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A prospective comparison of breast sensibility after reduction mammoplasty: Superior versus superomedial pedicle

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Summary *Background:* Breast sensitivity is a significant issue in preoperative consultation prior to reduction mammoplasty. Although a range of techniques is used, recovery of sensation is usually evaluated using the inferior pedicle. Our objective was to evaluate and compare the change in breast sensitivity using the superomedial versus the superior pedicle.
Methods: We performed a non-randomized, monocentric, prospective study. Thirty-six patients were examined by a single evaluator with von Frey monofilaments on the day prior to the surgery, at 3–6 months, and at 1 year postoperatively. The breast skin, areola, and nipple sensitivity were tested. The breasts were classified into two groups depending on whether the superior pedicle (S) or the superomedial pedicle (SM) technique was used.
Results: The differences between the two groups indicate that the SM group had better sensitivity at 4.5 and 12 months postoperatively. The thresholds for the size filaments that could be felt at the first follow-up on the skin, the areola, and the nipple for the S group vs. the SM group were 2.55 vs. 2.41 ($p = 0.41$), 4.57 vs. 4.45 ($p = 0.28$), and 4.17 vs. 3.81 ($p = 0.04$) size units, respectively. At 1 year postoperatively, the respective values were 2.62 vs. 2.52 ($p = 0.49$), 4.28 vs. 4.05 ($p = 0.04$), and 3.63 vs. 3.38 ($p = 0.10$).

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Conclusion: The nerve fibers appear to be better preserved in the superomedial pedicle than in the superior pedicle. However, these differences were not clinically relevant. The choice of the technique should be made on the basis of the size and the shape of the breast, the patient morphology, and the operator's preference rather than being on the basis of the recovery of sensitivity.

Introduction

Breast reduction is one of the most common surgeries performed in our specialty worldwide, with more than 460,000 patients being operated each year.[1] As preservation of breast sensitivity after reduction mammoplasty is a major concern among patients in preoperative consultation, it has become one of the main goals when performing this procedure.

In North America, the most commonly used technique involves an inferior pedicle, whereas the use of superior and periareolar pedicles is more common in Europe and South America.[2] Most studies analyzing breast sensitivity according to different pedicles have compared the inferior pedicle vs. superior pedicle or free nipple–areola complex graft techniques. We decided to perform a prospective study to compare the superior pedicle versus the superomedial pedicle, as these are the most commonly used techniques in our department, to evaluate as to what extent the recovery of breast sensitivity should determine the pedicle choice.

Materials and method

We performed a prospective, non-randomized, monocentric study that was approved by the relevant local ethics committee.

Between January 2017 and May 2017, 101 patients underwent a bilateral reduction mammoplasty. The procedure was performed by one of the six surgeons at our department, using a superior pedicle or superomedial pedicle. The patients who underwent other procedures in the same time period were excluded.

The breasts were classified into two groups depending on whether the superior pedicle (designated "S") or the superomedial pedicle (designated "SM") technique was used.

Each patient was examined the day before the surgery using a kit of 20 von Frey monofilaments (Bioseb©) after being provided information regarding the study and after having received their written consent.

They were examined by a single evaluator, who was the investigator of the study, with the same procedure and using the same monofilaments. Seven points were tested on the breast. These comprised one point on each quadrant (points 1–4), one point on the upper pole of the areola (point 5), one point on the lower pole of the areola (point 6), and one point on the nipple (point 7). (Figure 1)

The patient was examined in a private room, standing upright, with their breast uncovered and their eyes closed. The filament was applied perpendicularly against the breast surface until the pressure was sufficient to bend it. Starting with the thinnest monofilament on each point until it would bend, the evaluator asked the patient to indicate with her finger where she had felt pressure (if she had felt it). This procedure was repeated with increasing filament sizes until she felt the filament on every point that was tested.

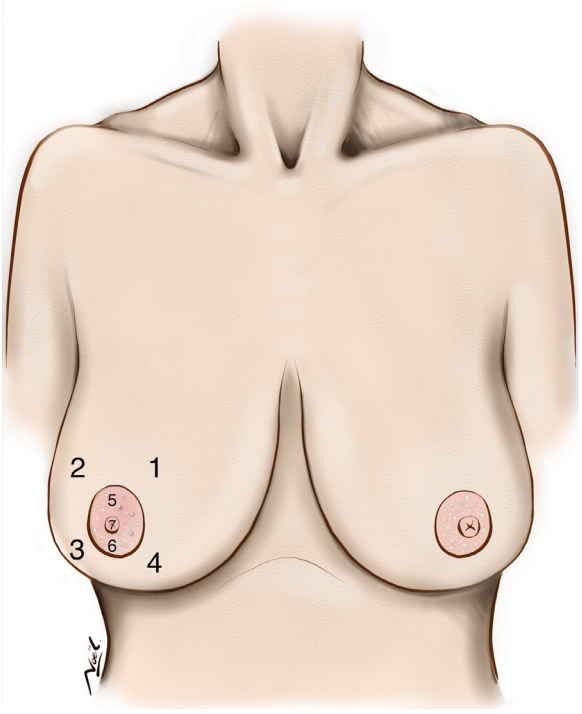

Figure 1 Tested points on the breast (1–4: skin; 5 and 6: areola; 7: nipple).

Each patient was seen twice in the postoperative period: first, between 3 and 6 months, and then after 12 months. At each consultation, the same evaluator performed the examination with the same monofilaments.

Statistical analysis

The analyses were stratified by location (skin, areola, and nipple). We used a linear univariate regression to compare the postoperative values between the two pedicles. All *p*-values less than 0.05 were considered statistically significant. Boxplots were also used, allowing a descriptive representation of the results.

Table 1 Description of the groups, presented as mean (min;max).

Parameters	Group S Superior pedicle $n=48$ breasts	Group SM Superomedial pedicle $n=24$ breasts
Age (years)	38.6 (15;77)	38.98 (16;65)
Weight (kg)	76.06 (53;99)	79.84 (52;104)*
Size (m)	1.639 (1.5;1.81)	1.643 (1.5;1.77)
BMI (kg/m^2)	28.42 (20.1;39.3)	29.58 (19.4;37.1)
Tobacco use	12.2%	8.3%
Breast tissue resected (g)	574.6 (180;1320)	636.3 (280;1320)

* $p<0.05$.

Outcomes

Between January 2017 and May 2017, 101 patients underwent a reduction mammoplasty.

The follow-up was performed on average at 131.2 (74-217) and 360.8 (309-421) days postoperatively. Sixty-five patients were excluded, one because of a subsequent total mastectomy (cancer was discovered upon anatomopathological examination) and sixty-four were lost to follow-up.

The values were classified according to the area for the statistical analysis: points 1-4 for the skin, points 5 and 6 for the areola, and point 7 for the nipple.

The characteristics of the groups are presented in Table 1.

The results relate to the size of the monofilament. The greater the size of the monofilament, the lesser the area that was sensitive.

In the preoperative period, there was no significant difference between the two groups in terms of the sensitivity of the skin, the areola, or the nipple.

At the first follow-up, 4.5 months after the surgery, the difference between the two pedicles indicated better sensitivity in the SM group than in the S group, with size units for the skin, the areola, and the nipple areas of 2.55 vs. 2.41, 4.57 vs. 4.45, and 4.17 vs. 3.81, respectively. These results were only significant for the nipple ($p=0.04$).

At 1-year postoperatively, these differences were still present, with a better sensitivity for the superomedial group at all three areas. The outcomes for the skin, the areola, and the nipple for group S vs. group SM were 2.62 vs. 2.52 ($p=0.49$), 4.28 vs. 4.05 ($p=0.04$), and 3.63 vs. 3.38 ($p=0.10$), respectively. These results were significant on the areola but not on either the nipple or the skin. (Table 2)

The boxplot shows that the SM group correlated with better sensitivity recovery than the S group for every area. The SM pedicles returned to the preoperative level of sensitivity at 1 year (Figure 2).

Discussion

In the USA, the inferior pedicle is the most commonly used technique, because of the degree of safety and viability of the nipple and areola complex (NAC). The main drawback, however, with this approach is the boxy shape, with a pseudoptosis or bottoming out over time.[2] The superior and superomedial techniques offer better long-term outcomes, with a better shape over time and with good NAC viability. Breast sensitivity is, however, still a concern for both the patients and the surgeon. Few studies in the literature have compared the change in breast sensitivity according to the technique. The majority of the studies to date have analyzed the inferior pedicle versus another technique.

Greuse and Hamdi[3] compared inferior vs. superior pedicles, and they did not find a difference at 6 months in 38 patients. *Chiummariello*[4] noted a greater degree of loss of sensitivity in the superior pedicle group after 1 year.

Muslu compared the inferior pedicle with the superomedial pedicle after 6 months in 60 patients, and they did not find a significant difference, while *Nahabedian* and *Schreiber* similarly did not find any difference when they compared it to the medial pedicle.[5-7]

Schreiber[7] also compared the NAC postoperative sensitivity in 42 patients using different techniques (NAC graft, medial pedicle, inferior pedicle, and control group) and they concluded that sensitivity was reduced after grafting.

Schlenz and Kuzbari, who compared five techniques (Lassus, McKissok, Lejour, Georgiade, and Wuringer), found that superior pedicles were associated with a higher risk of nerve injuries, whereas *Spear*, who compared four techniques (vertical, inferior, superior pedicles, and NAC graft) in 48 patients, found that there was reduced sensitivity after 1 year irrespective of the type of mammoplasty reduction.[8-10]

Table 2 Mean (min;max) of pressure thresholds on the different breast areas tested in the patients of group S (superior pedicle) vs. those of group SM (superomedial pedicle).

	Parameters	Group S ($n=48$ breasts)	Group SM ($n=24$ breasts)	p-value
Skin area	Preoperative values	2.92 (1.65;4.22)	3.11 (2.34;4.70)	0.90
	Postoperative values (4.5 months)	2.55 (1.65;4.25)	2.41 (1.65;4.47)	0.41
	Postoperative values (12 months)	2.62 (1.65;4.1)	2.52 (1.65;3.79)	0.49
Areola area	Preoperative values	4.13 (3.53;4.56)	4.02 (3.22;4.56)	0.11
	Postoperative values (4.5 months)	4.57 (3.42;5.88)	4.45 (3.70;5.48)	0.28
	Postoperative values (12 months)	4.28 (3.53;6.38)	4.05 (3.025;4.74)	0.04
Nipple area	Preoperative values	3.43 (2.44;4.17)	3.33 (2.44;4.56)	0.41
	Postoperative values (4.5 months)	4.17 (2.83;5.88)	3.81 (2.44;4.93)	0.04
	Postoperative values (12 months)	3.63 (2.44;6.65)	3.38 (2.36;4.56)	0.10

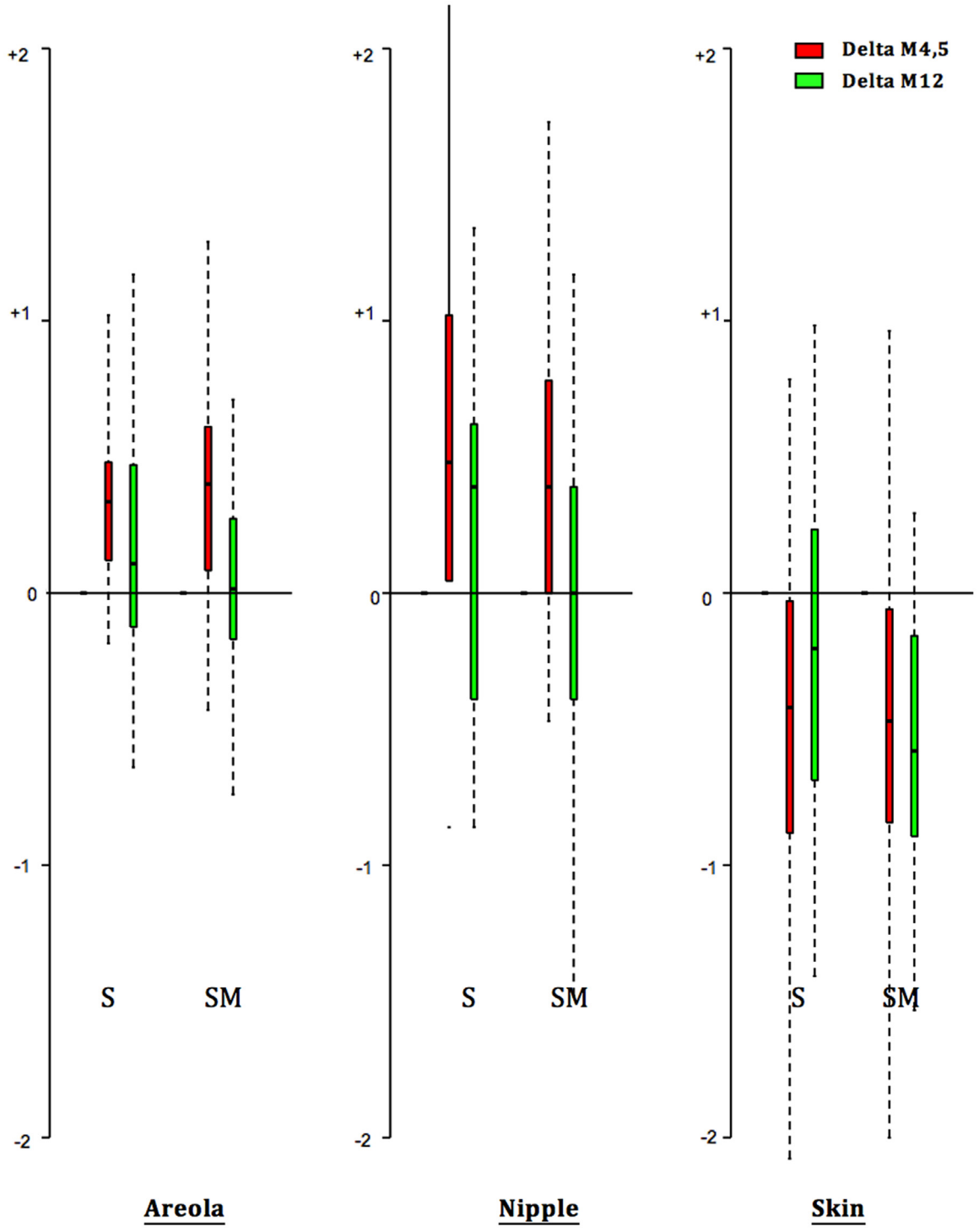

Figure 2 Delta of the breast sensibility at M4.5 and M12 compared to the preoperative value depending on the surgical technique.

To the best of our knowledge, our study is the only one to date to compare the change in breast sensitivity between the superior and superomedial pedicle techniques.

Our results indicate better sensitivity with the superomedial pedicle than with the superior pedicle on the nipple at 4.5 months postoperatively and on the areola after 1 year. On the other hand, the difference on the skin was not significant. This result is hard to interpret, however, as the skin area tested before and after the surgery is not the same. In fact, the lower quadrants are resected during surgery, and sometimes the upper ones are also resected. Moreover, as the different points on the skin after the surgery are no longer the same, these different values on the skin cannot be compared.

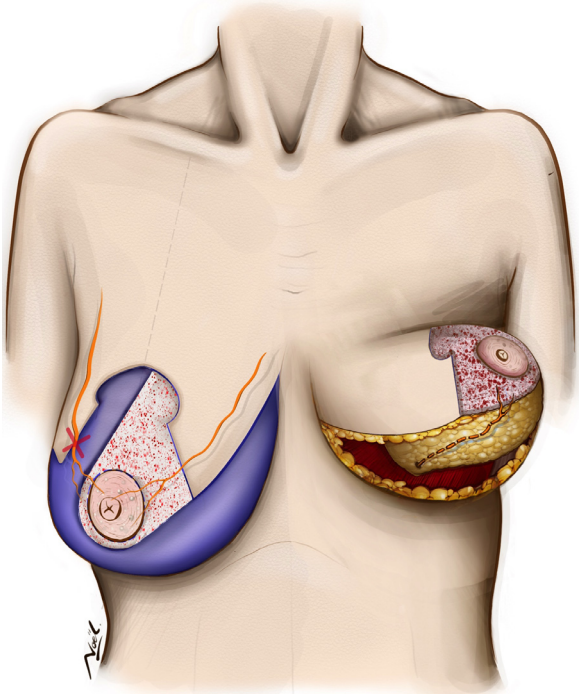

Figure 3 Innervation of the NAC with the superomedial pedicle procedure.

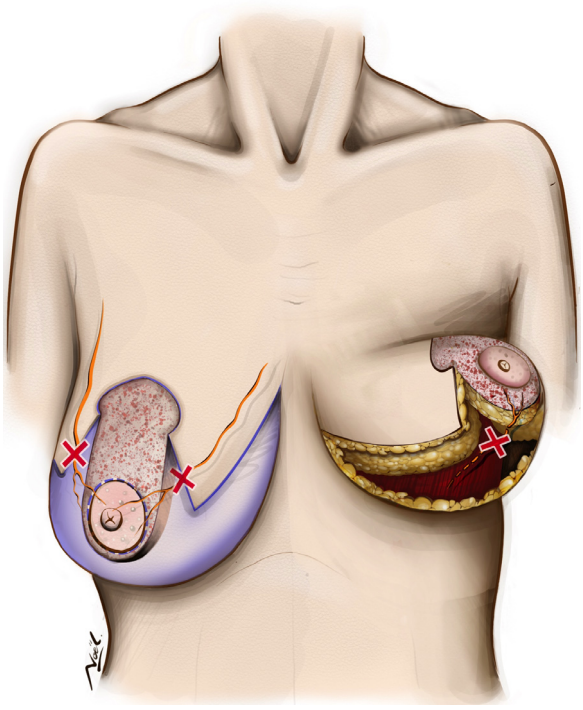

Figure 4 Innervation of the NAC with the superior pedicle procedure.

Therefore, the only outcomes we can interpret are in regard to the NAC, with better postoperative nipple and areola sensitivity in the superomedial pedicle group.

This result may be explained by the nerve anatomy described by *Hamdi*, with superficial and deep NAC innervation. Indeed, the nerves approach the areola from behind and deep within through the Wuringer septum (a deep branch of the lateral intercostal nerve), facing the 5th rib and superficially at 8 and 4 o'clock (a superficial branch of the lateral intercostal nerve and a lateral branch of the anterior intercostal nerve).[11] Yet, reduction mammoplasty using the superior pedicle leads to sectioning of all of these deep and superficial branches, unlike the superomedial pedicle, which only severs the superficial lateral branch, while preserving the integrity of the deep and the medial branches (Figures 3 and 4).

However, these outcomes need to be measured. The differences on the nipple and areola, even if they are statistically significant, are not necessarily clinically relevant. Indeed, the differences between the two pedicles were less than 0.4 size units, with a deviation of approximately 1 filament, corresponding to a minimal difference of pressure that may not be felt by the patient. In daily life, a 0.4 to 2 g difference is barely discernable. Furthermore, the outcomes could be biased because the two groups are not comparable in size, with twice as many patients in the S group (48 breasts) than in the SM group (24 breasts). The difference observed in the outcome was already small and could disappear with two similar-sized groups.

The most important challenge for our prospective study was in regard to the follow-up of the patients after the surgery. More than 50% of the patients included before the surgery did not return after the surgery for the follow-up consultations. Although this substantial loss of patients to follow-up is disappointing, it may also reflect a high level of patient satisfaction with the reduction mammoplasty, as this would obviate the need for follow-up treatment.[12]

This is the first study to date to assess the postoperative recovery of breast sensitivity comparing the superior and superomedial techniques.

Conclusion

Our study indicates that there is better recovery of sensitivity on the areola after reduction mammoplasty with the superomedial pedicle technique than with the superior pedicle technique. These results may reflect differences in the preservation of the nerve fibers. However, the differences in sensitivity are not clinically relevant. Thus, the choice of the technique should be made on the basis of the size and the shape of the breast, the patient morphology, and the operator's preference, rather than on the basis of the recovery of sensitivity.

Declaration of Competing Interest

None of the authors has financial interest in any of the products, devices, or drugs mentioned in this manuscript.

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