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Gender-Affirming Surgery

Gender-Affirming Vaginoplasty: A Comparison of Algorithms, Surgical Techniques and Management Practices across 17 High-volume Centers in North America and Europe

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Background: Penile inversion vaginoplasty is the most common gender-affirming genital surgery performed around the world. Although individual centers have published their experiences, expert consensus is generally lacking.
Methods: Semistructured interviews were performed with 17 experienced gender surgeons representing a diverse mix of specialties, experience, and countries regarding their patient selection, preoperative management, vaginoplasty techniques, complication management, and postoperative protocols.
Results: There is significant consistency in practices across some aspects of vaginoplasty. However, key areas of clinical heterogeneity are also present and include use of extragenital tissue for vaginal canal/apex creation, creation of the clitoral hood and inner labia minora, elevation of the neoclitoral neurovascular bundle, and perioperative hormone management. Pathway length of stay is highly variable (1–9 days). Lastly, some surgeons are moving toward continuation or partial reduction of estrogen in the perioperative period instead of cessation.
Conclusions: With a broad study of surgeon practices, and encompassing most of the high-volume vaginoplasty centers in Europe and North America, we found key areas of practice variation that represent areas of priority for future research to address. Further multi-institutional and prospective studies that incorporate patient-reported outcomes are necessary to further our understanding of these procedures.
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INTRODUCTION

Gender-affirming surgery (GAS) aims to align an individual's anatomy with their gender identity. Although not all transgender and gender diverse people pursue GAS, for those who need it there can be alleviation or reduction of gender dysphoria, substantial improvement in quality-of-life, and reduced negative health outcomes.[1] The number of GAS procedures being performed around the world continues to rise.[2–4] With more surgeons gaining experience in GAS combined with innovation in the field, it is important that techniques and approaches are studied to identify areas of consensus and areas in need of improvement.

The goals of vaginoplasty are to create an aesthetic and functional vulva and vaginal canal that can allow

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for penetrative intercourse, a sensate clitoris, and urine stream that is directed downward.[5] For creation of the vulva and vaginal canal, there are a variety of techniques, including penile inversion with penoscrotal flaps and skin grafts, extragenital skin grafts, peritoneal flaps and grafts, and intestine.[6–10] Although specific indications for these techniques have been proposed, there is still variability regarding their use.[10] Moreover, controversies regarding perioperative hormone management, hair removal, dilation regimens, and general postoperative management persist.[11–14]

Recognizing areas of agreement and divergence is important for improving clinical consistency and identifying and prioritizing topics for research and further study. We conducted a large, cross-sectional survey of high-volume vaginoplasty surgeons predominantly in North America and Europe to provide "averages" for benchmark comparison and to guide further research and innovation.

Takeaways

Question: What are the most common techniques for penile inversion vaginoplasty?

Findings: Across 17 western centers, there is significant consistency in practices across some aspects of vaginoplasty. Differences exist in use of extragenital tissue for vaginal canal/apex creation, creation of the clitoral hood and inner labia minora, elevation of the neoclitoral neurovascular bundle, and perioperative hormone management.

Meaning: This article provides a succinct summary of common practices at different centers and will be useful for guiding future research questions.

METHODS

Because no patient data were involved, this study does not require institutional review board approval. Based on the consensus of three senior surgeons (W.M.K., L.S., and D.C.), 17 high-volume surgeons performing vaginoplasty for transgender and gender diverse patients were identified. A high-volume surgeon was considered someone who has been performing gender-affirming vaginoplasty for at least 3 years with at least 40 cases annually. (**See table, Supplemental Digital Content 1,** which shows the consensus table, **http://links.lww.com/PRSGO/C581**.) (**See table, Supplemental Digital Content 2,** which shows surgeon demographics, **http://links.lww.com/PRSGO/C582**.) An email invitation for study participation was sent to each surgeon for a total of two attempts. Those who agreed to participate in the study were invited for a semistructured interview over the phone or in-person with one of the people conducting the study (W.M.K., D.C., or S.D.M.). Interviews were conducted between January 2020 and April 2021.

Instrument Development

Questions were developed by three senior surgeons (L.S., W.M.K. and D.C.) around techniques and management during vaginoplasty. A total of fifty questions were asked in an open-ended manner to allow for discussion amongst the interviewer and interviewee. Responses were recorded as accurately as possible by the interviewer. (**See table, Supplemental Digital Content 1, http://links.lww.com/PRSGO/C581**.)

Analysis

Data were coded into appropriate categories, and any discrepancies were clarified.

Inferential Statistics

Analyses were conducted in R (R Core Team, 2020). Pearson correlations for 43 variables (ie, 903 pairwise correlations) were calculated using pairwise complete observations and tested via *t* tests with false discovery rate control implemented in package *psych*.[15–17] The false discovery rate was set to 0.05.

KEY DECISIONS AND AREAS OF PRACTICE VARIATION

Vaginoplasty Technique

While penile inversion vaginoplasty (PIV) is the most common vaginoplasty technique, technical differences are common between surgeons.[6,18] In addition, indications for alternative vaginoplasty procedures remain in debate, and technical refinements are routinely described.[10]

Intestinal Vaginoplasty

Traditionally, the primary alternative to PIV was intestinal vaginoplasty. Perceived benefits may include greater depth, less need for postoperative dilation, and inherent lubrication from mucus secretion. The drawbacks include the need for a bowel anastomosis, excess secretion/mucus, odor, prolapse, diversion colitis, and the need for gastrointestinal cancer screening in the neovaginal segment.[9,19] Although intestinal vaginoplasty may be performed in a minimally invasive fashion (ie, either robotic or laparoscopic harvest), there has been a strong trend away from the intestinal vaginoplasty as a primary procedure. None of the surgeons involved offer intestinal vaginoplasty for routine, primary vaginoplasties. A few consider it an option for revision vaginoplasty (ie, after rectovaginal fistula or complete stenosis of the neovagina requiring full cavity lining) or in individuals who have undergone pubertal blockade and have insufficient penoscrotal tissue. (**See table, Supplemental Digital Content 3,** which shows types of vaginoplasty other than PIV, **http://links.lww.com/PRSGO/C583**.)

Disclosure statements are at the end of this article, following the correspondence information.

Related Digital Media are available in the full-text version of the article on www.PRSGlobalOpen.com.

Peritoneal Vaginoplasty

Initially described for vaginal agenesis, the concept of using peritoneum for vaginal lining dates back more than 50 years to Davydov. Within the past 5 years, the use of peritoneum for transgender vaginoplasty has been reported.[7,20] Although some centers have advocated the use of peritoneum as a free graft, concerns regarding contracture and graft take have led other centers to use flaps. Harvested robotically or laparoscopically, this involves two advanced peritoneal flaps that allow for the construction of the vaginal apex, one anteriorly-based (harvested off of the bladder) and the other posteriorly-based (harvested off of the rectum). Unlike cases of vaginal agenesis in cisgender women, the distal vagina and introitus are still created with penile or scrotal skin grafts. Potential advantages of this technique include greater attainable depth and a safer dissection plane in revision cases. Potential disadvantages include increased operative time, entrance into the abdominal cavity and cost and availability associated with the use of the robot. In addition, long-term data regarding the behavior of peritoneum in the vaginal canal, and its comparison with an epithelial-lined vagina (ie, skin grafts) is not available. In this study, only one center used peritoneal flap vaginoplasty and one center used peritoneal grafts in the great majority of cases. More centers use peritoneal tissue in select or revision cases. (**See table, Supplemental Digital Content 3, http://links.lww.com/PRSGO/C583**.) (**See table, Supplemental Digital Content 4,** which shows technique modification for penoscrotal hypoplasia, **http://links.lww.com/PRSGO/C584**.)

Minimal-depth Vaginoplasty

In select cases, a vaginoplasty is performed without the creation of a vaginal canal. This technique may be referred to by a variety of terms, including vulvoplasty, minimal-depth vaginoplasty (MDV), or zero-depth/shallow-depth vaginoplasty. Advantages of an MDV include shorter surgery, faster recovery, obviation of vaginal dilation, elimination of hair epilation and much-reduced risk of rectal injury or fistula. The drawback is the lack of a vaginal canal.[21] Surgeons typically counsel their patients that the decision for MDV is largely irreversible. In our study, a surgeon's primary indications for MDV include patient request (primarily, unwillingness to dilate/lack of interest in a vaginal canal) and co-morbid medical and surgical risk conditions (history of prostatectomy and/or radiation). Some surgeons outside this study have indicated that MDV comprises over 20% of their vaginoplasty practice. However, all of the surgeons participating in this study perform MDV less than 15% of the time. (**See table, Supplemental Digital Content 3, http://links.lww.com/PRSGO/C583**.) (**See table, Supplemental Digital Content 5,** which shows indications for minimal-depth vaginoplasty, **http://links.lww.com/PRSGO/C585**.)

Perioperative Management

Pre- and postoperative preparation and management is critical in achieving a successful result. Before surgery, most surgeons recommend epilation from the penile shaft and scrotal skin (source of skin graft for construction of the vaginal canal; Table 1). While hair can be removed during surgery (ie, "scraping," cautery, follicle removal), prior epilation reduces the risk of intravaginal hair growth. The presence of hair within the vaginal canal increases the risk of sebaceous discharge and odor, may form retained bezoars, and is difficult to address postoperatively. It is likely that in countries or practice settings where epilation is a covered insurance benefit, surgeons are able to be more stringent on this requirement.

Table 1. Preoperative Management

Consideration	N (%)
Hair removal	
Preoperative recommended	16 (94.1%)
Not compulsory preoperatively*	9 (56.2%)
Intraoperative	0 (0%)
None	1 (5.9%)
Type of hair removal	
Electrolysis	5 (29.4%)
Laser	3 (17.6%)
Either	9 (52.9%)
Estrogen management†	
Continue full dose‡	7 (38.9%)
Reduce dose§	4 (22.2%)
Stop	7 (38.9%)
2 wk¶	4 (57.1%)
3 wk¶	2 (28.6%)
4 wk¶	1 (14.3%)
BMI cutoff	
30	2 (11.8%)
32	1 (5.9%)
35	5 (29.4%)
40	4 (23.5%)
None/unknown	5 (29.4%)

*Of the 16 who recommend hair removal preoperatively.
†One respondent chose continue and partial reduction depending on estrogen dose.
‡One respondent holds estrogen the day of surgery.
§One respondent reduces to 3 mg/day if dose is more than 6 mg/day; one respondent reduces it to 1 mg/day 30 days before surgery.

The impact of obesity on surgical outcomes remains controversial. Both expert opinion and the limited available literature suggest that vaginoplasty on obese patients does not pose tremendous risk of severe morbidity, but wound complications increase substantially, and the result may require revisions to achieve a natural appearance. Beyond the intraoperative period, factors such as dilation can also made more difficult as BMI progressively increases. Most centers thus have a BMI or weight cutoff, with the median BMI being around 35.

Preoperative hormone cessation or reduction is practiced by most surgeons, but the number of surgeons who continue full-dose estrogen through vaginoplasty has grown (Table 1). Although there is no consensus as to the duration of hormone cessation, estradiol therapy may be a risk for postoperative venous thromboembolism (VTE) in what is often classified as a high-risk procedure by most VTE stratification methods (ie, lengthy pelvic surgery with prolonged bedrest). Although the available data suggest

that the risk of VTE is low, these are generally studies that are underpowered and not generalizable.[12,13,22,23] In addition, centers that continue hormone therapy throughout the pre- and postoperative period often utilize chemoprophylaxis as part of their VTE prophylaxis regimen or rapid postoperative ambulation. The risks of postoperative bleeding related to chemoprophylaxis are not considered in many of these studies. Further research is needed to better quantify what, if any, are the increased risks of VTE associated with continued hormone therapy.

In recent years, routine preoperative pelvic physical therapy has been incorporated into some surgical programs. Other programs utilize pelvic physical therapy when patients experience difficulty with postoperative dilation. The benefits of pelvic physical therapy may include both physical and psychological assistance with pelvic relaxation to facilitate postoperative vaginal dilation (comfort with inserting the vaginal dilator).[24]

Canal Dissection Method/Technique

Due to risk of rectal and/or urethral injury, dissection of the vaginal canal represents the highest risk step of the procedure. The dissection proceeds with release of the central tendon until the prostate is reached. At this point, Denonvillier (retroprostatic) fascia (and the prostate capsule) is identified and incised. After release of this fascial layer, blunt dissection is performed until the peritoneal reflection is reached. The peritoneal reflection represents the maximum depth that can be achieved without violating the peritoneum.

There is significant variation in how surgeons create the neovaginal space. Some surgeons use a foley catheter to define the membranous and prostatic urethra. This technique does not entail mobilization of the prostate. Other surgeons mobilize the prostate into the surgical field with the use of either a urethral sound or Lowsley retractor. Once the dissection has progressed beyond the prostate, the majority of surgeons responded that the neovaginal plane is developed bluntly (including the use of retractors, sponge sticks, or digital pressure; Table 2).

Once the neovagina has been created in the midline, a varying degree of lateral release of the pelvic musculature/diaphragm is performed. The levator ani muscles constitute the initial dissection of the lateral borders of the neovaginal canal. Release of these muscles allows for widening of the neovaginal canal, with the ultimate limit being the bony ischium. There is wide variation in how much muscle release is performed (Table 1). This ranges from no release to multiple releasing incisions to a particular endpoint (eg, accommodation of a large dilator). Levator muscle release can be associated with significant hemorrhage, which can be challenging to control (although packing and direct pressure are adequate in most cases). The variation in sidewall release is underscored by the range of surgeon responses (Table 2). Opinion differs as to whether canal width/levator contracture contributes to dilation difficulty, and subsequent vaginal stenosis. Some surgeons believe that muscle release is mandatory, whereas others believe that epithelial lining problems and skin graft contracture are the driving causes of vaginal stenosis (Table 2).

Table 2. PIV Technique Modifications

Technique Modification	N (%)
Dissection beyond prostatic capsule*	
Blunt	14 (82.4%)
Speculum/retractor	6 (35.3%)
Dilator	2 (11.8%)
Sharp	1 (5.9%)
Levator ani sidewall release	
Yes	14 (82.4%)
Resection of corpora cavernosum	
At crus and imbricate in midline	10 (58.8%)
To bony origin	7 (41.2%)
Resection of corpora spongiosum	
Partial	2 (11.8%)
Aggressive	14 (82.4%)
Imbricate only	1 (5.9%)
Plane of clitoral neurovascular bundle elevation	
Supratunical	5 (29.4%)
Subtunical	12 (70.6%)
Tissue used to create inner labia minora†	
Prepuce	13 (76.5%)
Urethra mucosa	6 (35.3%)
Staged with grafts	1 (5.9%)
Penile skin use‡	
Vaginal canal	8 (47.1%)
External vestibule	15 (88.2%)
Vaginal canal fixation (excluding packing)	
Suture fixation	1 (5.9%)
Fibrin glue	2 (11.8%)
Packing only	14 (82.4%)
Rectal injury identification§	
Observation only	7 (41.2%)
Manual exam	9 (52.9%)
Dyed enema	3 (17.6%)
Rectal insufflation with saline in cavity	1 (5.9%)

*Four respondents mentioned more than one technique.
†Three respondents use both prepuce and urethral tissue.
‡Six respondents mentioned both.
§Three respondents mentioned more than one technique.

Fixation of the vaginal apex, including sacrospinous fixation, has been reported so as to reduce the risk of vaginal prolapse. Few of the participating surgeons reported using any fixation method such as sacrospinous fixation or fibrin glue. Vaginal prolapse seems to be an uncommon event and, when it occurs, may be the manifestation of graft nonadherence rather than avulsion from inadequate fixation.

Dissection of the Glans Penis and Construction of the Clitoris (Neurovascular Bundle Elevation)

A portion of the dorsal glans penis is raised on the dorsal penile neurovascular bundle (NVB) to form a neoclitoris. In the majority of cases, this approach offers an aesthetic clitoris with sensory and orgasmic function.[5] This method represents a major technical advance over initial attempts at clitoral reconstruction which used free clitoral grafts or ventrally-pedicled urethral flaps.

Currently, there are two technical variations in neurovascular flap harvest. The method of dissection represents one of the characteristic signatures of a particular surgeon's vaginoplasty "style." The first technique, "Buck's fascial elevation" or "supratunical elevation," involves direct elevation of the NVB with Buck's fascia; the tunica albuginea overlying the cavernous bodies remains intact. This method involves careful dissection directly on the neurovascular structures, eventually yielding a thin pedicle. Nearly the entirety of the corpora cavernosa can then be resected. The neoclitoris is inset by folding the pedicle on itself beneath the mons pubis.

The alternate technique, "tunica elevation" or "subtunical elevation," entails an incision through the tunica. This extends the dissection into the corporal bodies on either side, yielding a pedicle that is 2–4 cm wide. This pedicle contains both tunical and corporal tissue on its ventral surface. At the level of the corporal crus, the tunica is typically incised so as to separate the NVB from the corpora. Management of the corporal bodies may include either complete resection or retention of a remnant of the cavernosal cylinders.

Perceived advantages to the "tunica" technique include (1) less risk of injury to the NVB as the tunica provides a protective barrier, and (2) speed, as the dissection plane is far less demanding. Perceived disadvantages include (1) undesirable bulk, either from the residual corpora or tunica on the underside of the pedicle (this may manifest as either mons or vulvar vestibule fullness), and (2) greater blood loss while entering and ligating the corporal bodies (followed by potential ongoing bleeding both intraoperatively and as postoperative hematoma). Interestingly, though most surgeons have tried both methods, the majority of surgeons use the subtunical method (Table 2). It is widely agreed that additional data are needed to address which technique offers advantages in sensory and aesthetic outcomes. The accompanying video illustrates the difference in supratunical and subtunical NVB elevation (**See Video [online],** which demonstrates variations in technique for harvest of neoclitoral flap. It demonstrates supra- versus subtunical dissection of the neoclitoral pedicle).

Clitoral Hood and Inner Labia Minora Creation

Clitoral hood creation is generally derived from either the prepuce/distal penile skin or the urethral mucosa. Both of these techniques have been described in the literature, and it seems the majority of surgeons favor use of the prepuce skin (Table 3).[8,25] Tension on the posterior fourchette is often used in addition to these tissues to enhance fold projection. Revision of the labia minora can be difficult to address.[26,27]

Postoperative Management

Vaginoplasty is one of the more elaborate postoperative management paradigms within surgery; both early- and lifelong care is required. In general, surgeons place either vaginal packing or stents within the vagina to promote graft/flap adherence. The duration of packing and stent placement varies, but is generally between 5 and 6 days postoperatively. Similarly, the duration of catheterization varies between centers and surgeons. Some surgeons maintain the catheter after packing removal due to risk of urinary retention. Most surgeons use drains postoperatively, whether within the neovagina or vulva. There is

Table 3. Postoperative Management

Consideration	N (%)
Timing to restart estrogen	
N/A	6 (35.3%)
POD 1*	1 (5.9%)
POD 2	1 (5.9%)
POD 3	1 (5.9%)
POD 5	1 (5.9%)
POD 7–10	5 (29.4%)
POD 11–20	2 (11.8%)
Drain use	
Yes	15 (88.2%)
Drain placement†	
Groin	1 (5.9%)
Labia	10 (58.9%)
Suprapubic	6 (35.3%)
Gluteal	2 (11.8%)
Number of drains	
One JP/Blake	4 (23.5%)
Two JP/Blakes	7 (41.2%)
Two Penrose	3 (17.6%)
Packing‡	
Yes	16 (94.1%)
Prosthetic	2 (11.8%)
Packing sewn in place	7 (41.2%)
Length of stay	
Overnight	1 (5.9%)
POD 2–4	5 (29.4%)
POD 5	4 (23.5%)
POD 6–9	7 (41.2%)
Use of chemoprophylaxis for VTE	
Yes	15 (88.2%)
None/unknown	2 (11.8%)
Length of chemoprophylaxis§	
Day of surgery only	3 (27.7%)
POD 1	2 (18.2%)
POD 7	1 (9.1%)
While inpatient	5 (45.5%)
Packing removal timing	
POD 5–6	14 (82.4%)
POD 7–9	3 (17.6%)
Foley removal timing	
POD 5–6	12 (70.6%)
POD 7–10	5 (29.4%)
Foley kept in longer than packing	7 (41.2%)
Dilation initiation timing	
POD 5–6	9 (52.9%)
POD 7–10	6 (35.3%)
POD 11–14	2 (11.8%)
Dilator size to start¶	
Smallest	7 (41.2%)
Largest that will fit	10 (58.8%)
Scheduled upsizing of dilator	7 (41.2%)
Vaginal rinses	
Yes	13 (76.5%)

*One respondent holds estrogen on the day of surgery only.
†Five respondents put drains in multiple anatomic positions.
‡One respondent sometimes uses packing and other times a prosthetic.
§Percentage is based on the 14 respondents who use chemoprophylaxis.
¶One respondent said it depends on the outcome with bolster takedown.

no consistency in terms of duration of VTE prophylaxis, but most surgeons use it. Current regimens include both chemo- and mechanical prophylaxis, as well as various ambulation/bedrest regimens. Dilation of the neovagina is required to maintain vaginal dimensions. Dilation protocols vary between centers, with some surgeons initiating dilation immediately after packing/stent removal and others waiting 10–14 days after surgery. As the epithelial-lined vagina is not self-cleansing, most surgeons recommend an intravaginal washing (ie, douching) protocol to help remove lubrication and desquamated skin (Table 3).

The heterogeneity of vaginoplasty practices is epitomized by pathway length of stay, which ranges from overnight observation to 9-day inpatient stay. For each practice, this is likely guided by other decisions (eg, many surgeons keep patients on bed rest until the packing is removed, necessitating a certain length of stay). However, length of stay has become an increasingly important and tracked metric. This area warrants further investigation and consensus development of enhanced recovery (ERAS) pathways, which have been shown to decrease narcotic requirements and improve outcomes in other procedures.

Complications and Management

Most complications after vaginoplasty entail wound disruptions, which may be treated on an outpatient basis with local care.[8,11] Fortunately, major complications, the most dreaded of which is rectovaginal fistula (RVF), are not common. Management of rectal injury and/or subsequent rectovaginal fistula varies.[28] This may include low residue diets, delay in dilation, and fecal diversion by colostomy (Table 4). There is variation between surgeons regarding their threshold for deciding to attempt salvage of the fistulized vaginal canal versus cessation of dilation with a planned secondary vaginoplasty after complete healing of the fistula and canal closure.

Other significant complications include stenosis of the vaginal canal. This may result from inadequate canal dissection, infection, graft/flap loss, and/or failure to dilate. Introital stenosis can also occur as an isolated entity, but appears mostly related to cases with young patients or those who have been puberty-blocked or have underdeveloped genitalia. More minor complications include spraying of urine and engorgement of the vaginal introitus from retained erectile tissue, which has been seen by the vast majority of surgeons in this study. Aggressive resection of the corpora spongiosum from the urethral bulb is commonly performed followed by imbrication of the edges to minimize blood loss (Table 4). In contrast, completeness of cavernosa resection seem less important because only one surgeon had ever seen issues attributable to inadequate resection of the corpora cavernosa, presumably because their erectile capacity is more easily disrupted by the procedure.

Table 4. Intraoperative and Postoperative Complication Management

Management Consideration	N (%)
Intraoperative rectal injury aside from direct repair*	
No change in operative course	3 (17.6%)
Diet change	10 (58.9%)
Colorectal consult	1 (5.9%)
Fecal diversion	1 (5.9%)
Abort procedure with vulvoplasty only	1 (5.9%)
Muscle flap	5 (29.4%)
Delay dilation	5 (29.4%)
Postoperative orchialgia	
Yes	3 (17.6%)
Tender stumps only	2 (11.8%)
Management of rectovaginal fistula†	
Fecal diversion	14 (82.4%)
Keep dilating	7 (41.2%)
Stop dilating	1 (5.9%)
Direct repair	5 (29.4%)
Muscle flap	2 (11.8%)
Low residue diet	2 (11.8%)
Etiology of vaginal stenosis‡	
Inadequate dilation	10 (58.9%)
Delayed wound healing/graft loss	10 (58.9%)
Wrong plane of prerectal dissection	1 (5.9%)
Introital scar contracture	2 (11.8%)
Pelvic sidewall muscle contracture	6 (35.3%)
Symptomatic swelling of corpora cavernosum	
Yes	4 (23.5%)
Symptomatic swelling of corpora spongiosum	
Yes	16 (94.1%)

*Ten respondents indicated multiple responses.
†Seven respondents indicated multiple responses.
‡Nine respondents indicated multiple responses.

LIMITATIONS AND PRIORITIES FOR FUTURE RESEARCH

Further research into various aspects of vaginoplasty are imperative as surgeons continue to improve and innovate. Areas of priority for research include patient-reported outcomes, the appropriate management of hormones in the perioperative period, and early and lifelong vaginal maintenance regimens, including cleaning and dilation.[29,30]

The thresholds chosen for inclusion on surgeon experience were based on expert opinion to identify surgeons devoting a significant portion of their practice to vaginoplasty, given that only a limited number of interviews could be conducted. Other limitations include a geographic focus on North America and Europe; future studies should include non-Western vaginoplasty centers to examine any potential practice differences.

Comparative, hypothesis-driven research is needed to address areas of surgical divergence. We identify areas where significant disagreement remains among experts, which should be top priorities for new research projects. Examples include the benefits and drawbacks of peritoneal tissue as compared with traditional skin epithelium, outcome differences across methods of clitoral NVB elevation, and whether vaginal canal contraction and stenosis are driven more by levator muscle function or fibroblast-driven skin graft contraction. To achieve the number of patients to adequately power these studies, multi-institutional and prospective studies will be needed.

CONCLUSIONS

The number of vaginoplasty procedures performed annually continues to grow rapidly. As one of the most complex procedures in reconstructive surgery, there are a broad variety of key decisions to be made pre-, intra- and postoperatively. This study conducts an in-depth comparison of the perioperative practices of a select number of high-volume centers across the world. We have identified uniformity of practice in many subjects, yet heterogeneity in others (eg, NVB dissection). Comparative outcomes research is needed to inform best practices in these areas. Future research projects should focus on these high-impact questions.

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DISCLOSURE

The authors have no financial intersts to declare in relation to the content of this article.

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