Breast sensation following reduction mammaplasty

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JS Fish, JR Bain, R Levine. Breast sensation following reduction mammaplasty. Can J Plast Surg 1994;2(1):28-31. This study has quantitatively measured breast sensation following reduction mammaplasty using a vertical bipedicle technique. Breast sensation was quantitatively assessed by determining pressure and vibratory threshold values preoperatively in 20 subjects, and postoperatively in 15 patients. The nipple, areola and breast body were all independently assessed. Early results, less than one month postoperatively, revealed significant reductions in vibratory and pressure thresholds in the nipple and areola. Long term follow-up revealed that breast sensation returned to normal using this surgical technique.

Key Words: *Breast sensation, Pressure/vibratory thresholds, Reduction mammaplasty*

Sensibilité des seins suite à une réduction mammaire

RÉSUMÉ : Cette étude visait à mesurer quantitativement la sensibilité des seins après une mammoplastie pour réduction mammaire par technique verticale bipédiculaire. La sensibilité mammaire a été évaluée quantitativement par la mesure des seuils de sensibilité à la pression et à la vibration chez 20 patientes avant l'intervention, et chez 15 patientes après l'intervention. Le mamelon, l'aréole et la masse du sein ont tous été évalués indépendamment. Selon les résultats préliminaires, moins d'un mois après l'opération, les seuils pour la pression et la vibration étaient beaucoup plus bas. Le suivi à long terme a permis de révéler que la sensibilité des seins revenait à la normale avec cette technique.

Although patients are informed of possible altered sensation following reduction mammaplasty, the extent and incidence of change is not known. Clinical documentation of postoperative hypoesthesia (1,2), and less commonly hyperesthesia, of the breast and nipple-areola complex are subjective in nature. Terzis et al (3) studied normal breast sensation in a quantitative manner and documented normal sensory patterns. In our study the nipple, areola and breast body all demonstrated distinct levels of sensation using pressure, vibration and pain thresholds and provided us with a method of quantitatively assessing breast sensation.

The widely quoted study on breast sensation by Courtiss and Goldwyn (2) evaluated breast sensation using qualitative (ie, crude touch, light pressure) measures of breast sensibility. This large clinical study included augmentation mammaplasty, reduction mammaplasty with and without free nipple grafts, subcutaneous mastectomy and mastopexy, and found that the nipple-areolar complex is more sensitive than the breast body with the nipple being the most sensitive. Gonzalez et al (4) showed that sensibility is maintained using a central mound reduction and inferior pedicle technique. Slezah and Dellon (5) showed that sensation improves in patients with gigantomastia following reduction mammaplasty, which is probably the result of reinnervation from intercostal and supraclavicular nerves.

The purpose of this study was to investigate the quantitative changes in breast sensation (vibration and pressure thresholds) following reduction mammaplasty.

MATERIALS AND METHODS

Twenty females, ages 18 to 58, undergoing reduction mammaplasty were consecutively selected for this study and each consented in accordance with the guidelines of our local hospital. Patients were excluded from the study if there was a known history of previous breast surgery or any medical disease which alters sensation. All subjects were tested preoperatively, one month postoperatively and an average of 17 months postoperatively (range 15 to 22 months). History of parity, breast feeding, weight change, body weight, chest size and cup size were recorded.

Sensory testing

Breast sensibility was measured using two modalities (6-8). Cutaneous pressure threshold was determined using Semmes-Weinstein monofilaments (6) which gives a recordable measure of applied force in grams per millimetres squared (g/mm^2) correlating with the presence of slow-adapting cutaneous receptors. Cutaneous vibratory threshold (5) was measured using a vibrometer (Biothesiometer, Chagrin

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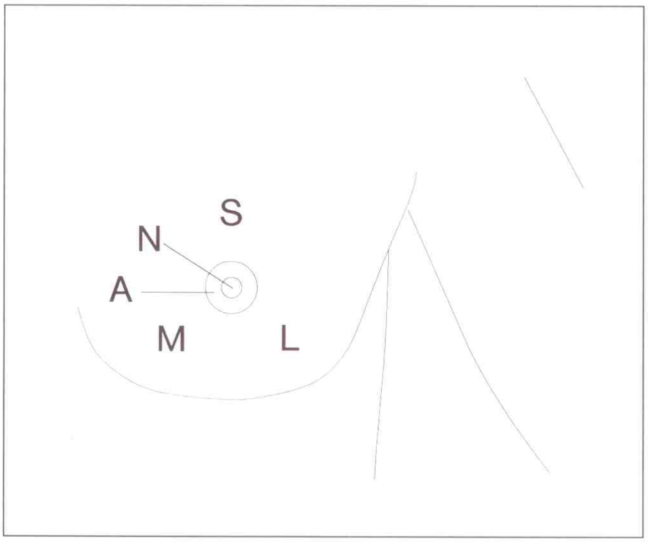

Figure 1) *Five separate areas were independently tested. The nipple, areola and three breast body segments (medial, lateral and superior)*

Falls, Ohio) which is a small cylindrical probe (13 mm diameter) which vibrates at a constant frequency of 120 Hz. The probe is applied by the examiner to the test location, then a variable resistor dial is slowly increased and the patient is asked to indicate when they first feel the vibration. The recorded measurement is micrometres, representing the amplitude of vibration which correlates with the presence of fast-adapting cutaneous mechanoreceptors.

Both modalities were tested in five breast locations (Figure 1) in both breasts of each patient. All testing was done in a temperature-controlled room with the patient placed in a semi-upright position. Preoperative and one-month follow-up testing was done by a single examiner with the long term evaluation measured by a second examiner. The second examiner was blinded to the initial measurements until all patients included in the study had been evaluated. A high inter-rater reliability for vibration threshold (R=0.982) and pressure threshold (R=0.999) using SemmesWeinstein monofilaments has already been demonstrated (9).

At the final assessment, 15 patients were evaluated. Demographic data were collected including final cup size, breast feeding and weight change since surgery. Patients were asked to rate their overall satisfaction with the surgery on a scale from 1 to 10. Patients were not directly asked any questions about breast or nipple sensation. All surgery was done with the senior surgeon (RL) operating on the right side and plastic surgery resident operating on the left side. A standard procedure was used for all patients using a McKissock vertical bipedicle technique. A 45 mm cookie cutter determined the size of the new nipple areola complex. A scalpel was used for incising epidermis with electrocautery for the remainder of the dissection. The reduction was carried down to the fascia of the pectoralis major. Figure 2 illustrates the pedicle at the conclusion of the dissection prior to closure of the superiorly based skin envelope. No attempt was made to identify intraoperatively any sensory nerves. The reduction weight was recorded for each side. All patients remained in

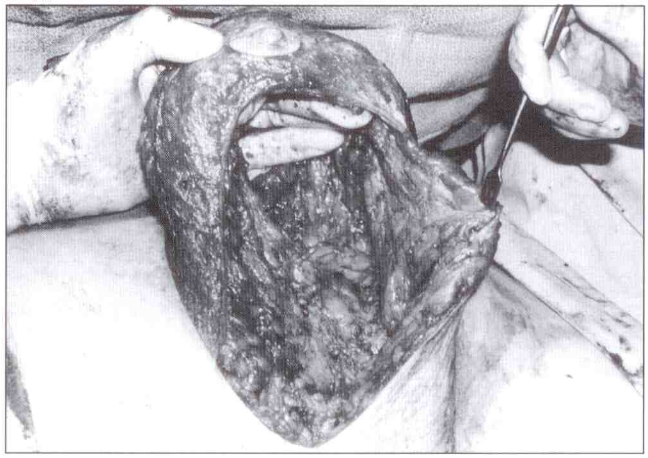

Figure 2) *The nipple-areola complex is dissected free relying on the vertical bipedicle for its vascularity. Note the medial and lateral flaps before advancement and closure which form the new segments of the breast for testing the medial and lateral segments of the breast body*

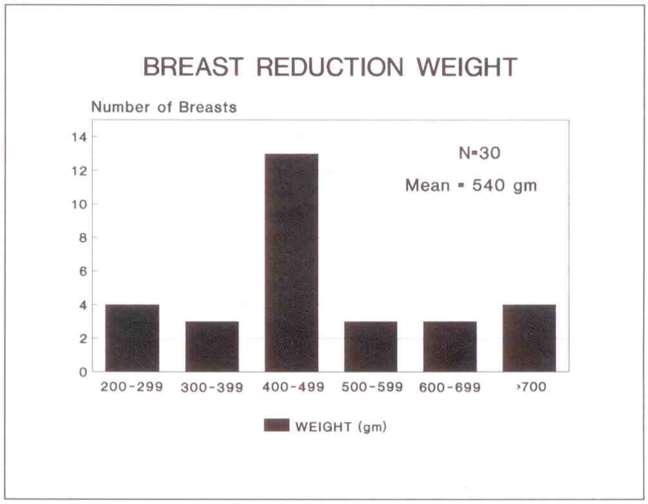

Figure 3) *Distribution of breast reduction weight for 15 subjects in the final long term assessment. Only two subjects required reductions above 700 g*

hospital for one or two days and were seen early in the first week postoperatively and 10 days following surgery for suture removal and then at one month for early postoperative testing.

All data were then computerized and, using SAS statistical software (Statistical Analysis Systems, SAS Institute, Cary, North Carolina), a multivariate analysis was done which compared the sensory modality measured (vibration or pressure) for each breast location (nipple, areola and breast body) to establish the presence of any statistically significant effects ($P<0.05$) of parity, age, breast cup size, breast feeding or reduction weight. All statistical comparisons were done comparing right and left breasts. Post hoc t-tests were done only for meaningful comparisons after an overall significance of other effects were determined.

RESULTS

Only 15 patients were available for the final long term evaluation. One patient refused to return for follow-up as-

TABLE 1: Demographic data

Variable mean (range)	Preoperative subjects n=20	Postoperative subjects n=15
Age (years)	28(16-58)	35 (18-58)
Body weight (kg)	67 (50-100)	64 (53-83)
Chest size (inches)	38 (34-46)	38 (34-44)
Parity	10	5
Breast feeding	6	2
Cup size	D (C-EE)	C (B-D)

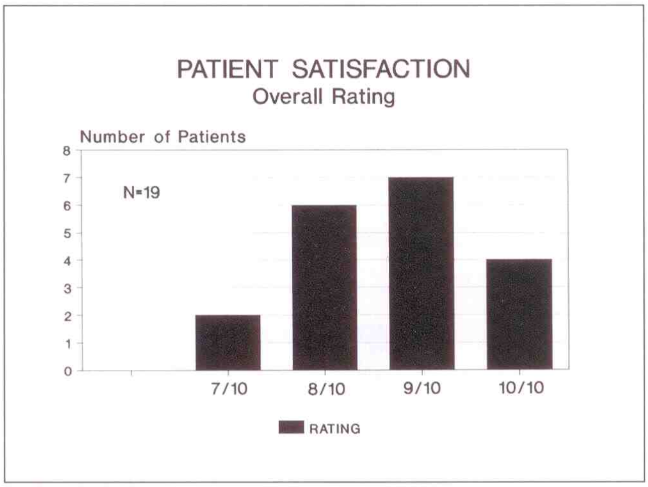

Figure 4) *Overall patient satisfaction rating based on verbal rating on a scale from 1 to 10 determined at the final assessment. Note that four patient responses are included which were contacted by telephone but not available for testing*

sessment and four patients were geographically not available. Figure 3 shows the overall rating of the surgery obtained from 19/20 subjects. All patients expressed a high degree of satisfaction with the final result. The demographic data in Table 1 give a profile of the patients followed and, except for a slightly greater average age of the follow-up group, it is important to note that parity and body weight did not change during this study for individual patients. The average breast reduction was 540 g (n=30 breasts) with the distribution shown in Figure 4. None of the subjects volunteered any specific comment or question related to breast sensation during the final interview. Multivariate analysis did not correlate breast sensation with reduction weight, age, cup size, chest size, parity or breast feeding ($P<0.05$). Comparison between right and left breast sensation preoperatively (nominal sensation) or postoperatively at all testing sites did not reveal any statistically significant differences ($P<0.05$).

Figures 5 and 6 represent the final results of sensory testing for both modalities of sensation. Preoperative sensation for both vibration and pressure thresholds demonstrated statistically significant decreased threshold of the nipple and areola compared with the breast body ($P<0.05$). This difference was more marked with the vibratory threshold (Figure 5). The superior segment of the breast body revealed

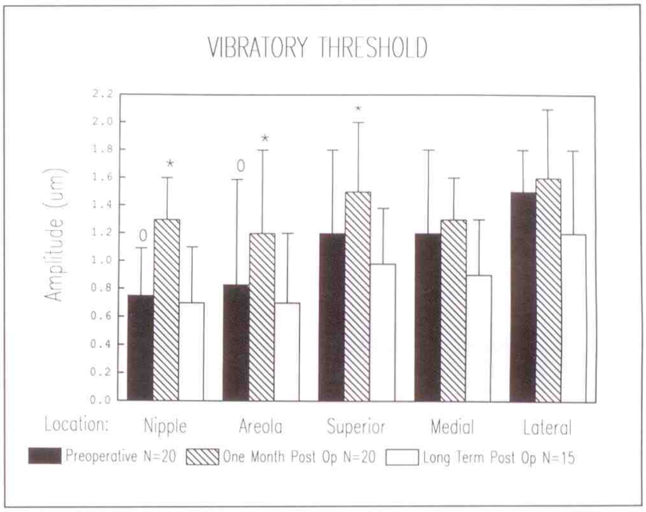

Figure 5) *Vibratory threshold values for all locations tested preoperatively, one month postoperatively and long term follow-up. Nipple and areola are significantly more sensitive compared with the breast body segments (0), as indicated by the lower thresholds. Statistically significant differences (P<0.05) comparing threshold values at the same breast location (*)*

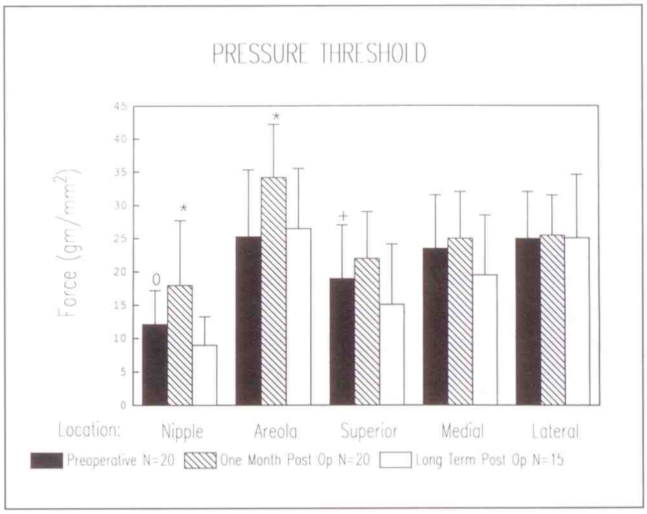

Figure 6) *Pressure threshold values for all locations tested preoperatively, one month postoperatively and long term follow-up. Nipple is more sensitive, indicated by lower thresholds, compared with the areola and breast body (0). The superior segment of the breast has a lower pressure threshold compared to other breast segments. Statistically significant differences (p) comparing threshold values at the same breast location (*)*

lower pressure threshold compared with the rest of the breast body ($P<0.05$) (Figure 6). Vibratory and pressure thresholds are significantly increased one month postoperatively compared to the preoperative normal values and returned to normal values at the final long term follow-up assessment (Figures 5,6).

DISCUSSION

This study has demonstrated that breast sensation is not quantitatively altered following reduction mammaplasty using this surgical technique. There are no other published reports which have performed similar quantitative measures for comparison. The findings of this study are interesting because they disagree with previous reports (1,2,8) which have subjectively measured breast sensation following reduction mammaplasty and report altered sensation.

Terzis et al (3) provide some numbers for comparison and also found that left and right breasts revealed no significant difference and demonstrated a similar profile of normal sensation as the one we are reporting. It is possible that the density of receptors of the nipple-areola complex is increased relative to the breast body. This, however, has not been confirmed histologically.

Although this data does not correlate breast size, cup size and parity with breast sensation, we cannot conclude that these are not significant factors in determining normal breast sensation on the basis of this study due to sample size. The sample of subjects in this study represents a group with only moderate breast hypertrophy, evidenced by the average 540 g weight reduction, and the small study sample may not reveal any significant effects if they do in fact exist.

The fact that nipple-areola complex and breast body sensation is preserved is evident from the long term follow-up measurements. Anatomical studies (2,11,12) have shown the fourth intercostal nerve supply to the nipple and areola. The course of the nerve as it passes through the breast body on its way to the nipple is well described as the nerve remains deep within the breast until halfway to the nipple-areola complex where it becomes superficial. It is difficult to imagine that the sensory nerve remains untouched during this procedure (Figure 2). Nonetheless, whether the mechanism of re-establishing breast sensation is by nerve preservation or innervation from surrounding cutaneous nerves (5) seems not to matter because the changes are transient and normal quantitative sensation is eventually restored using this surgical technique.

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