess weight loss), body questionnaire types, response rate, % of satisfaction, max BMI, mean follow-up time.

Dealing with missing data:

Standard error or the 95% confidence interval were used to compute the missing standard deviation (SD) of mean change from baseline (CI).

Direct Meta-analysis:

The inverse variance approach was used to pool continuous outcomes as mean difference (MD) or standardised mean difference (SMD), and the Mantel-Haenszel method was used to pool dichotomous outcomes as relative risk (RR). The use of the random-effects technique was predicated on the existence of sizable clinical and methodological variability. Using Review Manager (RevMan) 5.3 or Open Meta-analyst for Windows, we carried out all statistical analyses.

Assessment of heterogeneity:

By visually inspecting the forest plots and using the chi-square and I-square tests, we evaluated heterogeneity. Meta-analysis and the Cochrane Handbook of Systematic Reviews advise that I-square values indicate significant heterogeneity whereas chi-square p-values below 0.1 signify significant heterogeneity.

0% to 40%	Low heterogeneity
30% to 60%	Moderate heterogeneity
50% to 90%	Substantial heterogeneity
75% to 100%	Considerable heterogeneity

We intended to do a sensitivity analysis to compare results with and without any trials that were deemed to be impacting the homogeneity of the pooled estimates if any trials were determined to do so.

Evidence of publication bias:

used the funnel plot test to look for Based on the search results and the inclusion/exclusion criteria, a PRISMA flowchart has been created. Information was gathered to help with the assessment of potential risk of bias for each study using the (Cochrane collaboration tool for assessing the risk of bias).

The relative risk of each of the intended outcome measures of interest was calculated and compared after combining the data gathered from the required search investigations.

Results

Database search:

The database search produced 833 documents in total (last accessed February 25, 2022; PM = 215, WOS = 299, Scopus = 278 and EULC = 41). The remaining 536 records needed to be reviewed for eligibility after duplicate records were removed.

Screening and study-selection:

Title/Abstract screening follows 44 records were taken into account for full-text evaluation, while 492 records were excluded. After that, 26 full-text data were disregarded, leaving 18 records for the systematic review.

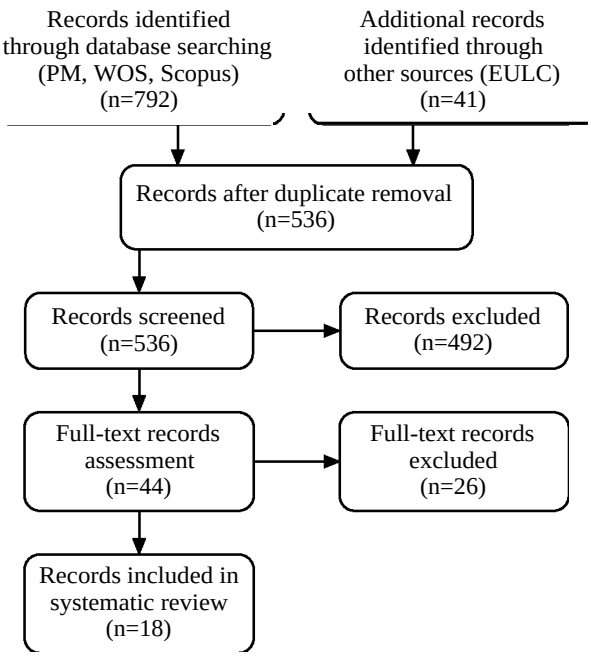

Fig. (1): Preferred reporting items for systematic review and meta-analysis (PRISMA) flow diagram.

Characteristics of included studies:

Out of the 18 investigations, three were cross-sectional, six were prospective, and nine were retrospective cohort studies, according to data gathered from the included studies, which are given in tables.

The oldest of the included studies was Van der Beek [5], while the most recent was Paul et al. [6].

Three studies were conducted in each of France, united states of America, two studies were conducted in each of Germany, Switzerland, Netherlands, while one study was conducted in each of Poland, Canada, Chile, brazil, Finland, Austria.

The highest sample size was 130 patients in meal 2019 and lowest was 10 patients in Azin et al. **[7]**.

The most commonly done bariatric surgery was Roux-en-Y Gastric bypass, and other surgeries were laparoscopic sleeve gastrectomy and Adjustable Gastric banding, with Highest mean Max BMI was 52.0±8.81kg/m^2 and lowest mean MAX BMI was 40kg/m^2 in Paul et al. **[6]**; the Excess weight loss% following bariatric surgery, the highest was 86.3± 13.6% and the lowest was 36.8±8% in Monpellier et al. **[8]**.

The most commonly done Body contouring surgery was Abdominoplasty and other surgeries were brachioplasty, lower body lift, thigh lift, mammoplasty (mastopexy, breast reduction), upper body lift, panniculectomy, lipo-abdominoplasty, classical body lift, medial thigh lift, buttock lift. the highest mean BMI before body contouring was 31.6±7.4kg/m^2 in Singh et al., 2012 and the lowest was 25kg/m^2 in Paul et al., 2020, with the highest mean follow up time was 8 years (96 months) in tremp 2015 study and the lowest was 3 months. The Quality of life and Body image assessment was done using the Moorhead-Arldelt QOL questionnaire in each of the following five studies, with the highest mean score was 2.1 ±0.9 in Rosa et al., 2019 and the lowest was 0.7.

The Short-form 36 questionnaire (SF-36) was used in two studies, Singh et al. **[9]** by 78.37, Song **[10]** by 56.8±4.88.

Table (2): Author name, date of publication, study design, country, setting, sample size, mean age.

N	Author/Date	Study design	Country	Setting	Sample size	Mean age/y
1	Paul et al., 2020	Prospective	Poland	The Lower Silesian Hospital	30	38±5.91
2	Monpellier et al., 2019	Retrospective	Netherlands	The Nederlandse Obesitas Kliniek	65	45.1± 11.4
3	Meal, 2019	Retrospective	France	University hospital of Rennes	130	39.64±9.97
4	Cai, 2019	Retrospective	Germany	University hospital Erlangen	45	40
5	Rosa et al., 2019	Retrospective cohort	Brazil	North wing regional hospital	107	41
6	Repo et al., 2019	Retrospective	Finland	Helsinki University Hospital	82	48.8
7	Vierhapper et al., 2017	Prospective	Austria	University hospital	40	40.9 + or - 10.3
8	Danilla, 2017	Prospective	Chile	Hospital Clínico Universidad de Chile	112	39.6±8.1 y
9	Song, 2016	Prospective	United states of America	University of California	41	–
10	Tremp, 2015	Prospective	Switzerland	University hospital Basel	23	53
11	Runz, 2015	Retrospective cohort	France	Nancy university hospital	55	41
12	Bertheuil, 2014	Retrospective	France	University hospital of Rennes	21	49.9±8.7
13	Zwaan et al., 2014	Cross sectional	Germany	Hannover Medical School	62	47.97
14	Modarressi, 2012	Prospective	Switzerland	University Hospitals of Geneva	89	42.6
15	Azin, 2013	Cross-sectional study	Canada	The Toronto Western Hospital Bariatric Surgery	10	40±5.62
16	Singh, 2012	Cross sectional	USA	Yale New Haven Hospital	16	45±9.1
17	Bloom et al., 2012	Retrospective	USA	University of Rochester Medical Center	54	46± 11.3
18	van der Beek, 2012	Retrospective	Netherlands	The St. Antonius Hospital in Nieuwegein	43	50.4

Table (3): Author name, date of publication, type of bariatric surgeries, life change weight loss, body contouring surgeries, BMI before Body contouring, excess weight loss in kg.

N	Author/Date	Bariatric surgeries	Life change wl	Body contouring	BMI b BC kg/m^2	EWL
1	Paul et al., 2020	LSG AGB RYGB		Abdominoplasty Lower body lift	25 kg/m^2	53.1kg
2	Monpellier et al., 2019	RYGB			27.6±4.5 kg/m^2	36.8±8.0%
3	Meal, 2019	GBP Sleeve LAGB	12.31%	Lipo body lift Classical body lift	26.83+/-3.08 kg/m^2	53.40±17.37
4	Cai, 2019	Gastric banding n1 1 Gastric bypass n16 Gastric sleeve n 4	15	Abdominoplasty Brachioplasty Thigh lift Mammaplasty Buttock lift Circular body lift Monsplasty	27.1 kg/m^2	–
5	Rosa et al., 2019	Rouxen-y gastric bypass (RYGB)	–	Abdominoplasty 91 Mastopexy 9 Brachioplasty 4 Thighplasty 3	27.6 + or -3.7 kg/m^2	47.7 + or - 17.3 kg
6	Repo et al., 2019	N15	N35	Abdominoplasty	31.2 kg/m^2	48.3 kg
7	Vierhapper et al., 2017	Gastric bypass n=32 gastric banding n=4	N=4	Lower circumferential body lift, medial thigh lift	27.6 +or - 3.6 kg/m^2	86.3 + or - 13.6%
8	Danilla, 2017	Gastric Bypass Sleeve Gastrectomy	1.8%	Lipo-abdominoplasty Abdominoplasty liposuction Lower body lift Breast Augmentation Rhinoplasty	25.1 +/- 2.2 kg/m^2	–
9	Song, 2016	RYGB Gastric banding Sleeve gastrectomy	–	Panniculectomy Belt lipectomy Lower body lift Upper body lift Breast reduction	-	–
10	Tremp, 2015	Gastric bypass n 7 Gastric banding 2	14	Abdominoplasty Rectus plication Liposuction	29 kg/m^2	29%
11	Runz, 2015	Rouxen-y gastric bypass 43 Sleeve gastrectomy 3 gastric band 1	8	Lower body lift Lipo abdominoplasty	28.2 kg/m^2	49.6 kg
12	Bertheuil, 2014	Lap adjustable gastric banding Roux-en-Y gastric bypass		Abdominoplasty Reduction mammoplasty Brachioplasty Medial thigh lift	28.4±4.8 kg/m^2	46±17.1 kg
13	Zwaan et al., 2014	Lap gastric bypass Sleeve gastrectomy Gastric banding		Abdominoplasty Thigh lift Upper back lift Brachioplasty Breast lift	32.46 kg/m^2	–
14	Modarressi, 2012	RYGBP		Abdominoplasty Mastopexy Breast reduction Breast augmentation Brachioplasty	29.9 kg/m^2	68.4 kg
15	Azin, 2013	Roux-en-Y gastric bypass Sleeve gastrectomy	–		27.96±8.0 kg/m^2	44.78±7.1 kg
16	Singh, 2012	Laparoscopic Roux-en-Y gastric bypass	–	–	31.6±7.4 kg/m^2	–
17	Bloom et al., 2012	Gastric Bypass		Monsplasty	31.0±6.22	
18	van der Beek, 2012	Lap gastric banding Gastric bypass		Abdominoplasty Mammary reduction Dermo lipectomy arms, legs Liposuction Dogg ear correction	29.6 kg/m^2	53 kg

Table (4): Author name, date of publication, type of questionnaire, Response Rate, percent of satisfaction, MAX BMI, mean follow-up time.

N	Author/Date	Body questionnaire	Response rate	% of satisfaction	Max BMI kg/m^2	Mean Follow-up time
1	Paul et al., 2020	The BODY-Q questionnaire	86%	73.38±19.02	40 kg/m^2	12 m
2	Monpellier et al., 2019	An unpublished questionnaire developed by the authors	100%	7.3±1.2	43.9±6.1 kg/m^2	32.6±3.7 m
3	Meal, 2019	A five-point scale	84.61%	4.28±1.05	46.62±7.03	12 m
4	Cai, 2019	Moorehead-Ardelt QOL II	21%	1.8 +or- 0.75	47.1 kg/m^2	50 m
5	Rosa et al., 2019	Moorehead-Ardelt QOL questionnaire	90%	2.1+ or -.9	45.5 +or -7.6 kg/m^2	18 m
6	Repo et al., 2019	The BODY-Q questionnaire The 15D instrument	65%	95%	–	–
7	Vierhapper et al., 2017	Body appraisal inventory [FBeK] and body image questionnaire [FKB-20] Body lift follow - up questionnaire	72.5%	90%	50.1+or- 10.8 kg/m^2	60.6 m
8	Danilla, 2017	The Body-QoL instrument	75%	84.4±12.7	–	27.2 m
9	Song, 2016	MBSRQ SF-36	100%	3.01	–	12 m
10	Tremp, 2015	Moorehead-Ardelt QOL	35%	0.7	–	8 y
11	Runz, 2015	Self-retained questions	94.5%	94.2%	–	24 m
12	Bertheuil, 2014	Moorehead-Ardelt QOL questionnaire	100%	1.49±1.3	46.1±7.5 kg/m^2	53.3±18.8 m
13	Zwaan et al., 2014	MBSRQ	100%	3.04	48.74 kg/m^2	49.8 m
14	Modarressi, 2012	Moorehead-Ardelt QOL questionnaire	100%	1.95	46.0 kg/m^2	18 m
15	Azin, 2013	Short-Form 36 Health Status Survey	100%	56.80±4.88	50.50±11.55 kg/m^2	27 m
16	Singh, 2012	Short-Form 36 Health Status Survey	–	78.37	48.9±7.2	–
17	Bloom et al., 2012	15 question mons satisfaction	57.8%	8.58	52.0±8.81 kg/m^2	3 m
18	van der Beek, 2012	The Obesity Psychosocial State Questionnaire	80%	55%	47.8 kg/m^2	86 m

Response rate:

17 studies were included assessing response rate showing significant heterogeneity between studies with I^2 (inconsistency) 94.97% and 95% CI for I^2 93.22-96.26.

Life change weight loss (wl):

7 studies were included assessing Life change weight loss (wl) showing significant heterogeneity between studies with I^2 (inconsistency) 93.56% and 95% CI for I^2 89.17-96.17.

Satisfaction:

18 studies were included assessing satisfaction showing significant heterogeneity between studies with I^2 (inconsistency) 98.25% and 95% CI for I^2 97.85-98.58.

Complications:

5 studies were included assessing complications showing significant heterogeneity between studies with I^2 (inconsistency) 82.15% and 95% CI for I^2 58.89-92.25.

Weight changes:

4 studies were included assessing Weight changes showing insignificant heterogeneity between studies with I^2 (inconsistency) 0% and 95% CI 1.611 to 2.086.

Table (5): Meta-analysis for response rate.

Study	Total number	Event	Event rate (%) (Proportion)	95% CI of rate (%)
Paul et al., 2020	30	30	100.0	88.430 - 100.0
Monpellier et al., 2019	65	65	100.0	94.483 - 100.0
Meal, 2019	130	110	84.615	77.244 - 90.342
Cai, 2019	45	9	20.0	9.576 - 34.596
Rosa et al., 2019	107	96	89.720	82.350 - 94.755
Repo et al., 2019	82	53	64.634	53.296 - 74.882
Vierhapper et al., 2017	40	29	72.500	56.112 - 85.399
Danilla, 2017	112	84	75.00	65.933 - 82.700
Song, 2016	41	41	100.0	91.396 - 100.0
Tremp, 2015	23	8	34.783	16.376 - 57.266
Runz, 2015	55	52	94.545	84.877 - 98.861
Bertheuil, 2014	21	21	100.0	83.890 - 100.0
Zwaan et al., 2014	62	62	100.0	94.224 - 100.0
Modarressi, 2012	89	89	100.0	95.940 - 100.0
Azin, 2013	10	10	100.0	69.150 - 100.0
Bloom et al., 2012	54	31	57.407	43.208 - 70.765
Van der Beek, 2012	43	34	79.070	63.958 - 89.956
Total (fixed effects)	1009		85.900	83.619 - 87.973
Total (random effects)	1009		85.771	74.804 - 93.988
Test for heterogeneity:				
Q		317.9272		
DF		16		
Significance level		<0.0001 *		
I2 (inconsistency)		94.97%		
95% CI for I2		93.22-96.26		

Q: Total variance for heterogeneity.
I^2: Observed variance for heterogeneity.
CI: Confidence interval (LL: Lower limit-UL: Upper Limit).

Table (6): Shows Meta-analysis for response rate of 17 studies included, Total number (participants), Event (number of responders), Event rate % proportion, CI (Confidence interval (LL: Lower limit-UL: Upper Limit).

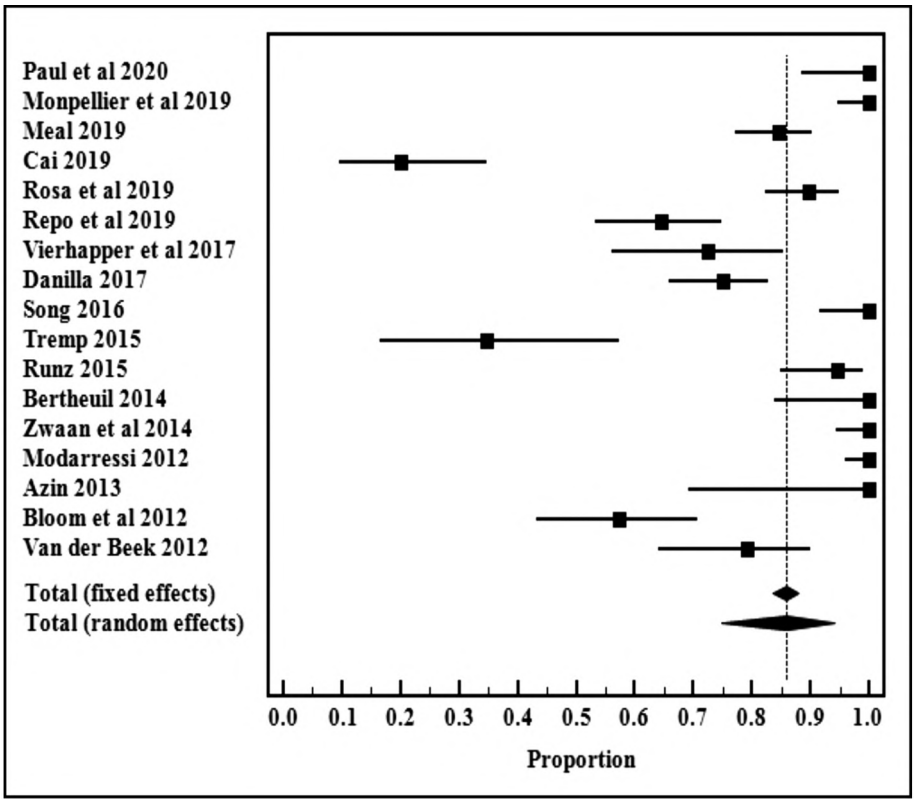

Fig. (2): Forest plot for response rate.

Table (7): Meta-analysis for Life change weight loss (wl).

Study	Total number	Event	Event rate (%) (Proportion)	95% CI of rate (%)
Meal, 2019	130	16	12.308	7.201 - 19.216
Cai, 2019	45	15	33.333	20.001 - 48.950
Repo et al., 2019	82	35	42.683	31.816 - 54.095
Vierhapper et al., 2017	40	4	10.000	2.793 - 23.664
Danilla, 2017	112	2	1.786	0.217 - 6.302
Tremp, 2015	23	14	60.87	38.542 - 80.292
Runz, 2015	55	8	14.545	6.495 - 26.663
Total (fixed effects)	487		16.942	13.739 - 20.546
Total (random effects)	487		22.057	9.280 - 38.391
Test for heterogeneity:				
Q		93.2247		
DF		6		
Significance level		<0.0001*		
I2 (inconsistency)		93.56%		
95% CI for I2		89.17 - 96.17		

Q: Total variance for heterogeneity.
I^2: Observed variance for heterogeneity.
CI: Confidence interval (LL: Lower limit-UL: Upper Limit).

Table (8): Shows Meta-analysis for Life change weight loss participants,7 studies included, Total number (participants), Event (number of life change weight loss participants), Event rate % proportion, CI (Confidence interval (LL: Lower limit-UL: Upper Limit).

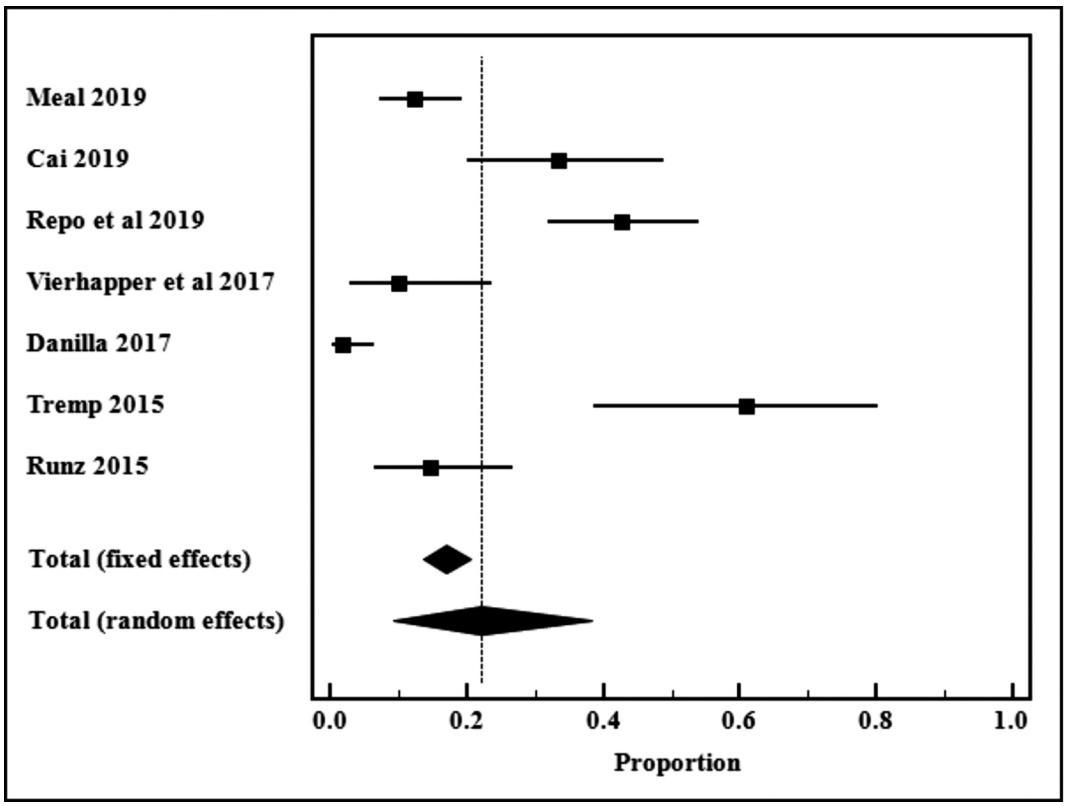

Fig. (3): Forest plot for Life change wl.

Table (9): Meta-analysis for proportion (%) of satisfaction.

Study	Total number	Event	Event rate (%) (Proportion)	95% CI of rate (%)
Paul et al., 2020	30	22	73.333	54.111 - 87.721
Monpellier et al., 2019	65	5	7.692	2.545 - 17.046
Meal 2019	130	6	4.615	1.712 - 9.775
Cai 2019	45	1	2.222	0.0562 - 11.770
Rosa et al., 2019	107	2	1.869	0.227 - 6.589
Repo et al., 2019	82	78	95.122	87.979 - 98.655
Vierhapper et al., 2017	40	36	90.000	76.336 - 97.207
Danilla 2017	112	95	84.821	76.813 - 90.902
Song 2016	41	1	2.439	0.0617 - 12.855
Tremp 2015	23	0	0.000	0.000 - 14.819
Runz 2015	55	52	94.545	84.877 - 98.861
Bertheuil 2014	21	0	0.00	0.000 - 16.110
Zwaan et al., 2014	62	2	3.226	0.393 - 11.172
Modarressi 2012	89	2	2.247	0.273 - 7.883
Azin 2013	10	6	60.00	26.238 - 87.845
Singh 2012	16	13	81.25	54.354 - 95.953
Bloom et al., 2012	54	5	9.259	3.075 - 20.300
Van der Beek 2012	43	24	55.814	39.875 - 70.922
Total (fixed effects)	1025		29.205	26.459 - 32.068
Total (random effects)	1025		31.907	12.905 - 54.762
Test for heterogeneity:				
Q			972.4987	
DF			17	
Significance level			<0.0001 *	
I2 (inconsistency)			98.25%	
95% CI for I2			97.85 - 98.58	

Q: Total variance for heterogeneity.
I^2: Observed variance for heterogeneity.
CI: Confidence interval (LL: Lower limit-UL: Upper Limit).

Table (10): Shows Meta-analysis for proportion (%) of satisfaction,18 studies included, Total number (participants), Event (number of participants according to proportion of satisfaction), Event rate proportion of satisfaction (%), CI (Confidence interval (LL: Lower limit-UL: Upper Limit).

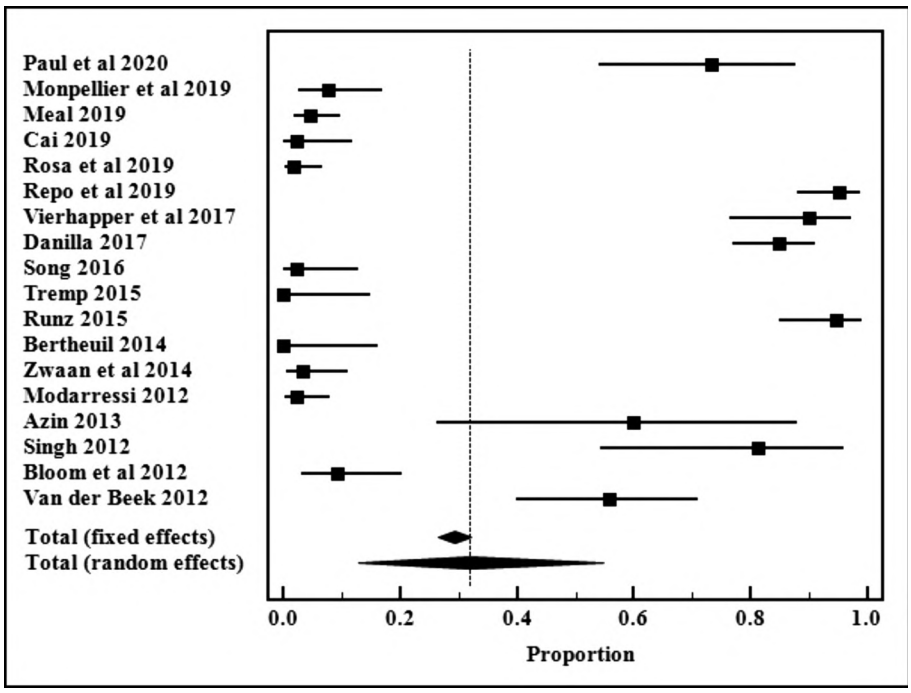

Fig. (4): Forest plot for % of satisfaction.

Table (11): Meta-analysis for complications.

Study	Total number	Event	Event rate (%) (Proportion)	95% CI of rate (%)
Paul et al., 2020	30	5	16.667	5.642 - 34.721
Meal 2019	130	40	30.769	22.976 - 39.462
Rosa et al., 2019	107	25	23.364	15.727 - 32.529
Runz 2015	55	5	9.091	3.018 - 19.954
Bertheuil 2014	21	12	57.143	34.021 - 78.180
Total (fixed effects)	343		24.977	20.515 - 29.870
Total (random effects)	343		25.494	14.828 - 37.910
Test for heterogeneity:				
Q			22.4068	
DF			4	
Significance level			0.0002*	
I2 (inconsistency)			82.15%	
95% CI for I2			58.89 - 92.25	

Q: Total variance for heterogeneity.
I^2: Observed variance for heterogeneity.
CI: Confidence interval (LL: Lower limit-UL: Upper Limit).

Table (12): Shows Meta-analysis for complications, 5 studies included, Total number (participants), Event (number of participants who developed complications), Event rate proportion of complications (%), CI (Confidence interval (LL: Lower limit-UL: Upper Limit).

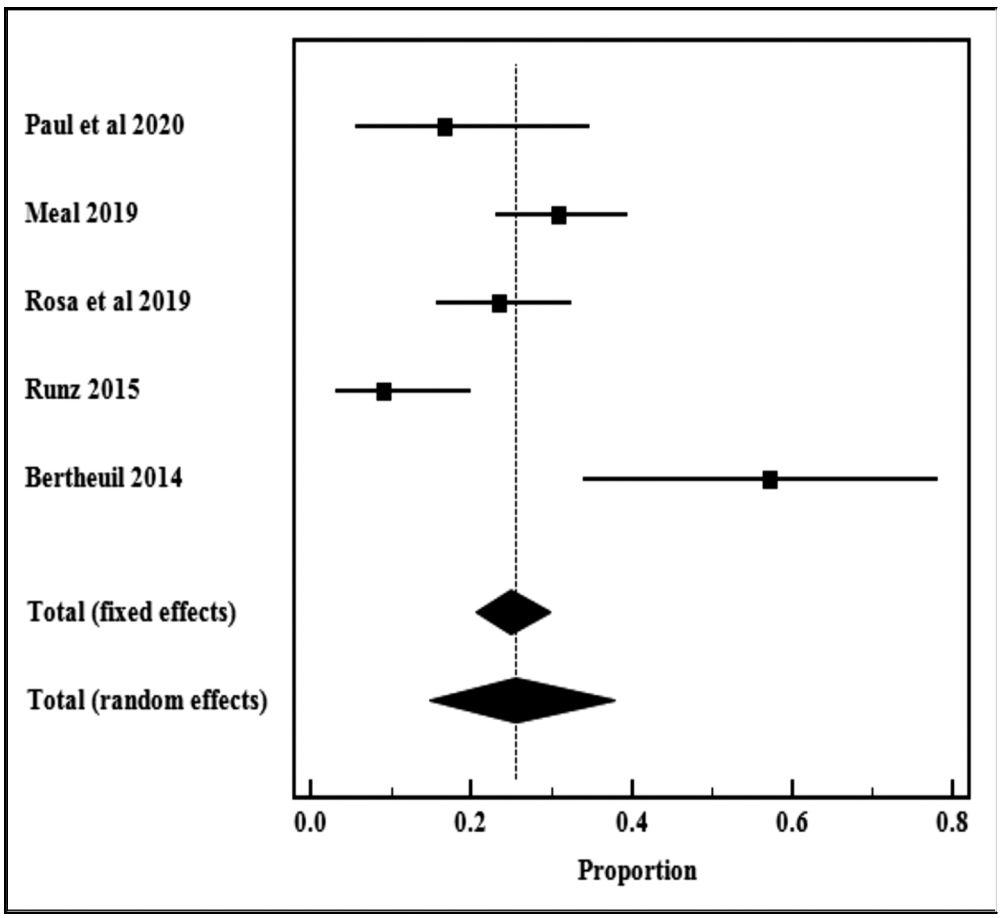

Fig. (5): Forest plot for complications.

Table (13): Meta-analysis for weight changes.

Study	Before	After	SMD	SE	95% CI
Rosa et al., 2019	120.8±24.2	73.1±27.8	1.824	0.162	1.504 to 2.144
Runz 2015	126.4±22.24	76.83±30.9	1.828	0.226	1.380 to 2.276
Bertheuil 2014	122.4±20	76.4±23.6	2.063	0.377	1.301 to 2.826
Azin, 2013	137.64±39	76.08±24.87	1.802	0.514	0.722 to 2.883
Total (fixed effects)			1.848	0.121	1.611 to 2.086
Total (random effects)			1.848	0.121	1.611 to 2.086
Test for heterogeneity:					
Q		0.3635			
DF		3			
Significance level		0.9477			
I2 (inconsistency)		0.0%			
95% CI for I2		0.00 - 0.00			

Q: Total variance for heterogeneity.
I^2: Observed variance for heterogeneity.
CI: Confidence interval (LL: Lower limit-UL: Upper Limit).
SMD: Standardized Mean Difference.

Table (14): Shows Meta-analysis for weight changes, 4 studies included, weight before massive weight loss (Before), weight after massive weight loss (After).

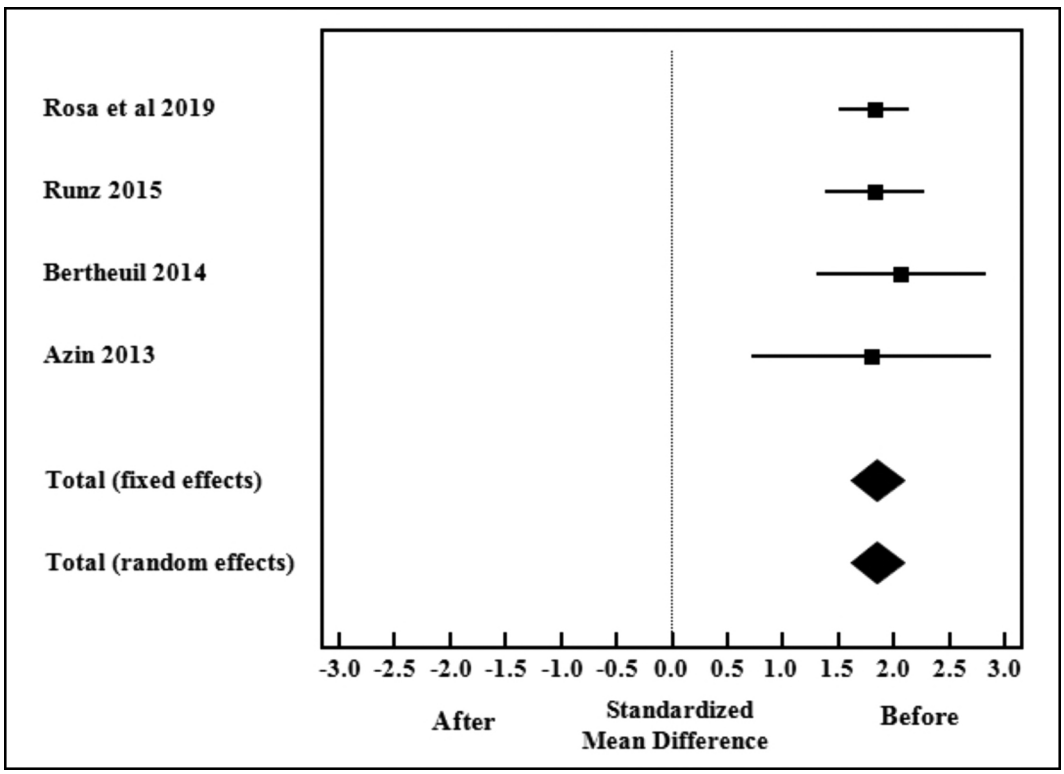

Fig. (6): Forest plot for weight.

Discussion

The purpose of this systematic review was to ascertain whether or not patients who received body contouring procedures after significant weight loss following bariatric surgery saw an improvement in quality of life and self-image. Online databases PubMed (PM), Web of Science, Scopus, and Egyptian Universities Libraries Consortium were all thoroughly searched (EULC). All eligible records' reference lists were manually checked for any additional pertinent records, study validity was determined using the PRISMA template, and conventional meta-analysis was carried out.

In patients at various stages of weight loss, abdominal BCS like panniculectomy and abdominoplasty are becoming more popular because they may enhance functional status and/or remove excess skin in addition to causing additional weight loss, which is crucial for post-bariatric patients who are still overweight **[11]**.

Procedures on the breast, thighs, or back are likely to come next in post-bariatric patients, with abdominoplasty being the most popular and preferred BCS operation overall. The majority of participants wanted BCS, and when asked which body site they chose for surgery, the abdomen was likewise the top choice for post-bariatric patients who did not have any BCS **[12-16]**.

Patients who had at least one BCS prior had a greater willingness for BCS Stuerz et al., **[17]**, Vierhapper et al., **[18]**.

At the 4- or 5-year visits, patients reported having a significant desire for BCS in the waist/abdomen, thighs, and chest/breast. This desire was linked to greater depression levels and worsened HRQoL scores, according to the Longitudinal Assessment of Bariatric Surgery (LABS)-2 study **[19]**.

Although BCS carries some surgical risks, leaves noticeable scars, and may result in problems, it appears that post-BCS patients will seek another BCS with less reluctance when confronted with excess skin in other regions due to a favourable risk-benefit ratio **[20]**.

Song et al. **[10]** also noted that after the initial operation, patients frequently ask for another BCS.

According to a study by Cintra et al. **[21]**, patients who want more treatments might not express unhappiness with their BCS results .

Many research looked into the disparity between the number of patients who wanted BCS and those who actually got it. The desire for BCS group had the greatest unemployment rate and the lowest income level when the relationship between income level and whether or not to choose BCS was examined; as a result, cost appeared to be the primary deterrent to not having BCS and/or not contacting a cosmetic surgeon **[22]**.

The BODY-Q focused on psychological well-being, social functioning, sexual well-being, and body image domains, whereas the short form (SF-36) included physical functioning, physical role, bodily pain, general health, vitality, social functioning, emotional role, and mental health subscales. The composition of comprehensive questionnaires also varied **[23]**.

Health-related quality of life (HRQoL) is a broad notion that is intricately influenced by an individual's physical and mental health, amount of independence, social connections, religious convictions, and interaction with key environmental elements **[24]**.

The authors noted that although patients were generally content with their appearance, they expressed dissatisfaction with particular body regions (such as the abdomen and breast), which they ranked lower because they wished they had BCS. Another study Zwaan et al., **[25]**.

That indicated the mid-torso (abdominal) area was the only section of the body that differed between the non-BCS and post-BCS groups validated this inconsistent satisfaction with the appearance of various body areas.

The quality of life is a significant consideration for people considering bariatric surgery. Self-esteem is the area of quality of life that is most impacted in patients with a BMI more than 40kg/m^2, particularly in women between the ages of 35 and 64 **[26]**.

The first few years following bariatric surgery saw a significant improvement in self-esteem, but this increases with MWL and the appearance of excess skin **[27]**.

In order to attain the objectives of their lifestyle changes-improving health, quality of life, and self-confidence-patients do require additional treatment in the post-MWL phase. According to numerous research in this study, patients who undergo BCS report better self-esteem and confidence in addition to improvements in their body image **[28]**.

The finding that BS patients who receive BCS have a better result than those who do not could be attributed to a variety of causes. Through increased motivation and the drive to achieve or keep a better appearance, the BCS's improvement in health-related quality of life helps patients lose weight more effectively **[29]**.

Such surgery appears to have a good impact primarily on physical functionality and appearance, not on overall psychosocial status **[30]**.

Similar BCS-related subjects have been the subject of other systematic reviews. Despite confirming the good effects of BCS, particularly in regard to enhanced well-being, function, and quality of life, Gilmartin et al., **[31]**. systematic review possessed a number of serious flaws.

Only nine eligible cohort or descriptive studies with modest sample sizes were included, and two single-arm studies, Menderes et al., **[32]** that only included post-BCS patients and whose data were subject to recall bias were also included.

Despite focusing on post-bariatric and post-BCS patients, the study by de Vries et al., [33] sought to evaluate the effectiveness of the quality of life measurement tools that are now available. According to their findings, the BODY-Q had the best proof for the accuracy of its measurement properties, making it potentially suitable for recommendation in upcoming clinical trials.

Only 18.5% of respondents had had BCS, with prevalence rates ranging from 10.6% to 54.3%, according to cross-sectional research. More specifically, more than half of all cases involved an abdominal operation [34].

Excessive skin folds can change the appearance of the medial thighs, mid-abdomen, flanks, breasts, buttocks, and upper arms in an unfavourable way Mitchell et al., [35] Gurunluoglu, [36].

Excess skin can create intertriginous rashes, ulcers, difficulty moving around, interfere with daily activities, and negatively affect the physical aspects of health-related quality of life (HRQoL) [37].

Enhancing psychosocial functioning is one of the main objectives of weight loss surgery. Post-operatively, a drop could take place, though. Some post-bariatric patients claimed that the loose, sagging skin following significant weight reduction was to blame for problems in their mental health and social functioning [38].

The majority of the research included in this review also mentioned an improvement in psychosocial function. According to studies, people who had BCS had much lower levels of anxiety and depression than those who did not Al-Hadithy et al., [39].

The majority of patients were happy with the outcomes of the BCS operations, but they frequently voiced their complaints about the extra skin that was left on their thighs, chests, or upper arms, which could have a detrimental effect on their mental health and social lives. Additionally, after BCS, patients reported advancements in their careers and relationship status Al-Hadithy et al., [39].

However, Toma et al., [40] conducted a systematic evaluation on the impact of BCS on post-bariatric patients' quality of life and found that the procedure reduced BMI by 2 points (–1.99, 95% CI [2.99, 0.98]).

Because patients are encouraged to shed more weight through exercise as they restore their physical functionality, the removal of extra skin and soft tissue may help patients achieve better weight loss results Toma et al., [40].

De Vries et al., [41] also stated that BCS may help to enhance the long-term management of co-morbidities associated with obesity. On the other hand, post-bariatric patients with or without body contouring surgery were shown to have identical signs of pre-existing psychiatric problems, such as depression and anxiety.

Limitations:

One of the most challenging research projects in plastic surgery is a systematic review, which applies Evidence-Based Medicine (EBM). The reason for this is that plastic surgery journals publish extremely few randomised clinical trials.

Even while EBM is a fantastic tool for assessing previously published content and producing reliable results when the data are submitted to meta-analysis, choosing high-quality studies is a very difficult undertaking.

Since journals began to demand studies with higher quality patient selection and with a defined criterion of randomization, this is why the main contribution of EBM in plastic surgery over the past ten years was in the improvement of future publications.

It is well known that among the top plastic surgery publications, articles with greater levels of evidence are typically mentioned more frequently than those with lower levels of evidence.

As files were utilised to gather the data for the retrospective studies used in this review, there may be some bias in the data collection process. Ideally, just one type of plastic surgery for patients who have had significant weight loss (MWL) should have been included in the selection of articles.

While the patient would gain weight following breast augmentation surgery, more skin and subcutaneous tissue is often removed with an abdominoplasty. In these patients, weight loss is therefore not necessarily a result of body sculpting surgery.

Finding papers in plastic surgery to use in EBM studies with all patients who have similar operations is a difficult undertaking, particularly for MWL patients who need numerous treatments of varying character.

The large range of bariatric surgery (BS) types undoubtedly had an impact on the outcomes. The issue we perceive is that these procedures may

result in varying amounts of weight loss, which may have an impact on the study's findings as the controls and patients were probably not paired.

Conclusion:

The evidence in this review strongly supports the additional long-term advantages of body contouring surgery for specific patients who have undergone bariatric surgery and have lost a significant amount of weight. The current review also showed that BCS in postbariatric patients leads to statistically significant improvements in a number of QOL indicators.

Acknowledgments:

Authors would like to thanks to Ain Shams University and the patients recruited in the study.

Funding: No funding sources.

Conflict of interest: None declared.

Ethical approval: The study was approved by the Institutional Ethics Committee.

References

1- FERRY A.M., CHAMATA E., DIBBS R.P. and RAPPAPORT N.H.: Avoidance and correction of deformities in body contouring. InSeminars in Plastic Surgery, May (Vol. 35, No. 02, pp. 110-118). Thieme Medical Publishers, Inc., 2021.

2- BIANCIARDI E., DI LORENZO G., NIOLU C., BETRÒ S., ZERBIN F., GENTILESCHI P. and SIRACUSANO A.: Body image dissatisfaction in individuals with obesity seeking bariatric surgery: Exploring the burden of new mediating factors. Rivista di Psichiatria., Jan 1; 54 (1): 8-17, 2019.

3- SARMA S., SOCKALINGAM S. and DASH S.: Obesity as a multisystem disease: Trends in obesity rates and obesity-related complications. Diabetes, Obesity and Metabolism. Feb. 23: 3-16, 2021.

4- IVEZAJ V. and GRILO C.M.: The complexity of body image following bariatric surgery: A systematic review of the literature. Obesity reviews, Aug. 19 (8): 1116-40, 2018.

5- VAN DER BEEK E.S., TE RIELE W., SPECKEN T.F., BOERMA D. and VAN RAMSHORST B.: The impact of reconstructive procedures following bariatric surgery on patient well-being and quality of life. Obesity Surgery, Jan. 20 (1): 36-41, 2010.

6- PAUL M.A., OPYRCHAL´ J., KNAKIEWICZ M., JAREMKÓW P., DUDA-BARCIK L´, IBRAHIM A.M. S. and LIN S.J.: The long-term effect of body contouring procedures on the quality of life in morbidly obese patients after bariatric surgery. PLoS One, Feb. 21; 15 (2): e0229138, 2020.

7- AZIN A., ZHOU C., JACKSON T., CASSIN S., SOCKALINGAM S. and HAWA R.: Body contouring surgery after bariatric surgery: A study of cost as a barrier and impact on psychological well-being. Plastic and reconstructive surgery, Jun. 1; 133 (6): 776e-82e, 2014.

8- MONPELLIER V.M., ANTONIOU E.E., MULKENS S., JANSSEN I.M., JANSEN A.T. and VAN DER MOLEN A.B.: Body Contouring Surgery after Massive Weight Loss: Excess Skin, Body Satisfaction, and Qualification for Reimbursement in a Dutch Post-Bariatric Surgery Population. Plastic and Reconstructive Surgery, May 1; 143 (5): 1353-60, 2019.

9- SINGH D., ZAHIRI H.R., JANES L.E., SABINO J., MATTHEWS J.A., BELL R.L. and THOMSON J.G.: Mental and physical impact of body contouring procedures on post-bariatric surgery patients. Eplasty, 12, 2012.

10- SONG P., PATEL N.B., GUNTHER S., LI C.S., LIU Y., LEE C.Y., KLUDT N.A., PATEL K.B., ALI M.R. and WONG M.S.: Body image and quality of life: Changes with gastric bypass and body contouring. Annals of plastic surgery, May 76 (Suppl 3): S216, 2016.

11- CORIDDI M.R., KOLTZ P.F., CHEN R. and GUSENOFF J.A.: Changes in quality of life and functional status following abdominal contouring in the massive weight loss population. Plastic and Reconstructive Surgery, Aug. 1; 128 (2): 520-6, 2011.

12- DERDERIAN S.C., PATTEN L., KAIZER A.M., INGE T.H., JENKINS T.M., MICHALSKY M.P., XIE C., DEWBERRY L.C. and SITZMAN T.J.: Body contouring in adolescents after bariatric surgery. Surgery for Obesity and Related Diseases, Jan. 1; 16 (1): 137-42, 2020.

13- STAALESEN T., OLBERS T., DAHLGREN J., OLSÉN M.F., FLODMARK C.E., MARCUS C. and ELANDER A.: Development of excess skin and request for body-contouring surgery in postbariatric adolescents. Plastic and Reconstructive Surgery, Oct. 1; 134 (4): 627-36, 2014.

14- STAALESEN T., FAGEVIK OLSÉN M. and ELANDER A.: Experience of excess skin and desire for body contouring surgery in post-bariatric patients. Obesity Surgery, Oct. 23 (10): 1632-44, 2013.

15- KITZINGER H.B., ABAYEV S., PITTERMANN A., KARLE B., BOHDJALIAN A., LANGER F.B., PRAGER G. and FREY M.: After massive weight loss: Patients' expectations of body contouring surgery. Obesity Surgery, Apr. 22 (4): 544-8, 2012.

16- KLASSEN A.F., KAUR M., BREITKOPF T., THOMA A., CANO S. and PUSIC A.: Using the BODY-Q to understand impact of weight loss, excess skin, and the need for body contouring following bariatric surgery. Plastic and Reconstructive Surgery, Jul 1; 142 (1): 77-86, 2018.

17- STUERZ K., PIZA H., NIERMANN K. and KINZL J.F.: Psychosocial impact of abdominoplasty. Obesity Surgery, Jan. 18 (1): 34-8, 2008.

18- VIERHAPPER M.F., PITTERMANN A., HACKER S. and KITZINGER H.B.: Patient satisfaction, body image, and quality of life after lower body lift: A prospective pre-and postoperative long-term survey. Surgery for Obesity and Related Diseases, May 1; 13 (5): 882-7, 2017.

19- MAREK R.J., STEFFEN K.J., FLUM D.R., POMP A., PORIES W.J., RUBIN J.P., WOLFE B.M. and MITCHELL J.E.: Psychosocial functioning and quality of life in patients with loose redundant skin 4 to 5 years after

bariatric surgery. Surgery for Obesity and Related Diseases, Nov. 1; 14 (11): 1740-7, 2018.

20- KRAUSS S., MEDESAN R., BLACK J., MEDVED F., SCHAEFER R., SCHALLER H.E., DAIGELER A. and WAHLER T.: Outcome of body-contouring procedures after massive weight loss. Obesity Surgery, Jun. 29 (6): 1832-40, 2019.

21- CINTRA W., MODOLIN M.L., GEMPERLI R., GOBBI C.I., FAINTUCH J. and FERREIRA M.C.: Quality of life after abdominoplasty in women after bariatric surgery. Obesity Surgery, Jun. 18 (6): 728-32, 2008.

22- SONG A.Y., JEAN R.D., HURWITZ D.J., FERNSTROM M.H., SCOTT J.A. and RUBIN J.P.: A classification of contour deformities after bariatric weight loss: The Pittsburgh Rating Scale. Plastic and Reconstructive Surgery, Oct. 1; 116 (5): 1535-44, 2005.

23- RUZ M.E., MOMANI A. and SHAJRAWI A.A.: Vitamin D mediates the relationship between depressive symptoms and quality of life among patients with heart failure. Journal of Cardiovascular Nursing, Mar. 1; 36 (2): 185-92, 2021.

24- MODARRESSI A., BALAGUE N., HUBER O., CHILCOTT M. and PITTET-CUÉNOD B.: Plastic surgery after gastric bypass improves long-term quality of life. Obesity Surgery, Jan. 23 (1): 24-30, 2013.

25- DE ZWAAN M., GEORGIADOU E., STROH C.E., TEUFEL M., KÖHLER H., TENGLER M. and MÜLLER A.: Body image and quality of life in patients with and without body contouring surgery following bariatric surgery: A comparison of pre-and post-surgery groups. Frontiers in Psychology, Nov. 18; (5): 1310, 2014.

26- LARSSON U., KARLSSON J. and SULLIVAN M.: Impact of overweight and obesity on health-related quality of life-a Swedish population study. International Journal of Obesity, Mar. 26 (3): 417-24, 2002.

27- SARWER D.B. and FABRICATORE A.N.: Psychiatric considerations of the massive weight loss patient. Clinics in Plastic Surgery, Jan. 1; 35 (1): 1-0, 2008.

28- KOLLER M., SCHUBHART S. and HINTRINGER T.: Quality of life and body image after circumferential body lifting of the lower trunk: A prospective clinical trial. Obesity Surgery, Apr. 23 (4): 561-6, 2013.

29- POULSEN L., KLASSEN A., ROSE M., ROESSLER K.K., JUHL C.B., STØVING R.K. and SØRENSEN J.A.: Patient-reported outcomes in weight loss and body contouring surgery: A cross-sectional analysis using the BODY-Q. Plastic and Reconstructive Surgery, Sep. 1; 140 (3): 491-500, 2017.

30- BOLTON M.A., PRUZINSKY T., CASH T.F. and PERSING J.A.: Measuring outcomes in plastic surgery: Body image and quality of life in abdominoplasty patients. Plastic and Reconstructive Surgery, Aug. 1; 112 (2): 619-25, 2003.

31- GILMARTIN J., BATH-HEXTALL F., MACLEAN J., STANTON W. and SOLDIN M.: Quality of life among adults following bariatric and body contouring surgery: A systematic review. JBI Evidence Synthesis, Nov. 1; 14 (11): 240-70, 2016.

32- MENDERES A., BAYTEKIN C., HACIYANLI M. and YILMAZ M.: Dermalipectomy for body contouring after bariatric surgery in Aegean region of Turkey. Obesity Surgery, Aug. 13 (4): 637-41, 2003.

33- DE VRIES C.E., KALFF M.C., PRINSEN C.A., COULMAN K.D., DEN HAAN C., WELBOURN R., BLAZEBY J.M., MORTON J.M. and VAN WAGENSVELD B.A.: Recommendations on the most suitable quality of life measurement instruments for bariatric and body contouring surgery: A systematic review. Obesity Reviews, Oct. 19 (10): 1395-411, 2018.

34- KITZINGER H.B., ABAYEV S., PITTERMANN A., KARLE B., KUBIENA H., BOHDJALIAN A., LANGER F.B., PRAGER G. and FREY M.: The prevalence of body contouring surgery after gastric bypass surgery. Obesity Surgery, Jan. 22 (1): 8-12, 2012.

35- MITCHELL J.E., CROSBY R.D., ERTELT T.W., MARINO J.M., SARWER D.B., THOMPSON J.K., LANCASTER K.L., SIMONICH H. and HOWELL L.M.: The desire for body contouring surgery after bariatric surgery. Obesity Surgery, Oct. 18 (10): 1308-12, 2008.

36- GURUNLUOGLU R.: Panniculectomy and redundant skin surgery in massive weight loss patients: Current guidelines and recommendations for medical necessity determination. Annals of Plastic Surgery, Dec. 1; 61 (6): 654-7, 2008.

37- REICHENBERGER M.A., STOFF A. and RICHTER D.F.: Dealing with the mass: A new approach to facilitate panniculectomy in patients with very large abdominal aprons. Obesity Surgery, Dec. 18 (12): 1605-10, 2008.

38- VAN HOUT G., BOEKESTEIN P., FORTUIN F.A., PELLE A.J. and VAN HECK G.L.: Psychosocial functioning following bariatric surgery. Obesity Surgery. Jun. 16 (6): 787-94, 2006.

39- AL-HADITHY N., ADITYA H. and STEWART K.: Does the degree of ptosis predict the degree of psychological morbidity in bariatric patients undergoing reconstruction?. Plastic and Reconstructive Surgery, Nov. 1; 134 (5): 942-50, 2014.

40- TOMA T., HARLING L., ATHANASIOU T., DARZI A. and ASHRAFIAN H.: Does body contouring after bariatric weight loss enhance quality of life? A systematic review of QOL studies. Obesity Surgery, Oct. 28 (10): 3333-41, 2018.

41- DE VRIES C.E., KALFF M.C., VAN PRAAG E.M., FLORISSON J.M., RITT M.J., VAN VEEN R.N. and DE CASTRO S.M.: The influence of body contouring surgery on weight control and comorbidities in patients after bariatric surgery. Obesity Surgery, Mar. 30 (3): 924-30, 2020.

تأثير نحت الجسم بعد فقدان الوزن الهائل بسبب جراحة السمنة على جودة الحياة وصورة الجسم: مراجعة منهجية

تظل جراحة علاج البدانة الحل الأكثر فعالية لفقدان الوزن بالنسبة للأشخاص الذين يعانون من السمنة المفرطة. إن الجلد المترهل هو عرض منتشر بعد عمليات إنقاص الوزن. يؤدى التغيير المفاجئ فى مؤشر كتلة الجسم بعد فقدان الوزن السريع إلى إنخفاض لون البشرة ويؤدى إلى فشل الأنسجة الرخوة الزائدة فى الرجوع للحجم الأصلى، مما يؤدى إلى ظهور جلد زائد عن الحاجة. لم يتم تسجيل أى ارتباط بين الجلد الزائد ورضا المريض عن مظهره. والمثير للدهشة أن المرضى الذين يعانون من السمنة المفرطة يصبحون أقل رضا عن صورة أجسامهم مع زيادة فقدان الوزن. تعد جودة الحياة وصورة الجسم من أهم جوانب رضا المريض بعد الجراحة التجميلية ولقد ثبت أن الإنقاص الجراحى للوزن مفيد إلى حد ما من حيث صورة الجسم ووظيفته.

هدفت هذه الدراسة إلى تحديد ما إذا كانت عمليات نحت الجسم بعد فقدان الوزن الهائل فى مرضى ما بعد جراحة السمنة تحسن نوعية الحياة وصورة الجسم أم لا عن طريق إجراء دراسة مراجعة منهجية.

فى الختام، فإن الأدلة المقدمة فى هذه الدراسة تدعم بقوة الفوائد الإضافية طويلة الأجل لجراحة نحت الجسم لمرضى مختارين بعد فقدان الوزن الهائل بعد جراحة علاج البدانة وأظهرت الدراسة الحالية أن جراحة نحت الجسم فى مرضى ما بعد السمنة تؤدى إلى تحسينات ذات دلالة إحصائية فى العديد من المؤشرات جودة الحياة.