# Augmentation-First Approach for Breast Asymmetry Correction Using Crisalix 3D Imaging

## *A Series of 3 Cases*

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**Abstract:** Gross breast asymmetry, characterized by significant differences in size or shape between breasts, poses both psychological and surgical challenges. Achieving optimal symmetry requires a tailored approach that balances patient preferences with surgical precision. This study evaluates a sequential strategy for managing breast asymmetry through a combination of augmentation and reduction techniques, enhanced by Crisalix 3D imaging software (version 2) for preoperative planning. Three patients presenting with varying degrees of breast asymmetry were included, each undergoing individualized surgical correction based on their specific anatomical characteristics. Preoperative planning involved 3D software simulation to determine implant sizes corresponding to patients' desired postoperative appearance, alongside external sizers to validate volume projections. Outcomes were assessed through clinical and photographic evaluations, a 5-point Likert scale for satisfaction, and complication rates. Across all cases, high satisfaction scores (average 4.7/5) were achieved, with notable improvements in symmetry. Minor scar hypertrophy was observed in one patient, which improved with silicone gel application. The integration of 3D imaging software significantly enhanced preoperative decision making and patient communication, allowing for more precise implant selection and improved prediction of postoperative outcomes. The sequential approach proved advantageous by providing a clean surgical field, reducing infection risks, and offering a stable reference for tissue removal during contralateral procedures. This approach also facilitated preoperative discussions with patients regarding their desired breast size, allowing informed decision making aligned with their preferences. A carefully planned sequential strategy, augmented by advanced imaging technology, offers a logical, patient-centered method for correcting breast asymmetry, minimizing complications and optimizing outcomes. Future studies integrating advanced imaging and planning tools may further enhance surgical precision and patient satisfaction.

**Key Words:** breast asymmetry, augmentation mammoplasty, reduction mammoplasty, 3-dimensional imaging, surgical planning

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Gross breast asymmetry-defined by marked differences in size, shape, or position between the breasts - is a multifactorial condition with significant aesthetic and psychological consequences. It may arise from congenital anomalies, developmental variation, hormonal influences, or trauma. Beyond the physical discrepancy, such asymmetry often results in emotional distress, adversely impacting self-image and quality of life.[1,2]

Women with noticeable asymmetry have been shown to experience higher levels of anxiety, depression, and social self-consciousness compared to unaffected individuals.[3] These psychological challenges frequently extend to intimate relationships, clothing choices, and social participation, with many patients seeking surgical correction primarily to improve symmetry rather than size.[4]

Management of breast asymmetry necessitates a patient-specific approach tailored to the underlying etiology, degree of asymmetry, and aesthetic goals. A range of surgical techniques including augmentation, reduction, mastopexy, or their combinations may be employed to achieve optimal outcomes.[5,6] Balancing technical precision with long-term symmetry remains a central challenge in these procedures.

Recent literature emphasizes individualized planning, supported by classification systems and surgical algorithms to guide decision making.[7,8] Combined procedures, such as augmentation with mastopexy or implant-assisted reduction, have demonstrated success in managing complex cases when executed with meticulous planning.[9–11]

Advancements in 3-dimensional (3D) imaging have significantly enhanced preoperative assessment, allowing for accurate quantification of asymmetry and simulation of surgical outcomes.[12,13] In addition to improving surgical precision, 3D imaging has proven valuable in-patient counseling by setting realistic expectations and enhancing satisfaction.[14]

This study presents the surgical management of 3 patients with varying degrees of breast asymmetry. By analyzing individualized treatment strategies, incorporation of 3D imaging, and postoperative outcomes, it aims to contribute to the evolving paradigm of aesthetic and functional correction in breast asymmetry.

## MATERIALS AND METHODS

### Study Design

This study evaluated 3 patients who underwent surgical correction of breast asymmetry at our institution between January 2022 and August 2024. All patients provided informed consent for the procedures and for the inclusion in the study, which was conducted in adherence to ethical guidelines for clinical research.

Three-dimensional analysis was conducted using Crisalix 3D imaging software (version 2), an FDA-cleared platform widely used in aesthetic surgical planning.

### Patient Selection

Three female patients with breast asymmetry were included in this series. The first case was a 27-year-old nulliparous woman who presented with a hypertrophic, pendulous right breast and an underdeveloped left breast, resulting in gross asymmetry. The second case was a 26-year-old unmarried woman with an underdeveloped left breast and a hypertrophic right breast, again demonstrating a marked volume difference and asymmetry. The third case was a 33-year-old unmarried

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woman with an underdeveloped left breast relative to a larger right breast, resulting in gross asymmetry. This patient expressed a desire for bilateral augmentation to improve breast volume and symmetry. None of the patients had a significant family history of breast asymmetry, congenital anomalies such as Poland syndrome, or any prior surgical intervention.

### Preoperative Assessment and Planning

1. Clinical examination: Detailed measurements of breast dimensions, including base width, upper pole pinch thickness, nipple-to-inframammary fold distance (N-IMF), sternal notch to nipple distance (SN-N), midline to nipple distance (ML-N), were measured
2. Standard photography: Standardized photographs were taken from anterior, lateral, and oblique views for documentation and comparative analysis.
3. Three-dimensional imaging: A key component of the preoperative assessment involved 3D imaging software for all 3 cases using Crisalix 3D imaging software (version 2).
   This technology allowed for the following:
   - Precise volumetric assessment of existing breast tissue
   - Digital simulation of potential surgical outcomes with various implant sizes and shapes
   - Visualization of expected postoperative appearance from multiple angles
   - Enhanced patient communication regarding realistic expectations
4. External sizer validation: Following 3D simulations, external sizers were used during in-person consultations to validate the digital projections and provide patients with a tangible sense of potential outcomes.

## Surgical Approach

A tailored surgical approach was employed in all cases to maximize symmetry while addressing each patient's unique anatomical features and aesthetic goals (Supplemental Digital Content 1, Table 1, http://links.lww.com/SAP/B231).

### For Patients With Gross Asymmetry (Cases 1 and 2)

The surgical sequence began with augmentation of the smaller breast using silicone implants. This created a fixed reference volume, which served as a live template for subsequent reduction of the contralateral, larger breast. The larger breast was then reduced in volume and reshaped to achieve symmetry, contour, and nipple-areola position relative to the augmented side. Breast Tissue excision was carefully planned and executed to match the projection and footprint of the implant-enhanced breast.

### For Patient Needing Bilateral Enhancement With Symmetry (Case 3)

Both breasts were augmented using different sized implants to correct asymmetry. The left (smaller) breast was augmented first to establish a visual reference for intraoperative comparison. Augmenting the smaller side first enabled more accurate sizing and shaping of the contralateral (right) breast. This was then augmented and mastopexy done to optimize contour and nipple position.

### Intraoperative Symmetry Assessment

Symmetry was assessed intraoperatively through direct clinical evaluation using multiple angles—head-end and leg-end views—combined with patient positioning in a semi-upright posture on the operating table. After augmentation of the smaller breast first, the patient (strapped securely to the table) was then flexed at the waist, simulating a sitting position. This maneuver provided a realistic view of breast projection and contour under gravity, allowing to fine-tune adjustments in real time and achieve optimal symmetry.

## Outcome Measures

Postoperative outcomes were assessed using 3 primary metrics:

1. Symmetry evaluation: Symmetry was evaluated through clinical examination and standardized photographic analysis conducted at follow-up intervals of 1, 3, and 6 months. Measurements included breast volume, shape, and nipple position.
2. Patient satisfaction: Satisfaction was measured using a 5-point Likert scale (1 = very dissatisfied, 5 = very satisfied), assessing the patients' perceptions of symmetry, aesthetic outcomes, and overall satisfaction with the procedure. Patients also rated the usefulness of the 3D imaging in their decision-making process.
3. Complication rates: Complications, such as infection, hematoma, seroma, implant malposition, or poor scar formation, were recorded during follow-up visits.

## Rationale for Augmentation-First Approach

The chosen approach—that is augmentation first followed by reduction—highlights the benefits of a customized strategy for addressing breast asymmetry, particularly in cases requiring both augmentation and reduction.[15] Tailored approach, enhanced by advanced imaging technologies, provides better long-term symmetry and patient satisfaction.[16,17] The integration of 3D imaging specifically addresses known challenges in pre-operative planning for asymmetry correction, including the difficulty of accurately predicting post-operative appearance and ensuring patient alignment with expected outcomes.[18]

# RESULTS

## Case 1

Postoperative evaluation demonstrated significant improvement in symmetry, as confirmed by clinical and photographic analyses. The nipple-areola complex was well aligned, with a harmonious contour achieved between both breasts. The patient reported the highest level of satisfaction, scoring 5/5 on the Likert scale, and specifically noted that the 3D imaging had been "extremely helpful" in understanding the expected results and feeling confident in her decision. No complications were observed during the follow-up period (Supplemental Digital Content 2, Fig. 1, http://links.lww.com/SAP/B231).

Postoperative measurements:

- SN-N: 21 cm bilaterally
- ML-N: 11 cm bilaterally

## Case 2

Clinical assessments indicated fairly good postoperative symmetry, with improvement in volume and contour. Minor scar hypertrophy was noted but resolved with silicone sheet application. The patient rated her satisfaction as 4/5 and reported that the 3D imaging had been "very valuable" in helping her understand what could realistically be achieved through surgery (Supplemental Digital Contents 3–5: Figs. 2a–c, http://links.lww.com/SAP/B231).

Postoperative measurements:

- SN-N: 20 cm (left), 19.5 cm (right)
- ML-N: 12.5 cm (left), 11.5 cm (right)

## Case 3

Postoperative evaluations indicated fairly good symmetry, with the breasts appearing balanced in volume and shape. The patient scored 5/5 on the satisfaction scale and emphasized that the 3D imaging had been "very valuable" in helping her decide between several surgical options. No complications were reported (Supplemental Digital Contents 6 and 7, Figs. 3a and b, http://links.lww.com/SAP/B231).

Postoperative measurements:

- SN-N: 21 cm bilaterally
- ML-N: 10 cm bilaterally

### Patient Satisfaction Assessment

A comprehensive 10-item five-point Likert scale questionnaire (0–5, where 0 = very dissatisfied and 5 = very satisfied) was filled by each patient, 6 months post-op, to evaluate patient satisfaction (Supplemental Digital Content 8, Table 2, http://links.lww.com/SAP/B231).

The results demonstrated high patient satisfaction across multiple assessment domains, with an overall average satisfaction score of 4.8/5.

## DISCUSSION

The tailored sequential strategy for managing breast asymmetry, enhanced by 3D imaging technology, offers an advantage in achieving optimal surgical outcomes. For patients with gross asymmetry (cases 1 and 2), beginning with augmentation of the smaller breast creates a stable reference for subsequent reduction of the larger breast, enhancing precision in achieving symmetry.[19] (Supplemental Digital Contents 9 and 10, Figs. 4 and 5, http://links.lww.com/SAP/B231). For patients desiring bilateral enhancement with existing asymmetry (case 3), the combination of differently sized implants with mastopexy allows for comprehensive correction of both volume and shape discrepancies.[20,21]

Advantages of augmentation-first approach are as follows:

1. Optimal surgical field: Performing augmentation first provides a clean surgical field, reducing the risk of implant-related complications such as infection or malposition.[22]
2. Enhanced precision: Using the augmented breast as a reference point, and intraoperative assessment of size post augmentation-first, allows for more precise planning and execution of tissue removal during reduction mammoplasty.[23]
3. Patient-centered decision making: The sequential approach, combined with 3D imaging technology, facilitates meaningful preoperative discussions with patients about their desired breast size, enabling them to visualize outcomes and make informed decisions.
4. Psychological benefits: Addressing breast asymmetry not only improves physical appearance but also significantly enhances psychological well-being, body image, and quality of life,[24] reflected in the high satisfaction scores across all cases (Supplemental Digital Content 8, Table 2, http://links.lww.com/SAP/B231).

Donfrancesco et al[25] reported a volumetric accuracy of 87%–94% in their study of 3D imaging for breast augmentation planning, whereas Eder et al[14] found that preoperative simulations achieved an average accuracy of 90.2% in predicting postoperative outcomes. These findings underscore the value of 3D imaging as a reliable planning tool for breast asymmetry correction.[26]

Emerging technologies and techniques hold promise for further refining breast asymmetry correction. Advanced 3D imaging with haptic feedback could enhance the simulation experience,[27] whereas artificial intelligence algorithms might improve the accuracy of outcome predictions.[28] Bioengineered scaffolds and refined fat grafting techniques offer additional options for volume manipulation and contour refinement.[29] Integrating these innovations into the sequential approach may further optimize outcomes and expand treatment options for patients with complex asymmetry.

## CONCLUSION

The sequential augmentation-reduction surgical approach demonstrates promise in managing gross breast asymmetry. By prioritizing patient-specific considerations and leveraging precise surgical techniques, symmetrical aesthetic and psychological outcomes can be achieved.

Tailored sequential strategies for managing breast asymmetry, enhanced by 3D imaging technology and including augmentation-first approaches for gross asymmetry and combined techniques for those desiring bilateral enhancement, offer effective solutions for achieving optimal symmetry and high patient satisfaction.

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### REFERENCES

1. Reilley AF. Breast asymmetry: classification and management. *Aesthet Surg J*. 2006;26:596–600.
2. Zehra S, Doyle F, Barry M, et al. Health-related quality of life following breast reconstruction compared to total mastectomy and breast-conserving surgery among breast cancer survivors: a systematic review and meta-analysis. *Breast Cancer*. 2020;27:534–566.
3. Sarwer DB, Bartlett SP, Bucky LP, et al. Bigger is not always better: body image dissatisfaction in breast reduction and breast augmentation patients. *Plast Reconstr Surg*. 1998;101:1956–1963.
4. Frederick DA, Lever J, Peplau LA. Interest in cosmetic surgery and body image: views of men and women across the lifespan. *Plast Reconstr Surg*. 2007;120:1407–1415.
5. Spear SL, Pelletiere CV, Menon N. One-stage augmentation combined with mastopexy: aesthetic results and patient satisfaction. *Aesthetic Plast Surg*. 2004;28:259–267.
6. Spear SL, Bulan EJ, Venturi ML. Breast augmentation. *Plast Reconstr Surg*. 2006; 118(7 Suppl):188S–196S.
7. Losken A, Fishman I, Denson DD, et al. An objective evaluation of breast symmetry and shape differences using 3-dimensional images. *Ann Plast Surg*. 2005;55:571–575.
8. Melita D, Innocenti A. Breast asymmetry, classification and algorithm of treatment: our experience. *Aesthetic Plast Surg*. 2020;44:247–248.
9. Peterson B, Alajmi H, Ladak A, et al. Breast equalization augmentation: the use of ultrasonic assisted liposuction for correction of primary breast asymmetry with bilateral augmentation. *Aesthetic Plast Surg*. 2022;46:667–674.
10. Spear SL, Schwartz J, Dayan JH, et al. Outcome assessment of breast distortion following submuscular breast augmentation. *Aesthetic Plast Surg*. 2009;33:44–48.
11. Layt CWL. Augmentation mastopexy: planning and performance for predictability: management of complications. *Clin Plast Surg*. 2021;48:45–57.
12. Tzou CH, Artner NM, Pona I, et al. Comparison of three-dimensional surface-imaging systems. *J Plast Reconstr Aesthet Surg*. 2014;67:489–497.
13. de Heras Ciechomski P, Constantinescu M, Garcia J, et al. Development and implementation of a web-enabled 3D consultation tool for breast augmentation surgery based on 3D-image reconstruction of 2D pictures. *J Med Internet Res*. 2012;14:e21.
14. Eder M, Waldenfels FV, Swobodnik A, et al. Objective breast symmetry evaluation using 3-D surface imaging. *Breast*. 2012;21:152–158.
15. Hammond DC, Loffredo M. Breast reduction. *Plast Reconstr Surg*. 2012;129: 829e–839e.
16. Hanwright PJ, Hirsch EM, Seth AK, et al. A multi-institutional perspective of complication rates for elective nonreconstructive breast surgery: an analysis of NSQIP data from 2006 to 2010. *Aesthet Surg J*. 2013;33:378–386.
17. de Vita R, Buccheri EM, Villanucci A, et al. Breast asymmetry, classification, and algorithm of treatment: our experience. *Aesthetic Plast Surg*. 2019;43:1439–1450.
18. Creasman CN, Mordaunt D, Liolios T, et al. Four-dimensional breast imaging, part I: introduction of a technology-driven, evidence-based approach to breast augmentation planning. *Aesthet Surg J*. 2011;31:914–924.
19. Stevens WG, Stoker DA, Freeman ME, et al. Is one-stage breast augmentation with mastopexy safe and effective? A review of 186 primary cases. *Aesthet Surg J*. 2006;26:674–681.
20. Swanson E. Prospective comparative clinical evaluation of 784 consecutive cases of breast augmentation and vertical mammaplasty, performed individually and in combination. *Plast Reconstr Surg*. 2013;132:30e–45e.
21. Tepper OM, Karp NS, Small K, et al. Three-dimensional imaging provides valuable clinical data to aid in unilateral tissue expander-implant breast reconstruction. *Breast J*. 2008;14:543–550.
22. Hidalgo DA, Spector JA. Breast augmentation. *Plast Reconstr Surg*. 2014;133: 567e–583e.
23. Tebbetts JB. A system for breast implant selection based on patient tissue characteristics and implant–soft tissue dynamics. *Plast Reconstr Surg*. 2002;109:1396–1409.
24. von Soest T, Kvalem IL, Skolleborg KC, et al. Psychosocial changes after cosmetic surgery: a 5-year follow-up study. *Plast Reconstr Surg*. 2011;128:765–772.
25. Donfrancesco A, Montemurro P, Hedén P. Three-dimensional simulated images in breast augmentation surgery: an investigation of patients' satisfaction and the correlation between prediction and actual outcome. *Plast Reconstr Surg*. 2013;132:810–822.
26. Pfaff MJ, Steinbacher DM. Plastic surgery applications using three-dimensional planning and computer-assisted design and manufacturing. *Plast Reconstr Surg*. 2016;137:603e–616e.
27. Chae MP, Rozen WM, Spychal RT, et al. Breast volumetric analysis for aesthetic planning in breast reconstruction: a literature review of techniques. *Gland Surg*. 2016;5:212–226.
28. Kiwan O, Al-Kalbani M, Rafie A, et al. Artificial intelligence in plastic surgery, where do we stand? *JPRAS Open*. 2024;42:234–243.
29. Khouri RK, Rigotti G, Khouri RK Jr., et al. Tissue-engineered breast reconstruction with Brava-assisted fat grafting: a 7-year, 488-patient, multicenter experience. *Plast Reconstr Surg*. 2015;135:643–658.