**CEOG** Clinical and Experimental Obstetrics & Gynecology

# Follow-up observational study of "bi-ring method" breast surgery for treating hypermastia and mastoptosis

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**Summary**

*Purpose:* This study investigated the efficacy and patient satisfaction of "bi-ring method" breast surgery in 46 patients with hypermastia and/or mastoptosis. *Materials and Methods:* A questionnaire survey, objective data measurements, visual analysis system survey, and various scoring scales were used to qualitatively and quantitatively assess the patients' indicators before and after surgery. *Results:* Statistical analysis showed the following: symptoms and signs in patients with macromastia improved significantly; all patients' breast shapes improved significantly and became more symmetrical and durable; all patients had minor hidden scars; the nipples and areolas had good feeling postoperatively, and there were relatively few mild complications. *Conclusions:* The patients' overall satisfaction was high, indicating that the "bi-ring method" of breast plastic surgery could not only improve the breast shape and boast concealed scars but could significantly improve the patients' signs and symptoms of hypermastia, but the nipples and areolas had good postoperative feeling and there were few complications. Thus, this is a reasonable surgical approach that is worthy of promotion.

*Key words:* Bi-ring method; Breast plastic surgery; Hypermastia; Mastoptosis; Patients' satisfaction.

## Introduction

The normal female breast is 250-350 g and has a hemispherical shape. The term "hypermastia" is used to describe a breast above the normal range. Mastoptosis is a more common breast deformity in middle-aged women, especially after childbirth and lactation. Hypermastia and mastoptosis affect the breast's appearance and increase the likelihood of skin diseases such as eczema and scabies occurring in the folds beneath them and can cause discomfort such as pain in the neck, shoulder, back, and arm, numbness or pain in both hands, breast pain, and even headache, and severe deformities can result in psychological issues [1-6]. There are currently numerous corrective surgery methods for treating hypermastia and mastoptosis, including the lateral breast incision, inside breast incision, areola-cycling incision, vertical incision, and liposuction [7-12]. Among the many hypermastia and mastoptosis correction methods, the "bi-ring method" has the advantages of a small incision, less tissue damage, and minimal scarring; thus, it would be easily accepted by patients, especially Oriental women, and it has become the preferred method by many plastic surgeons in the treatment of mild to moderate hypermastia and mastoptosis. In recent years, foreign and domestic plastic surgeons have made a series of improvements to the bi-ring method [13-17] and achieved even better outcomes. Although the preoperative symptoms and surgical methods have been widely recorded in the literature, patients' postoperative quality of life and satisfaction have rarely been documented. Thus, the authors performed postoperative follow-up observation of patients who underwent the bi-ring method for the treatment of hypermastia and mastoptosis to assess their outcomes and acceptance and explore whether this method was effective for the correction of hypermastia and mastoptosis.

## Materials and Methods

*Clinical information*

A total of 46 patients (92 breasts; age range, 18-53 years; median age, 35 years) were enrolled in this study and treated in the department of plastic surgery of the First Affiliated Hospital of Fujian Medical University between February 2004 and August 2013. Of these patients, 31 suffered from bilateral hypermastia, 15 cases suffered from simple bilateral mastoptosis, and six had never breastfed. This study was conducted in accordance with the declaration of Helsinki. This study was conducted with approval from the Ethics Committee of Fujian Medical University. Written informed consent was obtained from all participants.

Eight patents were excluded for refusing to accept the postoperative follow-up, so the data of a total of 38 patients (26 with bilateral hypermastia and 12 with simple mastoptosis) were analyzed. The follow-up period was an average of 15.95 months (range, six months to five years).

*Preoperative design*

With the patient in the sitting or standing position, the nipple position was designed to be at the horizontal junction of the midclavicular line and the 4$^{th}$ rib, while the distance from the nipple to the midpoint of the sternal notch was 19-21 cm. The inner ring was designed to set the nipple as the center with an inner areola diameter of 3.5 - 4.0 cm. The size of the outer ring varied ac-

Revised manuscript accepted for publication July 30, 2014

Table 1. — *The improvement of preoperative and postoperatively symptoms in macromastia patients ($\bar{x} \pm s$).*

| No. | Symptoms and signs | Preoperation | Postoperation | Difference |
|---|---|---|---|---|
| 1 | Bra and clothes were not suitable | 7.69±11.77 | 98.08±6.79 | 93.3±12.40* |
| 2 | Psychological pressure | 3.85±9.20 | 90.38±14.28 | 86.54±14.54 |
| 3 | Pain from the bra shoulder belt | 14.42±23.64 | 98.08±6.79 | 83.65±23.39* |
| 4 | Inconvenience in the motion | 13.46±21.48 | 95.19±12.2 | 81.73±21.86 |
| 5 | Neck and shoulder pain | 43.27±35.75 | 95.19±12.29 | 51.92±31.56* |
| 6 | Upper back pain | 38.46±38.81 | 91.35±15.72 | 52.88±27.68* |
| 7 | Low back pain | 39.42±29.3 | 94.23±12.86 | 54.81±23.47* |
| 8 | Shoulder pain | 35.58±36.18 | 96.15±11.60 | 60.58±34.04* |
| 9 | Itching and eczema in the lower folds of breast | 40.38±41.28 | 97.12±8.15 | 56.73±39.09* |
| 10 | Arm pain | 66.35±21.15 | 100 | 33.65±21.15* |
| 11 | Pain or numb in both hands | 75.00±10.00 | 100 | 25.00±10.00* |
| 12 | Distending pain of breast | 62.5±35.53 | 68.27±28.77 | 5.77±16.30 |
| 13 | Headache | 87.50±20.31 | 92.31±3.03 | 4.81±12.29 |
| | Total mean | 48.22±38.43 | 86.61±27.51 | 38.39±50.81* |

Note: *$p < 0.05$ was considered as the statistical significance.

cording to the breast size and mastoptosis degrees, which required surgeon flexibility, but it was normally five to six cm from the lower point to the inframammary fold, while the upper end was designed to be on the upper edge of the areola with a typical vertical diameter of 12-14 cm and a typical left-right diameter of nine to ten cm. Meanwhile, the range of subdermal dissection was indicated from the outer ring to the base of the breast.

*Surgical procedures*

The surgical procedures were as follows. 1) Incision design (formation of the dermic ring or cap): the epidermis between the rings was removed to form the dermic cap. 2) Dissection of the breast skin and gland: the subcutaneous tissues and breast glands were freed and the partial glands of each patient with hypermastia were removed, while five-cm-wide areas of breast tissue of the outer quadrant (4:00 o'clock position in the left breast, 8:00 o'clock position in the right breast) were kept along with the central breast tissues and breast base fascia. For the patients with mastoptosis, a prosthesis could be implanted behind the pectoralis major muscle to enable joint correction. 3) Breast shaping and determining of the new nipple position: the flaps of the breast tissues were sutured, and the dermic cap edge was then sutured and fixed with the breast peplos or breast base fascia. The operating table was then adjusted to a semi-sitting position so the nipple and areola could be placed at the horizontal junction of the midclavicular line and the 4$^{th}$ rib; the breast was then reshaped and the size, shape, and symmetry were observed. 4) Drainage: after the bleeding stopped, a negative pressure drainage tube was placed within the wound. 5) Incision suture: 5-O prolene sutures were used in dermic purse-string formation toward the outer ring incision; the dermis and skin were interruptedly sutured and then bandaged and fixed for shaping. The stitches were removed seven to ten days later.

Table 2. — *Statistical analysis of preoperative and postoperative breast shape.*

| | Preoperation | Three months after surgery | Difference |
|---|---|---|---|
| Mid-point of lower breast fold to the nipple | 8.31±1.16 | 6.91±0.75 | 1.40±0.52* |
| Supersternal notch to the nipple | 28.54±4.15 | 22.20±1.66 | 6.34±4.26* |
| Between the 2 nipples | 21.42±1.53 | 20.57±1.02 | 0.66±0.75* |
| Over-nipple chest circumstance | 92.78±7.48 | 86.49±4.57 | 6.30±3.32* |
| Areola diameter | 4.89±1.21 | 5.00±0.80 | 0.11±0.60 |
| VAS scoring | 3.51±1.56 | 7.57±1.07 | 4.05±1.97* |
| Scores of breast morphology | 53.46±2.85 | 89.32±7.28 | 35.87±7.97* |

Note: *$p < 0.05$ was considered as the statistical significance.

*Statistical analysis*

The statistical analysis used SPSS 17.0 statistical software. The measurement data were expressed as mean ± SD. Normally distributed data were subjected to t test analysis, while non-normally distributed data were subjected to the Wilcoxon signed rank test. Values of $p < 0.05$ were considered statistically significant.

## Results

*Comparison of symptoms and signs*

The improvement degrees of postoperative breast symptoms already had the relative quantitation criteria [18, 19]. The Kerrigan 13-symptom questionnaire was performed before and after surgery [1]. On this questionnaire, "0" indicates "always," "25" indicates "in most conditions," "50" indicates "occasionally," "75" indicates "rare," and "100" indicates "never."

Four weeks after the surgery, the results were compared with the preoperative assessments: except for "headache," the various signs and symptoms were significantly alleviated after surgery ($p < 0.05$, Table 1). Both the percentages and degrees of the symptoms and signs were significantly reduced; the preoperative symptoms' means were subjected to the paired *t*-test, and the obtained value was 13.89, indicating statistical significance ($p < 0.001$).

*Comparison of breast shape*

The comparison of breast shapes before and after surgery consisted of objective breast data measurement, visual analysis system (VAS) results, and breast shape scores, and the results were as follows.

In the comparison of mean preoperative and postoperative objective measurement data, the "areola diameter" had a value of $p > 0.05$, but the data of the other groups were significantly different ($p < 0.05$, Table 2). The follow-up photos showed that the postoperative breast shapes were significantly improved (Figures 1, 2).

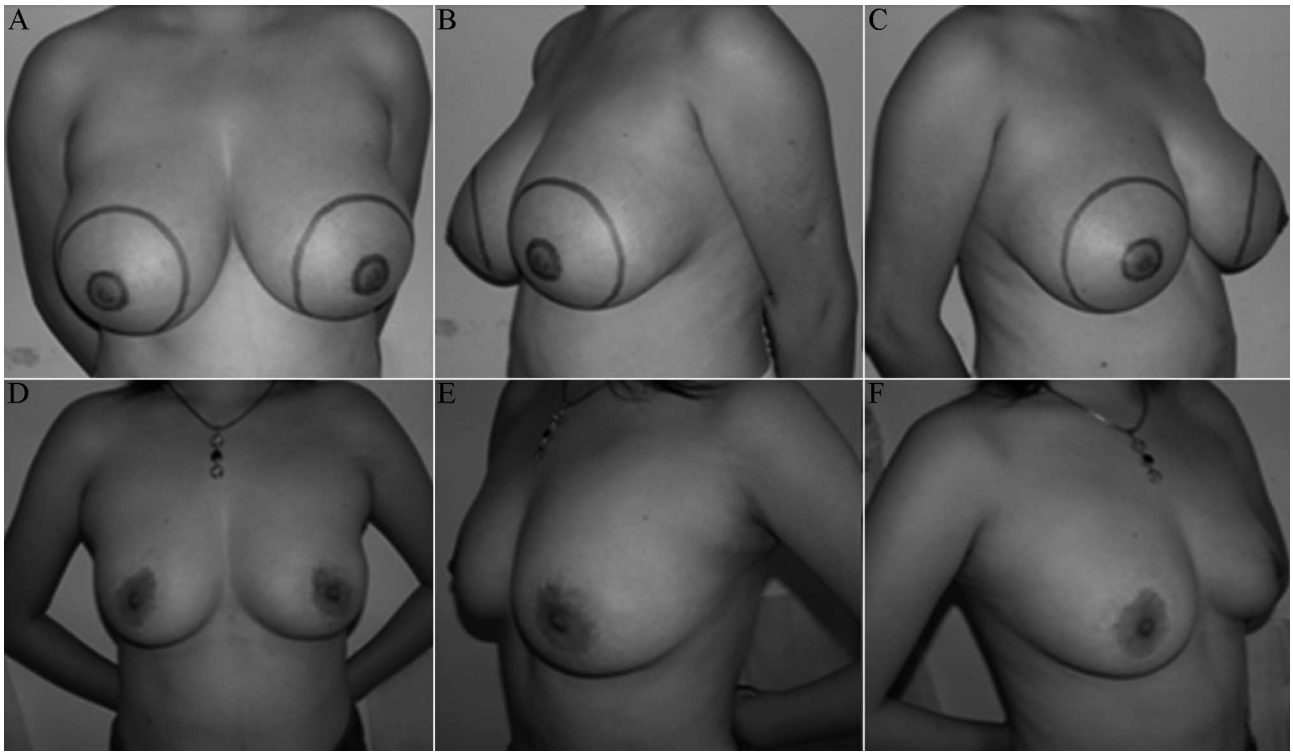


Figure 1. — 25-years-old, comparisons of breast shape and scar before and after surgery in the hypermastia case. A, B, C: before the surgery; D, E, F: two years after the surgery, the breast shape was normal and natural and the scar was not obvious.

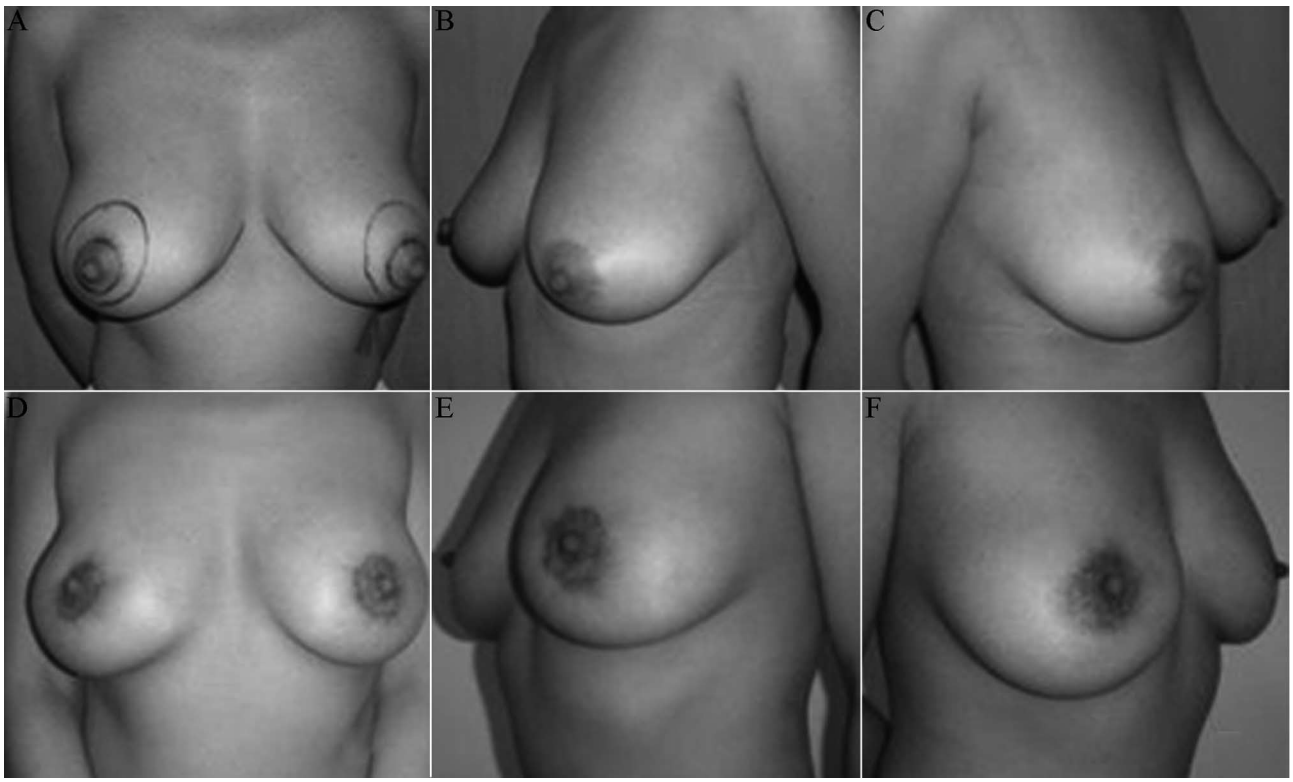


Figure 2. — 30-years-old, the breast shape and scar before and after surgery in the simple moderate mastoptosis case. A, B, C: before the surgery; D, E, F: six months after the surgery, the breast shape was natural and the scar was not obvious.

Table 3. — *Comparative analysis of the postoperative breast measured value and the standard value in common.*

| | Z | *p* |
|---|---|---|
| Mid-point of lower breast fold to the nipple | 4.90 | 0.00<0.05* |
| Supersternal notch to the nipple | 3.47 | 0.001<0.05* |
| Between the two nipples | 1.08 | 0.28>0.05 |
| Over-nipple chest circumstance | 1.80 | 0.07>0.05* |
| Areola diameter | 4.12 | 0.00<0.05* |

Note: *$p < 0.05$ was considered as the statistical significance.

Table 4. — *Scar follow-up situation six months after surgery.*

| | Mean |
|---|---|
| Grade 0-3 scoring scale | 1.56 |
| Vancouver Scar Scoring Scale | 2.85 |

Table 5. — *Postoperative feeling assessment of nipple and areola*

| Nipple and areola feeling | Mean |
|---|---|
| Pain | 2.7 |
| Temperature | 2.8 |
| Touch | 2.6 |
| Sex | 2.5 |

In the comparison of postoperative objective measurement data with the standard range of the Chinese population, the *p* values of "distance between the two nipples" and "over-nipple chest circumference" were > 0.05, while the differences between the other values were statistically significant (Table 3) and the postoperative measurement data were all closer to the standard values (Table 2).

*Assessment of postoperative scars*

All of the patients' postoperative scars were assessed in addition to the subjective self-feeling assessment, for which we used a grade 0-3 scoring sheet and the Vancouver Scar Scoring Scale for the qualitative and quantitative assessments. The degrees of scar improvement six months after the surgery are described below.

Within three postoperative months, the nipple-centered fold was visible, but it disappeared three to six months after the surgery; by six months after the surgery, most appeared as a small scar without obvious hyperplasia, and most were light red or white, not higher than the skin surface, soft, and did not itch. Four patients had visible areola scar hyperplasia one year after the surgery, but the overall satisfaction toward the scars of both those and the other patients who were followed up for > one year was high.

Both the scar grading self-rating and the Vancouver Scar Scoring Scale scores indicated that postoperative incision-scar hyperplasia was slight (Table 4). From the postoperative follow-up photos, it could also be seen that the scars were significantly improving as time went on (Figures 1, 2).

*Assessment of postoperative nipple sensation and lactation function*

The grade 0-3 scoring method was used to rate the sensations of pain, temperature, and feeling of the areola and nipple. A score of "0" represented no feeling, "1" represented a serious decline versus preoperative degree, "2" represented dysesthesia compared to preoperative degree, and "3" represented the same degree as that observed prior to surgery.

The six-month follow-up exam revealed no cases of sensation loss or severe decline, and the only case of postoperative complications expressed that the postoperative nipple sensation was slower than the preoperative (Table 5). After the long-term follow-up, the six patients who had not previously breastfed were able to lactate normally.

*Evaluation of postoperative complications*

A total of four patients demonstrated postoperative complications: three suffered from wound dehiscence upon stitches removal, but healed after a general dressing was applied, while one patient with severe mastoptosis exhibited a poor blood supply to the right nipple and areola in the early postoperative stage. In this patient, partial areolar flap necrosis appeared, but the wound healed after being dressed; three years later, the breast shape was natural, but the scar on the right breast was obvious, the areolar diameter was slightly larger than that of the contralateral breast, and the feeling in the nipple and areola was dysesthetic.

## Discussion

Having full, round, and moderately sized breasts is an important indicator of female physical beauty. Hypermastia and mastoptosis not only negatively impact female appearance but also trigger a series of uncomfortable physical and psychological symptoms. The bi-ring method of breast plastic surgery not only improves the symptoms of patients with hypermastia but also improves their physical appearance; because of the concealed scar and good postoperative nipple and areola sensation, it has become the ideal surgical method for the treatment of mild to moderate hypermastia and mastoptosis. It has also been used in recent years in breast-conserving surgery for breast cancer due to wide patient acceptance of the resulting concealed scar [20, 21].

The method of this follow-up study was simple, and some surveys could be performed by telephone; thus, most patients participated in the pre- and postoperative surveys. The same approaches were used to solve the pre- and postoperative problems, and the same scoring systems were used at two time points. The patients' individual differences were minimized through the use of a standardized grading system.

This study's results were similar with those reported in earlier studies. Birtchnell *et al.* and Goulart *et al.* [22, 23] found that the motivation of patients with hypermastia to seek surgery was mainly to ease the extreme physical discomfort or intense psychological distress caused by the hy-

permastia, whereas only a few patients came to the clinic for aesthetic purposes. This study showed that in the resting state, the surgery significantly alleviated the signs and symptoms of the patients with hypermastia.

During this follow-up, the preoperative scores of patients with hypermastia and mastoptosis, either through the VAS self-evaluation or the breast shape scoring sheet, showed relatively low scores, while the postoperative scores were significantly improved and the differences were significant compared to the preoperative scores; thus, the patients' self-evaluations were very similar to the physicians' evaluations of the breast shape improvements.

Comparison of objective measurement data before and after surgery suggested that through the surgery, the breast shapes were changed, the positions of the nipple and areola were improved and corrected, and the areolar diameter of the patients with mastoptosis was increased compared to the preoperative measurements, which might be due to the postoperative incision tension and scar hyperplasia, while that of the patients with hypermastia was reduced compared to the preoperative values, probably because of gravity and other reasons that made the preoperative diameters larger than those of other women. After the surgery, the breast tissues were significantly reduced and the effect of gravity was reduced, which improved the areolar diameter. The postoperative indexes were closer to the average standard range of Chinese women; namely, the postoperative breast shape was much closer to the perfect standard breast shape.

Gasperoni *et al.* [24] thought that the correct preoperative evaluation and design were the keys to the good results of glandular shaping in reductive mammoplasty. During the bi-ring method design, an overly small inner ring would increase the skin folds around the areola after suturing, while an overly large inner ring would impact the overall appearance of the areola and breast, while an overly large gap between the inner and outer rings would result in too much incision tension and the incision scar would be correspondingly much more apparent. The scar of this surgical incision was located around the areola and relatively concealed, which avoided the vertical scar that results in a traditional operation; the postoperative VAS scores and the Vancouver Scar Scoring sheet showed that the scars were slight and the patients' overall satisfaction was high. The proliferation of the scar was related with both the local tension and the patient's body characteristic, and this point of view has already been confirmed in many studies.

The sensations of the nipple and areola participate in sexual excitation, and mainly accepted the govern of anterior and lateral cutaneous branches of intercostal nerves, while the strikes of these nerve branches within the breast parenchyma were still lack of the consistent reports [25-27]. However, the lateral cutaneous branch of the 4$^{th}$ intercostal nerve has been recognized as the most important control nerve, so when the mammary glands were simply set as the pedicle, it should be noted that this lateral pedicle should be retained so it could maximally retain the lateral cutaneous branch of the 4$^{th}$ intercostal nerve. Therefore, the surgical method main retained the five-cm-wide breast tissues of the outer quadrant (4:00 o'clock position in the left breast, 8:00 o'clock position in the right breast) so that the blood supply and sensation function of the nipple and areola could be retained. Through the follow-up, the sensations of nipple and areola were well preserved and basically did not differ from preoperative values. Compared with the various glands dermic pedicle technologies, the bi-ring method could minimize the injuries from the central pedicle toward the breast duct, thus maximizing the lactation function.

This study showed that the bi-ring method could guarantee minor and concealed scars; the sensation functions of the nipple and areola resulted in good recovery; postoperative complication rates were rare and minor; and the operation was simple, safe and reliable, so it could be an ideal surgical method.

Nowadays, various surgical procedures have their own shortcomings and deficiencies, which still require effort from cosmetic plastic surgeons, and studies of good recovery of breast functions are still important.

## Acknowledgements

This study was supported by the Foundation of National Key Clinical Specialty Discipline Construction Program; Scientific Research Foundation of National Health and Family Planning Commission-Joint Research Projects of Fujian Provincial Health and Education (WKJ-FJ-03); Projects of Fujian Provincial Natural Science Foundation (2012J01125).

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