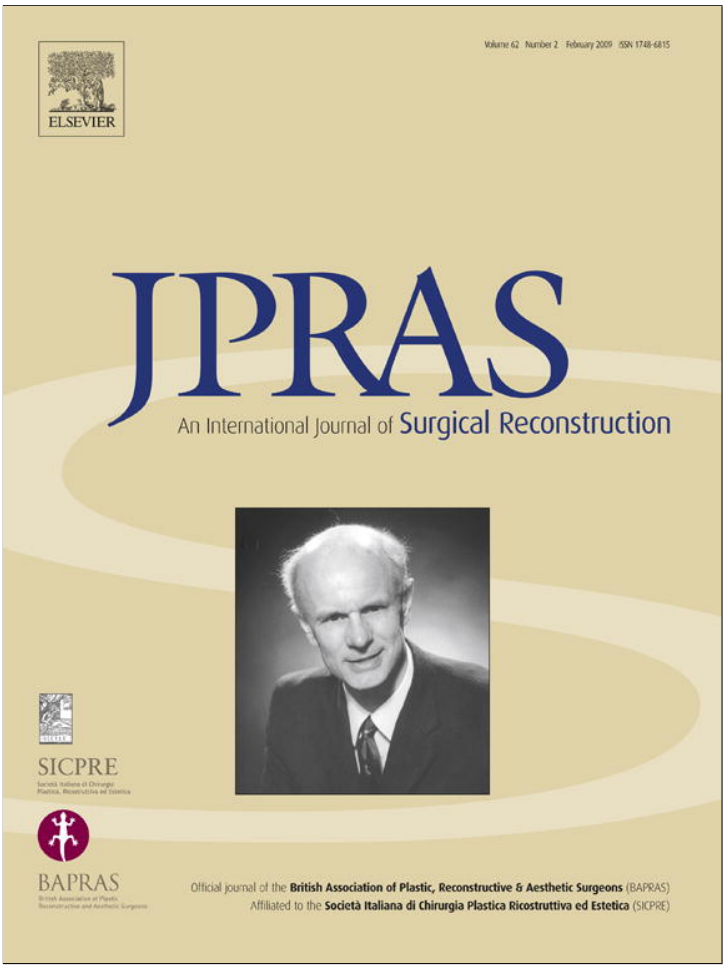

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Obesity and complications in breast reduction surgery: are restrictions justified?

L. Setälä*, A. Papp, S. Joukainen, R. Martikainen, L. Berg, P. Mustonen, M. Härmä

Department of Surgery, Division of Plastic and Reconstructive Surgery, Kuopio University Hospital, Kuopio, Finland

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Summary Breast reduction is effective in treating symptomatic macromastia. Access to surgery is sometimes limited for overweight and obese women for fear of complications. We studied the impact of body weight on postoperative complications in a consecutive series of 273 Finnish women who underwent breast reduction using either superior pedicle ($n = 94$) or inferior pedicle ($n = 175$) techniques; 78% of the patients were overweight (body mass index > 25). An inferiorly based pedicle was preferred in obese and big-breasted patients ($P < 0.001$), and the mean amount of resection per breast was greater using the inferior 2pedicle technique (888 g vs 431 g with superior pedicle technique, $P < 0.001$).

Postoperative complications were frequent (52%) but overall complication rate did not correlate with body weight, body mass index, age, surgical technique or surgeon's experience (consultant vs senior registrar). The most common complication was delayed healing due to superficial infection (26%), skin necrosis or wound dehiscence (18%), followed by deep infection (8%) and seroma formation (8%). In obese patients, areola necrosis was more frequent than in patients with normal weight (6% vs 0%, $P = 0.007$). The amount of resection and the distance between clavicle and areola were also associated with a risk of areola necrosis ($P < 0.05$). Seromas were more frequent after superior pedicle than after inferior pedicle reduction (14% vs 5%, $P = 0.019$). The use of antibiotics did not affect the infection risk. Surgical revisions were needed in 23% of the patients, for delayed healing (8.8%), haemorrhage (4.0%), deep infection (1.1%) and scars or puckers (13%). Reoperations were more frequent after operations performed by senior registrars (34% vs 16%, $P = 0.001$).

Our results indicate that obesity does not increase the complication risk in breast reduction surgery to the extent that access to reduction mammaplasty should be restricted based solely on body mass index.

* Corresponding author. Address: Department of Surgery, Kuopio University Hospital, PO Box 1777, 70211 Kuopio, Finland. Tel.: +358 17 173311; fax: +358 17 172611.
E-mail address: leena.setala@kuh.fi (L. Setälä).

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Symptomatic macromastia is defined as a syndrome of persistent neck and shoulder pain, painful shoulder grooving from brassiere straps, and frequent episodes of headache, backache and hand neuropathies caused by heavy breasts. The pain significantly decreases the patient's quality of life.[1] Breast reduction has provided long-term relief for most patients with high patient satisfaction.[2–4] The demand for this kind of plastic surgery is high and often exceeds the volume provided through public health care. In consequence, access to reduction mammaplasty has been limited by different measures, such as long waiting lists, as in Finland, or restricting the procedure to only women with normal body weight.[2,5] Many surgeons still find obesity a contraindication for breast reduction because a relationship between body weight and local complications has been reported in many studies.[6–9] However, in this rationing the potential benefits of surgery may not have been weighed against the disadvantages. The usual complications are minor, such as partial or superficial wound dehiscence, and infection and consequent scarring.[6–9] In these studies, the risk of major complications such as deep venous thrombosis or cardiopulmonary complications has been very small if at all. The purpose of this study was to investigate the complication risks in Finnish breast reduction patients with special reference to body weight.

Material and methods

The study was based on the data of 273 consecutive patients who underwent bilateral breast reduction during 1998–2003 in Kuopio University Hospital, which serves as a teaching hospital, and in two neighbouring central hospitals, where our senior consultants visit regularly for plastic surgical consultations. Data were collected in 2004 retrospectively from patient charts: body and breast dimensions were measured preoperatively and relative body weight (body mass index, BMI) was calculated. Postoperative complications were registered during the postoperative hospital stay and any later visit to the hospital, including the regular 6-month postoperative follow-up visit. Due to the retrospective nature of the data collection, no approval of an ethical committee was needed according to the local protocol.

Operative technique

The breast reduction technique was described as inferior pedicle technique (Robbins technique and its modifications) or superior pedicle technique (Lejour or Marchac or their modifications).[10–12] The technique was selected preoperatively based on the size of the breast and the distance between nipple and clavicle (measured from the midpoint of clavicle or from the jugulum), and to a lesser extent on the surgeon's preference of technique and patient's preference of the location of scars. All patients were operated under general anaesthesia, and local anaesthetic (0.5–1.0% lidocaine with epinephrine) was always infiltrated to the skin resection lines and breast tissue. Antithrombotic prophylaxis with low-molecular heparin was always given perioperatively but prophylactic antibiotic only occasionally. The resected breast tissue was weighed immediately after the resection. Suction drains were placed in both breasts and removed on the 1st or 2nd postoperative day before discharge from the hospital. In case of complications, the patients returned to the outpatient clinic of the hospital; small delays in wound healing were treated in the local health centres. In a regular follow-up visit at 6 months, the postoperative functional and aesthetic result was evaluated and, if considered necessary by the patient and surgeon, a corrective procedure was planned.

Statistical analysis

The data were analysed using a commercial software package (SPSS for Windows, 14.0, SPSS inc. Chicago, IL, USA). The results are presented as mean (range). The significance of the differences was tested with *t*-test, analysis of variance and Fisher's exact test. A *P*-value less than 0.05 was considered significant.

Results

The mean age of the patients was 43 years (17–70). Mean height and weight of the patients were 163 cm (140–180) and 75 kg (52–112), and mean BMI 28 kg/cm^2 (20–42). Most of the patients (78%) were overweight (BMI $>$ 25). Fifty-nine percent of the patients were operated on by consultants, and 41% by senior registrars. The inferior pedicle technique was used in 175 patients (64%) and the superior pedicle technique in 94 patients (34%); in four cases the technique was not registered. The mean amount of resected tissue from the right breast was 718 g (range 0–1920, SD 346) and 743 g from the left (range 69–2005, SD 363). The resection was significantly larger in obese and overweight patients compared to those with normal weight ($P < 0.001$). The inferior pedicle technique was preferred in obese patients and those with bigger breasts, and larger amounts of tissue were then removed (Table 1). The superior pedicle technique was highly preferred by senior surgeons, as 71% of the superior pedicle mammaplasties were done by consultants ($P = 0.009$).

Postoperative surgical complications were registered in 52% of the patients. The most usual complications were superficial infection with or without skin necrosis or wound dehiscence. No general complications, such as sepsis, deep

Table 1 Comparison of patients operated with superior or inferior pedicle technique

	Superior pedicle	Inferior pedicle	*t*-test
	Mean (SD)	Mean (SD)	(*P*)
Age (years)	43.6 (9.2)	42.9 (11.4)	0.093
Weight (kg)	70 (8)	78 (11)	0.007
Relative weight BMI	26.6 (2.7)	29.4 (3.9)	0.001
Resection (g, mean per breast)	431 (166)	888 (327)	0.000
Distance from clavicle to nipple (cm)	30.1 (2.3)	34.1 (3.3)	0.001

Table 2 Frequency of complications and reoperations among normal weight, overweight and obese patients

Complication	Overall (273 patients)		BMI						Exact test (*P*)
			20–25 (58 patients)		26–30 (149 patients)		31–42 (66 patients)		
Superficial infection	71	26.0%	11	19.0%	43	29.0%	17	26.0%	
Deep infection	23	8.4%	5	8.6%	10	6.7%	8	12.0%	0.565
Superficial and deep	1	0.3%	0		1	0.6%	0		
Skin necrosis	49	18.0%	13	22.0%	23	15.0%	13	20.0%	
Fat necrosis	8	2.9%	1	1.7%	3	2.0%	4	6.1%	0.481
Skin and fat necrosis	3	1.1%	0		2	1.3%	1	1.5%	
Areolar necrosis	7	2.6%	0		3	2.0%	4	6.1%	0.101
Haemorrhage	15	5.5%	5	8.6%	8	5.4%	2	3.0%	0.454
Seroma	22	8.1%	5	8.6%	15	10.0%	2	3.0%	0.213
Any complication	143	52.0%	29	50.0%	79	53.0%	35	53.0%	0.883
Reoperations									
Immediate	7	2.6%	3	5.2%	3	2.1%	1	1.6%	
One late	44	16.2%	13	22.5%	20	13.5%	11	16.7%	0.661
Two or more late	12	4.4%	1	1.8%	7	4.7%	4	6.1%	

venous thrombosis and pulmonary embolism, were registered. Prophylactic antibiotic was administered to 26% of the patients but was not related to the frequency of wound infection.

To evaluate the impact of body weight on the complication risks, the patients were divided into three groups according to the general classification of obesity: BMI 25 or less (normal weight), 26–30 (overweight) and BMI over 30 (obese). The distribution of complications in relation to BMI is shown in Table 2. Using Fisher's exact test, the relative body weight was not found to be associated with risk of different complications. However, when BMI was analysed as a continuous variable using *t*-test, the risk of areola necrosis increased along increasing BMI in all women ($P = 0.007$), as well as in those operated with inferior pedicle technique ($P = 0.004$) or superior pedicle technique ($P = 0.027$). From *t*-tests also large breast dimensions ($P = 0.040$) and large amounts of resection ($P = 0.046$) were related to an increased risk of areola necrosis, but not with other complications.

The overall complication rates for the inferior and superior pedicle groups were similar, but the risk of seroma was higher after superior pedicle mammaplasty (14% vs 6%, $P = 0.019$, Table 3). The impact of operative technique on complications was also evaluated within different degrees of obesity. In normal weight women, both techniques were equally safe. If BMI was 26–30, the use of the superior pedicle technique was associated with increased risk of areola necrosis (6% vs 0% in inferior pedicle, $P = 0.048$, Fisher's exact test). In obese patients, the superior pedicle technique was used only in 11% of cases, but in these cases the rate of infection was increased as compared to the inferior pedicle technique (72% vs 35%, $P = 0.035$, Fisher's exact test).

A total of 83 reoperations were performed in 63 patients (23%, Table 4). Postoperative haemorrhage occurred in 15 patients and indicated a reoperation within 24 h in seven cases (2%) and a later haematoma evacuation in four cases (1%). Wound dehiscence or tissue necrosis was treated

Table 3 Frequency of complications by operative technique

Complication	Inferior pedicle (175 patients)		Superior pedicle (94 patients)		Fisher's exact test (*P*)
Superficial infection	43	25.0%	26	28.0%	
Deep infection	10	5.7%	13	14.0%	0.070
Superficial/deep infection	1		0		
Skin necrosis	34	19.0%	14	15.0%	
Fat necrosis	4	2.3%	4	4.3%	0.410
Skin and fat necrosis	3	1.7%	0		
Areolar necrosis	3	1.7%	4	4.3%	0.243
Haemorrhage	9	5.1%	6	6.4%	0.782
Seroma	9	5.1%	13	14.0%	0.019
Any complication	85	49.0%	55	58.0%	0.200
Reoperations					
Immediate	3	1.7%	2	2.1%	
One late	26	15.0%	17	18.0%	0.206
Two or more late	8	4.6%	6	6.4%	

Table 4 Reoperations after 273 breast reductions

Type of reoperation	Patients	
Scar excision or liposuction for minor irregularities	35	13.0%
Revision for skin or fat necrosis, wound suturation	15	5.5%
Wound revision and skin graft	9	3.3%
Evacuation of a haematoma	11	4.0%
Incision of an abscess	3	1.1%
Breast tissue remodelling/re-reduction	6	2.2%
Breast augmentation	1	0.3%
Areolar reconstruction	1	0.3%
Transposition of both areolas	1	0.3%
Excision of an epidermal cyst	1	0.3%
Seroma aspiration (not included in reoperations)	8	2.9%

operatively in 24 cases (38% of the reported cases with delayed wound healing). Of these, a split-thickness skin graft was needed in nine cases. Late reconstruction of the mamilla—areola complex was needed in one of the seven patients with areolar necrosis. Of late reoperations, the most usual was for puckers. Serious asymmetry or poor shape of the breast was treated with a new mammaplasty in six patients. One patient did not approve of her new breast size, which was corrected with implants. Loss of breast skin by necrosis often required multiple operations, first to close the wound and later to revise the scars. The patients operated on by junior surgeons were more likely to require reoperation (34% vs 16%, $P = 0.001$, Fisher's exact test).

Discussion

In cosmetic surgery the end appearance is the most important result. In patients with symptomatic macromastia, decrease in pain and physical discomfort is the main goal of the operation.[2,4] After breast reduction, postoperative symptom relief occurs independently of body weight.[1,5] Local complications are frequent and cause distress for the patients and extra need for healthcare services during the convalescence period; additionally, they endanger the cosmetic result by permanent scarring or asymmetry. In some studies, the most important risk factor for local complications was found to be the amount of resection,[6—9,13] but in our study the impact was weak and limited to the risk of areola necrosis. Overweight and obese women have larger breasts, which logically explains the connection between large resections, obesity and local complications.[6,9] Interestingly, it has not been shown that weight loss before surgery would significantly decrease the amount of resection or the complication risk. However, the risk can be decreased by proper selection and execution of the surgical method, the experience of the surgeon and also by the patient stopping smoking before surgery.[4,9,14,15] Unfortunately, due to the retrospective nature of our study, we were not able to evaluate the impact of smoking because we could not obtain reliable data on smoking habits at the time of operation.

The reported overall complication rates after breast reduction surgery vary from 6% to 53%.[4,7,8,14,15] In an attempt to explain the wide range, the significant differences in reporting, surgical techniques and follow up must be noted. In our series, the frequency of complications was as high as 52%. As mentioned, some minor complications may have been treated in outpatient clinics and not reported to our surgeon; however, based on the structure of our healthcare system, it is likely that all major complications are brought to our knowledge. Wound dehiscence can result from poor design, tight closure, decreased skin perfusion due to wide undermining or postoperative haematoma, seroma or infection. Mandrekas et al.[14] reported a significantly small overall complication rate (11%) in their series of 371 mammaplasties using the inferior pedicle technique, with a mean resection similar to ours of 870 g per breast. They used two modifications to decrease tension at the T-junction: a somewhat longer vertical length of the flaps (8.5—10 cm compared to our 7—8 cm) and an additional triangle of non-epithelialised skin at the base of the pedicle. The wound dehiscence rate at the T-junction by this technique was as low as 4.6%, four times smaller than ours and that of some other reports.[8,13] Dehiscenced wounds are certainly prone to infections and scarring, so avoiding tension at the vertical closure remains a basic goal in the design and closure of breast incisions.

In vertical mammaplasty with superior pedicle technique, delayed healing is the most common complication, with reported frequencies from 13% to 30%.[13,16] Interestingly, Spector and his co-workers[17] showed recently a dehiscence rate of 0%, 17% rate of seromas and 13% rate of wound infection (in our series 15%, 14% and 14%, respectively). The patientś mean BMI and mean amounts of resection were comparable, but they used the technique of Hall-Findlay, in which wide undermining and gathering of the vertical incision are specifically avoided so as not to decrease the blood supply in the wound margin.[17,18] The method is not yet widely used in Finland, but the good results tempt us to consider it as an option.

Our frequency of reoperations for local complications is higher than reported by Rohrich et al.[19] (3—8.5%) or Beer et al.[16] (11%). Almost a quarter of our patients had surgical correction for some postoperative problem. Delayed wound healing can be treated conservatively or with skin grafts, depending on the size of the defect and the needs of the patient, and perhaps also on the preference of the surgeon. The indication for excising dog-ears or puckers is also subjective: the surgeon might choose to remove them always in the primary operation, or to leave them and wait to see if they will disappear or ever bother the patient.[17] In our series, dog-ears, scars and other irregularities were often later excised, which tells us that neither the surgeon nor the patient easily accepted the final outcome without correction. We believe that the personal learning curve should lead to an effort to prevent later corrections by careful attention to all avoidable risks and irregularities in the primary operation.

Our experience with the superior pedicle reduction is that local complications, such as wound dehiscence and areola necrosis, are usual, if it is performed in a very large breast. That is why we usually avoid this technique in obese women. This kind of selection makes it difficult to

compare the superior and inferior pedicle techniques directly to each other. Also, in the recently published studies on the superior pedicle technique, the patients were slimmer and their resections smaller as compared to patients with inferior pedicle mammaplasties.[16,17] In the superior pedicle group of the present study, the mean amount of resection was almost half of that in the inferior pedicle group. Despite the higher risk of seroma, superior pedicle reduction cannot be considered less safe than inferior pedicle reduction when selectively performed in moderate-sized breasts of patients with a normal or slightly increased BMI.

When treating the patients in this series, we considered BMI $>$ 30 to carry an increased risk of complications but not as a direct contraindication for mammaplasty. The patients had to wait for this operation for about 2 years, and during that time obese patients were advised to lose weight, but we found few patients able to do so. The impact of weight loss on breast hypertrophy has been studied by Collins et al.,[20] who found that 85% of mammaplasty candidates had tried weight loss but none of them found complete and permanent relief of their symptoms by conservative means.

We agree that obesity is a recognized health risk and an increasing problem among many nations; already more than 50% of Finnish women are overweight or obese.[21] Weight loss and exercise are important in controlling the risk of diabetes and cardiovascular diseases, but they may be difficult to execute if the quality of life is decreased by chronic pain and inability to move freely. In contrast, after reduction mammaplasty, most patients are free of pain and can participate in sports more actively.

In 2004, as a part of the National Health Care Project, uniform grounds for access to non-emergency care were created in Finland for about 200 diseases, including macromastia.[22] To assure equal functional benefit from surgery to any symptomatic patient with macromastia, obesity was not presented as a contraindication for surgery, but BMI was applied as a factor that slightly affects the impact of other physical symptoms. This decision is supported by our present data, showing that obesity does not cause complications to the extent that women with BMI 26–40 should be excluded from surgical treatment of symptomatic macromastia. However, careful consideration is needed in the decision over breast reduction in morbidly obese patients (BMI over 40), who often have other major health problems, including increased anaesthesia risk. Their treatment should focus first on losing weight to prevent premature death, and after that on the remaining functional problems.

In conclusion, we emphasise the fact that the health benefits of breast reduction surgery are long term and far exceed the risks of local complications. Despite high rates of delayed healing and revisional surgery, we are encouraged to continue performing reduction mammaplasties in all women with symptomatic macromastia, and do not exclude them from surgery solely based on BMI.

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