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MALE AND FEMALE SURGICAL INTERVENTIONS (A BURNETT AND C CARSON, SECTION EDITORS)

Female Cosmetic Genital Reconstruction: a Review of Current Trends, Treatments, and Techniques

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Abstract

Purpose of Review To examine the peer-reviewed publications on the topic of female cosmetic genital surgery (FCGS) and discuss recent trends, the factors motivating patients to request these procedures, and the controversy surrounding them.

Recent Findings In studies with the primary goal being esthetic improvement (e.g., labiaplasty), post-operative satisfaction rates are generally high. When procedure outcomes are focused more on functional aspects, such as enhancement of sexual function and response, statistically significant improvements are also reported after treatment. Complication rates vary across treatment sites and operating physicians.

Summary While FCGS procedures continue to rise, great variation still exists across patient-centered outcomes, treatment modalities offered, and quality of published studies examining outcomes. Small sample sizes and lack of standardization across study centers make scientifically validating existing data challenging. Consensus across disciplines pertaining to standardization of procedures and outcomes is necessary to optimize patient satisfaction, care, and safety.

Keywords Minimally invasive treatments for vaginal dryness · Female genital cosmetic surgery · Labiaplasty · Minimally invasive treatments for vaginal laxity · Non-surgical vaginal tightening · Vaginal rejuvenation · Radiofrequency treatments for vaginal laxity

Introduction

The popularization of feminine rejuvenation and increased demand for female cosmetic genital surgery (FCGS) in recent years have prompted discussion and controversy among physicians and surgeons across multiple disciplines. FCGS, also referred to as vulvovaginal rejuvenation, generally encompasses elective procedures of the vulva and vagina that alter a patient's anatomy for esthetic and/or functional reasons [1]. These procedures include surgical approaches such as labiaplasty, clitoral hood reduction, vaginoplasty, and perineorrhaphy, as well as minimally invasive interventions such as various energy-based devices and injections [2]. This review aims to explore the recent trends, patient motivations, public acceptance, and controversy of FCGS procedures as well as provide a discussion of an overview of these interventions with recent data in the literature.

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Trends in FCGS

National and global trends of FCGS demonstrate an overall increase in utilization over the recent decades. Among FCGS procedures, labiaplasty, or the surgical reduction of the labia minora, remains the most commonly performed procedure. According to the 2017 annual survey data published by the American Society for Aesthetic Plastic Surgery (ASAPS), the

number of labiaplasties since 2012 increased by 217% [3]. It should be noted, however, that labiaplasties in 2017 dropped 10% from the previous year [4]. Given recent fluctuation in trends and the steady increase in the number of procedures performed, it is still early to draw conclusions regarding the future direction in the utilization of labiaplasty and other FCGS considering their significant growth. Global labiaplasty trends also mimic those in the USA, with a nearly threefold increase in surgeries in Australia and an even greater increase in the UK between 2003 to 2013 [5, 6]. While other procedures, including newer minimally invasive modalities, are increasingly becoming more popular and represented in literature, the existing data tracking utilization and standardization of these procedures is limited [1, 2, 7–10].

Motivations to Pursue FCGS

When examining trends, it is important to consider intrinsic and extrinsic motivating factors that drive these patterns. The predominantly cited influences leading to patient decision to pursue FCGS for cosmetic reasons include modern media's representation of body image ideals, social media influencer opinion, accessibility of pornography, and the increased number of physicians offering FCGS [1, 11–15]. A trend toward "hairlessness," which makes details of the labia more visible, is also likely a contributor. The fact that physicians across various surgical and non-surgical disciplines are now showing awareness about FCGS is also impacting patient motivation and interest in these procedures. Few studies exist, however, correlating these extrinsic factors with patient decision-making, and those that do have differing conclusions and lack consensus. For example, in an Australian study by Sharp et al., women seeking labiaplasty reported more exposure to images of female genitalia and advertisements for labiaplasty online ($p = 0.004$ and 0.021, respectively) compared to those in the control group. The women seeking labiaplasty in this study also reported being significantly less satisfied with the appearance of their genitals compared to controls ($p < .001$) [16•]. In another study by Crouch et al., 60% of the women electing labiaplasty reported "improving" the appearance as the primary motivating factor, but only 12% reported exposure to pornography and/or female genitalia imagery [17]. The small sample sizes in these studies, often from single centers, limit the ability to assess the impact of existing factors on rising trends in FCGS. Larger scale surveys from a heterogeneous sampling are still needed. In addition to the role media plays, the greatest variable impacting the number of surgeries performed today is the number of surgeons advertising for and offering cosmetic vaginal procedures [3, 4]. This factor alone has been a huge source of controversy and debate, ultimately spurring a recent safety communication by the FDA.

In addition to esthetic goals, women also seek FCGS procedures for functional complaints. For example, peri- and post-menopausal women experience a constellation of atrophy-related symptoms including vaginal dryness, irritation, dysuria, pain, discomfort, and impaired sexual function collectively known as genitourinary symptoms of menopause (GSM) [18]. These patients frequently seek FCGS for functional relief of these symptoms by means of the minimally invasive energy-based therapies, with radiofrequency thermal generators and CO_2 lasers being the primary choices for treatments [19]. In a cross-sectional, multicenter study by Goodman et al., 76% of the women undergoing FCGS reported enhancement of sexual function as the primary motivating factor. Women who underwent vaginoplasty, perineoplasty, labiaplasty, and clitoral hood reduction, specifically, also reported improvement of their male partner's sexual experience as a factor influencing their motivation for treatment [20].

Interestingly, in a survey of 2403 men and their perceptions regarding the vulva and labiaplasty, 42% of responders were familiar with the procedure and 75% would not encourage their female partner to change her genital appearance [21•].

Attitudes and Controversy

The controversy surrounding FCGS is reflected in several professional societal opinions and review articles [11–15, 16•, 22–24]. It has been debated whether certain FCGS procedures should be considered a form of female genital mutilation by the World Health Organization (WHO) and their classification system [22–24]. Given the politically and emotionally charged nature surrounding the history of female genital mutilation, women now voluntarily requesting esthetic and functional genital alteration, from physicians and surgeons, raises controversy and concern. The question of medical necessity also comes into play because the WHO describes female genital mutilation as any procedures that intentionally alter female genital organs for non-medical reasons [24]. FCGS is an elective procedure that, under this definition, can technically qualify as mutilation. A stark difference between the two, however, is the element of volition and choice among women seeking FCGS. The subtleties differentiating elective surgery from "mutilation" basically come down to perception and societal norms and values. In parts of the world where FCGS is accepted and embraced, the focus and emphasis is on female empowerment and individual agency and the freedom that women have to make decisions for themselves, their bodies, and their health today. It is also important for healthcare providers to consider these procedures as they would another standard medical procedure—this includes deeply examining the indications for the procedure, obtaining informed consent, and discussing with patients the risks, benefits, and outcomes described in evidence-based research studies.

One of the most impactful articles contributing to the controversy today is the American College of Obstetricians and Gynecologists (ACOG) consensus opinion in 2007 [25]. The committee denounced "vaginal rejuvenation," "designer vaginoplasty," "revirgination," "G-spot amplification," and any other elective vaginal surgical procedures including cosmetic labiaplasty and stated that it is deceptive and misleading for a physician to claim that FCGS procedures qualify as accepted and routine surgical procedures. The committee further highlighted the lack of data supporting efficacy and reporting of the potential complications. Nearly 10 years later, ACOG modified its extreme position and released another formal committee opinion acknowledging the utility of labiaplasty in adolescents under 18 who experience persistent psychological distress or physical symptoms of discomfort, irritation, and pain [26•]. While not a complete reversal of the initial statement, this reflects a shifting perspective favoring acceptance of FCGS for a broader range of indications.

Discussion of FCGS Procedures

The expanding scope of FCGS now encompasses more invasive surgeries as well as minimally invasive modalities utilizing radiofrequency heat and laser ablation.

Surgical Procedures

Labiaplasty

Labiaplasty refers to the surgical manipulation of the labia minora and majora, but it is most commonly associated with surgical resection and reduction of the labia minora. For patients seeking esthetic labiaplasty, a popular, one-size-fits-all approach known as the "Barbie Labiaplasty" involves complete removal of the visible labia minora to achieve a more infantile appearance [2]. In addition to esthetic concerns, functional reasons for pursuing labiaplasty have included varying degrees of dyspareunia as well as irritation during physical and sports activities [27]. These, along with psychological distress, were cited reasons to consider labiaplasty in adolescents by the ACOG 2016 committee statement. Despite the natural variation in labia minora size and appearance, several investigators have made efforts to define "normal" variations in labia minora anatomy with "hypertrophy" being an indication for surgical management. Authors have also proposed labial width exceeding 3 to 5 cm as labia minora hypertrophy; however, still as of today, no consensus has been reached within the esthetic surgical groups as to the ideal esthetic of the vulva and/or "tightness" of the vaginal canal [28–31]. Surgical approaches to labiaplasty vary, based on anatomy, with wedge technique resections and edge resections being the most commonly cited in the literature [32, 33].

General outcomes for labiaplasty described in the literature include global satisfaction rates, reduction in distressing symptoms, and summaries of adverse events and complications. A recent study in 2018 by Surroca et al. examined 58 patients at a single site undergoing labiaplasty. They reported a mean global satisfaction score of 36.89 out of 40 at follow-up visits 3 to 6 months after the surgery. They also experienced a complication rate of 12% (six cases) including wound dehiscence, hematoma, and partial necrosis [34•]. Another recent study in 2017 by Ouar et al. reporting on 64 patients revealed a similar complication rate of 13%, with wound dehiscence being the most common (8%), followed by hematoma (3%) [33]. Older studies from high-volume surgical centers report similar satisfaction rates of over 90% and complication rates ranging from 4 to 7% [34•, 35–38]. Given the varying motivations and end goals for each patient, a lack of standardized validated assessment tools that consistently capture post-operative outcomes has been a barrier to most major academic teaching hospitals adopting and validating the technology for these minimally invasive treatments. Academic centers have the diversity and volume of patients required to perform sham-controlled studies and reach statistical significance. The growing interest in the topic of FCGS, and even the controversy, is spurring positive change in this regard. There are several academic teaching centers utilizing the minimally invasive technologies and performing studies and more coming on board as the patient demand continues to rise.

Surgical Vaginal Tightening

Among FCGS, the terms "vaginoplasty" or "vaginal rejuvenation" often refer to procedures that aim to achieve a more youthful restoration of the vagina, both functionally and esthetically. Ozel et al. demonstrated that women with pelvic organ prolapse and vaginal laxity were significantly more likely to report the absence of libido and lack of sexual excitement during intercourse compared to those without laxity or prolapse [38]. For multiparous patients complaining of vaginal laxity, management involves tightening the introitus and canal [2]. In women without significant prolapse, cosmetic surgical approaches to achieving "tightness" include modifications of anterior and posterior colporrhaphies, procedures traditionally used by urologists and gynecologists to treat symptomatic pelvic organ prolapse [2, 39]. Among the most common is perineorrhaphy, or the surgical restoration of the width of the perineal body resulting in a decreased caliber of the vaginal introitus. Other techniques include varying degrees of resection of the vaginal mucosa, such as a lateral colporrhaphy [40].

Compared to labiaplasty, fewer studies exist describing the post-operative outcomes of cosmetic vaginal tightening surgeries such as perineoplasty and lateral colporrhaphy, which typically involves an elliptical excision of the lateral vaginal wall from the vaginal apex to the posterior introitus followed by a reapproximation of the defect. A 2016 study by Ulubay et al.

examined 38 women complaining of vaginal laxity without prolapse who underwent perineorrhaphy. At the 6-month follow-up visit, patient satisfaction rate was 87.9% ± 6.85, male partner satisfaction rate was 92.63% ± 7.6, and the dyspareunia rate was 10%. Two cases of wound dehiscence occurred, but no intraoperative complications were noted [41]. The study by Adamo et al. described 40 women who underwent lateral colporrhaphy for vaginal laxity and reported 95% patients reporting some to significant improvement of vaginal sensitivity and 80% of partners reporting some to significant improvement in sexual satisfaction. Complications included two cases of localized infection and one case of post-operative vaginal bleeding [40].

Minimally Invasive Procedures

Energy-Based Vaginal Rejuvenation Treatments

Medical devices routinely used by cosmetic surgeons and dermatologists on skin, including light- and energy-based lasers, have recently been gaining significant momentum for use on vaginal mucosa, coining the term "vaginal rejuvenation." These new minimally invasive interventions aim to address peri- and post-menopausal symptoms known as genitourinary syndrome of menopause, or vulvovaginal atrophy, by stimulating increased proliferation of the vaginal epithelium and neo-collagenesis as well as increased vascular and neural regeneration [20]. Heat or

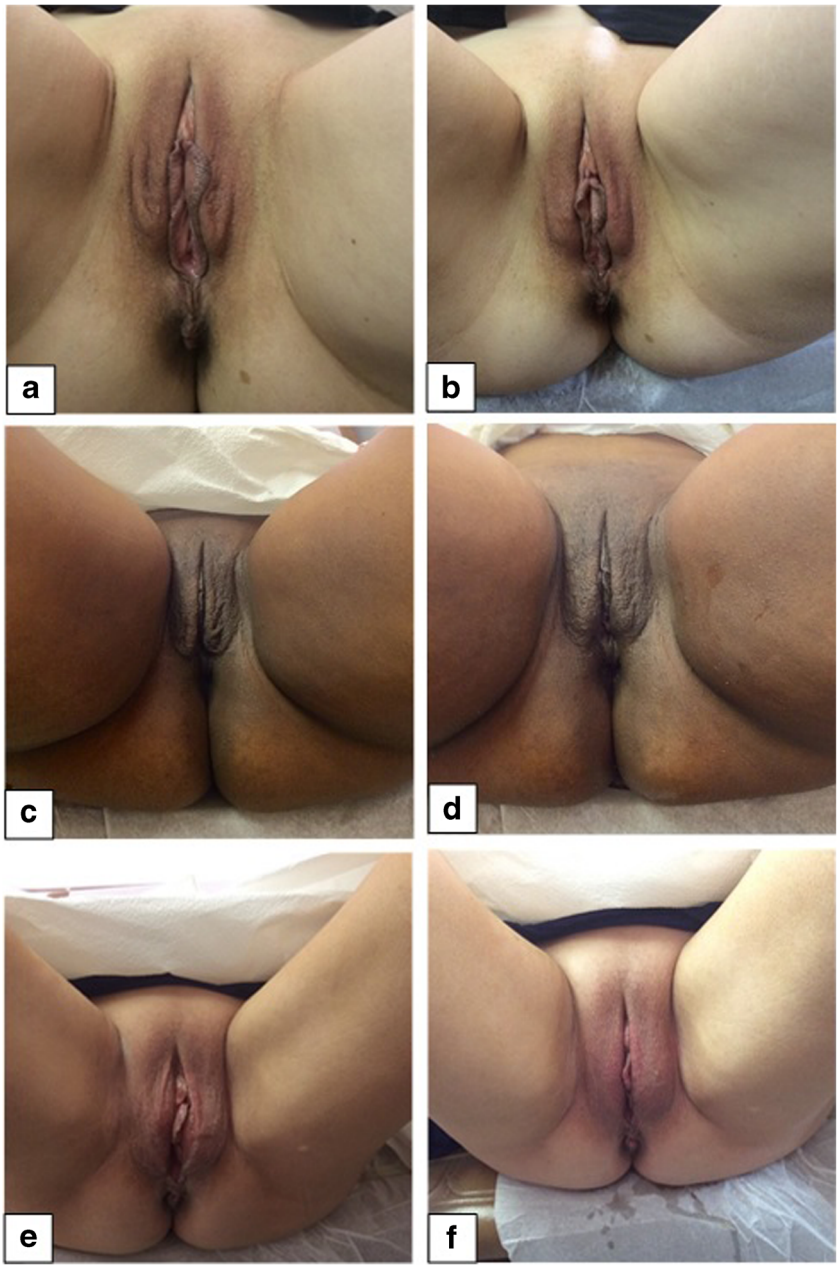

Fig. 1 External genitalia of patients treated with energy-based vaginal rejuvenation treatments. Patient 1 before (**a**) and after (**b**) treatment with ThermiVa®. Patient 2 before (**c**) and after (**d**) treatment with Votiva™ with FormaV. Patient 3 before (**e**) and after (**f**) treatment with Votiva™ with FormaV

laser/light energy creates zones of ablative tissue injury promoting and expediating regeneration and tissue repair [42, 43]. Two commonly used light-based lasers are the CO_2 laser (Monalisa®) and the Erbium:YAG (Er:YAG) (diVa®) laser, emitting light at wavelengths of 10,600 nm and 2940 nm, respectively [20, 44]. Radiofrequency (RF) devices use thermal energy to directly heat to adjacent tissue with target temperatures at or below 45 °C. Heat causes partial denaturation of existing collagen and promotes fibroblast-mediated production of new collagen [20, 45]. Histological assessment of these ablative methods demonstrates increased cellular thickness of the stratified vaginal epithelium and visibly greater amounts of collagen and vascular growth in the connective tissue [46–48]. Visible external changes with these therapies have also been noted, demonstrated in Fig. 1.

Several observational and prospective studies have emerged in the recent literature utilizing vulvovaginal energy-based treatments, some of which are summarized in Table 1. Of particular interest are the outcomes reflecting subjective improvement of symptoms in women with GSM. While evaluation of subjective and objective outcomes varies widely across studies, many have published data collected from validated assessment including the Female Sexual Function Index (FSFI), Female Sexual Distress Scale-Revised (FSDS-R), Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire (PISQ12), and the International Consultation on Incontinence Questionnaire-Urinary Incontinence (ICIQ-UI) [53–56].

Pilot studies, particularly involving non-ablative Er:YAG lasers, have reported improvement of stress urinary incontinence [57–59]. These findings, however, have been criticized due to study design bias and recruitment [60]. Recently, Blaganje et al. published a single-blinded randomized control trial comparing effects of Er:YAG lasers to sham treatment, as seen in Table 1. They recruited and randomized 114 premenopausal women with at least one vaginal delivery presenting with stress urinary incontinence and excluded women with pelvic organ prolapse grade > 1, urge urinary incontinence, and mixed urinary incontinence. The primary outcomes reported through validated assessment tools are summarized in the table. They demonstrated statistical significance in the improvement of urinary incontinence, with a decrease in the ICIQ-UI score by − 3.86 ($p < 0.001$) in the laser group versus − 1.05 ($p = 0.032$) in the sham group, as well as a reduction in sexual distress at 3-month follow-up. To our knowledge, this is the first and only published blinded randomized control trial to date examining the outcomes of Er:YAG laser vaginal treatment specifically for stress incontinence. Despite these initial promising results, further evaluation with more robust studies is required to understand how to approach treatment for various indications as well as to provide consistency with standards of care.

It should be noted that the U.S. Food and Drug Administration (FDA) recently issued a safety communication on July 30, 2018 warning patients and healthcare providers against the use of energy-based devices to perform vaginal "rejuvenation" or vaginal cosmetic procedures. The FDA highlights that it has not cleared or approved any energy-based devices for marketing claims that they can treat the aforementioned vulvovaginal symptoms. Furthermore, the FDA states that the safety and effectiveness of these devices have not sufficiently been established [61].

O-Shot® Injectable Platelet-Rich Plasma

The O-Shot® refers to platelet-rich plasma (PRP) that is injected into the peri-urethral space with the goal of treating female orgasmic disorder, which is the inability or difficulty to experience orgasm [62]. There is scant literature regarding the utilization of PRP to treat urologic or gynecologic conditions, though it has been offered commercially to patients [63].

Table 1 Recent studies on minimally invasive energy-based vaginal treatments and their outcomes

	Study	Year published	*N*	Results	Follow-up	Complications
Radiofrequency	Krychman et al.; single-blinded randomized control trial (VIVEVE I) [49•]	2017	174	Single treatment. Subjective report of "no vaginal laxity" (treatment vs. sham) 43.5% and 19.6% ($p = .002$). Difference values in FSFI and FSDS-R scores between treatment and were 1.8 ($p = 0.031$) and − 2.42 ($p = 0.056$)	6 months	No serious adverse events
	Sekuguchi et al.; prospective single-arm study [50]	2013	30	Single treatment. The mean FSFI total score improved from baseline 22.4 ± 6.7 to 26.0 ± 5.8 ($p = 0.002$) and the mean FSDS-R score improved form baseline 15.8 ± 11.7 to 9.8 ± 8.0 at 1 month and sustained through 1 year ($p < 0.001$–0.002)	6 months	No adverse events recorded
CO_2 Laser	Perino et al.; post-procedural clinical evaluation [51]	2015	48	Three treatments. Vaginal Health Index Scores after treatment were statistically higher than baseline at 21.5/2 vs. 10.5/3 ($p < 0.0001$). Additionally, statistically significant improvement in dryness: 8/2 vs. 2/1; burning: 6/2 vs. 2/1; itching: 6/1.75 vs. 2/0.75, dyspareunia 8/2 vs. 3/1 ($p < 0.0001$)	30 days	No adverse events recorded
Er:YAG	Blaganje et al.; single-blinded randomized control trial [52••]	2018	114	Single treatment. Change from baseline (treatment vs. sham) in ICIQ-UI was − 3.86 ($p < 0.001$) vs. − 1.05 ($p = 0.032$), PISQ-12 was 3.00 ($p < 0.001$) vs. 0.89 ($p = 0.129$), and FSFI was 3.06 ($p < 0.001$) vs. 1.35 ($p = 0.003$)	3 months	No serious adverse events reported

Use of PRP has been in practice with other medical specialties, including orthopedic surgery, by taking advantage of the role of platelets in tissue repair, vascular repair, and inflammatory and immune modulation through cellular signaling pathways [64]. This, in theory, would stimulate tissue healing and regeneration. A study by Hersant et al. published in 2018 reported a phase 2 pilot study of 20 post-menopausal women with a history of breast cancer and the outcomes in the treatment of vulvovaginal atrophy after injection with platelet concentrate and hyaluronic acid. This group demonstrated improvement using the subjective validated FSDS as well as objective Vaginal Health Index Score [65]. While this study demonstrates outcomes of using platelet products in a gynecologic setting, it does not examine the O-Shot® and its marketed use in the peri-urethral space. The evidence to support safety and efficacy with the O-Shot® remains lacking, with only a handful of smaller single-center case series, and no conclusion can be made about its use.

Conclusion

With the recent rise in elective female genital surgeries, along with the number of physicians and surgeons who perform them, it is important to critically evaluate the impact these procedures have on patients. For some surgeries that are sought out for various esthetic or functional reasons, such as labiaplasty, it is difficult to standardize and report the proper indications to pursue them. No single, validated assessment tools or objective measures exist to describe post-operative outcomes for labiaplasty because women who desire them have individualized end goals with how much labial tissue is removed. Furthermore, physicians should better characterize and understand the underlying societal influences that persuade women to seek purely esthetic or elective functional surgeries. With the exception of newer studies on energy-based minimally invasive treatments with GSM and urinary incontinence, the vast majority of literature on FCGS do not describe multi-center, blinded randomized control trials.

While FCGS intervention for functional involves objective data and validated assessment tools, it may be difficult to interpret the impact that increased post-surgical satisfaction has on patients. A potential paradigm to better characterize this is through a validated assessment of a woman's Genital Self-Image (GSI) score [66]. Berman et al. reported national survey data of 2206 randomly selected women and found that those who scored highest on the GSI Scale reported greater levels of sexual function [67]. This demonstrates that a woman's outlook and perception of her own genitals can directly impact her overall sexual experience and that esthetic procedures may contribute to that purpose. As society has accepted a more sex-positive outlook in recent years, women have been empowered to make bolder, individualized decisions regarding sex. As such, a woman's desire to pursue functional and/or esthetic FCGS procedures is a personal and unique one. Physicians and surgeons who provide FCGS must be sensitive to patient-centered goals and should be cautious and critical of one-size-fits-all approaches.

Furthermore, the link between sexual desire and experience to genital appearance and function is a multifaceted and complex relationship. Patients may have numerous factors contributing to their desire to pursue FCGS which should be further investigated by their healthcare providers prior to a procedure. This could include underlying psychiatric conditions, like body dysmorphic disorder, or other external societal pressures. The ideals of genital perfection alone based on societal norms do not necessitate or indicate a need for procedural management. As with all approaches in medicine, a physician's or surgeon's decision to provide intervention must incorporate a multidimensional understanding of their patient, including medical, social, cultural, and psychiatric considerations.

Given the elective nature of these procedures, without official validated society guidelines or indications for insurance coverage, they are paid out-of-pocket by patients. Therefore, there also exists the potential and incentive for physicians to over-recommend procedures that may be unnecessary or inadvertently compromise the safety of patients. Physicians and surgeons alike must remain vigilant in prioritizing patient safety, agency, and care. If the field of FCGS continues to grow and evolve, it is the responsibility of those who perform these procedures to develop a more rigid standardization of research and study design that interrogates the indications, techniques, and outcomes with patients in mind.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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- • Of importance
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