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ORIGINAL ARTICLE GENITAL SURGERY

Individualized Surgical Treatment of Different Types of Labia Minora Hypertrophy

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Abstract *Objective* To explore an optimal surgical approach for different types of labia minora hypertrophy and to design a better personalized surgical treatment plan for patients. *Methods* Forty-five patients with labia minora treated in our department from January 2014 to January 2019 were the study participants. Depending upon the appearance of the labia minora, they were divided into length labia minora hypertrophy, width labia minora hypertrophy, overall labia minora hypertrophy, and labia hypertrophy combined with clitoris foreskin. By combining the characteristics of the patient's labia minora hypertrophy and the aesthetic requirements for postoperative appearance, we designed a personalized treatment plan for each group of patients. The surgical approaches include upper pedicle flap wedge resection, upper and lower pedicle flap similar to wedge resection, lower pedicle flap pedicle wedge resection, and labia minora combined with clitoris foreskin surgery. We followed up the postoperative results, recovery, and complication rates for a period of 3 months. *Results* All patients who underwent surgery had good wound healing. The labia minora had good bilateral symmetry, moderate size, and desired appearance. The scar of the surgical incision was also not obvious. The postoperative labia minora felt normal without any serious complications. Overall, the treatment effect was satisfactory. *Conclusion* There are many surgical methods for the reduction in the labia minora. Our findings suggest that in order to achieve better results, a personalized surgical plan should be designed considering the patient's unique type of hypertrophy and the individual aesthetic requirements.
Level of Evidence IV This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

Keywords Labia minora hypertrophy · Types · Personalized surgery

Introduction

The labia minora can be identified as a pair of longitudinal skin folds located inside the labia majora. The labia minora are very small, thin and have variable size and color. The surface of the labia minora is smooth and pubescent-free. It is elastic in nature and has primary functions of shielding the vaginal opening of the urethra. It also helps in keeping the vaginal opening moist and maintaining the self-purification [1]. Under normal conditions, the labia minora is attached to the inside of the labia majora on both sides [2]. Any enlargement or thickening of the labia minora (> 1 cm above the labia majora) can cause local friction and discomfort during walking or cycling. It can also have a negative impact on the urine flow and even the sexual life [3]. In severe cases, repeated friction and stimulation can cause infection and chronic inflammation. Treatment protocol of such cases sometimes requires surgery. At present, there are various surgical procedures for labia minora reduction. Each type of surgery has its own advantages and disadvantages. Based upon the individual labia minora hypertrophy characteristics, our department has designed a personalized surgical plan and achieved promising results.

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Materials and Methods

Patients and Study Design

Clinical Data

The data from 45 patients (aged 20–45 years, the average age is 25.8 years old), who underwent surgery for labia minora hypertrophy in our department and followed up between January 2014 to January 2019, were reviewed. Among these, 11 patients had hypertrophy on one side and 34 patients had it on both sides. There were 14 cases of congenital labia minora hypertrophy and 31 cases of congenital labia minora hypertrophy. Using patient-specific clinical manifestations and the characteristics of the labia minora hypertrophy in terms of its size and position, the total data were divided into the following groups. (1) The length labia minora hypertrophy (seven subjects): This group consists of cases with labia minora length more than 2 cm and protruding from the labia majora. As per the position of the bulge, it was divided into upper, central, and lower length labia minora hypertrophy. (2) The width labia minora hypertrophy (two subjects): This group consists of cases where the length of the labia minora was not long but the width was beyond the level below the vagina leading to curved and wrinkled edges of the labia minora. (3) Overall labia minora hypertrophy (six subjects): In this group, both the length and width of the labia minora were hypertrophied; (4) Labia minora hypertrophy combined with clitoris foreskin (30 subjects): This group included any of the above types of labia minora hypertrophy along with long clitoris foreskin (Table 2).

Surgical Design

The patient takes the lithotomy position. In the case of unilateral hypertrophy, the surgical resection area was designed with reference to the contralateral size. In bilateral hypertrophy, the height of the labia minora tissue is generally 1 cm after the surgical resection, and the width is flush with the vaginal edge. The surgical plan was based upon the specific type of labia minora hypertrophy in different patients. It consists of five surgical procedures A, B, C, D, and E (Fig. 1).

A surgical method: Here, we design a rectangular flap with a pedicle on the lower side of the labia minora. The marginal tissue of the lower labia minora was preserved and the upper segment and the central tissue were removed. Finally, the flap is pulled up and sutured with the clitoris foreskin (Fig. 1a).

B surgical method: Two rectangular flaps were designed for the upper and lower portions of the labia minora. Here, both the upper and lower margin tissues of the labia minora were preserved. The central edge of the labia minora and the basal hypertrophy were removed. Suturing was done between the upper and lower flaps and the base (Fig. 1b).

C surgical method: A triangular flap was designed with a pedicle on the upper portion of the labia minora. The marginal tissue of the upper part of the labia minora was preserved. The central basement hypertrophy of the lower labia was removed and suturing between the epithelial flap and the base was performed (Fig. 1c).

D surgical method: The medial flap and the incisions were similar to the A method. In this case, the lateral incision of the labia minora extends to the base of the clitoris foreskin and cuts the long clitoris foreskin along with the base wedge (Fig. 1d).

E surgical method: The medial flap and the incision design were similar to the C method. The lateral incision of the labia minora extends to the base of the clitoris foreskin and cuts the long clitoris foreskin along with the base wedge (Fig. 1e).

We had chosen the appropriate surgical plan specifically for the types of labia minora hypertrophy. The specific plans and principles are discussed below.

1. The upper length labia minora hypertrophy: The upper part of the labia minora is thicker and the lower part is relatively thin. To preserve the lower part of the labia minora tissue during surgery surgical method, A is employed (Fig. 1a).
2. The central length labia minora hypertrophy: In this case, the central area of the labia minora is thicker, while the lower portion is thin. These thin areas in the upper and lower segments during surgery are preserved by performing surgical method B (Fig. 1b).
3. The lower length labia minora hypertrophy: Here, the lower part of the labia minora tissue is relatively thick, and the upper portion is relatively thin. In order to preserve this portion, we perform C surgical method (Fig. 1c).
4. The width labia minora hypertrophy: In this case, the labia minora is not too thick but it appears wide. To conceal the incision in a better way, we perform surgical method C.
5. Overall labia minora hypertrophy: Here, the labia minora is not only wide but it is also hypertrophic. The surgical design was based on the location of the hypertrophy, and the relatively thin areas were retained. We generally choose the wedge resection of the upper or lower flap according to the condition, and surgical method A or C are preferred.
6. Labia minora hypertrophy combined with clitoris foreskin: In these cases, correction in the clitoris foreskin along with the labia minora reduction was

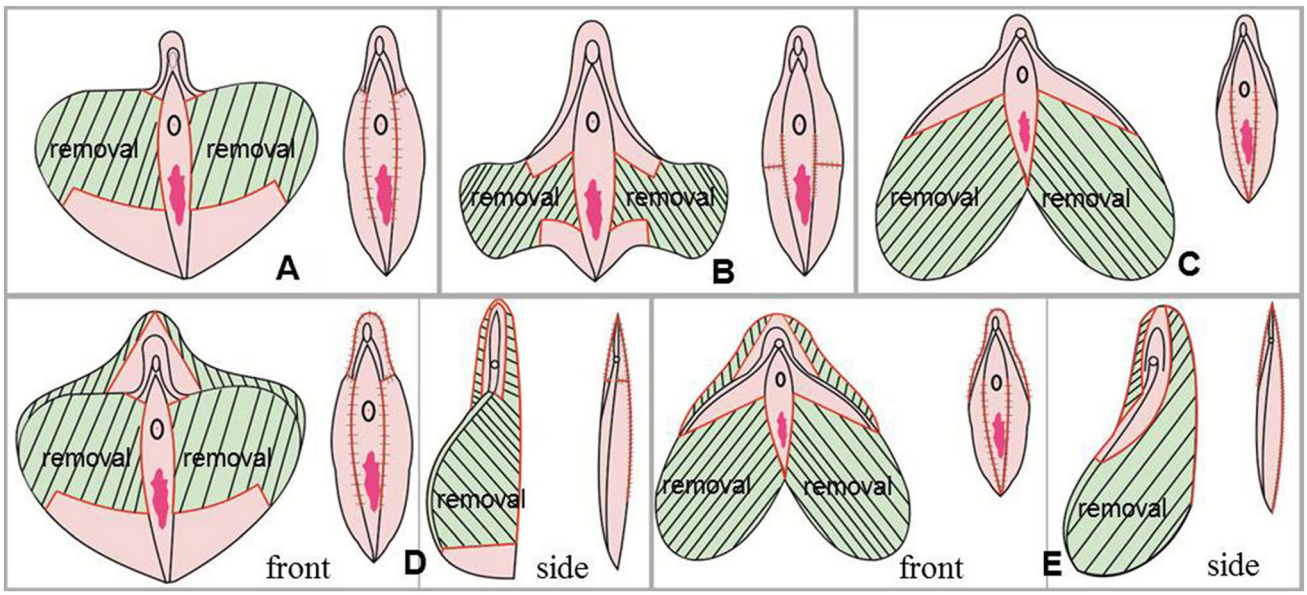

Fig. 1 Surgical design schematic diagram of different types of labia minora hypertrophy

required. We designed a wedge-shaped resection of the labia minora according to the above-mentioned methods based on the specific type of hypertrophy. At the same time, the foreskin was cut off on both sides near the base wedge. Therefore, surgical methods D or E are selected according to the specific situation (Fig. 1d, e).

Surgical Procedure

The process starts with routine disinfection and laying a sterile towel list. The surgical incision line was marked with methylene blue depending upon the above-mentioned surgical guidelines. Two (2) % lidocaine 10 mL + 1/500,000 epinephrine was used for local infiltration anesthesia. The surgery was performed along the incision line in the enlarged labia minora tissues with scissors. The 5-0 fast absorbable line was sutured intermittently after complete hemostasis. After cleaning and disinfecting the surgical area, the sterile gauze pads were pressed and replaced periodically.

Postoperative Care

The perineal disinfectant or antibacterial solution is applied to the area after urination. The patients were advised bed rest for 3 days and to avoid any strenuous exercise for 2 weeks and to refrain from active sex life for at least a month. The recovery information of the patient was recorded through patients return to hospital for follow-up, telephone follow-up, and WeChat (a social communication platform commonly used by Chinese people) follow-up within 3 months after surgery. This included parameters related to edema regression time, scar hyperplasia, bilateral symmetry aesthetics, sensation, and sexual sensation of labia minora (Table 1).

Results

Forty-five (45) participants of the study who underwent the treatment had a total of 79 sides. Of these, 78 sides of the wound healed in the first stage. One side of the wound was partially ruptured at the fifth day after surgery; however, it healed well after re-invasive debridement. At 2 weeks of postoperative follow-up, 39 patients showed edema in the operation area. Six patients had complained about un-resolved edema in the operation area. At 1-month postoperative follow-up, all patients had complete edema in the surgical area. The appearance and symmetry of the labia minora were found to be good and the scars of the surgical incisions were not obvious. The feelings of labia minora are normal, and the patients were satisfied with the surgical outcome (Fig. 2). The recovery information of the patient was recorded through outpatient follow-up using the telephone and WeChat within 3 months after surgery. This included parameters related to edema regression time, scar hyperplasia, bilateral symmetry aesthetics, sensation, and sexual sensation of labia minora. The follow-up method mainly depends on the patient's preferences and the contact information provided. Among them, 29 patients were only followed by telephone, eight patients were only followed by WeChat, and eight patients were followed by telephone and WeChat. All patient supervisors believe that there was

Table 1 Questionnaire used during follow-up

Date of surgery( ) Name( ) Age( ) Marriage( ) Review time( )
The time of the labia minora hypertrophy
( )At birth
( )Puberty
( )Appeared after having sex
( )Appeared during pregnancy
Reason of surgery
( ) Have symptoms (friction discomfort, more secretions, etc.), affecting life
( ) No obvious symptoms, just to improve the appearance
( ) Has mild symptoms but affects the appearance
( ) I feel nothing, my spouse wants treatment
( ) I feel nothing, my parents ask for treatment
( )Other reasons_____
Pre-treatment symptoms
( )Pain
( )Itching
( )Repeated inflammation
( )Increased vaginal secretions
( )Difficulty in cleaning
( )Friction discomfort while walking
( )Sexual pain
( )Other symptoms_____
Healing process
( )More postoperative bleeding, more menstruation
( )Postoperative pain is obvious, you need to take painkillers to endure
( )Wound infection
( )Wound does not heal
Postoperative pain duration time ( )d
Postoperative swelling regression time ( ) d
Other cases _____
Symptom comparison before and after treatment
Pain _____
Itching_____
Repeated inflammation_____
Increased vaginal secretions_____
Difficulty in cleaning_____
Friction discomfort while walking_____
Sexual pain_____
Other changes_____
Current symptoms
( )Swelling
( )Wound scar hyperplasia
( )Bilateral asymmetry
( )Poor appearance
( )Feeling numb
Other_____

no significant change in the feeling of the labia minora. Among the 30 patients who underwent the labia minora combined with clitoris foreskin surgery, 25 patients showed an enhancement in the clitoral sensation and five patients had no significant changes (Table 2).

Discussion

The labia minora hypertrophy not only affects the appearance of the vulva but also causes discomfort. It can lead to ulceration and inflammation and can also cause pain during intercourse [4]. Because of the repeated inflammatory stimuli, the symptoms of labia minora hypertrophy in some patients increases continuously. This can negatively affect the patient's body and mind. As the demand for the high quality of life is increasing, patients require plastic surgery not only to relieve the pain associated with labia minora hypertrophy but also to improve its appearance. The shape, color, size, contour, and symmetry of the labia minora are specific to a person. These differences are not only related to race, age, height, but also depend upon production, drug use, etc. [5]. Everyone has different requirements for the aesthetics of the labia minora. Most women think that it should be small rather than prominent in the labia majora. However, the symmetrical appearance of labia minora is considered as normal and desired [6].

Currently, labia minora plastic surgery contributes maximally in overall perineal plastic surgical procedures [7]. There are many surgical methods for reducing the labia minora each with its own advantages and disadvantages. The fundamental principle behind the surgical process is to restore the enlarged labia minora to normal size, improve clinical symptoms, and achieve symmetry and beautiful appearance. Therefore, a generalized surgical procedure will not be suitable for all patients. Additional aspects such as the degree and appearance of the labia minora and patient's aesthetic requirements need to be considered [8]. Commonly employed surgical approaches include labia minora straight line resection, central removal of the epithelium, and wedge resection. Other surgical approaches are extensions or combinations of these procedures [9]. Any surgical process should follow the principles of protection, symmetry, minimally invasive, safety, and incision concealment. Also, practicing plastic surgeons should master a variety of surgical techniques and choose a specific surgical plan suitable for a patient depending upon a comprehensive evaluation [10].

Optimal blood supply to the flap is the most important factor to consider while designing a surgical plan. The labia minora is rich in blood vessels and capillaries, and consists of a large number of elastic fibers. The major

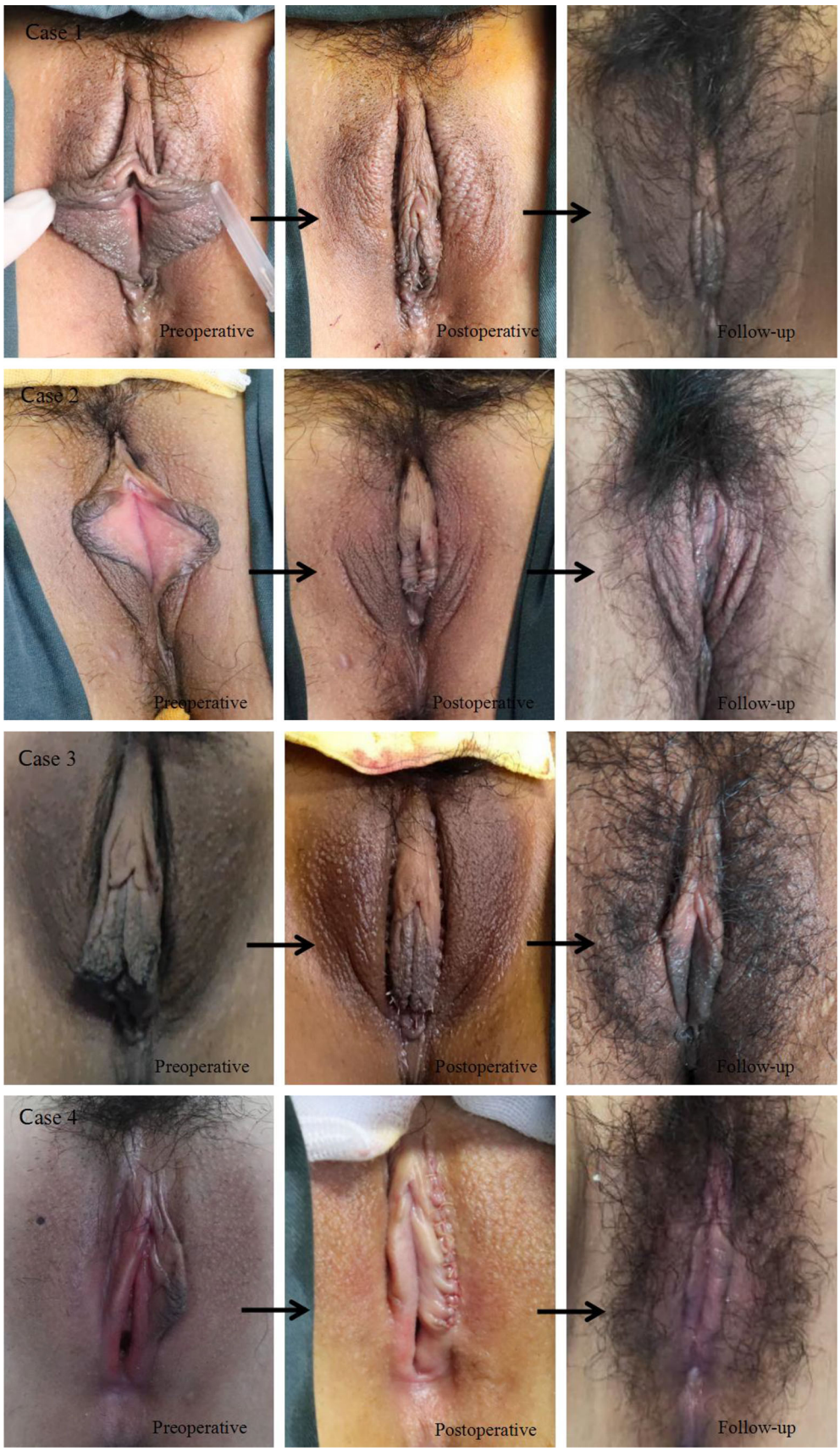

Fig. 2 Surgical cases of different types of labia minora hypertrophy

Table 2 Types of labia minora hypertrophy, surgical methods, and postoperative complications

Types	Cases	Surgical method	Detumescence time(d)	Incision Unhealed	Scar hyperplasia	Bilateral asymmetry	Feeling abnormal	Clitoral sensation weakened
The upper length labia minora hypertrophy	3	A	7.00	0	0	0	0	0
The central length labia minora hypertrophy	3	B	7.67	0	0	0	0	0
The lower length labia minora hypertrophy	1	C	5.00	0	0	0	0	0
The width labia minora hypertrophy	2	C	11.00	0	0	0	0	0
Overall labia minora hypertrophy	6	A/C	10.05	0	0	0	0	0
The upper length labia minora hypertrophy combined with clitoris foreskin	7	D	12.43	1	0	0	0	0
The central length labia minora hypertrophy combined with clitoris foreskin	2	D/E	11.00	0	0	0	0	0
The lower length labia minora hypertrophy combined with clitoris foreskin	2	E	11.50	0	0	0	0	0
The width labia minora hypertrophy combined with clitoris foreskin	3	E	13.00	0	0	0	0	0
Overall labia minora hypertrophy combined with clitoris foreskin	16	D/E	14.88	0	0	1	0	0

blood supply patterns are divided into main and parallel type. During sexual arousal, the blood flow and volume of the labia minora tissue are increased [11]. Our aim should be to save the main blood vessels as much as possible during surgery. If a wedge resection method is chosen, the length and width of the flap should not exceed 1:1. The surgical operation should be gentle and minimally invasive to avoid skin flap necrosis. The labia minora contains sensitive nerve fibers and a large number of delicate vasculatures. During sexual arousal, the labia become full and produce sexual sensation and pleasure. However, as the clitoris is also a sensitive part of female sexual arousal correction of the clitoris, foreskin should also be considered during surgery [12]. Sexual arousal is an extremely complicated process because of multiple influencing factors. Therefore, it becomes very difficult to observe and study because of patients' privacy and subjective factors. Alter [13] reported that among 166 women who underwent labia minora and clitoris foreskin surgery, 38 had increased sexual sensitivity, while nine had decreased sexual sensation. However, the authors did not distinguish between the feelings of the clitoris and the labia in the present study. None of the 45 patients who underwent labia minora plastic surgery in our department had a change in the sexual feelings of the labia minora. However, 83.3% of patients with clitoris foreskin had sexual sensation enhancement. Therefore, it can be concluded that the labia minora plastic surgery has little effect on sexual sensation, and clitoris foreskin shaping can improve the sexual sensation. The present study is limited in number and also lacks any evaluation of objective indicators. Additional in-depth studies with more samples are required to illustrate the relationship between labia minora and sexual sensation.

Incision non-healing, scar hyperplasia, bilateral asymmetry, edema, etc., are the common complications after labia minora plastic surgery. The non-healing and bilateral asymmetry can be largely avoided by the surgeon's fine preoperative design and standardized surgical procedures [14]. Scar hyperplasia is often related to wound non-healing and personal physique. The skin of the labia minora is thin and consists of mucosal tissue at the inner side. Sterile soft and minimally invasive operation during surgery and good postoperative care can reduce the incidences of scar hyperplasia. Tissue edema is a common and unavoidable complication after labia minora plastic surgery. It can eventually improve but the recovery time is different for each patient. The edema regression time of the patient with a large resection range and an extended surgical incision is longer. For example, in our study, overall labia minora hypertrophy combined with clitoris foreskin surgical approach has a large amount of tissue resection, extended surgical incision, and a complicated surgical procedure.

Therefore, the average time of postoperative edema regression was longer than other types. Temporary edema is also acceptable for better long-term results.

A large number of patients visiting the clinic require surgery only for aesthetic reasons. Therefore, it is very important to consider the postoperative aesthetics in the surgical design. Due to the differences in color and morphology of labia minora, specific kind of surgical methods should be chosen. Most patients with labia minora hypertrophy have different degrees of pigmentation. Therefore, the practicing surgeon should also consider the color of the labia minora after surgery. Especially for the patients with unilateral labia minora, a personalized surgical plan with reference to the color and size of the contralateral labia minora should be designed. For example, in upper length labia minora hypertrophy, only the affected area is thick and pigmented rest is normal. The rectangular flap with the lower pedicle was used to cut the thick and pigmented labia minora portions. The lower thinner part of the labia minora tissue with light color was preserved. The rectangular flap and the upper edge of the incision were stitched, and the edge was round and smooth. The color and shape were normal. Surgical methods for other types of labia minora hypertrophies were also designed utilizing the same principles and yielded good results. Overall, our study for the first time provided evidence about personalized therapeutic strategy for a specific type of hypertrophy. Further study with a large number of cases is required. Authors also recommend a detailed preoperative evaluation to design a specific surgical plan in order to achieve the desired outcome.

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Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflicts of interest to disclose.

Statement of Human and Animal Rights, or Ethical Approval The Ethics Committee of the First Affiliated Hospital of Chongqing Medical University approved the study. It is also studied in accordance with the ethical guidelines established in the Helsinki Declaration.

Informed Consent All patients gave informed consent to the study and publication and have signed relevant informed consent.

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