TRANSGENDER HEALTH

'Modified Phallourethroplasty' as a Surgical Alternative to Phalloplasty With Urethral Lengthening: Technique, How We Present This Option to Patients, and Clinical Outcomes

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ABSTRACT

Background: Most complications after masculinizing genital gender-affirming surgery (gGAS) are associated with urethral lengthening (+UL). While many transmasculine patients desire +UL for standing urination, not all patients prioritize this benefit over the significantly increased risk of complications. Currently, phalloplasty without UL (−UL) appears to be seldom offered, and previous −UL techniques create genital anatomy that is visibly different from the anatomy created by phallourethroplasty+UL (P+UL).

Aim: To describe a novel surgical technique to create a normal-appearing phallus tip, scrotum, and perineal urethral opening that avoids urethral complications associated with +UL.

Methods: We describe our surgical technique and approach to patient counseling. We report patient satisfaction outcomes from the first cohort of patients to undergo this 'modified phallourethroplasty' (−UL) approach to date.

Outcomes: Among patients who elected phalloplasty over metoidioplasty, 13/40 (32.5%) patients elected P−UL. Prior to 1/2020, before we standardized how we presented this option to patients, 17.4% elected this option. Of the patients that elected P−UL, 8 have completed first-stage and 7 have completed second-stage surgeries.

Results: All patients that have undergone P−UL have expressed satisfaction with body image and urinary function. Among patients asked to rank which of 14 preoperative factors were most important (1 = most important, 14 = least important), having a normal-appearing phallus (mean rank 4.14) and minimizing complications (mean rank 8.14) were ranked more highly than ability to urinate in a standing position (mean rank 9.14). When asked what factors most influenced their choice to have −UL (ranked from 1 to 9), elimination of risks was rated the most important (mean rank 2.71) and expected decrease in risk of needing revision surgery was rated the second most important (mean rank 3.57).

Clinical Implications: The significant reduction in +UL-related complications decrease morbidity, urgent revision surgeries, and cost to our healthcare system.

Strengths and Limitations: Strengths include a novel technique that provides a surgical alternative to P+UL that eliminates the majority of phalloplasty related postoperative complications. Limitations include the small number of patients who have completed first and second stage surgery, and short follow up time.

Conclusion: It is important to understand what factors drive individual patients' choices. Patients considering masculinizing gGAS should be offered both +UL and −UL options. The costs and benefits of each option should be presented objectively and in the context of each patient's unique priorities and needs. **Smith SM, Yuan N, Lee G, et al. *'Modified Phallourethroplasty'* as a Surgical Alternative to Phalloplasty With Urethral Lengthening: Technique, How We Present This Option to Patients, and Clinical Outcomes. Sex Med 2022;10:100495.**

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INTRODUCTION

Masculinizing genital gender-affirming surgery (gGAS) is a very important component of gender transition for many transgender men. Many that choose phalloplasty over metoidioplasty do so because they desire a penis of length/width proportions similar to that of an adult cisgender man. Early surgical techniques for phalloplasty did not include urethral lengthening and were associated with unfavorable cosmesis, largely because of the necessity to preserve the native urethral opening and its surrounding vaginal introitus.[1]

Today, phalloplasty is commonly offered with urethral lengthening (P+UL) by the method first described and popularized by Chang and Hwang.[2] This technique uses a single radial artery-based forearm free flap (RFFF) that they described as two contiguous segments separated by a narrow de-epithelialized strip. This flap design produces both a tubularized neourethra (skin facing inside) and phallus shaft (skin facing outside). Important innovations of this technique include a normal appearing phallus tip (complete with a urethral meatus), and the ability to stand to urinate. A similar flap design can also be used for an anterolateral thigh (ALT) flap. Although the ALT offers a less visible and more favorable donor site compared to forearm, a limitation of ALT is that it often results in an unfavorably thick and heavy phallus, due to thicker subcutaneous tissue in the thigh compared to the forearm.

Most postoperative complications after phallourethroplasty, including neourethral strictures, diverticula, fistulas, stone formation, neourethral hair regrowth, chronic odor, and urinary retention, are associated with urethral lengthening (+UL).[3-11] The risk of developing a neourethral stricture after phallourethroplasty has been reported to be between 22% and 75%.[9] Urethral strictures causing urinary retention and fistulae lead to decreased quality of life and increased risk of needing revision surgeries.[12,13] While many trans-masculine patients desire +UL for the ability to stand to urinate, not all patients prioritize this benefit over the significantly increased risk of complications.[8,14]

Phalloplasty without urethral lengthening (P−UL) has been described and is sometimes referred to as "shaft-only phalloplasty." It has been shown to have significantly lower complication rates as compared to P+UL.[8] Currently, however, P−UL appears to be seldom offered, and surgical techniques and cosmetic outcomes of this option are not well described in the literature. For example, Pigot et al. describe using their P−UL technique in only 6% of all phalloplasties performed over a 9 year period. In most cases it was performed for patients who for medical reasons could not otherwise undergo P+UL.[8] How, and by what parameters this option was offered to patients was not described. We hypothesize that the root cause of low utilization is two-fold. First, previously described P−UL techniques create genital anatomy that is visibly different from the anatomy created by the standard P+UL. Second, P−UL is not presented to patients in a way that directly and adequately addresses concerns regarding cosmesis, urinary and sexual function, and also, the specific benefits that P−UL offers.

What then, are important features of an optimal method to both provide the aesthetic benefits associated with +UL, while minimizing urethral complications? The primary purpose of our work is to describe a novel surgical technique to create: 1. A normal-appearing phallus tip and scrotum, both of which are indistinguishable from those of P+UL, and 2. An in-situ "scroto-perineal" urethral opening that is obscured from view by the overhanging scrotum and avoids the urethral complications associated with +UL. In addition, we share how we explain P−UL (and how we contrast it to P+UL) to our patients in consultation, and the changes to our utilization rate since we standardized how we present this option to patients. Finally, we share our early experience with patient-reported satisfaction outcomes.

METHODS

All consecutive new patients presenting for masculinizing gGAS during 1/2020−7/2021 were offered all phallourethroplasty and metoidioplasty options (+UL or −UL for each) by our standard 2-stage approach. For phalloplasty, patients were counseled about options for flap harvest from the forearm, anterolateral thigh (ALT) (P+UL & P−UL offered from both), and suprapubic (only P−UL) donor sites with the risks and benefits of each. Discussion was guided by individual patient considerations, such as body habitus or prior scars.

Presentation of Surgery Options

All patients were explicitly instructed that all final surgical decision making with regards to choosing +UL or −UL is made by them and not the surgeon, and that a focus of the risks/benefits discussion regarding each option was to highlight how each option could serve them based on the gGAS-related preferences, priorities, and concerns they relayed to their surgeon. We framed the surgeon's role as serving as a source of information, to identify and compare all available options, and to provide information to help the patient identify which option will likely serve them best. All patients were shown photographs representative of our surgical outcomes for P+UL and P−UL (Figure 1).

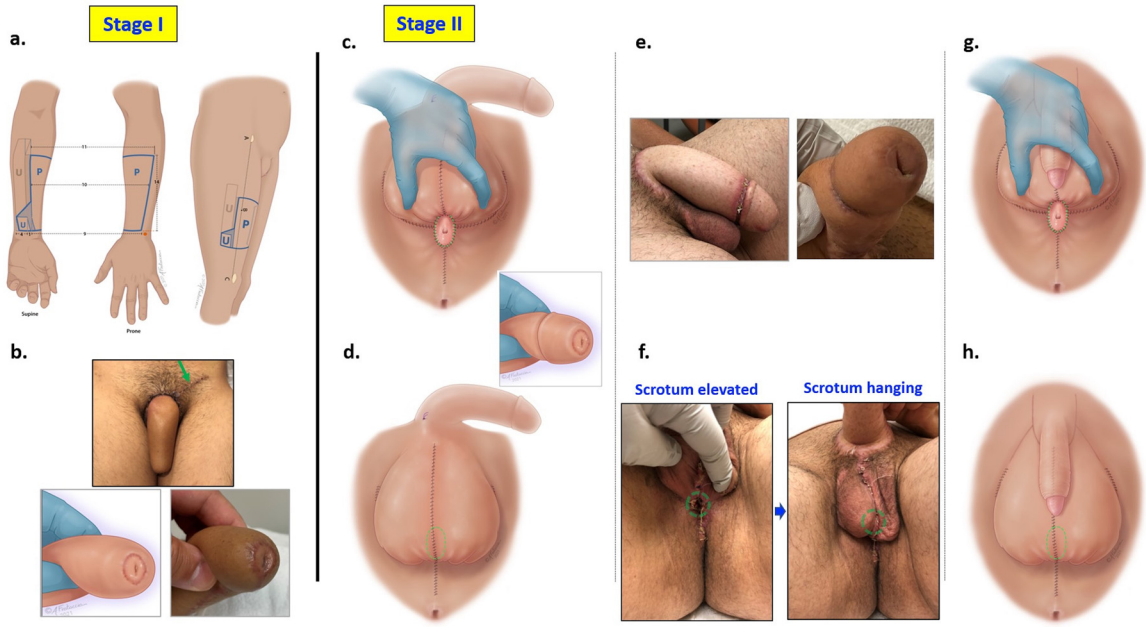

Figure 1. Medical illustrations and representative surgical photos of surgery stages I and II.

Surgery Decision-Making Questionnaire

Patients who elected P−UL were invited to complete a 28-item questionnaire (Table 1) querying their individual priorities regarding results and outcomes they most wanted to achieve (and to avoid) with surgery, their priorities regarding their own surgery pathway, and other domains related to their own surgical decision- making. The questionnaire was administered using the anonymous online platform Qualtrics XM (Qualtrics XM, UT, USA). This research study was reviewed and approved by our Institutional Review Board (IRB).

Overview of Our "Modified Phallourethroplasty" Technique

We perform phalloplasty, both +UL and −UL, in two stages. With "Modified Phallourethroplasty," which describes the −UL option, at Stage I we construct the phallus complete with a short (blind-ending) distal urethra.

Surgical Technique

Stage I. The donor flap template for P−UL for either the ALT (*left*), or RFF (*right*), is similar to the template used for P+UL, with the exception that only the distal ∼2.5 cm of the urethral segment (U) is included (Figure 1,a). With RFFF, the distal end of the flap extends to the level of the proximal aspect of the ulnar styloid process (*orange dot*). A 1 cm wide strip separating the urethra and phallus segments of the flap is de-epithelialized. With both P−UL and P+UL, the phallus (P) segment is usually ∼9 cm wide distally, 11 cm at midshaft, and 12 cm proximally (at what will be the base of the phallus). The urethra (U) segment is 4 cm wide (Figure 1,a).

For P−UL, the urethral segment of the RFF or ALT donor site is ∼2.5 cm long. The remainder of the flap urethral segment, shown in ghosted outline, is not harvested. A triangular area of skin is de-epithelialized at the proximal end of the shortened urethral segment (*blue diagonal hatch lines*) to maximize blood-supply to the urethral segment. The short urethral segment is tubularized using buried 5-0 Monocryl deep dermal sutures. To prevent urethral prolapse, the proximal end of the tubularized urethra is anchored to the dermis of the triangular de-epithelialized area just proximal to the urethra. As an alternative, when a flap is especially thin (and threatens to yield an unacceptably thin phallus), the proximal portion of the urethral segment can be de-epithelialized and retained to add bulk to the phallus.

At the end of Stage I surgery, the phallus tip has a normal appearing urethra and phallus tip (preglansplasty). The phallus is visibly indistinguishable from what is created with P+UL (Figure 1b).

Stage II. Stage II is performed ≥ 4 months after Stage I, to allow sufficient time for healing and tissue perfusion to be established. During Stage II we perform 6 key procedures: (1) Vulvectomy; (2)Vaginectomy; (3) Glansplasty; (4) Clitoral transposition; (5) Perineal urethroplasty; and (6) scrotoplasty. (Figure 2a)

Vulvectomy is performed to both eliminate "female-appearing" anatomy and to mobilize tissues that will be preserved for the urethroplasty and scrotoplasty procedures. A 1-cm. wide cuff of periurethral mucosa is incised and preserved (Figure 2c). The

Table 1. Questionnaire completed by patients who elected P-UL during initial consultation

Question #	Question stem	Question type
Q1	What is your age?	Free text
Q2	What is your height?	Drill down
Q3	How much do you weigh (in pounds)?	Free text
Q4	What is/are the gender(s) of your preferred sexual partner(s)? [*Note: You may select more than one answer choice.]*	Multiple choice (≥1 answer)
Q5	What masculinizing gender-affirming surgeries have you undergone?	Multiple choice (≥1 answer)
Q6	What urinary opening are you currently urinating from?	Multiple choice (one answer)
Q7	How long ago did you undergo your most recent phalloplasty procedure?	Multiple choice (one answer)
Q8	Where was your phalloplasty donor site?	Multiple choice (one answer)
Q9	How much was your choice to use your *thigh* for phalloplasty WITHOUT urethral lengthening influenced by the ability to avoid having to use your forearm as the donor site?	Multiple choice (one answer)
Q10	Please rate the importance of the following factors in your consideration/ decision to undergo phalloplasty: (See Table 2 for factors)	Matrix table - Multiple choice (one answer per bullet)
Q11	Concerning phalloplasty in general, please rank the following items, related to appearance, function, and complication risks, in order of importance to you: (See Table 2 for factors)	Rank order
Q12	Were there other factors not listed above that were important to you in choosing your surgery? If so, please describe below. If not, then leave the text blank.	Free text
Q13	How important was this to you? (Q12)	Multiple choice (one answer)
Q14	Please rate the importance of the following factors in your decision to undergo phalloplasty *without urethral lengthening (defined as: creation of a urethral opening at the penis tip only, with creation of a urinary opening in the perineum behind the scrotum)*: (See Table 3 for factors)	Matrix table - Multiple choice (one answer per bullet)
Q15	Please rank the following in order of importance to you the following factors, which may have been important in your choice to undergo phalloplasty with no urethral lengthening: (See Table 3 for factors)	Rank order
	The following questions ask about your preferences for *how* and *where* you urinate.	
Q16	Before your phalloplasty surgeries, have you *ever* tried to stand to urinate (e.g. in the shower, outdoors, over a toilet, etc.)? *Please select all that apply.*	Multiple choice (≥1 answer)
Q17	After your phalloplasty surgeries, have you been able to stand over a toilet to urinate?	Multiple choice (one answer)
Q18	Assuming that the tip of your penis has a visible/normal-looking urethral opening, and if you could stand to urinate over a toilet (but not at a urinal), how important is it to you that the urine stream comes *specifically* from the tip of your new penis?	Multiple choice (one answer)
Q19	Assuming that you could also urinate from a standing position *facing the toilet* in a closed bathroom stall, how important is it for you to urinate at a urinal?	Multiple choice (one answer)
	The following questions relate to your satisfaction towards appearance and function after your masculinizing genital gender-affirming surgery.	
Q20	How satisfied are you with your ability to urinate?	Multiple choice (one answer)
Q21	How satisfied are you with the length of your penis?	Multiple choice (one answer)
Q22	How satisfied are you with the girth (ie, overall "thickness") of your penis?	Multiple choice (one answer)
Q23	How satisfied are you with how *hidden from view* your perineal urethral opening is during normal/routine activity without clothes (examples include changing clothes in front of another person, public showers, etc.)?	Multiple choice (one answer)
Q24	How satisfied are you with the degree to which your penis *looks like* a phalloplasty penis WITH urethral lengthening?	Multiple choice (one answer)

(continued)

Table 1. Continued

Question #	Question stem	Question type
Q25	Did you experience any surgical complications that required additional surgeries to correct?	Multiple choice (one answer)
Q26	Please explain what complication(s) you experienced:	Free text
Q27	If you could "go back in time" and choose a specific phalloplasty surgery all over again, would you still make the same choice: phalloplasty without urethral lengthening?	Multiple choice (one answer)
Q28	Please explain why you choose <selected answer from Q27>:	Free text

junction of the labia minora and majora is outlined in ink (Figure 2d, *dark purple*) and incised. The remainder of the midline vulva (*purple hatched lines*) is excised/discarded, including the entire labia minora (Figure 2c, d).

Vaginectomy is performed by sharply excising the epithelium lining ~3−4 cm of the posterior and lateral vaginal introitus. A 1-2 cm cuff of vaginal mucosa at the anterior vaginal introitus is incised and reflected anteriorly. A 1-cm portion at the midline of this flap is preserved for anastomosis to perineal skin at time of urethroplasty, the rest is discarded. The vaginal mucosa remaining in the vault is fulgurated with ball-tip electrocautery set to 70 cut to ablate the mucosa. The side walls of the vaginal vault (3 o'clock & 9 o'clock) are then sutured together with interrupted 2-0 PDS sutures, deep to proximal. A suction-drain is left in place.[16] We routinely leave a closed suction drain inside the vaginectomy site, and a ¼" Penrose drain in the subcutaneous tissue and exteriorize both drains via separate stab incisions in the perineum.

Glansplasty is performed by a modified approach to the Norfolk technique[17] (Figure 2b).

Clitoris transposition: The entire clitoris is de-epithelialized and the glans clitoris is placed into a sub-dartos pouch at the base of the shaft ipsilateral to the flap's vascular pedicle, where it is hidden from view but can be easily stimulated.

Perineal urethroplasty and *Scrotoplasty:* These are commenced during vulvectomy. After complete excision of the labia minora, the lateral edges of the labia majora are incised (Figure 2d, e; *blue hatched lines)* from the vaginal introitus (*orange asterisk*) cephalad, to the horizon level of the ventral base of the clitoris (*yellow asterisk*). With medial and lateral dissection of the labia majora, it is important to carry the incisions deep, down to the level of pelvic fascia, so that all subcutaneous fat remains with the labia majora skin (Figure 2, e). Next, the vaginectomy is completed by suture closure. The posterior ends of the full-thickness labia majora flaps (*orange asterisk*) are sutured to the anterior midline of the periurethral mucosa cuff (Figure 2f). The lateral dissection of the

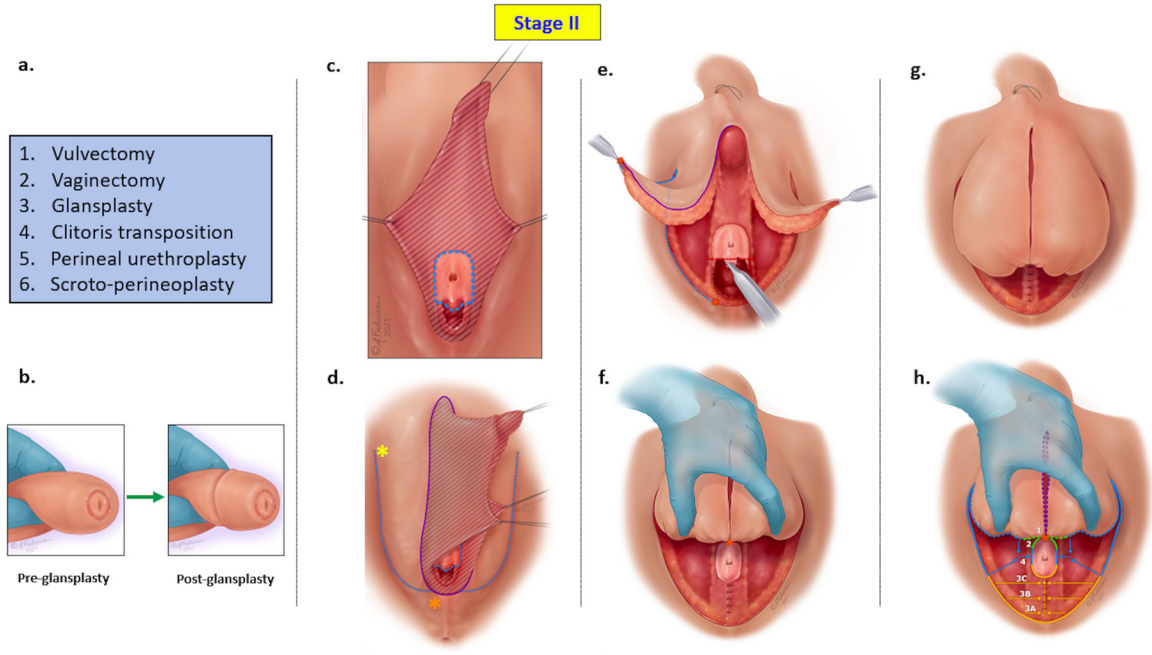

Figure 2. Stage II surgery overview and medical illustrations of key steps.

labia majora is extended anteriorly to the level of the ventral base of the clitoris (Figure 2d-e; *yellow asterisk*). This creates a redundancy of scrotal skin at midline and para-midline, which ultimately hangs over the urethral opening and obscures it from view (Figure 2, g).

Scroto-perineoplasty completes the scrotum and closes the perineal defect. The scrotum is completed by suturing the new scrotum along the vertical midline (Figure 2h; *white hatched lines*), followed by suturing of the para-midline posterior edges of the scrotum (Figure 2h; #2: *green hatched lines)* to the para-midline peri-urethral skin cuff (Figure 2h, #2: *green solid lines*). Before suturing the lateral posterior edges of the scrotum to the lateral periurethral cuff, we have found it easier to first approximate the posterolateral edges of the perineum at midline as a "V→Y-plasty" in a posterior-to-anterior direction (Figure 2h; #3A-3C; *solid yellow line*), until the newly constructed perineum can be anastomosed to the posterior edge of the peri-urethral cuff (*yellow peri-urethral cuff line; see also* Figure 1c). After closing the posterior perineum, we suture the anterolateral edges of the perineum (Figure 2h; blue solid lines) to the lateral edges of the scrotum (*blue hatched lines*). Our scrotoplasty technique differs from previously described techniques[15] where the center of the scrotum is shorter than its lateral aspects. By our technique, the dependent-most portion of the scrotum hangs low in the center, over the midline urethral opening to obscure it from view. (Figure 1, c-f). In this way the perineal urethral opening is not visible (unless the patient manually lifts the scrotum anteriorly, to expose it).

The modified technique we describe to create the perineal urethra and scrotum can also be used with metoidioplasty, to offer a "metoidioplasty-UL" option to patients who prefer metoidioplasty over phalloplasty.

RESULTS

We report clinical outcomes and self-reported satisfaction measures from the first cohort of patients to undergo "modified phallourethroplasty" (P-UL). Among all patients who elected phalloplasty instead of metoidioplasty, 13/40 (32.5%) patients elected P-UL. Prior to January 2020, before we standardized how we presented this option to patients, only 17.4% elected this option.

Of the 13 patients that elected P-UL, five patients are awaiting surgery, eight have completed first stage, and seven of the eight have completed second stage surgeries (Figure 3). Of the seven patients that completed first and second stages of surgery, two had the flap harvested from the radial forearm, four from the anterolateral thigh, and one from the flank (latissimus dorsi flap). With mean follow-up of 8.7 months after second stage, no (0%) urethral/urinary complications have occurred. All patients

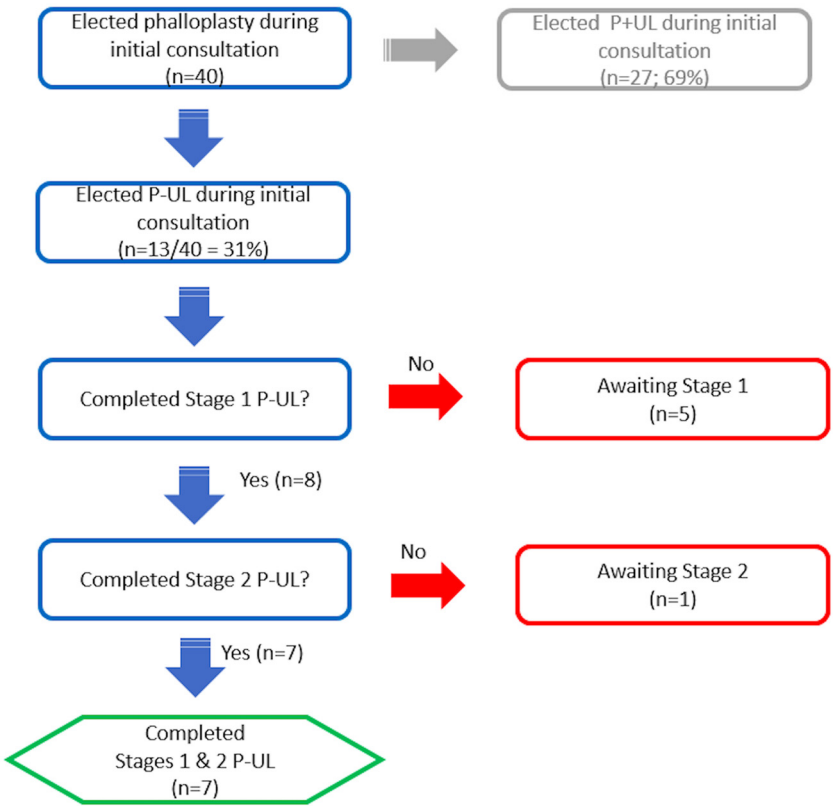

Figure 3. All consecutive new patients presenting for phalloplasty consultation from 1/2020–7/2021.

(100%) have expressed satisfaction with body image and urinary function.

Respondents who completed P-UL were asked to rank 14 phalloplasty-related potential priorities in order of greater-to-lesser personal importance, with 1 being the most important, and 14 the least important (Table 2). Elimination of female-appearing genital birth anatomy was ranked by patients as the most important goal of surgery, with a mean rank of 2.57. Having a normal-appearing phallus (mean rank 4.14) and minimizing complications (mean rank 8.14) were ranked more highly than ability to urinate in a standing position (mean rank 9.14).

Decision-Making Factors for P−UL Versus P+UL

Patients who completed P-UL were asked what priority-factors may have influenced their choice to undergo P−UL instead of P+UL (ranked high to low importance, 1−14). (Table 3). All patients who elected P−UL expressed a low personal priority for being able to urinate from the tip of their penis and from a standing position. Elimination of +UL-related risks was rated highest (most important; mean rank 2.71). Expected decreased risk of needing revision surgery and having a normal appearing urethral opening tied for second most important (mean rank 3.57). When patients were asked to ascribe importance to each of these factors individually, elimination of female genitalia, elimination of +UL-related complication risks, and decreased risk of needing revision surgery were rated as important by all patients (Figure 4).

Satisfaction with Urinary Function and Appearance

Six of seven patients reported they were satisfied with their ability to urinate, were satisfied with how well the perineal urethral opening was hidden from view, and that they were satisfied with the degree to which their penis looks similar to a P+UL penis. One patient reported that they were neither satisfied nor dissatisfied to each of these questions (Figure 5).

DISCUSSION

In the present work we have described a novel technique that provides transmasculine patients seeking phalloplasty a surgical alternative to P+UL that eliminates the majority of phalloplasty related postoperative complications. We describe creation of a normal-appearing phallus and urethral meatus combined with a urinary opening hidden from view by the overlying scrotum. These two features offer male genitals that are outwardly

Table 2. Ranked potential priority factors (1-14) associated with phalloplasty.

Decision-making factor	Mean ranking	Std. dev.	Highest ranking (1−9)	Lowest ranking (1−9)
Elimination of birth anatomy (female genitalia)	2.6	2.6	1	8
To have a "normal appearing" penis (ie, to have a penis that, regardless of size, passes as "generally similar" in appearance to a cis-man's penis)	4.1	3.8	1	11
Penis size that approximates average or above average for a many my age	4.7	2.8	1	10
Ability for my new penis to become sufficiently erect so I can have insertive sexual intercourse	5.1	3.9	2	14
Preservation of erogenous (ie, sexual) sensation of my new penis	5.6	1.7	3	8
Preservation of tactile (ie, general, nonsexual touch) sensation of my new penis	5.7	1.5	3	8
To minimize the need for additional urgent doctor visit (s) to manage post-surgery complications	8.1	2.1	4	11
The visibility/appearance of the phalloplasty donor site (e.g., arm, thigh, or other donor site) during day-to-day activities	8.3	4.1	4	13
To minimize the need for additional corrective surgeries to manage post-surgery complications	8.6	2.9	3	12
The preservation of normal function of the donor site (ie, where the skin flap is taken from on my body should continue to function normally)	9.1	2.8	4	14
Ability to urinate from a standing position	9.1	4.6	2	14
To minimize the overall time required to complete ALL of my genital gender-affirming surgeries	9.6	1.7	6	11
To minimize the time away from work to have and recover from my genital gender-affirming surgery	11.6	1.6	8	13
To avoid significant, long-term limitations on my ability to perform my job duties	12.7	1.7	9	14

Table 3. Ranked priority factors among patients who elected P-UL over P+UL

Decision-making factor	Mean ranking	Std. dev.	Highest ranking (1–9)	Lowest ranking (1–9)
Elimination of risks of complications from +UL	2.7	1.5	1	5
Normal appearing urethral opening at tip of penis	3.6	1.8	1	6
Expected decreased risk of need for revision surgery	3.6	2.1	1	7
Ability to avoid using the forearm as the flap donor site	3.9	2.6	1	8
Urethral opening in perineum is well-hidden behind scrotum (ie, minimally visible)	4.7	2.7	1	8
Expected decreased total number of clinic visits	6	1.9	3	9
Decreased risk of delay for penile prosthesis implant	6.7	1.5	4	9
Possibility of being able to stand to urinate over a toilet	6.9	2.6	2	9
Elimination of need for suprapubic tube	7	1.4	5	9

indistinguishable from P+UL. The overarching goal behind development of this technique is to offer patients an aesthetically "normal appearing" option that allows them to forego urethral lengthening surgery, which is associated with the majority of traditional phalloplasty-related complications.

We have also identified specific priorities that many transmasculine patients weigh as they consider phalloplasty surgery. These include benefits associated with P−UL: elimination of visible native female genital anatomy, genital anatomy that is normal appearing and similar to that with P+UL, preservation of tactile and erogenous sensation, and a shorter time to completion of all gGAS surgeries. Our work also identified factors that many patients seek to avoid with phalloplasty, including genital anatomy that is visibly different from the standard alternative (P+UL), risk of postoperative complications requiring post-operative revision surgeries, loss of sensation, and prominent visibility of the flap donor site.

At present, there is no single "ideal" procedure for masculinizing gGAS. Because each individual patient has unique priorities our findings underscore the importance of providing transmasculine patients with a spectrum of options, where different surgical options favor different priorities.

"Modified phallourethroplasty" fits into a spectrum of established surgical alternatives akin to metoidioplasty (as an alternative to phalloplasty) and shallow-depth vaginoplasty (SDV) (as an alternative to full-depth vaginoplasty[18]), where the alternative

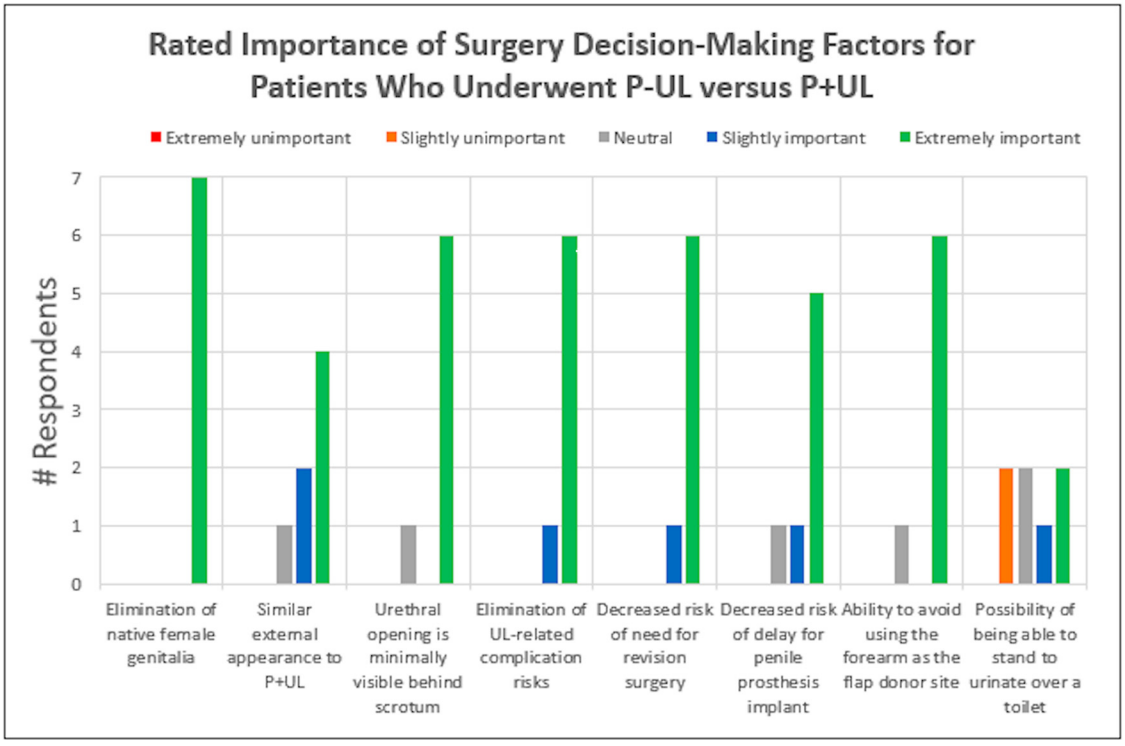

Figure 4. Rated importance of surgery decision-making factors for patients who underwent P-UL vs P+UL.

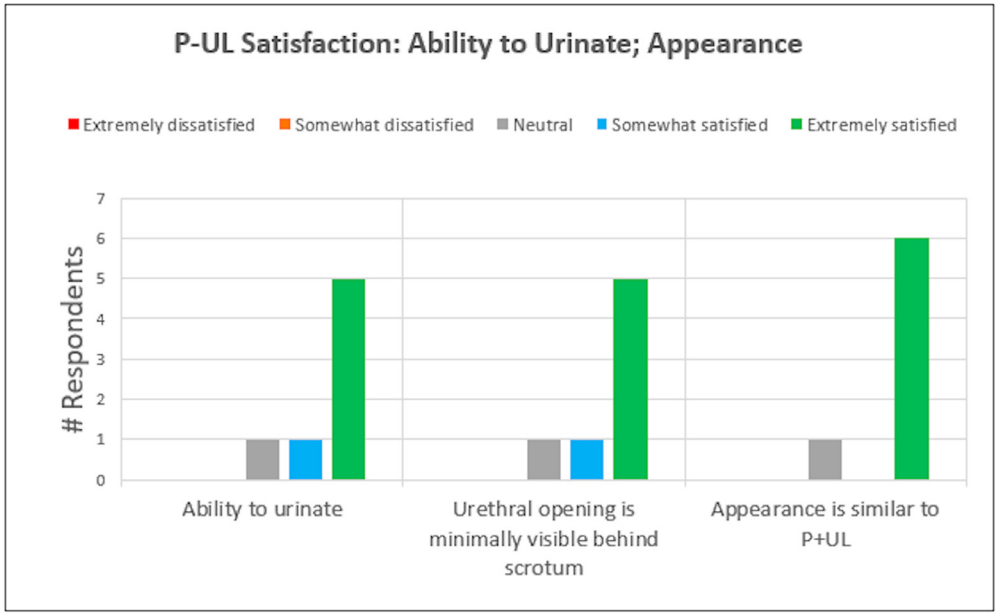

Figure 5. P-UL satisfaction: ability to urinate; appearance.

operation trades specific valued features for specific benefits. With P−UL, the ability to urinate from the tip of the phallus and the ability to stand to urinate at a urinal are traded for elimination of +UL-related complications. With our technique of P-UL, as genital anatomy and appearance after P−UL appear similar to what is achieved with P+UL, patients are freer to focus on the potential functional benefits of P−UL and less on visible differences.

By our technique, the native urethral opening remains in situ, eliminating the anastomotic stricture risk associated with P+UL. Because only a ∼1-cm cuff of periurethral skin is preserved, the urinary opening does not have a "female" appearance. With our scrotoplasty technique the midline scrotum is the most pendulous part and serves to hide the urethral opening. Patients are counseled that while they will not be able to urinate at a urinal, they will be able to urinate either sitting on a toilet, or potentially while standing facing the toilet in a closed stall while straddling the edge of the toilet. In our early experience, some of our patients could urinate standing over a toilet, but not all could. Those who can do so in a closed bathroom stall, as they have privacy, and they can stand facing the toilet (which appears normal to anyone standing outside the stall).

Phalloplasty-UL also has several other important secondary benefits that patients may not readily anticipate:

1. For those who favor using an ALT flap donor site, P-UL is more feasible than P+UL. This is because the subcutaneous thickness of the ALT is much thicker than that of an RFFF. When the P+UL flap is tubularized in a "tube within a tube" design, the resulting phallus will often be too thick, heavy, and not usable for insertive intercourse.[19] With P-UL, the absence of a full-length urethra segment makes the phallus less heavy and thick. Furthermore, because there is no full-length urethra, there is minimal to no risk with opening the phallus (at Stage II surgery) to thin and narrow it by excising excess adipose tissue and skin.
2. Some patients have especially thin arms, such that a phallus made from the forearm will be undesirably small. However, some of these same patients have thick thighs that would result in a phallus that is too thick and heavy if it included +UL. P-UL offers an intermediate option, whereby the patient benefits from the added girth the ALT provides, but not the excess weight and thickness associated with +UL.
3. The ALT flap donor-site scar is less visible than the RFFF donor site.
4. Patients may also have tattoos on the forearms that they either may wish to preserve, or not have transposed onto their phallus.
5. Completion of permanent hair removal is not a prerequisite for proceeding with P−UL surgery, as only 2-cm. of the urethral portion of the flap will be tubularized. This distal neourethra will have no contact with urine. As it remains easily accessible after surgery, it can be treated with laser or electrolysis post-operatively. By contrast, with P+UL, the entire urethral portion of the flap must be rendered permanently hair free *before* surgery. Because permanent hair removal typically takes 9−12 months to complete, the resulting surgery delay can be intolerably long for many patients. By comparison, P-UL has a much shorter surgery lead time. Permanent hair removal of the portion of the flap that will be visible (shaft) can continue any time after surgery. An added benefit is that treatment of the shaft during the first few months post-op is pain-free, because tactile sensation in the phallus is not yet well-established.
6. Additional general urologic benefits to patients of our technique include that with −UL: 1. The urethra can be catheterized easily, immediately and without requiring urethroscopy by a urologist, and 2. The short native urethra renders the bladder easily accessible for cystoscopy (eg, hematuria work up, stone management), and for endoscopic diagnosis and treatment of the upper urinary tracts. This is especially important for patients with limited access to specialized care.

Based on our experiences, we also gained valuable insight into how best to counsel patients about options of +UL vs −UL. Many new patients are simply not aware of all the surgical options available to them, and/or they may have an incomplete understanding of the potential benefits, risks and limitations of each. For some patients, standing to urinate is a primary motivation for electing phalloplasty. However, others may more heavily prioritize general appearance and insertive and/or erectile function, with less focus on standing to urinate.[14] For patients who do not highly prioritize standing to urinate, and/or those who prioritize minimizing the short and long-term surgical complications associated with UL, P-UL is an important alternative option.

A frequently voiced concern expressed by our patients when we discuss phalloplasty-UL is that they want to have a "normal appearing" phallus and scrotum. When we show patients photographs of the various surgical options during consultation, we also use the pictures to illustrate how the phallus tip is identical with both P−UL/P+UL surgeries, and how, with P-UL, the urethral opening behind the scrotum is not readily visible. Since we first standardized the way in which we present P-UL to our patients, the rate of people who choose UL has increased from 17.4% to 32.5%.

CONCLUSION

All patients considering masculinizing gGAS with phalloplasty or metoidioplasty should be counseled about both +UL and -UL options, and discussion should include the risks and benefits of each, taking into account individual patient's unique priorities and needs.

Factors that appear to have increased the proportion of our patients who selected P−UL were: (1) Refinements in surgical technique that yielded improved cosmetic outcomes; (2) Providing a balanced discussion of the pros and cons of all options, neutral to surgeon preference; (3) Including representative photographs of both P−UL and P+UL; and (4) Sharing with patients that for some, P−UL even affords the ability to urinate standing over the edge of the toilet (while facing the toilet) in a closed bathroom stall.

While the present work reflects the early experience of our series, given that ours is a field with relatively few practitioners and few to no gold standard techniques, we believe it is worthwhile to share our experience and surgical technique so that others may potentially utilize and make refinements. The overarching goal of this technique is to decrease phalloplasty-related morbidity, urgent revision surgeries, and cost to our healthcare system. A larger cohort of P-UL using this technique, matched with P+UL, would be fruitful for these goals, and is the subject of ongoing work by our group.

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REFERENCES

1. Golpanian S, Guler K, Tao L, et al. Phalloplasty and urethral (re) construction: a chronological timeline. **Anaplastology 2016;5:159.**
2. Chang TS, Hwang WY. Forearm flap in one-stage reconstruction of the penis. **Plast Reconstr Surg 1984;74:251–258.**
3. Al-Tamimi M, Pigot GL, Ronkes B, et al. The first experience of using the pedicled labia minora flap for urethral lengthening in transgender men undergoing anterolateral thigh and superficial circumflex iliac artery perforator flap phalloplasty: a multicenter study on clinical outcomes. **Urology 2020;138:179–187.**
4. Al-Tamimi M, Pigot GL, Sluis Wbvd, et al. Colpectomy significantly reduces the risk of urethral fistula formation after urethral lengthening in transgender men undergoing genital gender affirming surgery. **J Urol 2018;200:1315–1322.**
5. Massie JP, Morrison SD, Van Maasdam J, et al. Predictors of patient satisfaction and postoperative complications in penile inversion vaginoplasty. **Plast Reconstr Surg 2018;141:911e–921e.**
6. Rashid M, Tamimy MS. Phalloplasty: the dream and the reality. **Indian J Plast Surg 2013;46:283–293.**
7. Wierckx K, Van Caenegem E, Elaut E, et al. Quality of life and sexual health after sex reassignment surgery in transsexual men. **J Sex Med 2011;8:3379–3388.**
8. Pigot GLS, Al-Tamimi M, Nieuwenhuijzen JA, et al. Genital gender-affirming surgery without urethral lengthening in transgender men-a clinical follow-up study on the surgical and urological outcomes and patient satisfaction. **J Sex Med 2020;17:2478–2487.**
9. Nikolavsky D, Hughes M, Zhao LC. Urologic complications after phalloplasty or metoidioplasty. **Clin Plast Surg 2018; 45:425–435.**
10. Djordjevic ML, Stojanovic B, Bizic M. Metoidioplasty: techniques and outcomes. **Transl Androl Urol, 2019;8:248–253.**
11. Santucci RA. Urethral complications after transgender phalloplasty: strategies to treat them and minimize their occurrence. **Clin Anat 2018;31:187–190.**

12. Veerman H, de Rooij FPW, Al-Tamimi M, et al. Functional outcomes and urological complications after genital gender affirming surgery with urethral lengthening in transgender men. **J Urol 2020;204:104–109.**
13. Lumen N, Monstrey S, Goessaert AS, et al. Urethroplasty for strictures after phallic reconstruction: a single-institution experience. **Eur Urol 2011;60:150–158.**
14. Garcia M, Zhao L. Masculinizing genital gender affirming surgery. AUA University Core Curriculum; 2021.
15. Monstrey SJ, Ceulemans P, Hoebeke P. Sex reassignment surgery in the female-to-male transsexual. **Semin Plast Surg 2011;25:229–244.**
16. Garcia MM, Christopher NA, Thomas P, et al. Genital gender affirming surgeries for transgender patient. **Am Urolo Assoc Updates Ser 2017:36.**
17. Garcia MM, Shen W, Zhu R, et al. Use of right colon vaginoplasty in gender affirming surgery: proposed advantages, review of technique, and outcomes. **Surg Endosc 2020.**
18. Garcia MM. Sexual function after shallow and full-depth vaginoplasty: challenges, clinical findings, and treatment strategies-urologic perspectives. **Clin Plast Surg 2018;45:437–446.**
19. Isaacson D, Aghili R, Wongwittavas N, et al. How big is too big? the girth of bestselling insertive sex toys to guide maximal neophallus dimensions. **J Sex Med 2017;14:1455–1461.**