Reduction Mammaplasty is not Associated with a Decrease in BMI for Overweight or Obese Women

Paige Myers and Jose Guillherme Christiano

University of Rochester Medical Center, Rochester, NY 14642, USA

Corresponding author: Paige Myers

✉ paige_myers@urmc.rochester.edu

Plastic Surgery Resident, University of Rochester Medical Center, Rochester, NY 14642, USA.

Tel: 315-286-3481

Abstract

Introduction: Reduction mammaplasty can be a life-changing event for women with symptomatic macromastia. Many women experience improvement in physical symptoms, including resolution of neck, back and shoulder pain. There are other reported positive changes, including more physical activity, improved glucose control and a self-confidence. Adolescents have demonstrated weight loss following reduction mammaplasty but there is little objective data in the adult population.

Methods: After obtaining institutional review board approval, eligible patients were identified in our institution's electronic record database, eRecord (Epic; Madison, WI). Eligible subjects were identified using i2b2 software for the diagnosis of macromastia (ICD-9 611.1) and the CPT code for reduction mammaplasty (19318). A retrospective study chart review was performed from June 1, 2011 to time September 30, 2015 for97 women. The mean BMI was calculated at different time intervals post-operatively, including 1 week, 1 month, 3 months, 6 months, 12 months, 1 year, 2 years and 2+ years. The BMI values for each patient were then compared to the 1 week postoperative BMI. The change was then analyzed to determine if there was any significant weight loss.

Results: There is a slight increase in BMI with increasing post-operative time (mean of 31.934 at one week compared to 33.255 2+ years) although this is not statistically significant. The lowest 50% of patients based on baseline-BMI was compared with the highest 50% of patients; each group showing no significant difference over time. Similar analyses using a mixed-effects model were performed given the longitudinal nature of the data, however this also showed that there was no significant change.

Conclusion: Despite well-document physical and psychological improvements following reduction mammaplasty, there is no statistically significant BMI decrease for women of all BMIs at time points from 1 month to more than 2 years when compared to their 1- week post-op BMI.

Keywords: Mammaplasty; Adolescents; Diagnosis; Psychological

Citation: Myers P, Christiano JG. Reduction Mammaplasty is not Associated with a Decrease in BMI for Overweight or Obese Women. J Aesthet Reconstr Surg. 2017, 3:1.

Introduction

Reduction mammaplasty can be a life-changing event for women with symptomatic macromastia. Many patients experience after surgery improvement or resolution of physical symptoms and other preoperative complaints, including neck, back and shoulder pain, intertrigo and shoulder grooving [1-5]. There is also evidence that reduction mammaplasty may result in correction of vertebral abnormalities [6,7]. Women presenting with macromastia are often less healthy, engage in less physical activity, and exhibit lower levels of self-esteem when compared to age-matched controls without the diagnosis [3]. This could set the stage for postoperative benefits beyond physical pain relief. In fact, other authors have reported increase in physical

activity, improvement in glucose control with decreased insulin resistance, and increase in level of self-confidence [1-9]. The goal of our study was to determine whether reduction mammaplasty was associated with a drop in BMI in macromastia patients.

Methods

Approval for retrospective chart review was obtained from our institutional review board (RSRB 00059571). Eligible patients were identified in our institution's electronic record database, eRecord (Epic; Madison, WI), using i2b2 software (Partners Health Care; Boston, MA) for querying. All women who underwent bilateral reduction mammaplasty for macromastia between June of 2011 (implementation of eRecord in our institution) and September of 2015 were included. They were identified by searching for the diagnosis of macromastia (ICD-9 611.1) under Encounter Diagnoses, Past Medical History, or Problem List, and the CPT code for reduction mammaplasty (19318) under Procedures. Women were excluded from analysis if they were under the age of 18, if they became pregnant, or were diagnosed with malignancy within the study period, or if there was insufficient documentation in the electronic record database.

The charts of ninety-seven patients who met our study's inclusion criteria were reviewed. The mean BMI was calculated for all 97 patients included in the study at different time intervals post-operatively, including 1 week, 1 month, 3 months, 6 months, 12 months, 1 year, 2 years and greater than two years. The BMI values for each patient at the aforementioned time intervals were then compared to the 1 week post-operative BMI (to account for the weight of the tissue removed). This change in BMI was then analyzed to determine if there was any significant change. All analyses were carried out using SAS/STAT v9.4 (SAS Institute Inc.; Cary, NC).

Results

For preliminary exploration, the change in mean BMI was examined at each follow-up time, using 1-week post-operative BMI as the baseline and following through 2 years and greater post-operative BMI. There is a slight increase in BMI with increasing post-operative time (mean of 31.934 at one week post-operative compared to 33.255 2+ years post-operative) although this relationship is not significant **(Table 1)**.

To investigate this relationship further, the time trend of the lowest 50% of patients based on baseline-BMI was compared with the highest 50% of patients based on BMI. Looking at patients who comprise the lower 50% of baseline BMIs, it is apparent that through three months after surgery, the average BMI is relatively maintained and unchanging. This is followed by an increase in BMI after three months post-operatively. There is large variability in these estimates, as illustrated in the 95% confidence interval bands, indicating no significant difference over time **(Table 2)**.

For patients who comprise the higher 50% of baseline BMIs, there is an increase in BMI over time, with a slight decrease at six months after surgery **(Table 3)**. Note that as more time elapses from date of the operation, there is less BMI information for fewer patients. In particular, the fewest observations at later time points are for patients who originally were in the lowest 50% of BMIs. Thus, when looking at later time periods, most of the subjects examined already started with a higher BMI. As a result, overall summary results to also appear higher than what may have been the case if all BMI measurements were observed. Additionally, by twelve months after surgery, there is only a total of 37 observations—16 of which were from the lower 50% and 21 were from the higher 50%—compared to the 97 observations at one week after surgery. With such small samples sizes, there is no significant change in BMI over time.

Since the data is longitudinal in structure, with patients being followed over time, a mixed-effects model with independent correlation structure was employed to incorporate the correlated nature of the data. This analysis was restricted to include BMI observations up through and including twelve months post-

Table 1: Mean BMI from 1 week post-op to +2 years post-op.

Time (post-op)	N	N Miss	Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
1 week	97	0	31.9337073	5.8901688	30.7465755	33.1208392
1 month	85	12	31.9928383	5.8646335	30.7278662	33.2578104
3 months	73	24	32.4581355	6.3609511	30.9740158	33.9422552
6 months	56	41	32.5591754	5.5282797	31.0786925	34.0396584
12 months	42	55	33.3060786	5.8668998	31.4778240	35.1343333
2 years	42	55	33.0400511	6.2180927	31.1023570	34.9777452
+2 years	37	60	33.2545510	5.6579919	31.3680826	35.1410194

Table 2: Trend of mean BMI from 1 week post-op to +2 years post-op, lower 50% BMI category.

Time of Visit (post-operative)	N Obs	N	N Miss	Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
1 week	49	49	0	27.4588956	2.5256041	26.7334574	28.1843338
1 month	49	43	6	27.4041576	2.4996681	26.6348733	28.1734419
3 months	49	35	14	27.4854026	2.8609938	26.5026168	28.4681883
6 months	49	25	24	27.9292590	3.1596298	26.6250279	29.2334900
12 months	49	18	31	28.1025020	3.0719489	26.5748578	29.6301463
2 years	49	20	29	28.4694471	3.0051369	27.0629997	29.8758944
2+ years	49	16	33	28.5031039	3.1541137	26.8223953	30.1838125

operatively to alleviate some issues with missing data at later time periods. Although again, there is no significance in this study (p=0.5656). These analyses also indicate that no significant change occurs in BMI over time. In fact, there is no significant pairwise difference between any two time points **(Table 4)** Examining each of the BMI groups (i.e., lower 50% and upper 50%) separately, similar results of no significant change in BMI over time were discovered **(Tables 5 and 6)**.

Discussion

Many other authors have reported physical and psychological improvements following reduction mammoplasty [1-9]. However, we found no statistically significant decrease in BMI following breast reduction in women of all included BMIs at any time interval. At 1 month, the mean BMI was 31.9928, compared to 31.9337 at one week, which is not significant. Similarly, at 3 months (BMI 32.4581), 6 months (BMI 32.5591), 1 year (BMI 33.3060), 2 years (BMI 33.0401) and more than 2 years (BMI 33.2545) there was no statistically significant change

in BMI compared with 1 week post-op (BMI 31.9337) **(Table 1)**. Clinically, there was a slight increase in BMI, although this was not statistically significant (mean of 31.9928 at one week post-operative compared to 33.0401) greater than 2+ years post-operatively. Given the correlated nature of the data following patients over a period of time, all intervals were compared to assess if a relationship exists with BMI, however there was no pairwise significance in this study (p=0.5656).

Similar results have been reported by Pauzenberger et al. [10]. In this study, only 50 women were retrospectively studied. It was discovered that 26 subjects gained weight and 18 lost weight, while 6 remained stable. The average weight loss was 3.5 kg (7.72 pounds) and the average weight gain was 4.5 kg (9.92 pounds). Neither weight gain nor loss was statistically significant.

Pike et al. studied adolescents undergoing breast reduction and also found no significant difference between mean pre-operative and post-operative BMIs overall, although overweight and obese patients progressed with significant weight gain post-operatively

Table 3: Trend of mean BMI from 1 week post-op to +2 years post-op, upper 50% BMI category.

Time of Visit (post-operative)	N Obs	N	N Miss	Mean	Std Dev	Lower 95% CL for Mean	Upper 95% CL for Mean
1 week	48	48	0	36.5017443	4.7077772	35.1347483	37.8687403
1 month	48	42	6	36.6907733	4.4014602	35.3191818	38.0623649
3 months	48	38	10	37.0382843	5.1262575	35.3533254	38.7232432
6 months	48	31	17	36.2929790	3.9716571	34.8361634	37.7497946
12 months	48	24	24	37.2087611	4.1592336	35.4524708	38.9650514
2 years	48	22	26	37.1951457	5.4161635	34.7937534	39.5965381
2+ years	48	21	27	36.8747012	4.2825323	34.9253159	38.8240865

Table 4: Pairwise comparison of post-operative BMI at all-time points post-operatively.

	Time of Visit (post-op)	Estimate	Standard Error	DF	t Value	Pr>|t|
1 month	1 week	0.04470	0.1824	251	0.25	0.8065
1 month	12 months	-0.1760	0.2427	251	-0.73	0.4690
1 month	3 months	-0.2184	0.1993	251	-1.10	0.2741
1 month	6 months	-0.2145	0.2184	251	-0.98	0.3269
1 week	12 months	-0.2207	0.2374	251	-0.93	0.3534
1 week	3 months	-0.2631	0.1929	251	-1.36	0.1739
1 week	6 months	-0.2592	0.2141	251	-1.21	0.2271
12 months	3 months	-0.04244	0.2466	251	-0.17	0.8635
12 months	6 months	-0.03854	0.2581	251	-0.15	0.8814
3 months	6 months	0.003899	0.2249	251	0.02	0.9862

Table 5: Lower 50% pairwise comparison of mean BMIs at all-time points post-operatively.

Time of Visit (post-op)	Time of Visit (post-op)	Estimate	Standard Error	DF	t Value	Pr>|t|
1 month	1 week	0.05848	0.1412	116	0.41	0.6796
1 month	12 months	-0.2338	0.2013	116	-1.16	0.2478
1 month	3 months	-0.09282	0.1570	116	-0.59	0.5554
1 month	6 months	-0.2740	0.1783	116	-1.54	0.1270
1 week	12 months	-0.2922	0.1969	116	-1.48	0.1405
1 week	3 months	-0.1513	0.1527	116	-0.99	0.3238
1 week	6 months	-0.3325	0.1755	116	-1.89	0.0607
12 months	3 months	0.1409	0.2045	116	0.69	0.4921
12 months	6 months	-0.04024	0.2189	116	-0.18	0.8545
3 months	6 months	-0.1812	0.1839	116	-0.99	0.3265

Table 6: Upper 50% pairwise comparison of mean BMIs at all-time points post-operatively.

Time of Visit (post-op)	Time of Visit (post-op)	Estimate	Standard Error	DF	t Value	Pr>|t|
1 month	1 week	0.03650	0.3318	131	0.11	0.9126
1 month	12 months	-0.1323	0.4165	131	-0.32	0.7513
1 month	3 months	-0.3261	0.3567	131	-0.91	0.3623
1 month	6 months	-0.1507	0.3795	131	-0.40	0.6921
1 week	12 months	-0.1688	0.4072	131	-0.41	0.6792
1 week	3 months	-0.3626	0.3439	131	-1.05	0.2935
1 week	6 months	-0.1872	0.3705	131	-0.51	0.6143
12 month	3 months	-0.1939	0.4229	131	-0.46	0.6474
12 months	6 months	-0.01840	0.4344	131	-0.04	0.9663
3 months	6 months	0.1755	0.3898	131	0.45	0.6533

(22% of them increased BMI by at least 10%). These authors observed that 24% of overweight patients at surgery (BMI 25.0-29.9 kg/m^2) dropped post-operatively to the "healthy BMI" category (18.5-24.9 kg/m^2), and 38% of obese patients (BMI ≥30 kg/m^2) migrated down to the overweight category, with only 8% and 12% of patients changing BMI categories in the opposite direction, respectively [11]. As such, we also tiered the groups into the lowest 50% of patients based on baseline BMI was and the highest 50% of patients based on BMI. In the lower cohort, the 1 week post-operate mean BMI was 27.4589 **(Table 2)**. This value was not statistically significantly higher than the mean BMI values at all other time points, specifically 1 month (BMI 27.4042), 3 months (BMI 27.4854), 6 months (BMI 27.9292), 1 year (BMI 28.1025), 2 years (BMI 28.4694) and greater than 2 years (BMI 28.5031). **Table 5** illustrates no pairwise significance with any two time points and BMI within the lower 50% BMI cohort. The 1 week post-operative BMI for the higher 50% cohort was 36.5017 **(Table 3)**. Compared to the time intervals at 1 month (BMI 36.6908), 3 months (BMI 37.0383), 6 months (BMI 36.2928), 1 year (BMI 37.2088), 2 years (BMI 37.1951) and greater than 2 years (BMI 36.8747), this value was not statistically significant. Again, there is no pairwise significant difference between any two time points for the higher 50% BMI cohort **(Table 6)**. In contrast to the work by Pike et al, there was no clinical (or statistical) weight gain with time for this cohort.

Coriddi et al. reported that obese patients who underwent reduction mammaplasty with the intention of losing weight ultimately required bariatric surgery to achieve their weight loss goals [12]. Interestingly, Singh et al. divided their study participants in two groups based on whether or not patients perceived the upcoming surgery as a stimulus for future weight loss, and later found significant postoperative weight loss only in the group who did [3] We did not preoperatively screen our patients' motivation, but it could quite possibly be the most important factor towards meaningful weight loss in macromastia patients, with reduction mammaplasty taking an enabling role. Further studies in this direction are needed.

A shortcoming of the current analyses is the relatively small sample size, although to our knowledge this is the largest series of objective adult data in this population. Additionally, there is more missing BMI data for patients farther away from the date of surgery, specifically for patients who have the lowest BMI. This is likely due to the lack of follow-up in eRecord for healthy patients. Our method of collecting BMI data through eRecord is through all encounters where a weight was obtained, not just within Plastic Surgery. Therefore, patients with higher BMIs may have additional co-morbidities that warrant more frequent health care provider encounters for all reasons. Presumably healthier patients with lower BMIs, although still overnight (BMI 25.00-29.99) were lost to a relatively short follow-up period. Because of this non-ignorable missingness pattern and the relatively small sample of patients for which complete data is present, we are not able to find significant changes in BMI over time. Additionally, other factors that affect weight loss were not analyzed, such as other medical co-morbidities or age, level of physical activity and diet. Women may have experienced improvements in their health and cardiovascular status, although their BMI remained unchanged. A prospective study, specifically with strict BMI collection, different co-morbidities and exercise regimens over time tracked would be useful. Inclusion of a control group (perhaps nonsurgical patients with macromastia), which our current study lacks, could also provide an interesting comparison of weight changes and BMI over time.

Conclusion

Reduction mammoplasty is not associated with a decrease in BMI in patients with symptomatic macromastia. There was also no significant increase in BMI. Further studies are needed to compare the operated population to the nonoperated population as well as monitoring other metrics of health following surgery.

References

1   Güemes A, Pérez E, Sousa R, Gil I, Valcarreres MP, et al. (2016) Quality of Life and Alleviation of Symptoms After Breast Reduction for Macromastia in Obese Patients: Is Surgery Worth It? Aesthetic Plast Surg 40: 62-70.

2   O'Blenes CA, Delbridge CL, Miller BJ, Pantelis A, Morris SF, et al. (2006) Prospective study of outcomes after reduction mammaplasty: long-term follow-up. Plast Reconstr Surg 117: 351-358.

3   Singh KA, Pinell XA, Losken A (2010) Is reduction mammaplasty a stimulus for weight loss and improved quality of life? Ann Plast Surg 64: 585-587.

4   Miller BJ, Morris SF, Sigurdson LL, Bendor-Samuel RL, Brennan M , et al. (2005) Prospective study of outcomes after reduction mammaplasty. Plast Reconstr Surg 115: 1025-1031.

5   Singh KA, Losken A (2012) Additional benefits of reduction mammaplasty: a systematic review of the literature. Plast Reconstr Surg 129: 562-570.

6   Karabekmez FE (2014) Does reduction mammaplasty revert skeletal disturbances in the vertebral column of patients with macromastia? A preliminary study. Aesthetic Plast Surg 38: 104-112.

7   Berberoğlu Ö, Temel M, Türkmen A (2015) Effects of Reduction Mammaplasty Operations on the Spinal Column: Clinical and Radiological Response. Aesthetic Plast Surg 39: 514-252.

8   Uzun H, Bitik O, Baltu Y, Sönmez C, Kaymak OA (2015) The Effects of Reduction Mammaplasty on Serum Leptin Levels and Insulin Resistance. Int J Endocrinol.

9   Kececi Y, Sir E, Gungor M (2015) Patient-reported quality-of-life outcomes of breast reduction evaluated with generic questionnaires and the breast reduction assessed severity scale. Aesthet Surg J 35: 48-54.

10 Pauzenberger R, Bauer T, Kirchebner M, Pikula R, Verstappen R, et al. (2014) Reduction mammaplasty: outcome analysis based on bodyweight. Aesthetic Plast Surg 38: 120-128.

11 Pike CM, Nuzzi LC, DiVasta AD, Greene AK, Labow B (2015) Weight Changes After Reduction Mammaplasty in Adolescents. J Adolesc Health 57: 277-281.

12 Coriddi M, Koltz PF, Gusenoff JA (2011) Reduction mammaplasty, obesity, and massive weight loss: temporal relationships of satisfaction with breast contour. Plast Reconstr Surg 128: 643-650.