

Vaginoplasty Modifications to Improve Vulvar Aesthetics



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KEYWORDS

- Vaginoplasty • Gender confirmation surgery • Male-to-female • Labia minora reconstruction
- Penile inversion • Preputial flap • Clitoroplasty • Gender dysphoria

KEY POINTS

- The author introduces a nonpenile inversion modification technique for vulvar aesthetic improvement using prepuce, and penile or scrotal skin to reconstruct the double surfaces of labia minora.
- The sensate clitoris, clitoral hood, and clitoral frenulum are constructed using the dorsal neurovascular whole glans penis preputial island flap.
- The simple full-thickness genital skin-mucosal graft vaginoplasty is used for the neovaginal wall lining.

INTRODUCTION

Male-to-female (MTF) gender confirmation surgery (GCS) is complex genital surgery, the outcome of which has an enormous psychological effect on the transwoman individual. Several vaginoplasty techniques including genital or nongenital skin grafts vaginoplasty, penile-scrotal skin flap inversion vaginoplasty, or pedicle intestinal vaginoplasty have been introduced since 1931 to reconstruct a functional vaginal canal.^{1–6} The sensate clitoris reconstruction using the dorsal neurovascular glans penis flap was developed to introduce sexual sensation.^{7,8} To date, penile skin inversion vaginoplasty (PIV) with the dorsal neurovascular glans penis clitoroplasty is the de facto choice in MTF GCS, which successfully provides sexual sensation and neovaginal depth.

Improvements to vulvar aesthetics, particularly the clitoral complex and labia minora reconstruction, are still difficult and remain the challenge of genital reconstructive surgeons. Several techniques exist to improve the clitoral complex and labia minora reconstruction; most are modified PIV and yield varied aesthetic results.^{9–11}

BACKGROUND LEADING TO DEVELOPMENT OF THE AUTHOR'S TECHNIQUE

Between 1992 and 2000 the author had personal experience of MTF GCS in some 450 transwomen using the traditional PIV, modified with scrotal skin graft in cases of inadequate penile skin, and the dorsal neurovascular glans penis clitoroplasty. Generally these gave satisfactory neovaginal depth and sexual sensation results, but good vulvar aesthetic results were mostly not achieved because most penile tissue is consumed within the vaginal cavity in PIV. This leaves little to no surplus material to create a realistic vulvar appearance.

In preoperative surveys during 2014 to 2017, 580 patients prioritized their postoperative preferences to be

1. Sexual sensation 58.1% (n = 337)
2. Natural vulvar aesthetics 37.4% (n = 217)
3. Vaginal depth 4.5% (n = 26)

Sexual sensation and vulvar aesthetics are seen by most as being most important, whereas vaginal depth is generally the least important outcome to

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most patients, even though this had traditionally been the priority of the PIV technique. To improve vulvar aesthetics, the PIV technique was reviewed and revised by the author to prioritize material usage toward aesthetic appearance of the labia minora and construction of the clitoral complex in preference to achievement of vaginal depth.

GOALS OF VULVAR AESTHETIC APPEARANCE

The ideal aesthetic outcome of the reconstructed structures of female genitalia includes the following:

1. Clitoris should have a round/oval projection shape, located approximately 3 to 4 cm above the urethral orifice, covered with the clitoral hood dorsally, which splits into a clitoral frenulum connecting with the upper one-third part of labia minora on either side.
2. Labia minora must have a lip-like shape with the length running each side posteriorly from the clitoral region toward the bottom of the vagina. Labia minora need double surfaces; the inner surface of labia minora is hairless with a thin, pink color, whereas the outer surface is normal skin color and texture.
3. Urethral orifice is located near the vaginal entrance with minimum erectile tissue.
4. The constructed clitoris, clitoral hood, clitoral frenulum, labia minora, labia majora, urethral orifice, and vaginal introitus are all realistically placed in the correct three-dimensional planes.
5. Vaginal wall lining should be hairless, thin, and pink in color.

CHOICE OF DONOR TISSUE

For the best vulvar aesthetic reconstruction, each feature of the constructed female genitalia must be created from the most appropriate donor tissue of male genitalia to match typical color and tissue consistency.

1. The glans penis in a male is biologically homologous to the clitoris in female. The glans penis has about 10 times more volume than a typical clitoris, whereas there are fewer sexual sensory nerve endings than in a typical clitoris. Glans penis is considered as the most appropriate donor tissue for sensate clitoris reconstruction but reduction of glans penis to that of a typical clitoris size would also reduce postoperative sexual sensation. The author tries to keep the entire glans penis to preserve as much postoperative sexual sensation as possible.
2. The prepuce of penis is an extremely thin skin fold consisting of two layers of different color. The prepuce is hairless and contains no

subcutaneous fat. The inner layer of the prepuce has similar texture, color, and quality as the inner surface of labia minora in a genetic female. Prepuce is also rich with innervated erogenous sensory receptors. The prepuce of penis is considered to be the most appropriate donor tissue for the inner surface of labia minora reconstruction, not only for the satisfactory aesthetic result but also for enhancement of sexual sensation.

3. The penile shaft skin has similar color and texture to the outer surface of natural labia minora and is considered as the most appropriate donor tissue to construct the outer surface of labia minora.
4. The scrotal skin in male genitalia has been used successfully as donor tissue for the reconstructed labia majora. With PIV, scrotal skin is always excess and excised. The excess scrotal skin is used as full-thickness graft addition with PIV by some surgeons for vaginal lining to attain adequate neovaginal depth.^{9,12}

PRINCIPLE OF THE AUTHOR'S MALE-TO-FEMALE GENDER CONFIRMATION SURGICAL TECHNIQUE

In September 2000, the author originated the Suporn technique for MTF GCS using a dorsal neurovascular whole glans penis preputial island flap for sensate clitoris, clitoral hood, clitoral frenulum, and inner surface of labia minora reconstruction. To preserve sexual sensation as much as possible, the remaining glans penis tissue from the clitoris reconstruction is retained and named "the secondary sensate organ." The penile shaft skin flap is for the outer surface of labia minora reconstruction. The described labia minora reconstruction technique is known as "type A labia minora reconstruction" where adequate penile donor tissue is present. The technique was presented at the 27th Annual Scientific Meeting of The Royal College of Surgeons of Thailand on 26th July 2002, Na Chom Thian, Sattahip, Chonburi, Thailand.¹³ Since its introduction, the technique has been used by the author on some 2700 transwomen.

Overcircumcision or penile-scrotal hypotrophy from hormone therapy, may lead to there being insufficient penile skin to construct the double surface of labia minora. In such cases an alternative "type B labia minora reconstruction" is applied, in which the inner surfaces of labia minora are constructed from existing penile skin and the outer surface from the medial part of scrotal skin flaps.

Because all or almost all penile skin is used for labia minora reconstruction, the remaining penile

skin is inadequate in quality and quantity for neovaginal wall lining. Full-thickness genital skin-mucosal grafts harvested from excess scrotal skin, combined with the excess penile skin and urethral mucosa, are used for neovaginal wall lining in every case. This enables adequate neovaginal depth in all cases even with limited penile skin.¹⁴

The author's technique uses the following:

- *Dorsal neurovascular whole glans penis preputial island flap*: For sensate clitoris, clitoral hood, clitoral frenulum, secondary sensate organ, and internal surface of labia minora reconstruction.
- *Penile skin flap or scrotal skin flap*: For external surface of labia minora reconstruction.
- *Full-thickness scrotal skin, penile skin, urethral mucosa, with or without groin skin grafts*: For neovaginal wall lining.

Procedural steps are performed sequentially as follows:

1. Neovaginal cavity dissection
2. Orchidectomy
3. Penile skin flap dissection
4. Dorsal neurovascular whole glans penis preputial island flap dissection
5. Sensate clitoris, clitoral hood, clitoral frenulum, and secondary sensate organ reconstruction
6. Inset posterior perineal skin flap
7. Inner and outer surface of labia minora reconstruction
8. Labia majora reconstruction
9. Urethral reconstruction
10. Vaginal introitus reconstruction
11. Lining of vaginal cavity

The neovaginal cavity is carefully dissected between urethra-bladder and rectum guided by a silicone urinary catheter anteriorly and a guiding sponge stick in the rectum posteriorly. A vaginal cavity depth of at least 6 inches (15 cm) should be attained. Orchidectomy is performed, then bulbospongiosus muscle is excised.

The penis is pulled down to evaluate the adequacy of the donor penile tissue for the type of labia minora reconstruction choices. Circumferential incision is made at 3 to 4 cm from the corona of glans. The proximal penile skin is dissected off the penis superficial to buck fascia. Dorsal neurovascular whole glans penis preputial island flap is dissected from the tunica albuginea (**Fig. 1**).

A small strip (1 cm × 3 cm) of tunica albuginea that attaches to the dorsal neurovascular pedicle and the corona of glans is preserved for suspending the constructed clitoris at the best aesthetic

position. After the glans penis preputial flap is completely dissected off corpus cavernosa, the resected corpus cavernosum stump is resected and secured by 1–0 absorbable suture. The strip of tunica albuginea flap is fixed to periosteum of pubic tubercle on either side of the dorsal neurovascular pedicle with 4–0 absorbable suture to suspend the constructed clitoris in the right position 3 to 4 cm superior to the urethral orifice.

The glans penis is divided into three parts of which the middle part is used for sensate clitoris reconstruction. The lateral parts are sutured together and fixed to the corpus cavernosum stump, to become the secondary sensate organ. The preputial flap is divided on the dorsal side at midline just proximal to the corona of glans. The upper third part of each preputial flap is used to create the clitoral hood and clitoral frenulum. The lower two-thirds of preputial flap are used for the inner surface of labia minora reconstruction (**Figs. 2 and 3**).

The posteriorly narrow base perineal flap is inset to form the posterior aspect of the vaginal introitus. Urethral reconstruction is performed by everting the urethral mucosa to join the secondary sensate organ superiorly, the middle third part of the constructed inner surface of labia minora laterally, and the skin graft inferiorly.

In the type A procedure (adequate penile tissue), the inner surface of labia minora is reconstructed by suturing the volar rim of preputial flap to the constructed urethra and covering the lateral aspect of vaginal introitus (see **Fig. 3F**). The proximal penile skin flap is pulled down and divided in the midline (**Fig. 4A**). Each side of the divided skin flap is used for the outer surface of the labia minora reconstruction. The interlabial sulcus on either side are created to differentiate the labia minora from the labia majora. A 4–0 absorbing suture needle is used to pierce between the junction of penile skin flap and scrotal skin flap, with quilting fixed to the deep structures, such as corpora stump, crus of penis, and lateral aspect of neovagina introitus to create the deep interlabial sulcus on both sides (**Fig. 4B**). Both constructed inner and outer surface of labia minora are sutured together to form the double surfaces of labia minora (**Fig. 4C**).

In the type B procedure (limited donor penile tissue), all or almost existing penile skin is used for construction of clitoral hood, clitoral frenulum, and inner surface of labia minora. The scrotal skin flaps are pulled down, then a vertical 3- to 4-cm-long cut is made through all layers of the medial part of scrotal skin flap around 1 cm offset from the medial rim. This is to separate the scrotal

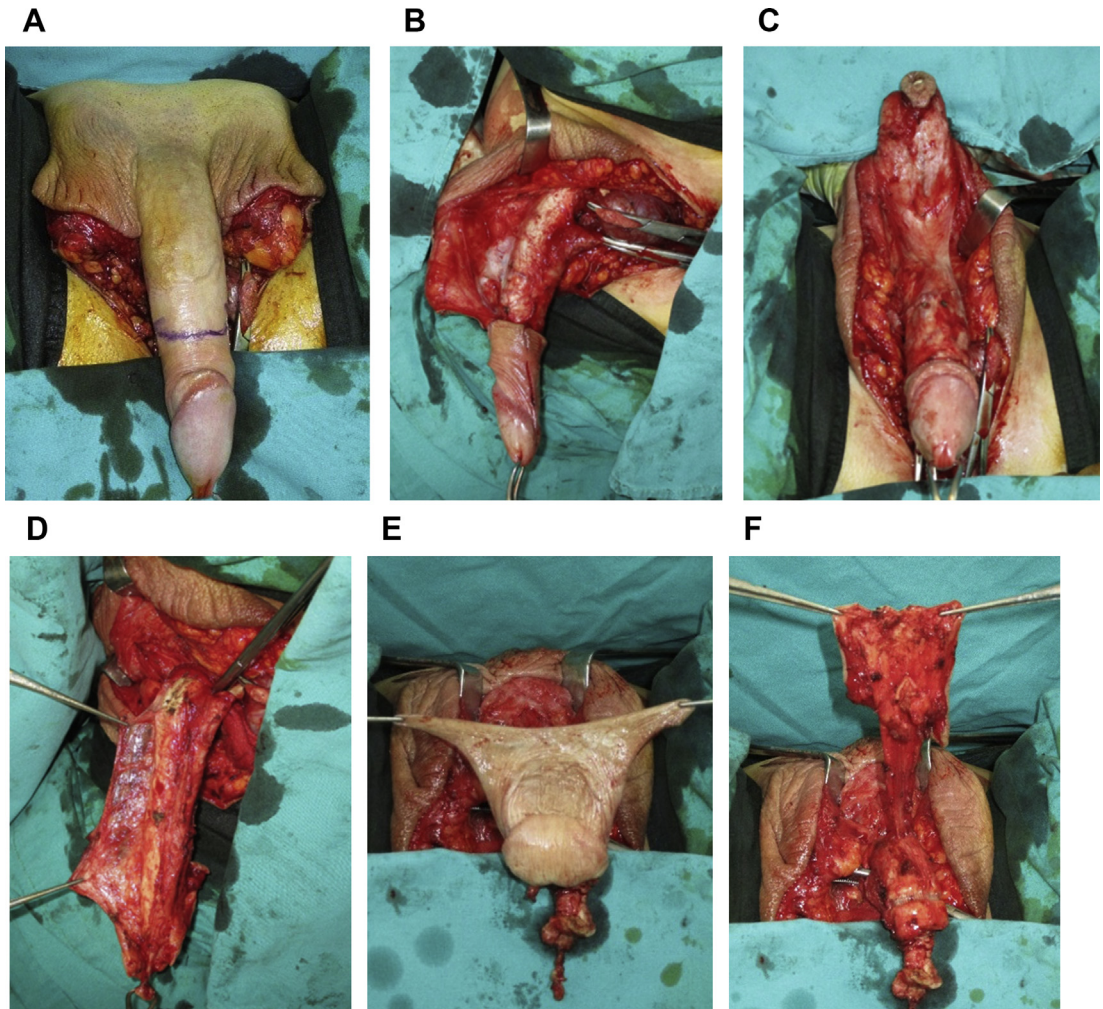


Fig. 1. The dorsal neurovascular whole glans penis preputial island flap dissection. (A) Marking and evaluation of penile skin. (B) Circumferential incision is made at 3 to 4 cm from the corona of glans. (C) The proximal penile skin is dissected off the penis superficial to buck fascia. (D) Dorsal neurovascular whole glans penis preputial island flap is dissected from the tunica albuginea. (E) The glans penis preputial flap is completely dissected. (F) A small strip of tunica albuginea that attaches to the dorsal neurovascular pedicle and the corona of glans is preserved.

skin flap into two flaps: the medial and the lateral scrotal skin flap. The medial scrotal skin flap is used for reconstruction of the outer surface of labia minora. A 4-0 absorbing suture needle is used to pierce between the medial and lateral scrotal skin flap and quilting fixed to the deep structures to create the deep interlabial sulcus on either side (Fig. 5). Labia majora are reconstructed from the lateral scrotal skin flap.

The vaginal introitus in Suporn technique is constructed with multiple skin flaps. A skin graft is never used to create the vaginal introitus to avoid scar contracture and unsightly scar. The inferior aspect (horizontal plane) of the vaginal introitus is lined by the posterior perineal skin flap. The superior aspect is everted urethral flap. Lateral aspects (vertical plane) of vaginal introitus on both sides

are created by a penile skin flap, preputial flap, or scrotal skin flap.

The full-thickness genital skin-mucosal graft harvested from the excess scrotal skin, penile skin, or addition with urethral mucosa is used for neovaginal wall lining, which enables adequate neovaginal depth in all cases. The subcutaneous tissue and any hair follicles resident in all donor skins are excised completely to ensure a permanently hair-free vaginal cavity and sutured together to form a tubular skin on a plastic tube. The tubular skin is sutured to the neovaginal introitus, which is reconstructed from the urethral flap, penile skin flap, scrotal skin flap, and posterior perineal flap then inverted into the vaginal cavity with the dermis outside for full-thickness genital skin-mucosal graft vaginoplasty.

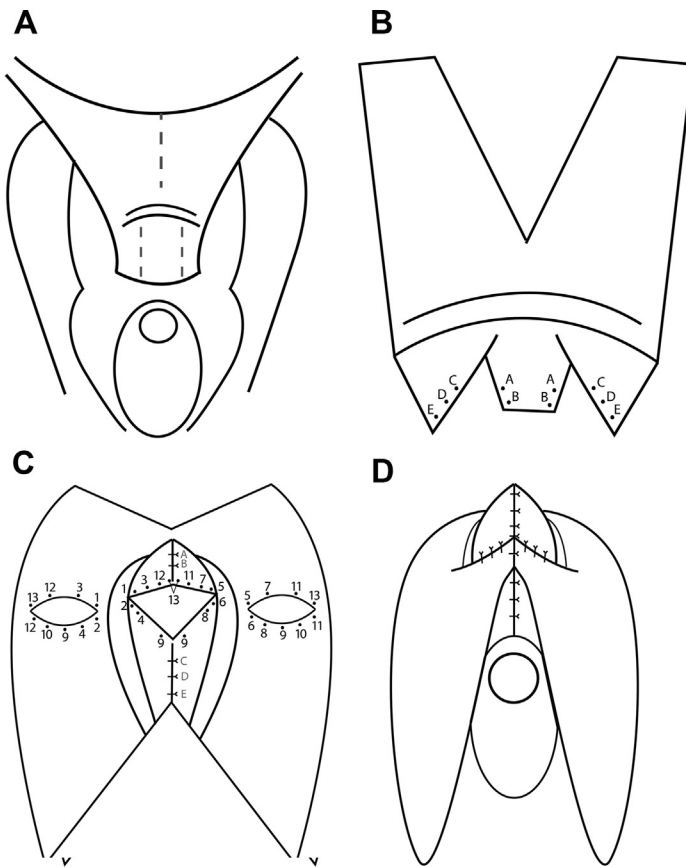


Fig. 2. Method for reconstruction of clitoral complex and inner surface of labia minora. (A) Mark and divide the glans penis into three flaps and prepuce into two flaps. (B) Clitoris and secondary sensate organ reconstruction is achieved by suturing the five pairs of the alphabetically marked points, starting by suturing point A with A then point B with B and repeating consecutively through points E. (C) The clitoral hood and clitoral frenulum reconstruction is achieved by suturing the numerically marked pairs of points sequentially from 1 through 13. (D) Outcome of the constructed clitoris, clitoral hood, clitoral frenulum, secondary sensate organ, and inner surface of labia minora.

The constructed neovagina is firmly packed with a roll of gauze soaked with povidone inside double condoms to hold in place and press the skin graft to the entire raw surface of the neovaginal cavity.

Patients are confined to bed for 4 to 5 days. The vaginal packing and urethral catheter are removed on Day 7. Patients are instructed how to care for the neovagina and instructed in the technique of vaginal dilation. The patient is scheduled to dilate the neovagina for 0.5 hour, two to three times daily, every day for 3 to 6 months then once a day until 1 year postoperative.

To maintain the integrity of a functionally deep neovaginal cavity, full preoperative understanding by the patient of the necessity for adequate dilation is essential. This is supplemented by encouragement and support by our team in the early postoperative period, and ongoing cooperation is given.

RESULTS

During 2014 to 2017, 580 cases of MTF GCS were performed on patients from 46 countries

using the Suporn technique. Average age of the patients was 33 years (range, 18–65 years). Patients with prior circumcision numbered 249 (42.9%) and 19 (3.3%) had prior bilateral orchidectomy. Type A labia minora reconstruction was used in 424 patients (73.1%) and type B in 156 cases (26.9%).

VULVAR AESTHETICS OUTCOME

Goals of the ideal vulvar aesthetics outcome are successfully achieved by the author's technique.

1. The round projection shape of the clitoris with the clitoral hood superiorly and clitoral frenulum inferior-laterally is constructed (Fig. 6).
2. The constructed lip-like labia minora have double surfaces with different color and texture on either surface, with the length running each side posteriorly from the clitoral region toward the bottom of the vagina. The labia minora is clearly differentiated from labia majora by the constructed interlabial sulcus. The inner surface of the constructed labia minora in type A is thin, pink color, and hairless, which closely

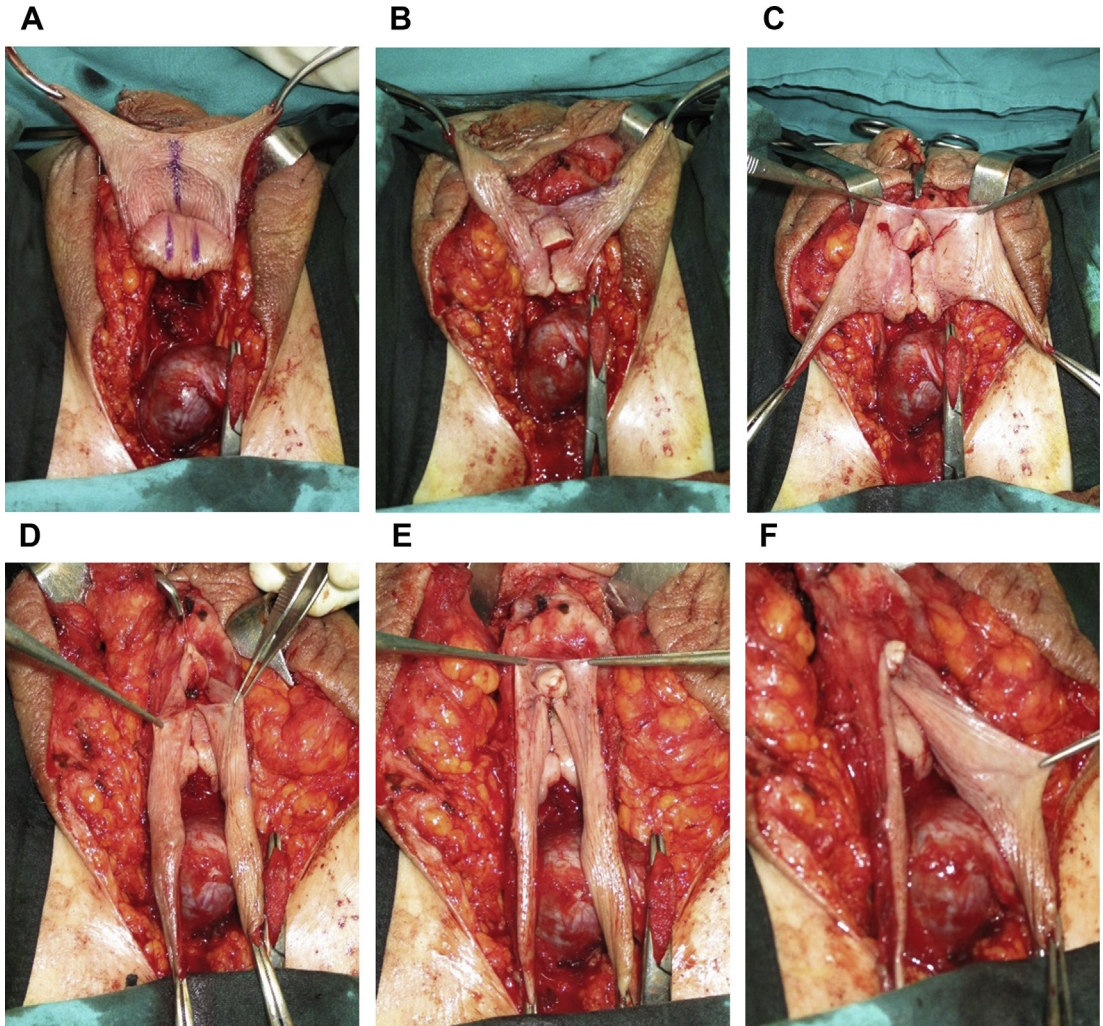


Fig. 3. The clitoral complex and labia minora reconstruction. (A) Markings on the glans penis and prepuce for division. (B) The middle part of glans penis is for sensate clitoris reconstruction. The lateral parts are sutured together and fixed to the corpus cavernosum stump to become the secondary sensate organ. (C) Incision on either side of the upper third part of preputial flap laterally to the constructed clitoris. (D) Suturing the preputial flaps to attach the lateral and volar part of the clitoris. (E, F) The constructed clitoris, clitoral hood, clitoral frenulum, secondary sensate organ, and inner surface of labia minora, front and lateral views.

simulates the characteristics found in the genetic female (Fig. 7).

3. The aesthetic result of the constructed labia minora in type B may be less natural than type A depending on the existing prepuce of penis, the circumcision scar, and the quality and quantity of the donor penile and scrotal tissue (Fig. 8).
4. The constructed clitoris, clitoral hood, clitoral frenulum, labia minora, labia majora, urethral orifice, and vaginal introitus are correctly placed relative to each structure in three-dimensional planes. The clitoris is located approximately 3 to 4 cm superior and 0.5 to

1 cm anterior to the urethral orifice. The labia minora and labia majora are anterior to the vaginal introitus. Urethral orifice is located near vaginal entrance with minimum erectile tissue (see Figs. 7 and 8).

5. The vaginal wall lining is hairless, thin, and pink color (see Figs. 7F and 8F; Fig. 9F).

SEXUAL SENSATION

Sexual sensation is the primary priority requirement for most patients. This is achieved with the dorsal neurovascular whole glans penis preputial island flap. Because the whole sensate glans penis

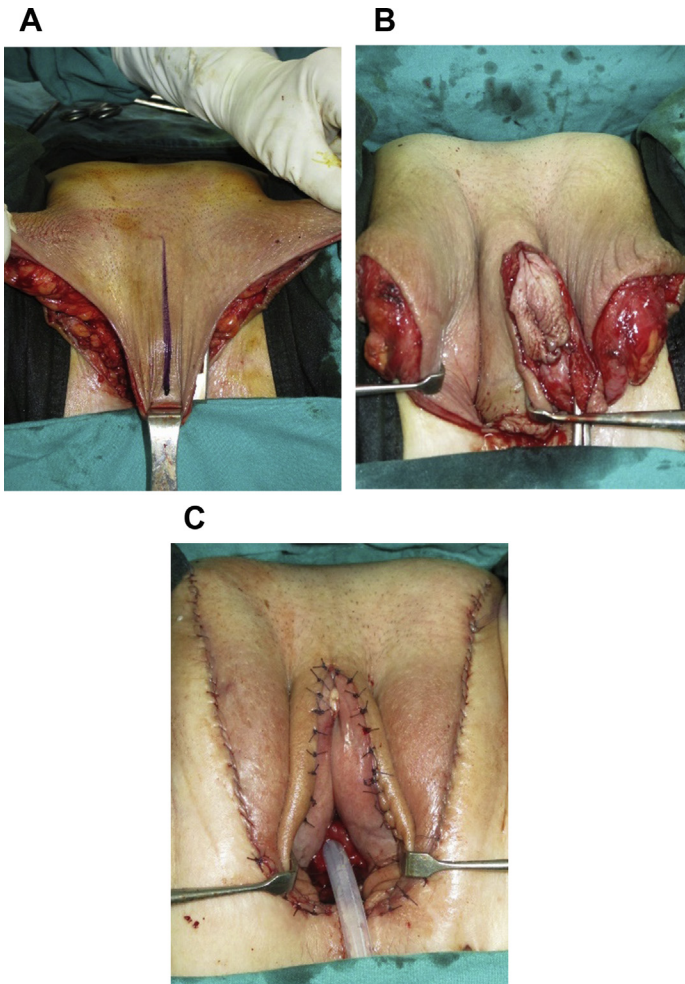


Fig. 4. Type A labia minora reconstruction (adequate donor penile tissue). (A) After the clitoral complex and inner surface of labia minora reconstruction, the proximal penile skin flap is pulled down and divided in midline. (B) The interlabial sulcus on either side are created to differentiate the labia minora from the labia majora. (C) The constructed inner and outer surface of labia minora are sutured together to form the double surfaces of labia minora.

preputial flap is used, patients can have sexual sensation on these constructed structures:

1. The clitoris created from the middle part of glans penis.
2. The secondary sensate organ created from the lateral parts of corona glans penis.
3. The clitoral hood and the inner surface of labia minora created from the prepuce, particularly the part of prepuce close to the corona of penis.

NEOVAGINAL DEPTH

Neovaginal depths were measured with a 32-mm diameter dilator intraoperatively, 1 week, 1 month, and later than 1 year postoperatively as listed in [Table 1](#). Using the full-thickness genital skin-mucosal grafts vaginoplasty, adequate neovaginal depth is achieved in almost all cases including those with limited penile skin ([Fig. 9](#)).

EARLY POSTOPERATIVE COMPLICATIONS

In 580 patients, early postoperative complications noted were as follows:

- 39 patients (6.7%) experienced difficulty with urination after removal of the vaginal packing and urethral catheter on Day 7 and needed further urethral catheterization for 4 to 7 days.
- 8 patients (1.4%) needed additional measures to stop bleeding from the urethra or vaginal canal in operative room.
- There was partial necrosis of clitoris in 96 cases (16.5%).
- 10 patients (1.7%) had significant necrosis of glans penis flap (more than 50% of the constructed secondary sensate organ).
- Partial necrosis of the constructed labia minora with spontaneous healing was seen in 178 cases (30.7%).

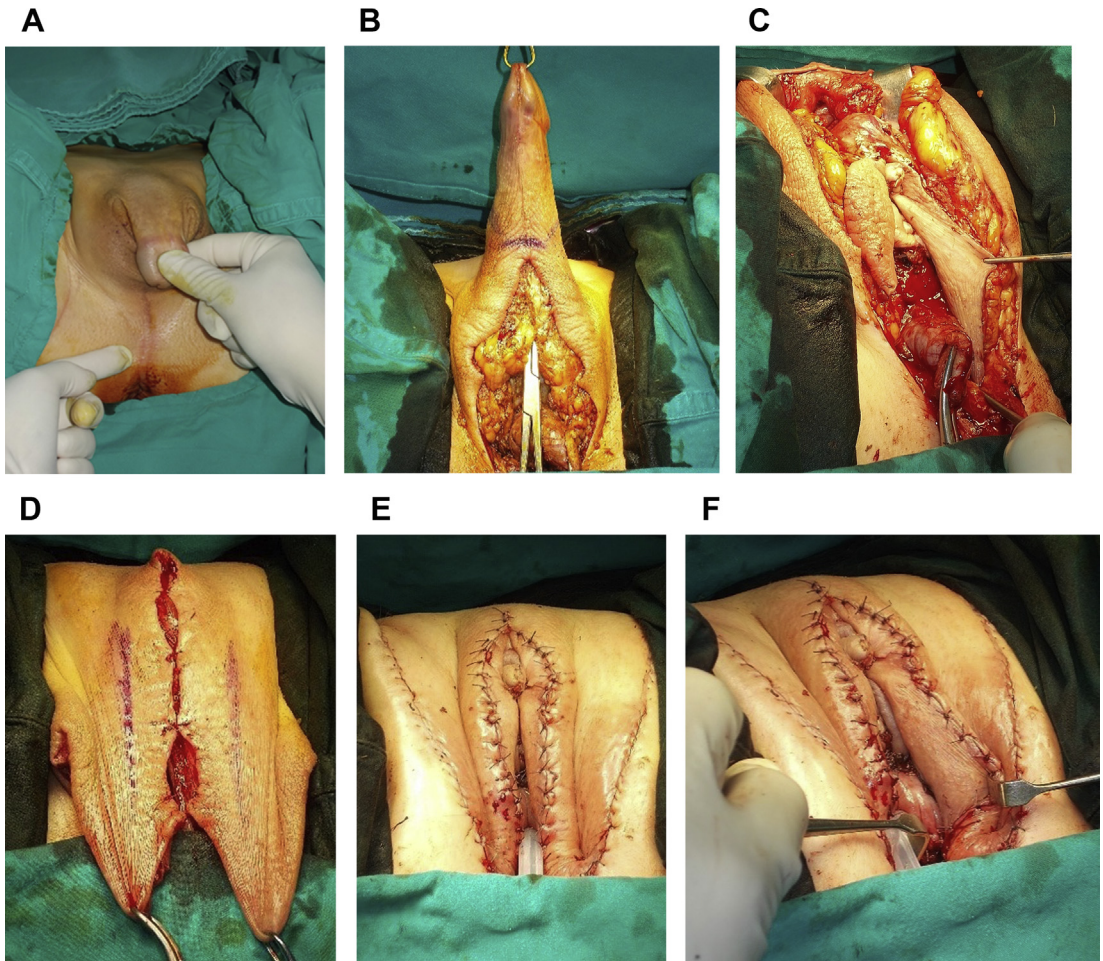


Fig. 5. Type B labia minora reconstruction (limited donor penile tissue). (A) Evaluation of penile skin. (B) Marking the circumferential incision at 3 to 4 cm from the corona of glans. (C) In cases of inadequate penile skin, all or almost existing penile skin is used for construction of clitoral hood, clitoral frenulum, and inner surface of labia minora. (D) Marking for dividing the scrotal skin flap into two flaps, medial and lateral scrotal skin flap. The medial scrotal flap is used for outer surface of labia minora reconstruction and lateral scrotal flap is used for labia majora reconstruction, which are separated by the deep interlabial sulcus. (E, F) The constructed inner and outer surface of labia minora are sutured together to form the double surfaces of labia minora, front and lateral views.

- 32 patients (5.5%) had significant necrosis of labia minora with detachment requiring immediate minor revision.
- No rectovaginal fistula occurred during the study period.

SECONDARY AESTHETIC IMPROVEMENT SURGERY

One hundred and sixty-two patients (27.9%) subsequently requested further minor aesthetic vulvar improvement surgery later than a year postoperative. Typical aesthetic improvement surgery requested were as follows:

- Posterior commissure reconstruction in 33 cases (5.7%) to narrow the exposure of

the vaginal entrance. If the labia minora are long and have adequate tissue, the lower part of both labia minora are mobilized and joined together to form the posterior fourchette.

- Labia minora revision in 95 cases (16.4%) to improve asymmetrical shape and size of either labia minora.
- Revision of clitoris, clitoral hood, and clitoral frenulum in 58 cases (10%) to improve the clitoris complex appearance. In case of clitoris loss, secondary sensate clitoris reconstruction is performed using the secondary sensate organ.
- Urethral orifice revision in 95 cases (16.4%) to reduce prominent erectile tissue.

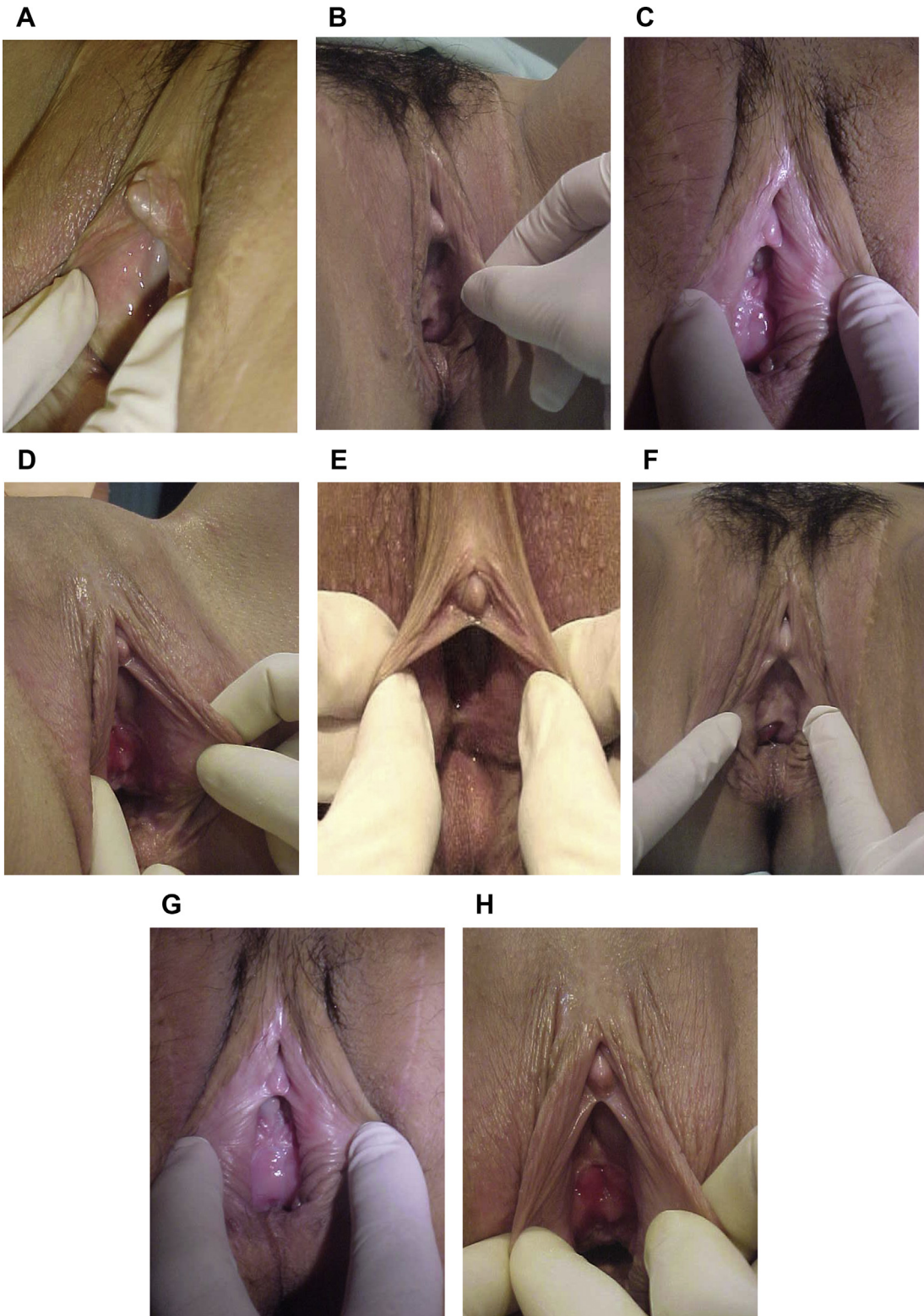


Fig. 6. The clitoris complex appearance. The round projection shape of the clitoris with the clitoral hood superiorly and clitoral frenulum inferior-laterally. (A, B, C, D) Lateral view. (E, F, G, H) Front view.

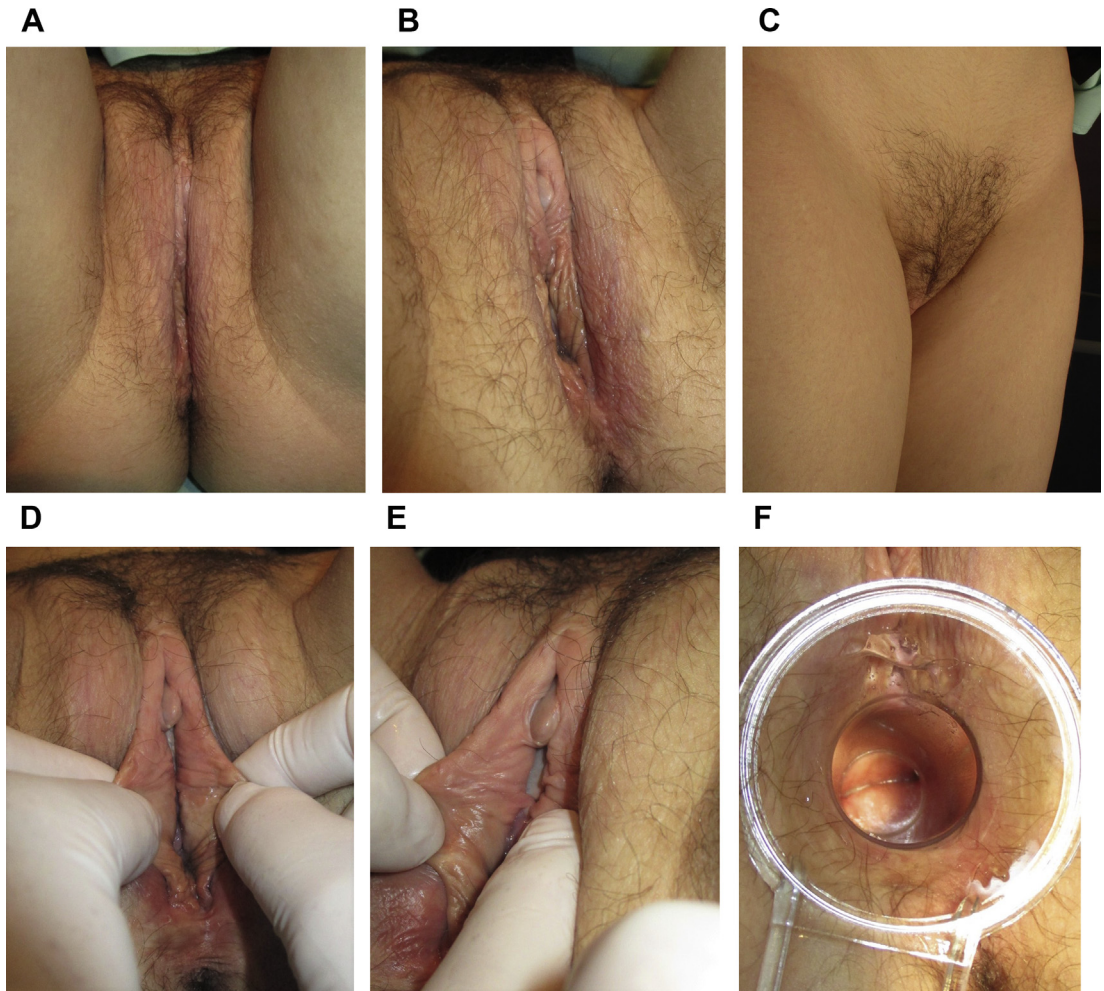


Fig. 7. Vulvar aesthetic appearance of type A Suporn technique vaginoplasty. (A, B, C) Front, lateral and top views. The constructed lip-like labia minora which clearly differentiated from labia majora by the constructed interlabial sulcus. (D, E) Front and lateral views. All constructed structures are correctly placed relative to each structure in three dimensional planes. (F) The vaginal wall lining is hairless, thin, and pink color.

- Removal of granulation on vaginal entrance or vaginal canal in 30 cases (5.2%) by electrical cauterization. Three patients (0.5%) needed full-thickness skin graft coverage of the wound after the granulation removal.
- 17 cases (2.9%) had narrow vaginal entrance from scar contraction on the junction of the skin-mucosal grafts and the skin flap of the constructed vaginal introitus, which were corrected by Z-plasty.
- Anterior commissure reconstruction in 108 cases (18.6%) to reduce the wide gap between the anterior labial commissure. The prominent dorsal neurovascular pedicle bundle is set backward to the deep plane tissue by mobilizing the subcutaneous fat of anterior labia majora on either side to midline

and suturing together. Loose skin on the gap is excised and closed to form the anterior commissure (Fig. 10).

DISCUSSION

Most MTF GCS conducted world-wide are performed by using PIV, in which generally satisfactory neovaginal depth is achieved, but there is usually insufficient surplus material to create a realistic facsimile of external female genitalia because most penile tissue is consumed for vaginal lining. Despite its widespread adoption and use, it is considered to have many limitations toward achieving a satisfactory vulvar aesthetic outcome, particularly natural appearance of the constructed labia minora.

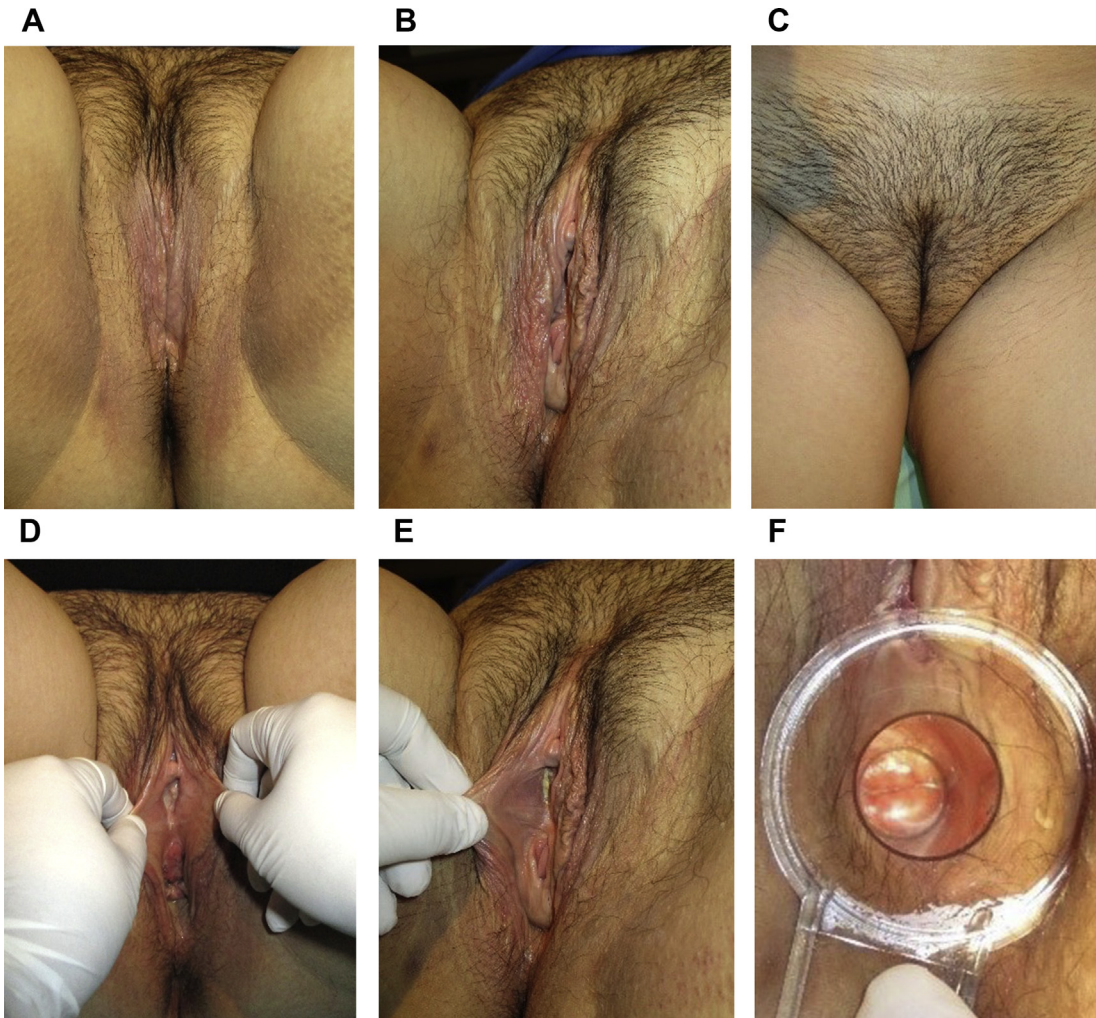


Fig. 8. Vulvar aesthetic appearance of type B Suporn technique vaginoplasty. (A, B, C) Front, lateral and top views. The external appearance. (D, E) Front and lateral view. All constructed structures are correctly placed relative to each structure in three dimensional planes. (F) The vaginal wall lining is hairless, thin, and pink color.

Development of the clitoroplasty technique using the dorsal portion of glans penis with dorsal neurovascular pedicle island flap is the gold standard for providing satisfactory sexual sensation and was the first significant step for vulvar aesthetic improvement.^{7,8} Various techniques exist to construct the clitoral hood and labia minora reconstruction by using the glans penis preputial flap and yield varied aesthetic results.⁹⁻¹¹

Vulvar aesthetic expectation is much more important than neovaginal depth in most of our patients. The inner layer of prepuce is the only tissue of male genitalia that has the same texture, color, and quality as the inner surface of labia minora. The prepuce and penile shaft skin are the most appropriate donor tissue used by the author to

construct the double surface of labia minora for the vulvar aesthetics purpose.

By using the dorsal neurovascular whole glans penis preputial island flap to reconstruct the sensate clitoris, clitoral hood, clitoral frenulum, secondary sensate organ, and inner surface of labia minora, vulvar aesthetics have been improved significantly. It allows sexual sensitivity to be preserved located on the constructed sensate clitoris, clitoral hood, secondary sensate organ, and the inner surface of labia minora.

Two types of labia minora reconstruction procedures were developed to allow for variances in quantity and quality of donor genital tissue. Ideal aesthetic labia minora is created by using two pairs of different matching donor tissue. Type A labia minora reconstruction is used where

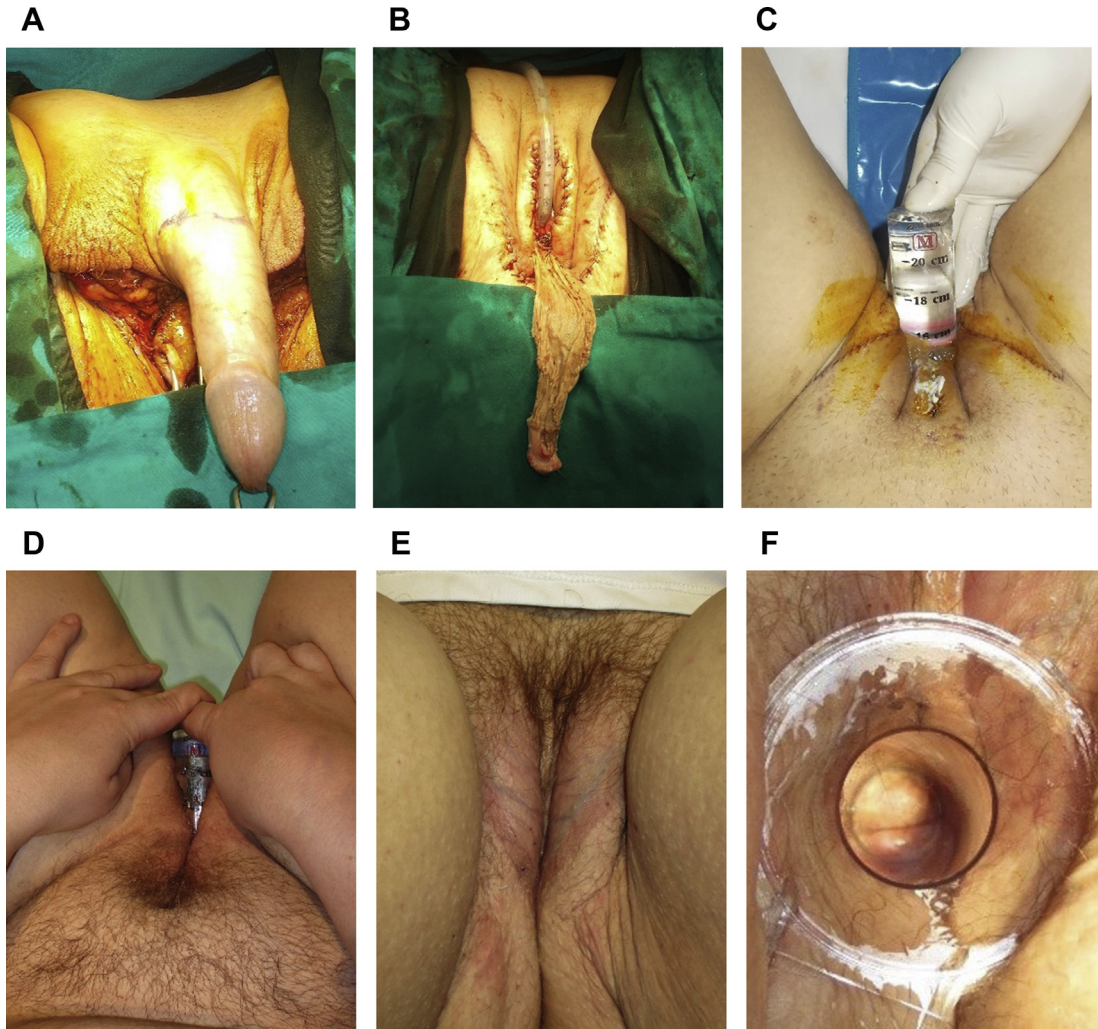


Fig. 9. The neovaginal depth outcome in cases of limited donor penile skin. (A) Limited donor penile tissue, almost all penile skin was used for vulvar aesthetic purpose. (B) Full-thickness scrotal skin, penile skin, and urethral mucosal graft vaginoplasty for neovaginal wall lining. (C) Neovaginal depth of 16 cm on the 7th day postoperatively. (D) Neovaginal depth of 17 cm in the 16th month postoperatively. (E) Vulvar aesthetic appearance. (F) Aesthetic outcome of the neovaginal canal.

adequate length of penile skin exists, whether circumcised or not. The inner surface of labia minora is reconstructed from the preputial skin flap in noncircumcised cases, or from the distal penile skin flap in circumcised cases. The outer surface of labia minora is reconstructed from the proximal penile skin flap. Where there is inadequate penile skin, an alternative type B labia minora reconstruction is used. The inner surface of labia minora is reconstructed from existing penile skin and the outer surface of labia minora is reconstructed from the medial part of scrotal skin flap.

The labia minora constructed by both methods have double surface with different color and texture on each surface. Particularly in type A, the inner surface of the constructed labia minora is thin, pink color, and hairless skin matching to biologic females.

Table 1
Neovaginal depth measurement immediately, 1 week, 1 month, and later than 1 year postoperatively compared with patients' preoperative depth expectation

	Neovaginal Depth (cm)		
	Minimum	Maximum	Average
Preoperative expectation	10.2	22.9	16.6
Intraoperative	10.2 ^a	17.8	15.8
Day 7	12.7	20.0	17.2
Week 4	12.0	20.3	16.3
>1 y	6.0 ^b	21.6	16.0

^a By patient's request.

^b 3 in 162 patients who returned for aesthetic improvement surgery had neovaginal depth less than 12 cm.

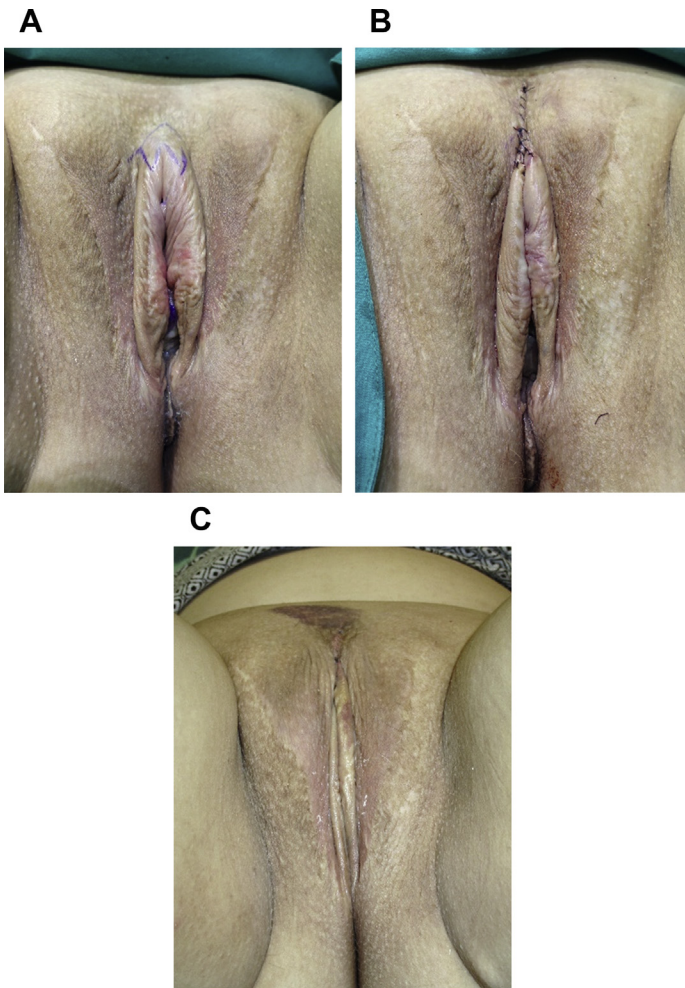


Fig. 10. Anterior commissure reconstruction. (A) The wide gap between the anterior labial commissure. (B) The skin on the gap was excised then the subcutaneous fat of anterior labia majora was undermined and sutured together in midline. (C) Aesthetic improvement seen after the anterior commissure reconstruction.

The constructed labia minora have adequate length running each side posteriorly from the clitoral region toward the bottom of the vagina.

By carefully selecting the most appropriate donor tissue, the ideal aesthetic clitoris, clitoral hood, clitoral frenulum, and labia minora are created. The constructed clitoral complex, labia minora, labia majora, urethral orifice, and vaginal introitus all must be realistically placed in the correct three-dimensional planes to achieve ideal vulvar aesthetics.

Because all or almost all penile skin is used for aesthetic purposes, adequate neovaginal depth by PIV is usually not possible. Instead, full-thickness genital skin-mucosal graft vaginoplasty harvested from the excess scrotal skin, penile skin, and urethral mucosa is the author's choice because of the simplicity of the technique, minimum complications, and no additional donor scar. This enables reconstructing an adequate vaginal cavity in every case. Long-term (>1 year)

average vaginal depth is 16 cm with maximum depth of 21.6 cm. Only 3 out of 162 patients (1.8%) had neovaginal depth less than 12 cm.

Because of the skin graft technique used, vaginal prolapse is not possible. Primary colon vaginoplasty is never necessary.

SUMMARY

Based on the author's previous personal experience of gaining satisfactory neovaginal depth results by the scrotal skin graft addition with the traditional PIV, a modified non-PIV technique, the Suporn technique for MTF GCS, was originated in September 2000 to provide enhancement of vulvar aesthetics without detriment to neovaginal depth. The technique uses the dorsal neurovascular whole glans penis preputial island flap for the sensate clitoris, clitoral hood, clitoral frenulum, and inner surface of labia minora reconstruction. It offers two different techniques (type A using preputial flap and penile

skin flap, and type B using penile skin flap and scrotal skin flap) for the double surface of labia minora reconstruction. Full-thickness genital skin-mucosal graft is the choice for neovaginal wall lining. The technique has been proven to achieve satisfactory results of vulvar aesthetics, sexual sensation, and neovaginal depth in most cases.

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