

A Standardized Postoperative Recovery Atlas Reduces Early Anxiety After Female Genital Cosmetic Surgery: A Prospective Study

Ziyi Qi

First Hospital of Qinhuangdao

Wenbo Li

First Hospital of Qinhuangdao

Zhongxing Li

First Hospital of Qinhuangdao

Fenglian Wu

1099782826@qq.com

First Hospital of Qinhuangdao

Research Article

Keywords: Female genital cosmetic surgery, Labiaplasty, Postoperative recovery, Patient education, Anxiety, Patient-reported outcomes

Posted Date: May 7th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-9212553/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: No competing interests reported.

Version of Record: A version of this preprint was published at BMC Women's Health on October 1st, 2026. See the published version at <https://doi.org/10.1186/s12905-026-04955-5>.

Abstract

Background

Female genital cosmetic surgery (FGCS) has gained increasing popularity worldwide, with high reported satisfaction rates. However, dynamic postoperative changes may lead to patient anxiety and misinterpretation during early recovery. This study aimed to develop a standardized postoperative recovery atlas and evaluate its impact on patient experience.

Methods

This single-center prospective before–after study included 132 patients undergoing labiaplasty with or without clitoral hood reduction. Patients were assigned to a control group (M1, routine education; $n = 60$) or an intervention group (M2, routine education plus recovery atlas; $n = 72$). The atlas was constructed using standardized photographs at five time points. Primary outcomes included postoperative anxiety (week 1), satisfaction (month 1), recovery experience, and Female Genital Self-Image Scale (FGSIS) scores.

Results

Interobserver agreement was excellent ($k = 0.874$). Compared with the control group, the intervention group showed significantly lower anxiety scores at postoperative week 1 ($P < 0.001$) and higher recovery experience scores at month 1 ($P < 0.001$). FGSIS scores significantly improved postoperatively in both groups ($P < 0.001$), with no significant between-group difference ($P = 0.345$). Overall satisfaction at month 1 did not differ significantly between groups ($P = 0.294$).

Conclusions

The postoperative recovery atlas reduces early postoperative anxiety and improves recovery experience, but has limited impact on final satisfaction. Its primary value lies in enhancing perioperative psychological adaptation.

1. Introduction

In recent years, female genital cosmetic surgery (FGCS), particularly labiaplasty combined with clitoral hood reduction, has become one of the fastest-growing procedures worldwide, with steadily increasing demand^[1]. Previous studies have demonstrated that these procedures are generally safe^[2], and most patients report high levels of postoperative satisfaction^[3]. With increasing societal attention to female

body image, more patients seek surgical interventions to improve vulvar appearance, thereby enhancing self-confidence and quality of life.

Despite favorable overall outcomes, the postoperative recovery process often exhibits distinct stage-dependent changes. Early postoperative findings commonly include edema and ecchymosis, and some patients may experience temporary asymmetry. These dynamic changes may differ from the final stable appearance, potentially leading to patient anxiety, misinterpretation, and unnecessary concern^[4, 5]. Previous studies have shown that women seeking labiaplasty often exhibit specific psychological characteristics and are primarily motivated by appearance-related concerns and body image dissatisfaction^[6]. Therefore, helping patients gain a better understanding of the recovery process has become an important part of perioperative management.

Standardized medical photography provides a reliable method for longitudinal documentation of morphological changes. In plastic surgery research, it has been widely used for objective evaluation of surgical outcomes^[7, 8]. Multitimepoint imaging allows systematic visualization of postoperative recovery trajectories and offers intuitive visual references for patients. However, systematic imaging data describing recovery after FGCS remain limited.

Accordingly, this study collected standardized clinical photographs at five time points—preoperatively, immediately postoperatively, postoperative day 1, week 1, and month 1—to construct a postoperative recovery atlas. Furthermore, the clinical value of this atlas in improving patient experience and satisfaction was evaluated. To our knowledge, this is the first study to construct a standardized postoperative recovery atlas for FGCS and evaluate its psychological impact.

2. Materials and Methods

2.1 Study Design and Participants

This study was designed as a single-center prospective before–after interventional study. It consisted of two phases: a control phase (M1, routine education) and an intervention phase (M2, education plus recovery atlas). The two phases were separated by a 6-month interval, during which surgical techniques and perioperative management protocols remained unchanged to minimize confounding factors.

A total of 132 adult female patients were enrolled, including 60 in the M1 group and 72 in the M2 group. All patients underwent labiaplasty with or without clitoral hood reduction and agreed to complete scheduled follow-ups and standardized photography. Exclusion criteria included prior related surgery, postoperative infection, or incomplete follow-up.

Baseline characteristics (e.g., age, surgical type) were comparable between the two groups ($P > 0.05$).

2.2 Intervention

Patients in the control group (M1) received routine perioperative education, including verbal explanations of postoperative care and recovery.

In addition to routine education, patients in the intervention group (M2) were provided with a postoperative recovery atlas. This atlas included standardized photographs at predefined time points (preoperative, immediate postoperative, day 1, week 1, and month 1), illustrating typical morphological changes at each stage with brief explanatory notes to facilitate understanding of the normal healing process (Fig. 1).

All other surgical and nursing conditions were identical between the two groups.

2.3 Surgical Procedure

All procedures were performed by the same senior surgeon using a standardized edge resection technique. Uniform postoperative care instructions were provided to all patients.

2.4 Standardized Photography

Standardized clinical photographs were obtained using an iPhone 13 (Apple Inc., Cupertino, CA, USA) with a 12-megapixel wide-angle camera (f/1.6 aperture), at a resolution of 4032 × 3024 pixels under consistent lighting conditions.

Patients were positioned in the lithotomy position, with hips flexed, knees bent, and thighs slightly abducted in a relaxed state. The camera was positioned perpendicular to the perineal plane at a fixed distance of approximately 50 cm. Uniform, shadow-free lighting and a consistent background were used to minimize variability and ensure comparability of images ^[8].

2.5 Atlas Construction

2.5.1 Image Preprocessing

All images were de-identified prior to analysis. Images were categorized according to predefined time points and standardized in terms of cropping and display ratio to ensure comparability.

2.5.2 Evaluation Metrics

Postoperative local conditions were assessed using the Vulvar Postoperative Appearance and Healing Scale (VPAHS). The scale includes edema (0–3), ecchymosis (0–1), wound edge approximation (0–2), morphological symmetry (0–2), and wound healing status (0–2). Total scores range from 0 to 10, with higher scores indicating more severe postoperative reactions. The scale was developed with reference to the REEDA scale ^[9]. The VPAHS provides a structured and reproducible tool for evaluating postoperative vulvar healing based on standardized photographic assessment. (Table 1)

Table 1
Vulvar Postoperative Appearance and Healing Scale (VPAHS)

Variable	Score	Definition
Edema	0	No edema; normal contour and skin texture
	1	Mild edema with slight tissue swelling and minimal contour blurring
	2	Moderate edema with obvious swelling and mild tissue tension
	3	Severe edema with marked swelling, tight tissue, and contour distortion
Ecchymosis	0	No visible ecchymosis
	1	Localized or diffuse ecchymosis present
Wound edge approximation	0	Wound edges well approximated without tension
	1	Mild tension present but edges remain approximated
	2	Marked tension or partial separation of wound edges
Morphological symmetry	0	Bilateral morphology symmetrical
	1	Mild asymmetry with minimal visual difference
	2	Obvious asymmetry with clear morphological difference
Wound healing status	0	Wound completely epithelialized
	1	Partial epithelialization with small residual defect
	2	Unhealed wound with open surface

2.5.3 Assessment and Reliability

Two independent plastic surgeons (≥ 5 years of experience), blinded to time sequence, evaluated all images. Recovery quality was categorized based on composite scores: 0–2: Excellent; 3–4: Good; 5–7: Fair; 8–10: Poor. Only cases with scores ≤ 5 were included as representative images. Interobserver agreement was assessed using Cohen’s kappa coefficient ^[10].

2.5.4 Atlas Development

Representative images were selected based on complete follow-up, absence of infection or major complications, and a typical recovery trajectory. Images were arranged chronologically to construct a postoperative recovery atlas as demonstrated. (Fig. 1)

Each time point included brief annotations highlighting stage-specific features and normal healing trends. The atlas was developed to ensure authenticity, representativeness, and educational value,

without clinically misleading image modifications.

A total of 75 patients were initially screened; after excluding cases with incomplete follow-up ($n = 7$), infection ($n = 2$), and poor image quality ($n = 6$), 60 patients were included. The mean age was 24.32 ± 5.98 years (range, 16–45), and the mean symptom duration was 5.1 ± 2.3 years.

2.6 Outcome Measures

Primary outcomes included:

- (1) Anxiety at postoperative week 1, assessed using a 5-point Likert scale;
- (2) Overall satisfaction at postoperative month 1, assessed using a 5-point Likert scale;
- (3) Recovery experience score at month 1 (0–10 scale);
- (4) Genital self-image assessed using the Female Genital Self-Image Scale (FGSIS).

Secondary outcomes included VPAHS scores and interobserver agreement.

2.7 Statistical Analysis

Statistical analysis was performed using SPSS version 31.0 (IBM Corp., Armonk, NY, USA).

Normality was assessed using the Shapiro–Wilk test. Continuous variables were presented as mean $\pm$ standard deviation or median (interquartile range), as appropriate. Between-group comparisons were performed using the Mann–Whitney U test, and within-group comparisons were analyzed using paired t-tests. Categorical variables were compared using the chi-square test. Interobserver agreement was assessed using Cohen’s kappa coefficient. A two-tailed $P < 0.05$ was considered statistically significant.

3. Results

A total of 132 patients were included in this study, with 60 patients in the M1 (control) group and 72 patients in the M2 (intervention) group. There were no significant differences between the two groups in terms of age or surgical procedures ($P > 0.05$).

Interobserver agreement for image evaluation was excellent, with a Cohen’s kappa coefficient of 0.874, indicating high reliability of the scoring system.

Standardized photographic analysis demonstrated a clear temporal pattern of postoperative morphological changes. Edema was most pronounced immediately after surgery and on postoperative day 1, often accompanied by mild ecchymosis. By postoperative week 1, edema had significantly subsided and wound tension was reduced. At postoperative month 1, the vulvar appearance became stable, with improved contour and symmetry.

Based on these findings, a postoperative recovery atlas was constructed to illustrate typical healing trajectories.

At postoperative week 1, As shown in Table 2, the M2 group had significantly lower anxiety scores (Mann–Whitney U test, $P < 0.001$), indicating that the recovery atlas effectively reduced early postoperative concerns regarding appearance.

Table 2
Comparison of Postoperative Outcomes Between the M1 and M2 Groups

Outcome	M1 Median(IQR)	M2 Median(IQR)	P value
Preoperative FGSIS score	22.00 (4)	22.00 (5)	0.468
Postoperative month-1 FGSIS score	28.00 (6)	28.00 (5)	0.929
ΔFGSIS change	6.00 (6.75)	7.00 (6.00)	0.345
Postoperative week-1 anxiety score	10.00 (3)	7.00 (1)	< 0.001
Postoperative month-1 satisfaction score	5.00 (0)	5.00 (0)	0.294
Month-1 recovery experience score	9.00 (2)	10.00 (1)	< 0.001

In addition, the overall recovery experience score at postoperative month 1 was significantly higher in the M2 group than in the M1 group (Mann–Whitney U test, $P < 0.001$), suggesting that the use of the recovery atlas improved patients’ overall postoperative experience.

Within-group analysis showed that FGSIS scores at postoperative month 1 were significantly higher than preoperative scores (paired t-test, $P < 0.001$), indicating a significant improvement in genital self-image after surgery. However, no significant difference was observed between the M1 and M2 groups in terms of FGSIS score changes ($P = 0.345$).

At postoperative month 1, overall satisfaction scores did not differ significantly between the two groups ($P = 0.294$), suggesting that the atlas had limited impact on final satisfaction outcomes. (Table 2)

4. Discussion

This study systematically developed a postoperative recovery atlas for female genital cosmetic surgery (FGCS) and evaluated its psychological impact in perioperative education. The results showed that: (1) the atlas significantly reduced appearance-related anxiety at postoperative week 1; (2) patients in the atlas group reported better overall recovery experience; (3) FGSIS scores at postoperative month 1 were significantly higher than preoperative scores; and (4) no significant difference in overall satisfaction was observed between groups at month 1. These findings suggest that the primary value of the recovery

atlas lies in optimizing perioperative psychological adaptation rather than improving final satisfaction outcomes.

Previous studies have demonstrated that structured preoperative education enhances patients' understanding of surgical procedures and recovery processes. In this study, the atlas intervention provided intuitive visualization of normal healing trajectories and common postoperative changes, thereby reducing concerns about postoperative appearance. Consistent with our findings, Ali et al. reported a significant reduction in patient anxiety following preoperative education^[11]. Collectively, these data support the notion that adequate visual information can substantially improve psychological adaptation in patients.

Regarding self-image, FGSIS scores at postoperative month 1 were significantly improved compared with baseline, consistent with the validation study by Herbenick et al.^[12]. Prior research indicates that the decision to undergo labiaplasty is often associated with appearance-related concerns and psychological factors^[13]. However, the atlas intervention did not confer additional improvement in FGSIS outcomes, suggesting that long-term reconstruction of self-image is primarily determined by the objective surgical result rather than perioperative educational strategies.

In terms of early postoperative psychological responses, appearance-related anxiety at week 1 was significantly lower in the atlas group. Previous studies have shown that the early postoperative period is characterized by the greatest psychological fluctuation, during which edema and ecchymosis are frequently misinterpreted as surgical failure, leading to unnecessary consultations and increased communication burden. Improving patient understanding of the recovery process is therefore critical for enhancing overall patient experience^[14]. Although the concept of "expectation management" has been emphasized in aesthetic surgery, it is often limited to verbal counseling without structured tools. Evidence suggests that perioperative education significantly reduces patient anxiety^[15]. In this study, the recovery atlas provided a visual timeline, enabling patients to form stable expectations and reduce cognitive bias. These findings offer empirical support for the application of expectation management in FGCS.

With respect to satisfaction, no significant difference was observed between groups at postoperative month 1. This may be attributed to the substantial improvement in appearance achieved by surgery itself, which largely fulfilled patient expectations. Additionally, previous systematic reviews have reported high satisfaction rates for these procedures^[16]. Patient satisfaction is influenced by multiple factors, including surgical outcomes, safety, and physician–patient communication. As both groups achieved favorable aesthetic and functional results, overall satisfaction remained high.

Notably, the intervention group demonstrated significantly better recovery experience scores. Recovery experience reflects patients' subjective perception of the entire postoperative course, including understanding of healing stages, psychological comfort, and communication with clinicians. The visual information provided by the atlas likely enhanced predictability and patient engagement, thereby

improving the overall care experience. Similar recovery atlases in other surgical fields have also been shown to improve patient understanding of postoperative processes ^[17]. This tool may be readily integrated into routine clinical practice to enhance patient counseling and perioperative care.

Methodologically, this study utilized standardized photographic protocols and validated interobserver reliability, enhancing data objectivity. Standardized photography is widely recognized as an essential tool for documenting postoperative changes in plastic surgery research ^[18]. Previous studies have largely relied on case-based image presentation without systematic time-series data. By incorporating multitimepoint imaging and quantitative scoring, this study established a reproducible image database, providing a foundation for future multicenter studies and digital platform development ^[19].

Several limitations should be acknowledged. First, this was a single-center, non-randomized study with a relatively small sample size, which may introduce temporal bias. Second, the follow-up period was limited to 1 month, precluding assessment of long-term self-image stability. Third, psychological evaluation was primarily based on FGSIS and recovery experience scores without incorporating broader measures of anxiety or body image. Future studies should include multidimensional psychological assessments. Finally, cultural differences in perceptions of FGCS may limit the generalizability of these findings, warranting validation in diverse populations.

5. Conclusion

Female genital cosmetic surgery significantly improves genital self-image. A structured postoperative recovery atlas reduces early postoperative anxiety and enhances recovery experience, but has limited impact on final satisfaction. Its primary value lies in improving perioperative psychological adaptation and patient experience.

Abbreviations

FGCS

Female genital cosmetic surgery

VPAHS

Vulvar Postoperative Appearance and Healing Scale

FGSIS

Female Genital Self-Image Scale

Declarations

Ethics approval and consent to participate

The study was approved by the ethics committee of the First Hospital of Qinhuangdao and adhered to the guidelines of the Declaration of Helsinki. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors have no known conflict of interests to disclose.

Funding

This research did not receive any specific grants from public, commercial or non-profit funding bodies.

Authors' contributions

Ziyi Qi obtained patient consent, conceptual design, and manuscript review. Ziyi Qi and Wenbo Li performed literature review and interpretation of results. Ziyi Qi performed manuscript writing. Wenbo Li and Zhongxing Li performed manuscript review. Fenglian Wu performed surgeries, revised the manuscript and gave final approval for publication. All authors read and approved the final manuscript.

Acknowledgements

The authors thank all participants for their cooperation. The authors would like to thank Zhu Donglai, a plastic and aesthetic surgeon from the First Hospital of Qinhuangdao, for his technical guidance.

References

1. Géczi AM, Varga T, Vajna R, et al. Comprehensive assessment of labiaplasty techniques and tools, satisfaction rates, and risk factors: a systematic review and meta-analysis. *Aesthet Surg J*. 2024;44(11):NP798–808.
2. Lista F, Mistry BD, Singh Y, Ahmad J. The safety of aesthetic labiaplasty: a plastic surgery experience. *Aesthet Surg J*. 2015;35(6):689–95.
3. Alavi-Arjas F, Goodman MP, Simbar M, Majd HA, Sharp G, Nahidi F. The effect of female genital cosmetic and reconstructive procedures on body and genital self-image: a systematic review and meta-analysis. *Aesthet Surg J*. 2023;43(10):1161–73.
4. Mirzabeigi MN, Jandali S, Mettel RK, Alter GJ. The nomenclature of vaginal rejuvenation and elective vulvovaginal plastic surgery. *Aesthet Surg J*. 2011;31(6):723–4.
5. Sorice SC, Li AY, Canales FL, Furnas HJ. Why women request labiaplasty. *Plast Reconstr Surg*. 2017;139(4):856–63.

6. Veale D, Eshkevari E, Ellison N, et al. Psychological characteristics and motivation of women seeking labiaplasty. *Psychol Med*. 2014;44(3):555–66.
7. Thornton SM, Attaluri PK, Wirth PJ, Shaffrey EC, George RE, Carbullido MK, Rao VK. Picture perfect: standardizing and safekeeping clinical photography in plastic surgery. *Aesthet Surg. J Open Forum*. 2024;6:ojae012.
8. Kang Y, Xia Z, Wang S, et al. Standardized photography of female genitalia and anatomical evaluations. *Aesthet Surg J*. 2023;43(11):1334–44.
9. Hill PD. Psychometric properties of the REEDA. *J Nurse Midwifery*. 1990;35(3):162–5.
10. Viera AJ, Garrett JM. Understanding interobserver agreement: the kappa statistic. *Fam Med*. 2005;37(5):360–3.
11. Ali Z, Ahsan Z, Liaqat N, Din IU. Bridging the gap: evaluation of preoperative patients' education by comparing expectations and real-perioperative surgical experiences: a mixed-methods descriptive cross-sectional study. *BMC Health Serv Res*. 2024;24(1):964.
12. Herbenick D, Reece M, Schick V, et al. The female genital self-image scale (FGSIS): results from a nationally representative probability sample of women in the United States. *J Sex Med*. 2011;8(5):1585–91.
13. Sharp G, Tiggemann M, Mattiske J. Factors that influence the decision to undergo labiaplasty: media, relationships, and psychological well-being. *Aesthet. Surg J*. 2016;36(4):469–78.
14. Fiala T. Commentary on: the positive patient experience: a comprehensive analysis of plastic surgery online reviews. *Aesthet Surg J*. 2022;42(9):1094–6.
15. Musa AS, Derbi H, Salami A, Khalaf I. Impact of preoperative education on postoperative pain and anxiety among patients undergoing elective laparoscopic surgery: a randomized controlled trial. *J Perianesth Nurs*. 2022;37(2):215–21.
16. Iglesia CB, Yurteri-Kaplan L, Alinsod R. Female genital cosmetic surgery: a review of techniques and outcomes. *Int Urogynecol J*. 2013;24(12):1997–2009.
17. Chua ME, Ming JM, Sauders MA et al. Utilization of postpenile surgery illustrated healing atlas: a comparative study. *Urology*. 2018;112:151–154.
18. Persichetti P, Simone P, Langella M, Marangi GF, Carusi C. Digital photography in plastic surgery: how to achieve reasonable standardization outside a photographic studio. *Aesthetic Plast Surg*. 2007;31(2):194–200.
19. Parker WL, Czerwinski M, Sinno H, Loizides P, Lee C. Objective interpretation of surgical outcomes: is there a need for standardizing digital images in the plastic surgery literature? *Plast. Reconstr Surg*. 2007;120(5):1419–23.

Figures

Day 7

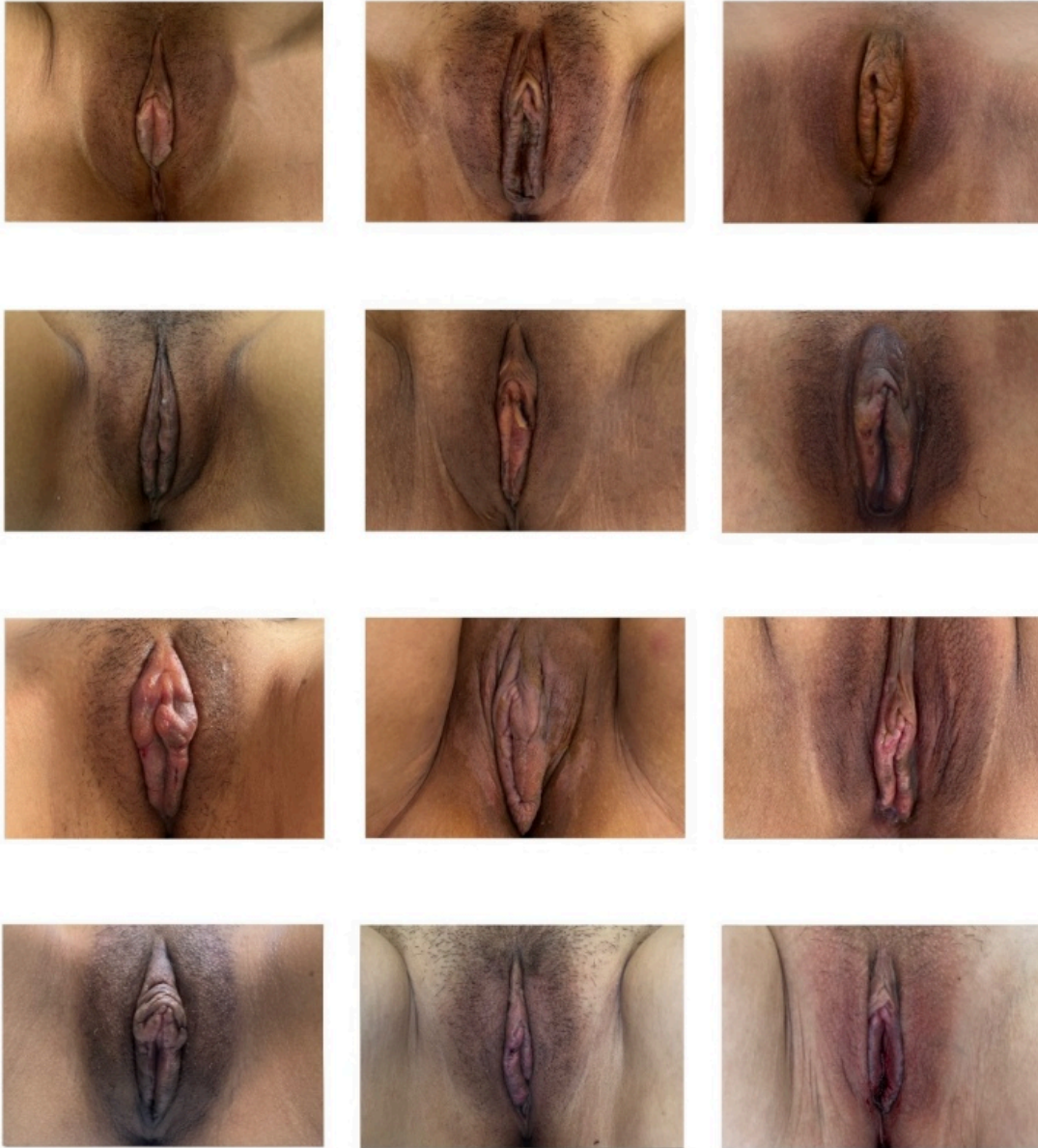


Figure 1

Standardized Postoperative Recovery Atlas Following Female Genital Cosmetic Surgery

Representative standardized photographs illustrating typical morphological changes at five time points: preoperative, immediate postoperative, postoperative day 1, week 1, and month 1. Early postoperative stages are characterized by edema, ecchymosis, and temporary asymmetry, which gradually resolve over

time. By postoperative month 1, vulvar morphology becomes stable with improved contour and symmetry. All images were obtained under standardized conditions and selected based on typical healing trajectories without complications. The atlas is intended to provide visual guidance for patient education and to facilitate understanding of normal postoperative recovery.