

Female genital cosmetic surgery: a review of techniques and outcomes

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Abstract The aesthetic and functional procedures that comprise female genital cosmetic surgery (FGCS) include traditional vaginal prolapse procedures as well as cosmetic vulvar and labial procedures. The line between cosmetic and medically indicated surgical procedures is blurred, and today many operations are performed for both purposes. The contributions of gynecologists and reconstructive pelvic surgeons are crucial in this debate. Aesthetic vaginal surgeons may unintentionally blur legitimate female pelvic floor disorders with other aesthetic conditions. In the absence of quality outcome data, the value of FGCS in improving sexual function remains uncertain. Women seeking FGCS need to be educated about the range and variation of labia widths and genital appearance, and should be evaluated for true pelvic support disorders such as pelvic organ prolapse and stress urinary incontinence. Women seeking FGCS should also be screened for psychological conditions and should act autonomously without coercion from partners or surgeons with proprietary conflicts of interest.

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Introduction

Consumer marketing and media hype have spawned the considerable controversy over female genital cosmetic surgery (FGCS). FGCS articles first appeared in North American journals in 1978, and the first technical article appeared in 1984 [1, 2]. This review describes the techniques and outcome data of labiaplasty, vaginoplasty, and other cosmetic gynecological procedures.

Female genital perceptions

Women seek FGCS for both aesthetic and functional reasons including pain with intercourse or sports, vulvar irritation, chafing, and discomfort with underwear or clothing [3]. Younger generation X women (ages 18–44) prefer pubic hair removal, which allows for easier vulvar visualization compared with older women [4]. König et al. found that 78 % of 482 women learned about labia minora reduction via the media and 14 % thought their own labia minora looked abnormal [5]. Indeed, many women undergoing labia minora reduction perceive their own genitalia as abnormal [6]. Feelings of embarrassment with sexual function including a strong desire to improve strained relationships are also commonly cited as reasons for FGCS [7]. Issues of vulvar dissatisfaction can start in early adolescence and have been reported in girls less than 10 [8, 9]. Michala et al. evaluated 16 girls with a mean age of 14.5 years who presented for labia minora reduction [8]. Six girls were bothered by labia minora asymmetry while 10 complained of labia minora protrusion, despite having normal labial width.

Western perception of ideal female external genitalia differs from other countries. In Rwanda and Mozambique elongated labia minora are considered attractive [10, 11]. Elongated labia minora are seen as a sign of modesty in Mozambique, and the butterfly appearance of the labia minora is considered desirable in Japan [11, 13].

Cosmetic gynecological surgery versus female genital mutilation

Critics of FGCS note parallels with female genital mutilation surgery (FGMS) [13]. According to the World Health Organization, female genital mutilation comprises all procedures that involve partial or total removal of external female genitalia, or other injury to female genital organs for non-medical reasons [14]. There is legislation and call for reform in some European and Western countries based on this definition [15]. Clearly, opponents of FGCS are motivated by a desire to protect women from the potential dangers of elective genital surgery and the societal pressures some girls and women may feel about the appearance of their own genitalia. While FGMS should be prosecuted, FGCS is a matter of debate. The decision to operate should account for the physical and mental health of each patient, including assessment for body dysmorphic disorder. Informed consent of the potential benefits, risks, and limited outcome data should be reviewed and consideration for additional evaluation by a clinical psychologist or psychiatrist may prove useful.

Surgeons performing FGCS

Traditionally, gynecologists are most comfortable with vaginal and vulvar surgery. However, more plastic surgeons have been performing FGCS, and have added modifications such as fat grafting. A survey of the American Society of Plastic Surgeons revealed that more than half (51 % of the 750 respondents) offer labiaplasty [16]. Only 31.5 % had formal training for this procedure. Case volume over 24 months ranged from 0 to 300 procedures with a mean of 7.37 procedures. Gynecologists, urogynecologists, and urologists also perform FGCS. While no formal training programs exist, several marketing and franchised training programs have been developed in the USA and abroad.

Indications for cosmetic gynecological surgery

In general, cosmetic surgery does not require a medical indication. According to a 2007 ACOG committee opinion, indications for FGCS include reversal or repair of female genital

cutting and treatment for labial hypertrophy or asymmetry secondary to congenital conditions, chronic irritation, or excessive androgenic hormones [17].

Surgeons focused on vulvar aesthetics also cite vaginal relaxation, feeling loose or lacking friction during intercourse, and enhancement of a partner's sexual experience as additional reasons to pursue FGCS [18]. In one multicenter retrospective study, 76 % of 258 women underwent surgery for functional reasons; 53 % percent had surgery for cosmetic reasons and 33 % to enhance self-esteem. Fifty-four percent of women who underwent vaginoplasty and perineoplasty and 24 % of those who had a combined vaginoplasty, perineoplasty, labiaplasty, and clitoral hood reduction did so to enhance their male partner's sexual experience. Only 5 % of participants underwent surgery because they were urged by their partner [18]. In another retrospective study on labiaplasty, 94 % (503 women) felt that their labia minora protruded beyond the edge of the labia majora, 46 % felt that their labia minora were enlarged, and 71 % felt that the edges were dark [19]. Fifty-two percent wanted the labia minora edge below the labia majora [19].

Types of cosmetic surgery

The types of cosmetic surgery are detailed in Tables 1–3.

Vaginoplasty/vaginal rejuvenation/vaginal tightening

Vaginoplasty refers to plastic surgery of the vaginal opening, vaginal canal, and vaginal epithelium. Perineoplasty is the surgical reconstruction of the vaginal introitus and is often part of a complete vaginoplasty repair. Vaginoplasty is not intended to correct pelvic floor defects; however, these repairs are modifications of traditional colporrhaphy and are frequently performed in conjunction with reconstructive procedures for prolapse [20].

“Laser vaginal rejuvenation” is a trade-marked term and most commonly refers to traditional posterior and anterior colporrhaphies carried out to treat a “wide” vagina [8, 18, 21, 22]. These procedures involve vaginal reconstructive techniques to anatomically modify the vaginal caliber by decreasing the diameter of the lower third of the vagina while reconstructing the perineal body [21, 23–26]. A “full-length vaginoplasty” consists of decreasing the vaginal caliber of the lower two thirds of the vagina as far up as the ischial spines [26]. The desired surgical outcomes of these procedures include improvement in both aesthetic external appearance and an increase in frictional forces during intercourse; however, loss of sexual pleasure due to vaginal laxity has not been established [24], and no currently published FGCS studies adequately address the complex psychological components involved with sexual function and response. No comparative

Table 1 Labiaplasty studies

Author	n	Hypothesis	Results	Follow-up (months)	Complications	Study type	Grade
Triana and Robledo [63]	74	Labia minora excision with or without clitoral hood molding and management of the labia majora	92 % satisfaction 8 % dissatisfaction (6 % asymmetry, 2 % fat reabsorb into the labia majora)	6	Infection 2 Wound dehiscence 1 Fatty cyst in the labia majora 6	Retrospective cohort	Very low
Goodman et al. [18]	258	Evaluation satisfaction for labiaplasty (Clitoral hood reduction Vaginoplasty Perineoplasty)	91.2 % satisfaction 83 % satisfaction for vaginoplasty and perineoplasty	6–42	Dyspareunia 5 Skin burn 1 Introitus narrow 1 Rectal perforation 1 Repair dehiscence 6 Postoperative bleeding 2 Introital narrowing 2 Perineal fistula 1	Retrospective Cross-section	Low
Marchitelli et al. [70]	32	Evaluate indication for vulvovaginal plastic surgery	Labia minora reduction 95 % satisfied Widening of vaginal reduction 100 % satisfied Patient satisfaction on questionnaire 97 %	Not recorded	Wound dehiscence 3 (9.3 %) Vulvar hematoma 1 (3.1 %)	Retrospective cohort	Low
Munhoz et al. [46]	22	Inferior wedge resection and superior pedicle flap reconstruction of the labia minora	86 % cosmetic result good / very good 95 % very satisfied 14 % unaesthetic scar	46 6–77	Dyspareunia 2 Flap necrosis 1 (4.7 %) Wound dehiscence 2 (9.5 %) Infection 1 (4.7 %) Hematoma 1 (4.7 %)	Retrospective cohort	Very low
Pardo et al. [71]	55	Laser labia minora labiaplasty	50 (91 %) very aesthetically satisfied 5 (9 %) aesthetically satisfied 55 (100 %) very functionally satisfied 100 % satisfaction	2	Suture dehiscence 3 (5.4 %) Transient pain 2	Prospective cohort	Very low
Giraldo et al. [41]	15	Central wedge resection of the labia minora with 90 ° Z-plasty	93 % (n=151) anatomical surgeon satisfaction	30 6–80	Wound dehiscence 2 (13 %)	Prospective cohort	Very low
Rouzier et al. [53]	163	Inferior wedge resection	89 % (n=87) patients satisfied with aesthetic outcome 93 % (n=91) patient satisfied with functional outcome 100 % satisfaction	Not recorded	Wound dehiscence requiring 2nd procedure 11 (7 %) Transient entry dyspareunia 23 %	Prospective cohort	Very low
Maas and Haage [52]	13	Running W-shape resection with interdigitated suturing	18/21 satisfied with results	2–72	Hematoma 1 (8 %) Minor dehiscence 1 (8 %)	Prospective cohort	Very low
Trichot et al. [56]	21	Labiaplasty	45 patients satisfied (85 %) viewed results as good or very good	6–25	None reported; telephone survey	Retrospective	Very low
Rezai and Jansson [44]	50	Labiaplasty W resection versus de-epithelialization		2–24	5 dissatisfied in resection group 8 with decreased sensation	Retrospective	Very low

Definitions of grades of evidence [72]

High = further research is unlikely to change our confidence in the estimate of effect

Moderate = further research is likely to have an important impact on our confidence in the estimate of the effect and may change the estimate

Low = further research is very likely to have an important impact on our confidence in the estimate of the effect and is likely to change the estimate

Very low = any estimate of the effect is very uncertain

Table 2 Vaginoplasty studies

Author	n	Hypothesis	Results	Follow-up (months)	Complications	Study type	Grade
Ostrzenski [32]	10	Vaginal rugation rejuvenation with CO ₂ laser	18.7 % (5.1) increase PISQ-12 100 % improvement in vaginal wide smooth sensation	Not recorded	None	Case-control	Very low
Adamo and Corvi [31]	40	Lateral colporrhaphy can improve sexual sensitivity in women with a wide vagina	16 (40 %) some improvement 22 (50 %) significant improvement	1.5	Local infection 2 (5 %) Post-operative vaginal bleeding 1 (2.5 %)	Prospective cohort	Very low
Pardo et al. [21]	53	Traditional colporrhaphy to treat subjective wide vagina and sexual dysfunction	94 % tighter vagina, able to achieve orgasm 74 % expectations fulfilled 4 % regret	1.5	2 (4 %) wound dehiscence 4 % regretted having procedure	Prospective cohort	Low
Moore and Miklos [23]	76	Vaginal rejuvenation with or without prolapse surgery	Mean PISQ-12 improvement from 30.4 to 38.9 ($p < 0.001$) 98 % satisfaction	6 months		Prospective cohort	Low
Alinsod [33]	200	In-office vaginoplasty and perineoplasty		up to 6 years	2 % post-operative vasovagal reaction 1 % perineal wound breakdown 3 % dyspareunia needing an in-office band release at the introitus 1 recto-perineal fistula	Retrospective	Low

trials of FGCS and traditional pelvic reconstructive surgical repairs have been published [18, 27].

Laser-assisted colporrhaphy, also known as laser vaginal rejuvenation, uses a 980-nm diode contact fiber laser to cosmetically alter the vulva and vagina [28]. Compared with conventional surgery, laser vaginal rejuvenation is reportedly associated with reduced morbidity, scarring, and favorable outcomes in vaginal caliber and sensation [23]. Radiofrequency surgery, in combination with standard cautery, achieves similar results [26], but no studies confirm the superiority of laser or radiofrequency dissection compared with traditional scalpel, scissors or electrocautery.

Designer laser vaginoplasty (DLV) is a trademark-registered term for the reshaping and resculpting of the external vulva including clitoral unhooding, labiaplasty of the labia minora and majora, augmentation labiaplasty of the labia majora, and liposuction of the vulva and mons pubis. Ideal candidates for office-based vaginal rejuvenation surgery are healthy, nonsmokers, with a normal BMI [22].

The term “laser” in laser vaginal rejuvenation and designer laser vaginoplasty is the trademark-registered term. Variations of similar techniques have been performed and are marketed without using the word “laser.”

Vaginoplasty: surgical technique

The surgical procedures employed in aesthetic vaginoplasty vary and include anterior colporrhaphy, high-posterior colporrhaphy, excision of the lateral vaginal mucosa, or a combination of techniques. Lateral ablation or removal of mucosal strips from the anterior and posterior sides of the vaginal fornices allows tightening of the diameter of the vaginal canal as well as the introitus and perineum [20, 24, 26, 27]. Compared with other procedures, lateral colporrhaphy reportedly causes less scarring [20, 24], but does not adequately address pelvic floor defects.

Frequently, vaginoplasty involves dissection of the posterior vaginal epithelium and trimming of tissue to the desired diameter. Rectovaginal muscularis is plicated creating a narrower diameter similar to traditional colporrhaphy. Sometimes, a levator ani plication is also performed, but this may cause significant dyspareunia and is not recommended for cosmetic surgery.

Laser therapy for vaginoplasty

Contact (Nd:YAG and 980 nm Diode) and CO₂ lasers are used for vaginoplasty with claims of reduced blood loss and improved healing [22]. Gaspar et al. evaluated the effects of vaginal fractional CO₂ laser combined with local application of platelet-rich plasma and pelvic floor exercise [28]. Less dyspareunia was noted in the vaginal fractional CO₂ laser group with histological evidence of an increase in the fibrillar

Table 3 Clitoral hood reduction

Author	n	Hypothesis	Results	Follow-up (months)	Complications	Study type	Grade
Alter [47]	17	Clitoral hood flap for treatment of severe deformation after labia minora reduction due to trimming technique. Wedge excision, YV advancement flap, controlled touch up trimming.	Revisions 5 100 % satisfaction	Not recorded	Pain at scar requiring revision 1 Necrosis at tip 1 Epidermolysis 1 Dyspareunia 1	Prospective cohort	Very low

component of the extracellular matrix and vaginal epithelial thickness [28]. In a comparative study using the laser for vaginal tightening, group 1 received ablative CO₂ laser therapy, while group 2 underwent treatment with a non-ablative erbium:YAG laser [29]. Improvement in vaginal tightening was observed in both groups; however, more complications were recorded in CO₂-treated patients [29]. Of note, these findings are limited to one center with proprietary conflicts [28, 29].

Another technique utilizes injection of autologous fat or the bulking agent, hyaluronic acid. This procedure remains experimental and should be used with caution [24, 30]. There are several creams and potions advertised to tighten the vagina, but none has adequate clinical evidence to support such claims.

Vaginal rejuvenation studies

In one study on vaginal rejuvenation, resection of the lateral vaginal mucosa to “tighten” and treat a sensation of a wide vagina, 16 out of 40 patients (40 %) noticed some improvement and 22 (55 %) noticed significant improvement of vaginal sensitivity [31]. Of the partners, 15 (37.5 %) noticed some improvement and 17 (43 %) noted significant improvement. Goodman et al. evaluated 81 patients who underwent either vaginoplasty, perineoplasty, or a combination. Eight-seven percent had a positive effect on sexual function and 82 % percent perceived enhancement of their partner’s sexual satisfaction.

Another cosmetic gynecological procedure uses a CO₂ laser to restore vaginal rugae by vaporizing tissue. In one small case control study [32], sensation remained intact using a heat–cold test; however, the clinical importance of the sensation of a smooth vagina is unclear.

Complications

Risks of vaginal tightening procedures include dyspareunia, wound disruption, and de novo incontinence [18]. In the study by Goodman et al., 16.6 % of women had complications including poor wound healing, dyspareunia, postoperative bleeding, pain, over-tightening of the introitus common and bowel or bladder injury with resultant fistula formation [18,

33]. Complications from CO₂ laser and erbium:YAG laser include a burning sensation [28], agglutination, and vaginal constriction [29].

Conclusion

Despite the paucity of quality studies with long term follow up on aesthetic vaginoplasty, short-term patient satisfaction is high for medical, functional and psychosocial outcomes [18, 21–23]. It is uncertain whether any ablative or non-ablative laser technology, ultrasound, or radiofrequency modality will be able to shrink the vaginal diameter enough in women with symptomatic pelvic organ prolapse. Serious adverse events do exist and monitoring for long-term safety and effectiveness is necessary.

Perineoplasty

Background

Perineoplasty, also known as perineorrhaphy, refers to surgical reconstruction of the vaginal introitus. Perineoplasty tightens the perineal muscles and the vagina in an effort to decrease the size of the vaginal opening. Perineoplasty is often performed with a posterior colporrhaphy. Reverse perineoplasty involves reconstruction of scar tissue caused by lichen sclerosus or prior surgery [34]. In refractory vestibulitis cases, perineoplasty can be used as a salvage treatment and is referred to as vestibulectomy [35]. While incision and excision procedures remain the primary technique used in perineoplasty, laser and radiofrequency resurfacing have also been described [33].

Surgical technique

Perineoplasty involves removal of a diamond-shaped wedge of tissue on the perineum above the anus. The lateral borders of the diamond-shaped resected tissue extend to the hymeneal ring or a few centimeters past it. The bulbocavernosus and superficial transverse perineal muscles are reapproximated to produce an elevated perineum, tightened vaginal orifice, and reconstructed perineal body [20].

Reverse perineoplasty to treat dyspareunia involves incision of palpable bands and scar tissue while creating an advancement flap to widen the diameter of the introitus. Resurfacing perineoplasty uses radiofrequency or CO₂ laser to eliminate skin tags, ridges, uneven edges, and redundant skin and purportedly regenerates collagen, making the epithelium softer and paler.

Clinical evidence

In McCormack and Spence's approximately 5-year follow-up of women who underwent traditional perineoplasty for vulvar vestibulitis, relief of preoperative vulvar discomfort was noted in 27 out of 34 women (80 %) [36]. Of 33 sexually active women, 85 % reported improvement of painful intercourse after surgery. Foster et al. studied 93 patients undergoing perineoplasty for vulvar vestibulitis and 7.5 % were "unchanged," while 4.3 % had "worse" symptoms [37].

Laser therapy for perineoplasty

There are no published articles on the use of lasers or radiofrequency in resurfacing the perineal tissue for smoothing or tightening effects. Alinsod reported using radiofrequency resurfacing of the perineum to achieve a smoother and more aesthetically pleasing perineal and anal appearance [33]. Laser treatment, particularly CO₂ lasers, however, should be used with extreme caution, since this therapy can lead to an unacceptable level of patient discomfort [38, 39].

Labia minora labiaplasty

Background

Labiaplasty, less commonly called labioplasty, is a procedure to reduce the size and shape of either the labia majora or the labia minora [3, 40]. Nymphae, the labia minora, are bilateral longitudinal mucosal-cutaneous folds located between the labia majora and the vulvar vestibule that contain a core of erectile connective tissue and profuse nerve endings that are sensitive to touch during sexual stimulation [3, 40–42]. The labia minora vary in length, thickness, symmetry, and protuberance [3, 42–44]. The mean width of the labia minora is 2.5 cm with a range of 7 mm to 5 cm (Fig. 1) [24, 43]. There is no consensus on the precise measurements of abnormally enlarged minora, but labia minora with a length of 3–5 cm are classified as hypertrophic by FGCS providers [40]. When the labia minora protrude past the labia majora or are disproportionally larger than the labia majora, patients may view this as aesthetically unattractive [24, 41]. Labiaplasty may be a therapeutic intervention as well as a cosmetic surgical procedure.

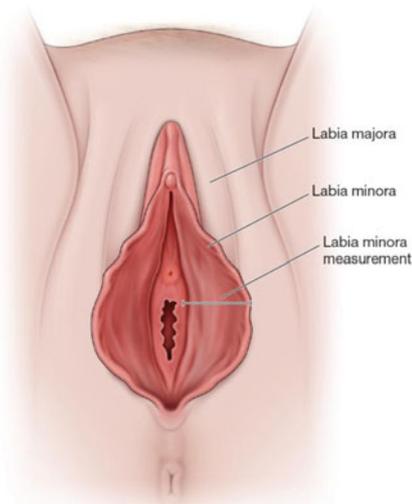


Fig. 1 Measurement of the labia minora. Normal width ranges from 7 mm to 5 cm

In 1984, Hodgkinson and Hait described their experience in performing aesthetic labiaplasty on three women dissatisfied with the size and protuberance of the labia minora [2]. Today, labia minora labiaplasty ranks as one of the most frequently performed FGCS procedures. First described in 2005, the "Barbie look" was a slang term used by lay patients in Los Angeles who requested all or almost all of the labia minora to be removed [26]. Similar slang terms such as the "rim look", a linear curved excision that removes the dark edges of the labia minora, and the "hybrid look", removing all the labia minora and leaving only a small amount of tissue, emerged [45]. In one study, 98 % of 238 women requested the "Barbie look." [3]

Surgical technique

Labia minora linear resection with reapproximation of the epithelial edges was the first technique described in case reports [2]. In an attempt to decrease contraction, wound dehiscence, and tension on the suture line, the wedge resection was developed. First described by Alter in 1998, a V-shaped center portion of the labia minora was resected and the edges reapproximated to preserve the labial edge and color [45]. Another modification called the inferior wedge resection and superior pedicle flap reconstruction involves a V-shaped wedge excision of the inferior portion of the labia minora [46]. Other modifications of this original procedure include de-epithelialization; laser, radiofrequency, or W-shaped resection; and Y–V advancement flaps [21, 26, 47–50]. The goal of labiaplasty often is to preserve the contour of the lips and maintain the labial edge color. The procedure can be performed under local anesthesia, conscious sedation, or general anesthesia.

A combination of techniques may be required to achieve adequate reduction. Elliptical or curved linear resection, also known as the “amputation technique,” removes protuberant tissue followed by over-sewing of the edge (Fig. 2) [49]. The goal of this trimming technique is to maintain a minimum labial length of 1 cm and permit protrusion past the introitus [42]. However, this technique fails to preserve the natural contour of the corrugated free edge of the labia [24, 40]. Risks include over-correction or complete amputation warranting surgical revision [47]. In one study of 550 women, 97 % requested removal of the dark edges [19] Fig. 5.

The wedge resection is a full-thickness excision with theoretically less risk of nerve injury or residual scar [24, 40, 45]. The advantage of this technique is prevention of over-resection and excessive tightening [42, 45]. The extended central-wedge resection incorporates an external wedge (“hockey stick V”) to reduce excess lateral clitoral hooding or dog-ear formation [42, 51]. This approach is associated with wound edge separation, fistula formation, clitoral hood excess, and postoperative pain [42]. The addition of a 90-degree Z-plasty to the central-wedge excision spreads the tension over the suture line, thus minimizing traction on the suture line [41]. The Maas and Hage technique closes opposing z-shaped incisions with a tension-less zigzag suture-line running obliquely across the edge of the labium [52]. This surgical method decreases the likelihood of wound dehiscence (Fig. 3). In the inferior wedge resection approach, the wedge is removed in the inferior part of the labia, and the superior pedicle is then used to reconstruct the labia [46]. The downside of wedge type labiaplasty surgery is the variable blood supply of the labia and

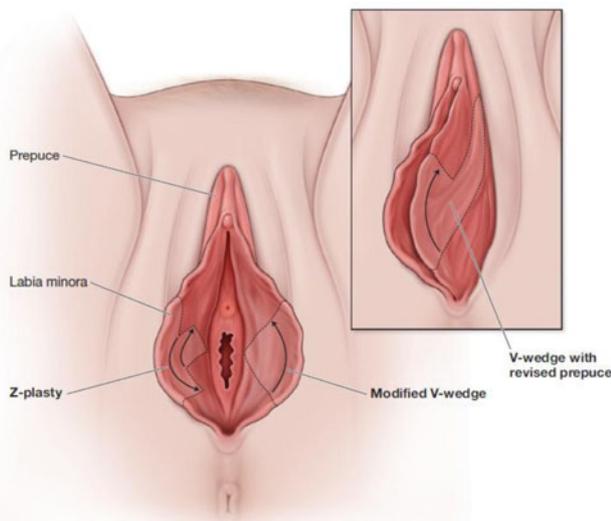


Fig. 2 Labia minora labiaplasty examples of Z-plasty, modified V-wedge, V-wedge with revised prepuce. The goal is to prevent overcorrection and excessive tightening thereby spreading tension over the suture line to avoid excessive traction

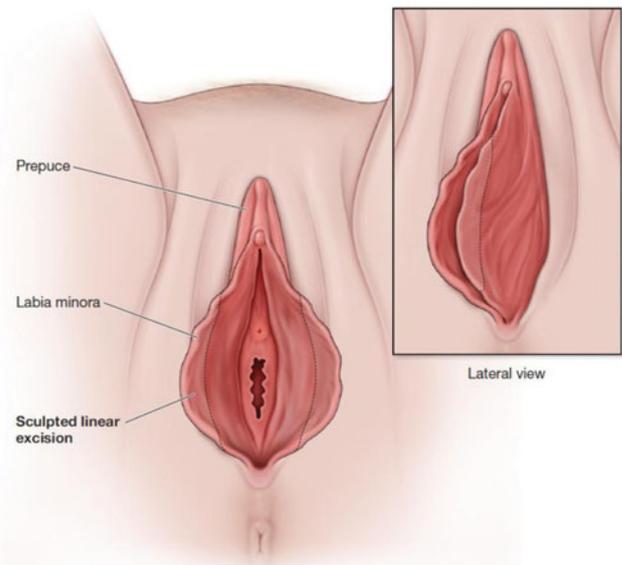


Fig. 3 Labia minora labiaplasty linear resection technique

outwardly pulled edges due to tension, which can result in improper healing, holes in the labia, or distinct pizza shaped gaps when the edges are pulled apart. In a review of 35 labiaplasty revisions, over 75 % of the defects were the result of wedge edges pulling apart [33].

In bilateral de-epithelialization both the medial and lateral sides are marked to delineate hypertrophic areas, and then both sides are de-epithelialized with either a scalpel or laser (Fig. 4) [24]. This technique is appropriate when only a minimal amount of labial tissue needs to be excised. Possible complications include a redundant free border, increased labial thickness, and abrupt color change at the suture line [24].

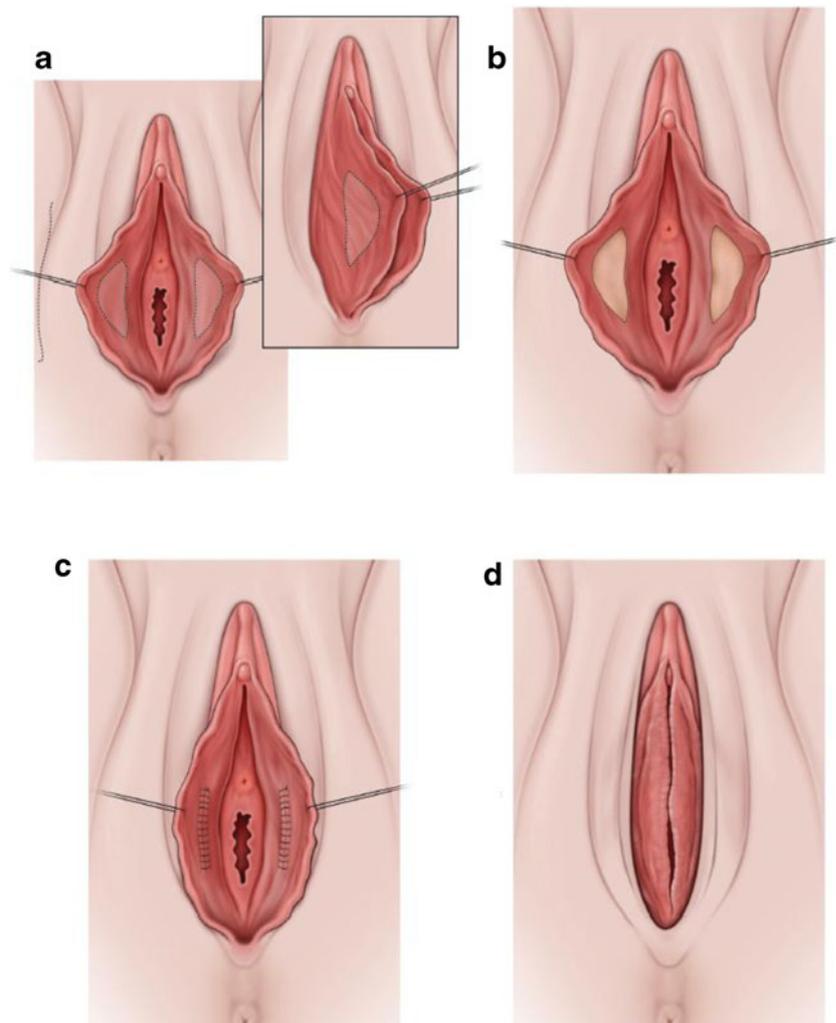
Complications

Adverse effects of labia minora plasty range from 2.65 to 6 % [18, 51, 53, 54]. Complications include postoperative infection, hematoma, asymmetry, poor wound healing, wound separation, over-zealous resection, urinary retention, skin retraction, delayed local pain, and dyspareunia (Figs. 6–8) [26, 33, 42, 44, 50, 55].

Conclusion

Studies of labia minora labiaplasties reveal high rates of overall satisfaction, including improved self-esteem [18, 42, 44, 46, 51, 53, 56]. In a survey of clinicians who perform labia minora labiaplasties, curved linear resection/simple amputation (52.7 %) was the most common technique followed by a central V-wedge (36.1 %) [16]. The linear edge excision leaves a suture line at the periphery that may result in scar contracture and pain during coitus [57]. Some experts consider the wedge resection the technique of choice; however, there is no

Fig. 4 Bilateral de-epithelialization. **a** Both the medial and lateral sides are marked to delineate hypertrophic areas. **b** De-epithelialized bilaterally with either a scalpel or laser. **c** Reapproximation of the incision. **d** Postoperative outcome



consensus [24, 44]. In the absence of long-term follow-up, no recommendations can be made regarding which technique provides the best cosmetic result with the fewest complications.

Clitoral hood reduction

Background

The clitoral hood, or preputium clitoridis, is a fold formed from the labia minora that drapes over the external tip of the clitoral glans [42]. Clitoral hood reduction, also known as reductive clitoral hoodectomy, is an elective vulvovaginal aesthetic procedure to separate the prepuce from the clitoral tissue [20, 42]. Clitoral hood reduction involves excision of excess skin in the fold surrounding the clitoris. Rich in nerve endings, the clitoris contains small corporeal bodies and is protected by skin that varies in volume and size [42, 58].

Clitoral hood reduction differs from clitoridectomy, the surgical excision of the clitoris, a form of “female genital mutilation”.

Although there is no consensus on the definition of clitoral hood enlargement some women opt to undergo clitoral hood reductions to improve sexual function and aesthetic appearance [20]. The main surgical goal of a clitoral hoodectomy is to decrease the length, protuberance and thickness of the clitoral prepuce, or to remove redundant clitoral hood folds [18, 20]. This operation is performed less frequently for functional purposes. Some women seek clitoral hood reduction to expose a larger area of the clitoris to enhance sexual gratification [20]. Other reasons include interference with coitus due to a trapped clitoris, chafing, interference with exercise, and hygiene concerns [18, 20, 21, 51, 53].

Surgical technique

Clitoral hood reduction typically involves wedge resection labiaplasty followed by bilateral fusiform excision of excess lateral clitoral hood skin [18, 51, 54, 59]. Wedge resection labiaplasty is performed to reduce the size of the clitoral hood as well as the overall size of the labia minora. The ablated or

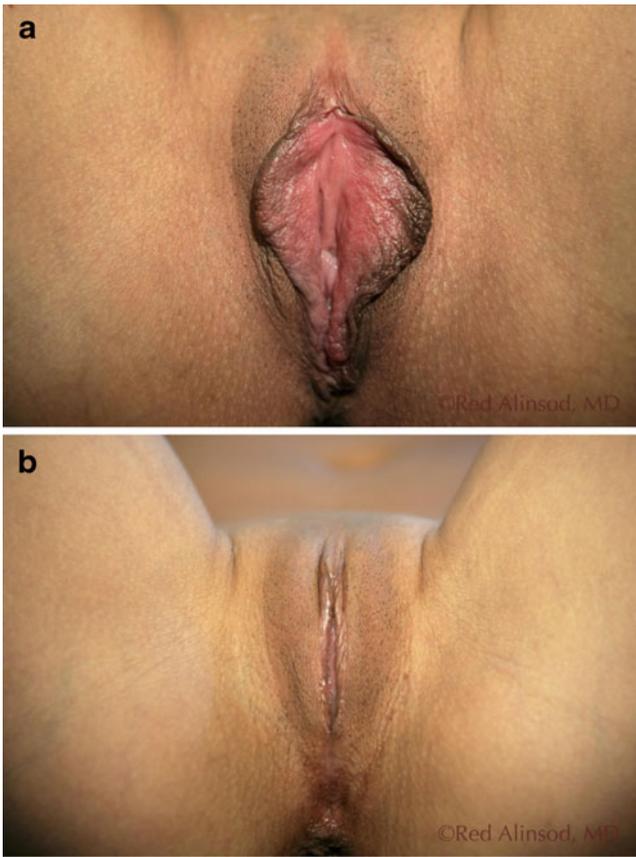


Fig. 5 Labiaplasty **a** before and **b** after

excised exterior wedge sections of labial tissue are extended to include redundant clitoral prepuce tissues [51]. The surgeon must ensure that the clitoris is not over-exposed, which potentially could raise the risk of hypersensitivity. Other risks are nerve damage leading to anorgasmia or accidental severing.

Another technique involves bilateral semicircular, elliptical, fusiform excision of the redundant folds of clitoral prepuce



Fig. 6 Complication of a labial sinus hole after labiaplasty. Red arrow highlights the sinus tract. The patient also had a clitoral hood reduction leading to scarring



Fig. 7 Complication: wedge resection separation

[26, 54, 59]. Incisions are made parallel to the long axis of the clitoris, on the fold between the minora and majora, thus leaving the clitoris more exposed, but maintaining a midline position relative to both the labia minora and majora (Fig. 9) [54, 59].

Complications

Of 407 patients who underwent central wedge labia minor labiaplasty with lateral clitoral hood excision, 4 % had complications and 2.9 % needed revision surgery [51]. According to Felicio, concurrent labial and clitoral hood surgeries carry a higher risk of prolonged edema lasting up to 3 months [54]. Without the use of cooling measures, clitoral hood skin can become large and edematous, resulting in re-formation of excess skin. Future studies are needed and patients should be counseled about possible pain, denervation injury, and adverse effects on orgasm. Similar to other FGCS, there are few studies with large sample sizes and long-term follow-up to establish clear safety and efficacy guidelines.



Fig. 8 Complication of labial separation

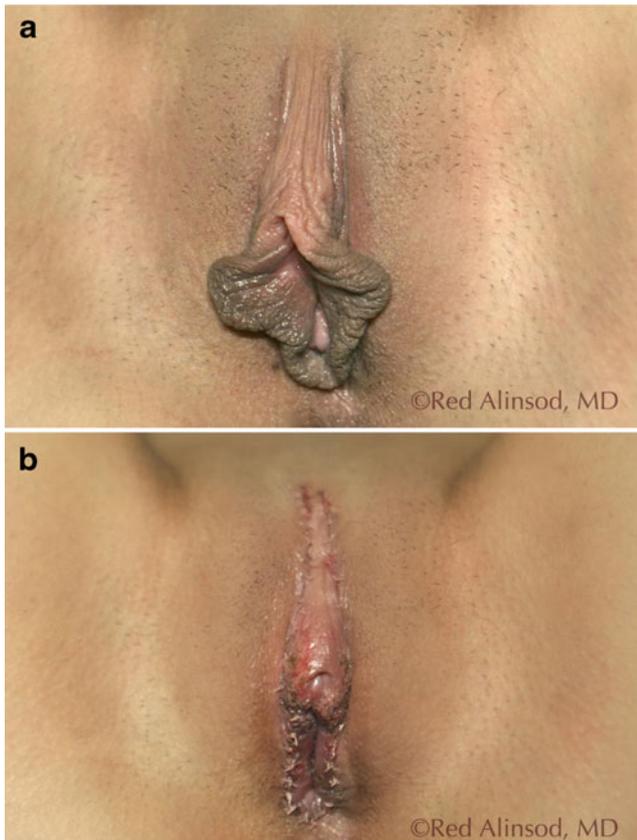


Fig. 9 **a** Before and **b** immediately after clitoral hood reduction labiaplasty

Labia majora augmentation

Background

Labia majora augmentation by autologous fat transfer enhances the volume, shape, symmetry, firmness, and contour of atrophied labia majora. This technique involves an injection of excess fat extracted from areas of the patient's body into the labia majora [54, 60, 61]. The procedure is similar in principle to other cosmetic dermal surgeries that utilize microfat injection to repair sagging, lax, and wrinkled skin [60, 61]. Aging or rapid weight loss causes a loss of hyaluronic acid, dermal collagen, and fat in the labia majora leading to potential laxity of the labia majora, decreased volume, wrinkles, discoloration, and sometimes reduced skin elasticity [60].

Hypotrophic labia majora may be too small to cover the labia minora, thus making the minora look unusually large. Atrophy of the labia majora can cause exposure of the labia minora, resulting in dryness [60]. To correct labia majora atrophy, autologous fat is injected into the subcutaneous fat layer of the labia majora where it serves as a filler [54]. An alternative to fat grafting is to perform a labia majora plasty [26]. Excision of the excess labia majora skin can produce a smoother labial appearance.

Surgical technique

Purified fat is collected from body sites such as the knee, abdomen, and hips and then processed [61]. In the syringe technique, the harvested fat is put in a small diameter blunt cannula connected by tubing to a 10–20 cc Luer–Lock syringe for injection [61]. Alternatively, fat may be harvested using liposuction under low negative pressure with 3-mm suction cannulas [61]. The harvested fat is mixed with autologous platelet-rich plasma (PRP) in a 4:1 ratio to promote graft viability, and then injected using a 15-cm, 14-gauge blunt cannula subcutaneously about 20 mL in a fan-like pattern through 1-mm incisions per labium majorum [61]. Salgado uses dual grafts with dimensions of 10×2 cm harvested from the abdominal skin-fat paddle and then positioned on the dermal side of each labium majorum and sutured with 3–0 absorbable suture [60].

Clinical evidence: safety and efficacy

In one case report, a patient with pain and deformity after resection of the labia majora for Bowen's disease underwent an autologous fat injection [62]. Suction-assisted liposuction aspirated fat grafts were used in the fat transfer technique. This procedure was effective in attaining cosmetic results and in reducing mucosal exposure and dryness, but differs from standard methods used for augmentation [54, 60, 61].

Felicio performed labia majora augmentation followed by liposculpture in 31 out of 449 (6.9 %) FGCS cases [54]. A maximum of 60 mL of fat per labium majorum was transferred using the syringe transfer technique initially with additional fat grafts after 6 months. Lipoplasty was performed with either an S incision/excision, syringe common or with both techniques [54]. After fat transfer, the labia majora were re-contoured using skin excisional techniques. In some cases concomitant grafts and flaps are combined with fat injections to achieve volumetric enhancement [54].

Complications

Several complications are associated with labia majora augmentation. The overall complication rate in Felicio's study was 2.65 % [54]. Triana et al. examined the outcomes of 74 patients who had labia minora excision with or without clitoral hood molding and, in some cases, labia majora augmentation. Palpable fatty cysts were found in the labia majora after fat injections in 6 patients who underwent labia majora augmentation [63]. Resolution of the cysts occurred in 5 of 6 patients by 6 months. One patient had a palpable mass that was not visible or painful, which persisted for 8 months [63]. In Salgado's case report, the labia majora increased by 40 % from 2.5 cm to 3.5 cm after dermal fat grafting [60]. Increased perspiration and the appearance of a "camel toe" (a slang term

referring to the outline of the labia majora in tight clothing) are other reported adverse effects [33].

Conclusion

Insufficient data exist to conclude procedural safety and efficacy for labia majora plasty.

G-Shot® (G-spot amplification)

Background

G-Shot® (G-spot amplification) is a trademarked non-invasive technique intended to amplify the small anatomical region known as the Gräfenberg spot, or G-spot, to increase sexual stimulation during friction with intercourse [64]. Originally described by the German gynecologist Ernst Gräfenberg in 1950, the G-spot refers to an erogenous zone located 1–2 cm from the urethra on the anterior vaginal wall [65]. Since this description was published, there have been many reviews and papers questioning the validity of the G-spot [66, 67]. Ostrzenski claimed to have found the G-spot during a cadaver dissection; however, no histological analysis was performed to confirm neurovascular tissue [68].

Surgical technique

G-spot amplification is a non-invasive dermal filler injection technique used to expand the size of the G-spot, as identified individually by each patient. The procedure was developed to produce an increased responsiveness to tactile stimulation during sexual activity. The G-Shot® consists of a small dose of hyaluronic acid (high molecular weight hyaluronan) injected via a 3.5-inch needle into the presumed G-spot that causes the target area to enlarge by nearly 100 %. Injection of hyaluronic acid is an “off-label” use. The effects of the G-Shot® vary individually, typically lasting 3–5 months. Other substances, such as autologous fat, collagen, and Radiesse (a subdermal filler) have been injected into the G-spot with varying and unpredictable results [33].

Complications

The danger with the G-spot injection is intravascular placement. A case report of a woman presenting with shortness of breath and cough after injection of 5 mL of hyaluronic acid to the anterior vaginal wall ultimately ended in her need for mechanical ventilation because of a nonthrombotic pulmonary embolism [69]. A granulomatous foreign body reaction with multinucleated giant cells was confirmed by video-assisted thorascopic lung biopsy. Listed risks of G-Shot® include: bleeding, infection, hematoma, urinary complications, accelerated hyaluronan re-absorptions, allergic reaction, and lack of therapeutic effect.

Conclusion

Low-quality anecdotal reports exist for G-spot injection and no conclusions can be made on procedural effectiveness and safety.

Summary

The aesthetic vaginal surgeon’s intent is to alleviate distress—psychological and/or physical pain—triggered by unattractive, obtrusive common or poorly functioning genitalia. Although gynecological surgeons are the original architects of FGCS, the growth of this field is driven by the patients and the media. Some gynecologists fail to grasp the intimate relationship between a woman’s perception of her own vulva-vagina and her self-esteem, the psychobiological need for sexual gratification, and self-worth.

The aesthetic and functional procedures that comprise FGCS signal the latest final frontier of cosmetic surgery. The line between cosmetic and medical surgical procedures is blurred, and today many operations are performed for both purposes. The contributions of gynecologists are crucial since the pelvic floor, perineum, and vulva are the rightful domains of our profession.

Adolescents and adult women who are waxing, shaving, and using other depilatory agents often have a clear view of the perineum. Genital images, many of which are enhanced, on internet pornography and other social media promote narrow genital hiatuses and thin labia minora. Aesthetic vaginal surgeons who have significant proprietary conflicts of interest may unintentionally blur legitimate female pelvic floor disorders with other aesthetic conditions. Deceptive marketing practices that promote vaginal rejuvenation for the correction of prolapse, cure of stress incontinence, and improvement in sexual function are concerning and should be discontinued. In the absence of quality outcome data, the value of FGCS in improving sexual function remains uncertain. Procedures performed on pre-pubescent adolescents should also be discouraged.

Women seeking FGCS need to be educated about the range and variation of labia widths and genital appearance, and should be evaluated for bona fide pelvic support disorders for which well-established treatment options exist. Women seeking FGCS should also be screened for psychological conditions including body dysmorphic disorder and should act autonomously without coercion from partners or surgeons. The ethical obligations of surgeons include truth telling, avoidance of conflicts of interest and patient exploitation. Appropriate informed consent about alternatives, potential benefits and harms, and the lack of long-term data should be discussed. Adequate training is necessary. While FGCS represents “luxury medicine,” our professional

responsibility is indeed great and patients deserve the best evidence-based therapies.

Conflict of interest Dr Alinsod: Consultant Coloplast, Ellman International, Cooper Surgical, Monarch Medical Products. None for Drs Iglesia and Yurteri-Kaplan.

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