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Analysis of the Radial Forearm Phalloplasty Donor Site: Do Dermal Matrices Improve Donor Site Morbidity?

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Background: The radial forearm free flap is frequently chosen for phalloplasty; however, flap size required for phalloplasty is associated with a large scar burden and functional concerns. We sought to investigate donor site functionality, aesthetics, and volume deficits in a cohort of individuals who underwent radial forearm phalloplasty (RFP) with donor site skin grafting alone or dermal substitute and subsequent skin grafting.

Methods: Donor site functionality was assessed using the quick Disabilities of Arm, Shoulder, and Hand (qDASH). Patient- and clinician-reported aesthetics were assessed using the Patient and Observer Scar Assessment Scale (POSAS). An Artec Leo three-dimensional scanner was used to measure volumetric differences from the donor site forearm and contralateral forearm.

Results: Fifteen patients who underwent RFP agreed to participate. No statistically significant differences were identified between different donor site closure methods regarding qDASH, patient-reported POSAS, or total volumetric deficits. A blinded clinician reported that POSAS approached significance at 4.7 for biodegradable temporizing matrix (BTM), 4.2 for Integra, and 3.0 for split-thickness skin graft ($P = 0.05$). No statistically significant differences were identified regarding distal, middle, or proximal volume deficits; however, a trend was observed regarding total volumetric deficits with BTM experiencing the lowest deficit (10.3 cm^3) and skin graft experiencing the highest deficit (21.5 cm^3, $P = 0.82$).

Conclusions: The addition of dermal matrix (BTM or Integra) to the treatment algorithm for RFP did not show statistically significant improvement in donor site volume deficits, patient-reported scar appearance (POSAS), or functionality (qDASH).
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INTRODUCTION

Visibility in gender diverse individuals continues to grow. Against this backdrop, the demand for gender-affirming surgery, including phalloplasty, is increasing. The number of transmasculine procedures rose from 1360 to 9985 from 2015 to 2020. Additionally, there were approximately 1100 genital procedures performed for transgender male patients in 2020 alone.[1] The primary goals of performing a phalloplasty are often to create an aesthetic appearing phallus, achievement of tactile and erogenous sensation, allowing for standing micturition, and the ability to have an erection and penetrative intercourse. Although various techniques can be used in phalloplasty, use of the radial forearm free flap (RFFF) remains the most common in the United States. The RFFF is often selected to construct the neophallus because of its long pedicle, supple skin quality, and consistent nerve and blood supply. However, the flap size required for phalloplasty is associated with a large scar burden that has aesthetic and functional concerns. The high visibility of the RFFF donor site can be a major drawback for individuals

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who have undergone phalloplasty by inviting unwanted inquiries regarding experienced gender, highlighting the importance of optimizing donor site aesthetics. Skin grafting at the time of forearm flap may result in poor volume replacement, lower rate of graft take over tendons, and poor aesthetic outcomes. Use of dermal substitutes as a bridge to skin grafting may help optimize aesthetic and functional outcomes.

The ideal dermal substitute should allow for good color matching to surrounding native skin, cause minimal scar burden, have a high rate of incorporation, prevent any functional limitations, have low infection rate, provide adequate bulk to minimize volume deficiency of the donor site, and provide an ideal wound bed for subsequent skin grafting. Innovations in skin tissue engineering in recent decades have led to several bioengineered and synthetic dermal substitutes with a variety of applications in reconstructive surgery.[2] When positioned over a wound bed or skin defect, dermal substitutes provide a scaffold that becomes incorporated into the wound bed, aided by vascular ingrowth. The donor site defect created by autologous tissue transfer is frequently managed with subsequent autologous skin grafting. Two-stage autologous skin grafting incorporating a dermal substitute as the first step of wound closure has been associated with decreased cosmetic and functional donor site morbidity.[3–5] The first and most popular dermal substitute, Integra (Integra LifeSciences, Plainsboro, N.J.) has been used for a variety of clinical indications, including aiding donor site closure, but is costly.[6] More recently, biodegradable temporizing matrix (BTM) has become popularized, in part due its lower cost. BTM is a novel synthetic dermal matrix made from polyurethane foam that has been used in chronic wounds, burns, and to reduce donor site morbidity in free flap reconstruction.[7,8] Wagstaff et al[9] demonstrated improved long-term scar outcomes with the use of BTM on radial forearm donor sites in head and neck reconstruction. We sought to investigate donor site functionality, aesthetics, and volume deficits in a cohort of individuals who had undergone radial forearm phalloplasty (RFP) at our institution using split-thickness skin graft (STSG), BTM with STSG, and Integra with STSG.

METHODS

This study was approved by the institutional review board (IRB# 00158451). All individuals 18 years or older who had undergone RFP from May 2019 to June 2022 were queried. Patients were stratified by technique of donor site closure: STSG only (Fig. 1), BTM with STSG (Fig. 2), or Integra with STSG (Figs. 2B, 3A). The postoperative outcomes of interest included complications, functionality of the donor site forearm, aesthetics of the donor site, and volume deficit experienced at the donor site.

Surgical Technique

Phalloplasty was undertaken using an RFFF, creating a tube-in-tube construct. After harvest of the RFFF, the

Takeaways

Question: Does the addition of dermal matrices at the time of forearm closure improve donor site morbidity in radial forearm phalloplasty?

Findings: There was no difference identified in blinded clinician or patient-reported Patient and Observer Scar Assessment Scale scores, or total volumetric deficits between Integra, biodegradable temporizing matrix, and split-thickness skin graft only. Areas of the forearm that experienced the greatest volume deficit volarly overlay the flexor carpi radialis tendon and dorsally overlay the outcropping muscle tendons.

Meaning: The addition of dermal matrix to the treatment algorithm for radial forearm phalloplasty did not improve donor site volume deficits, patient-reported scar appearance, or functionality.

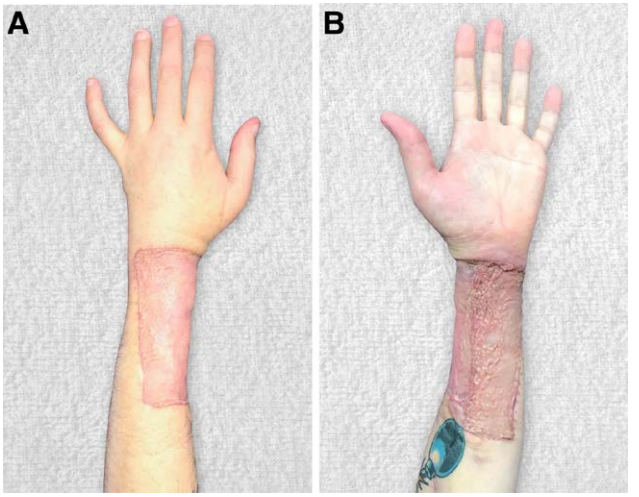

Fig. 1. Postoperative photographs of donor site closure. Dorsal (A) and volar (B) view of a patient who received STSG only.

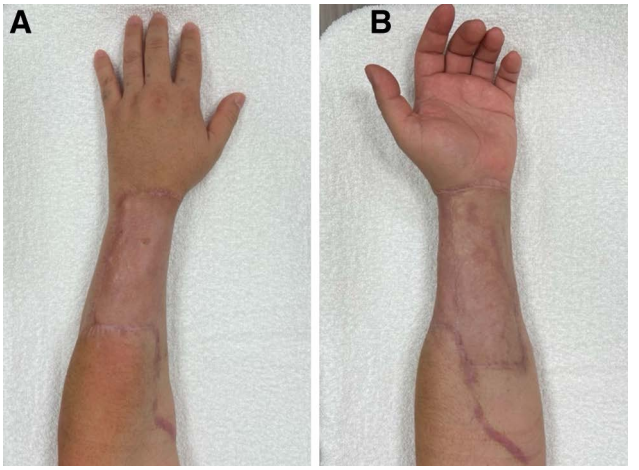

Fig. 2. Postoperative photographs of donor site closure. Dorsal (A) and volar (B) view of a patient who received BTM with STSG.

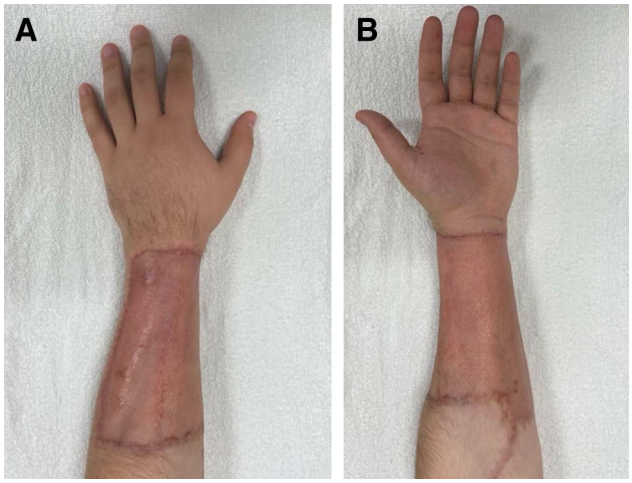

Fig. 3. Postoperative photographs of donor site closure. Dorsal (A) and volar (B) view of a patient who received Integra with STSG.

donor site was covered by either a skin graft or dermal substitute (BTM or Integra). For those receiving dermal substitutes, the matrix was cut to fit the exact dimensions of the forearm donor site. The material was sewn in place with running 4-0 chromic suture. Often, multiple sheets of dermal substitute were sewn in side by side to achieve the necessary coverage. After insetting, the dermal substitute was covered in Mepitel (Mölnlycke Healthcare, Gothenburg, Sweden). A GranuFoam (3M, Saint Paul, Minn.) sponge was then placed over the wound. A KCI (3M) wound vac system was then applied and set to −125 mm Hg suction. After wound vac placement, a forearm-based volar splint was created with 4 inch Orthoglass (Medline Industries, Inc., Northfield, Ill.) with the metacarpophalangeal joints of the fingers free. The wound vac was kept in place for 5 days, at which point the wound vac and Mepitel were removed. The patient then performed every-other-day dressing changes with nonstick gauze over the dermal substitute for 2 weeks.

Approximately 4 weeks after phalloplasty, second-stage reconstruction was undertaken with split-thickness skin grafting to the forearm donor site concurrently with glansplasty of the phallus. The donor site was washed with sterile saline and GU irrigation (40 mg neomycin base and 200,000 units polymyxin B sulfate). The outer sealing membrane is removed from the dermal substitute and a no. 10 scalpel is used to tangentially excise any hypergranulation tissue from the wound edges and achieve a smooth contour. An STSG measuring 0.014 inch to 0.016 inch was taken from the thigh using a dermatome. Attempt to preserve paratenon on the flexor carpi radialis (FCR) and brachioradialis (BR) tendons is taken to facilitate STSG take. A small strip of fascia is taken from the radial side of the FCR and ulnar side of the BR muscle as the septum between these two muscles is approached during radial artery dissection. It is our practice to imbricate the flexor digitorum superficialis and flexor pollicis longus muscles to the cut edges of FCR and BR, respectively, to improve contour in the area of radial artery harvest and cover any exposed tendons with more tissue. The nonmeshed skin graft was then sewn in place with a running 4-0 chromic suture. Several less than 1-cm fenestrations were made in the skin graft for drainage in areas of tenting. The graft was covered with Mepitel, and then the KCI wound vac system was applied at −125 mm Hg continuous suction. The forearm was splinted. The vac and splint were removed after approximately 1 week, at which point daily dressing changes with nonstick are performed until skin graft has matured (typically 2 additional weeks).

Functional and Aesthetic Outcomes

Donor site functionality was assessed using the quick Disabilities of Arm, Shoulder, and Hand (qDASH).[10] The qDASH is a shortened version of the DASH questionnaire that uses 11 items to measure the degree of difficulty in performing various physical activities due to shoulder, arm, or hand problems (six items); the severity of pain and tingling (two items); and the problem's effect on social activities, work, and sleep (three items). The responses to the items are summed and converted to a score of 0–100 with higher scores reflecting greater disability. Patient- and clinician-reported aesthetics were assessed using the Patient and Observer Scar Assessment Scale (POSAS).[11] It consists of two numeric scales. The Patient Scar Assessment Scale is completed by the patient and evaluates parameters for pain, itching, color, stiffness, thickness, and irregularity. The Observer Scar Assessment Scale (OSAS) is completed by the provider and evaluates vascularization, pigmentation, thickness, relief, and pliability. In both patient and provider scores, a scale of 0 indicates normal skin and 10 indicates the worst scar imaginable. The provider-reported scale was completed by the same assessor for all patients, and the assessor was blinded with regard to the method used for donor site closure.

Volumetric Assessment

An Artec Leo (Artec Europe, Senningerberg, Luxembourg) three-dimensional scanner was used to obtain three-dimensional images of the donor site forearm and contralateral, nonoperated forearm. Key anatomical points were identified, and scans from the donor site forearm and contralateral forearm were mirrored and superimposed. Total volumetric differences were calculated for each patient in cubic centimeters and further divided into proximal, middle, and distal segments utilizing Artecstudio 15 (Artec Europe). Volumetric heatmaps were used to identify areas of the donor site forearm that most frequently experienced volume deficits. [**See Video (online)**, which demonstrates the volumetric analysis technique.]

Statistical Analysis

Patient characteristics and postoperative measures were summarized descriptively and stratified by substitute types. Continuous variables were summarized as mean and SD, median and interquartile range, and range, then compared across the three groups using a Kruskal-Wallis test. Categorical variables were summarized as frequency and percentage and compared

across groups using the Fisher exact test. Total volume difference was the primary outcome of interest and was compared across the groups using linear regression, adjusting for age and body mass index (BMI), and centered at the cohort mean. Regression coefficients were reported with 95% CIs and *P* values. All analyses were performed using R 4.2.1 (R Foundation, Vienna, Austria), and the *P* value for statistical significance was set at less than 0.05.

RESULTS

Fifteen patients who underwent RFP agreed to participate. Of these 15, eight received BTM with STSG, five received Integra with STSG, and two received STSG only. The median age at time of operation was 27.5, 39.0, and 40.5 in the BTM-, Integra-, and STSG-only cohorts, respectively ($P = 0.37$). The Integra cohort had the highest BMI (31.1) when compared with the BTM- (22.8) and STSG-only cohorts (26.4, $P = 0.07$). The occurrence of phalloplasty donor site complications was low. One patient in the Integra cohort experienced donor site neuropraxia. Two patients in the BTM cohort, and one patient in the Integra cohort and in the STSG cohort experienced hand edema. There were no occurrences of donor site infection, donor site skin graft failure, or wound complications (Table 1).

Regarding patient-reported functional outcomes (qDASH), the BTM cohort had the highest score (9.6) when compared with STSG (6.8) and Integra (3.2). However, this was not statistically significant ($P = 0.49$). Regarding aesthetic outcomes (POSAS), the blinded clinician reported that OSAS scores approached significance, with worse scores reported for the BTM cohort (4.7) when compared with Integra (4.2) and STSG (3.0; $P = 0.05$). Patient-reported Patient Scar Assessment Scale scores were worse in the BTM cohort (5.8) and best in the STSG cohort (2.3); however, no statistically significant differences were identified ($P = 0.09$) (Table 2).

The greatest mean volume deficit was experienced at the proximal third of the donor site in all cohorts (BTM: 5.0 cm^3; Integra: 11.8 cm^3; STSG: 16.4 cm^3; $P = 0.58$). No statistically significant differences were identified in regard to distal, middle, and proximal volume deficits. A trend was observed regarding total volumetric deficits, with BTM experiencing the lowest deficit (10.3 cm^3) and skin graft experiencing the highest deficit (21.5 cm^3, $P = 0.82$) (Table 3). However, this was not statistically significant. Heatmaps demonstrated that the areas of the forearm that experienced the greatest volume deficit were at

Table 1. Patient Characteristics and Postoperative Complications

	BTM	Integra	STSG	*P*
No. patients	8	5	2	—
Age at phalloplasty, mean (SD)	30.0 (8.7)	33.8 (11.1)	40.5 (2.1)	0.37
Median (IQR)	27.5 (24.2–35.2)	39.0 (22.0–40.0)	40.5 (39.8–41.2)	—
Range	(20.0, 45.0)	(22.0, 46.0)	(39.0, 42.0)	—
BMI, mean (SD)	22.8 (7.5)	31.1 (4.2)	26.4 (5.3)	0.07
Median (IQR)	19.8 (19.1–23.2)	32.4 (30.6–33.7)	26.4 (24.5–28.2)	—
Range	(17.3–40.4)	(24.1–34.9)	(22.6–30.1)	—
Days to skin graft, mean (SD)	32.6 (16.7)	35.0 (8.3)	0.0 (0.0)	0.051
Median (IQR)	26.0 (22.0–35.8)	35.0 (30.0–43.0)	0.0 (0.0–0.0)	—
Range	(21.0–71.0)	(24.0–43.0)	(0.0–0.0)	—
Donor site infection	0(0%)	0(0%)	0(0%)	1.00
Donor site SG failure	0(0%)	0(0%)	0(0%)	1.00
Donor site neuropraxia	0(0%)	1(20%)	0(0%)	0.47
Hand edema	2(25%)	1(20%)	1(50%)	1.00
Wound complications	0(0%)	0(0%)	0(0%)	1.00

IQR, interquartile range.

Table 2. Donor Site Functional (qDASH) and Cosmetic (POSAS) Outcomes

	BTM (n = 8)	Integra (n = 5)	STSG (n = 2)	*P*
Functionality				
qDASH, mean (SD)	9.6 (8.7)	3.2 (3.4)	6.8 (9.6)	0.49
Median (IQR)	11.4 (0.0–14.7)	2.3 (0.0–6.8)	6.8 (3.4–10.2)	—
Range	(0.0–22.0)	(0.0–6.8)	(0.0–13.6)	—
Cosmesis				
Provider-reported OSAS, mean (SD)	4.9 (0.8)	4.0 (0.9)	3.0 (0.3)	**0.048**
Median (IQR)	4.7 (4.6–5.0)	4.2 (3.3–4.5)	3.0 (2.9–3.1)	—
Range	(3.8–6.5)	(2.8–5.0)	(2.8–3.2)	—
Patient-reported PSAS, mean (SD)	5.8 (2.2)	4.6 (1.1)	2.3 (0.7)	0.09
Median (IQR)	6.5 (4.7–7.1)	4.5 (4.3–4.7)	2.3 (2.0–2.5)	—
Range	(2.5–8.3)	(3.2–6.2)	(1.8–2.8)	—

IQR, interquartile range.
Boldface values indicate statistical significance.

Table 3. Outcomes of a Volumetric Analysis Measuring the Difference between the Donor Site and Contralateral Forearm to Assess for Volumetric Difference

	BTM (n = 8)	Integra (n = 5)	STSG (n = 2)	*P*
Distal third (cm^3), mean (SD)	0.1 (7.3)	2.1 (3.1)	0.3 (3.7)	0.87
Median (IQR)	2.5 (1.1–3.3)	2.0 (0.4–2.7)	0.3 (−1.0 to 1.6)	—
Range	(−17.2 to 5.4)	(−1.3 to 6.9)	(−2.3 to 2.9)	—
Middle third (cm^3), mean (SD)	5.9 (7.2)	8.0 (12.0)	4.7 (7.7)	0.85
Median (IQR)	3.7 (2.1–13.3)	2.3 (1.5–5.9)	4.7 (2.0–7.4)	—
Range	(−5.4 to 14.7)	(1.1–29.2)	(−0.7 to 10.1)	—
Proximal third (cm^3), mean (SD)	5.0 (6.7)	11.8 (13.8)	16.4 (20.2)	0.58
Median (IQR)	6.2 (−1.0 to 9.4)	7.3 (2.5–13.1)	16.4 (9.3–23.6)	—
Range	(−3.3 to 14.9)	(1.3–35.0)	(2.1–30.7)	—
Total (cm^3), mean (SD)	11.0 (16.1)	22.0 (28.0)	21.5 (31.6)	0.82
Median (IQR)	10.3 (2.4–22.2)	11.6 (6.7–17.7)	21.5 (10.3–32.7)	—
Range	(−16.6 to 30.9)	(2.8–71.1)	(−0.8 to 43.8)	—

IQR, interquartile range.

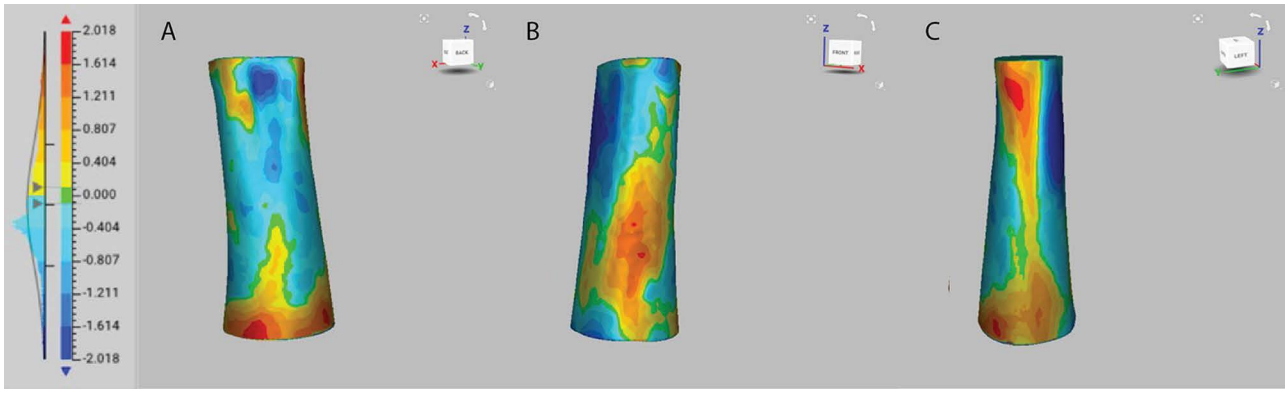

Fig. 4. Heatmaps demonstrating areas of greatest volume deficit. Darker red indicates more convex surfaces whereas darker blue indicated more concave surfaces and, thus, the greatest deficit. The greatest deficit (dark blue) was experienced (A) volarly overlying the FCR tendon and (B and C) dorsally overlying the outcropping muscle tendons. APL, abductor pollicis longus; EPB, extensor pollicis brevis; EPL, extensor pollicis longus.

Table 4. Multivariate Regression Model Comparing Total Volume Differences between Dermal Substitutes and STSG Adjusting for Age

Variable	Coefficients (95% CI)	*P*
Integra vs BTM	10.86 (−25.07 to 46.79)	0.51
STSG vs BTM	28.48 (−16.22 to 73.17)	0.18
STSG vs Integra	17.62 (−63.45 to 28.22)	0.41
Age	−2.02 (−4.31 to 0.26)	0.08
BMI	2.02 (−0.73 to 4.77)	0.13

the proximal forearm native skin junction with the donor site, on the volar side overlay the FCR tendon, and dorsally overlay the outcropping muscle tendons (abductor pollicis longus, extensor pollicis brevis, and extensor pollicis longus) (Fig. 4).

On multivariate analysis, no statistically significant differences were identified in volumetric deficit between Integra [odds ratio (OR) 10.9, $P = 0.51$) and STSG (OR 28.5, $P = 0.18$) when compared with BTM. Similarly, no significant differences in volume deficit were identified when comparing STSG to Integra (OR 17.62, $P = 0.41$). BMI was not associated with greater or lesser total volumetric deficit (OR 2.02, $P = 0.13$) (Table 4).

DISCUSSION

With an increasing demand for gender-affirming phalloplasty, minimizing associated morbidities remains a vital goal. The RFFF is thin and pliable, making it an ideal choice for construction of a neophallus. Despite its advantages, a large (~15 cm × 15 cm) donor site defect creates a visible scar that is aesthetically different from the unoperated forearm and potentially stigmatizing.[12] Conclusions supported by broader literature reporting on donor site morbidity of RFFF may not be reasonably extrapolated to gender-affirming phalloplasty, as the dimensions of the flap for other indications, such as head and neck reconstruction, are much smaller. Several studies have demonstrated decreased quality of life associated with donor site morbidity in RFP, including nerve pain, limitations in wrist motion and grip strength, and lymphedema.[13–16]

Our study demonstrated that the addition of dermal matrices to the treatment algorithm for donor site closure in an effort to improve donor site outcomes yielded little difference between those who received BTM/STSG, Integra/STSG, or STSG alone. Little difference was identified regarding functional outcomes between treatment groups. Overall, qDASH scores remained low. Previous studies have similarly demonstrated that the harvest of

a large RFFF for single-stage phalloplasty does not affect functional outcomes, including finger mobility or overall strength.[17]

Although recent literature largely supports excellent functional outcomes at the donor site after harvest of a large RFFF for phalloplasty, several studies have reported aesthetic impairment.[18–21] Several techniques have been described to improve donor site aesthetics, including the use of vacuum-assisted wound closure, fat grafting, modifications of surgical site closure, preoperative tissue expansion devices, and reducing flap size by prelamination of the neourethra.[4,20,22–24] Autologous fat transplantation, or fat grafting, has been shown to improve RFFF donor site aesthetics by increasing soft tissue thickness and improving overall appearance.[25] Although generally, 40%–60% of grafted fat is expected to persist, long-term results of volume retention for the RFFF donor site are limited in the literature. Additionally, fat grafting is not often an insurance-covered procedure, which may significantly impact patient access to this technique, especially as a sizable portion of patients may already be paying for gender-affirming care out of pocket.[26] As efforts have been made to promote insurance coverage for fat grafting to the breast as part of cancer reconstruction, the same could be applied in the case of patients undergoing phalloplasty.[27] Fat grafting can be used in conjunction with other scar-reduction techniques, such as the above-discussed vacuum-assisted wound closure, and topical silicone dressings.

Many modifications of RFFF surgical site reconstruction have been proposed to improve outcomes, such as delayed site closure versus closure at time of phalloplasty, or the utilization of increased graft thickness. One study demonstrated significantly less surface deviation with full-thickness skin grafting (FTSG) when compared with STSG; however, no aesthetic differences were noted between the two grafts utilizing patient questionaires.[28] Although the results of our study demonstrated no difference in patient- and provider-reported aesthetics, Wafta et al reported improved aesthetics of RFP donor site with the use of MatriDerm when compared with STSG alone in a cohort of 37 patients.[24] Similarly, Cristofari et al[3] demonstrated improved DASH and Vancouver Scare Scale in FTSG with MatriDerm when compared with FTSG alone and STSG with MatriDerm, raising the question as to whether we would observe improved aesthetics if FTSG had been used. However, the large size of the RFP donor site limits the ability to use FTSGs which can lead to larger donor site scars and lower survival rates because the thicker tissues require revascularization. An additional consideration when deciding on whether to skin graft at the time of phalloplasty versus use a delayed closure with a dermal substitute is cost. In general, 100 cm^2 of Integra costs $3150 compared with $850 for BTM. Beyond the cost of the material itself is the additional clinic visits required for vac changes and additional time needed in the OR for delayed skin grafting. If delayed closure is chosen, the skin graft can be performed concurrently with glansplasty in an effort to reduce additional costs for returning to the OR.

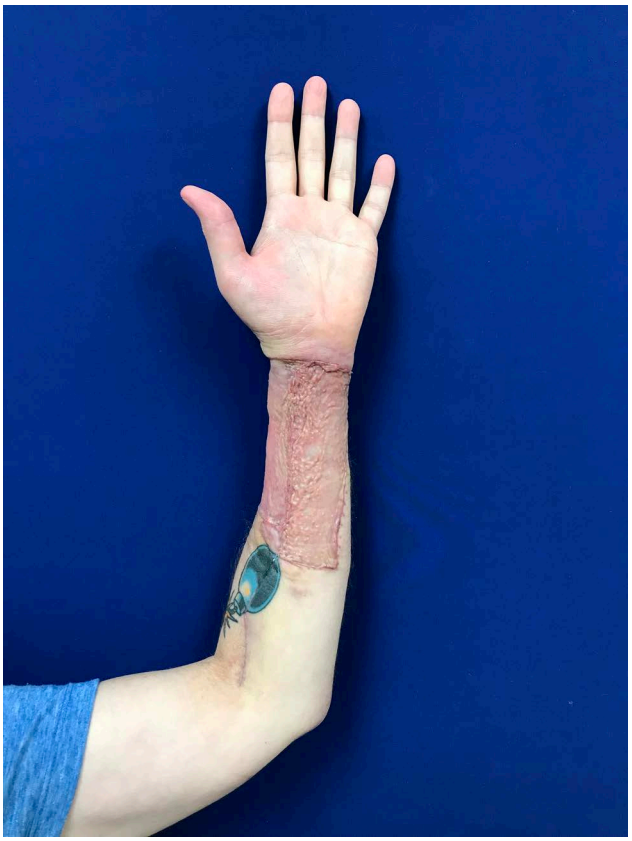

Fig. 5. Photograph of a patient who received STSG only demonstrating significant volume depletion and increased scar burden. The patient was offered fat grafting to improve overall donor site cosmesis and volume fill.

Notably, those in our study who received BTM had the smallest volumetric deficit when compared with Integra or STSG alone, though this was not found to be statistically significant. Therefore, we suggest that STSG alone may be preferred with RFP. Given that little differences in overall donor site functionality, aesthetic outcomes, and volumetric deficits exist between each closure method, we suggest that the donor site be closed at the time of phalloplasty using a thicker (0.016 inch) STSG. Our practice has also evolved to include the possibility of fat grafting to the RFFF donor site at a later date, as we have found it to be a feasible method to improve forearm contour and restore overall volume (Figs. 5, 6). Additionally, utilizing mucosa (buccal, vaginal, colonic, bladder, or uterine) to prelaminate the neourethra in patients undergoing phalloplasty has been shown to reduce subsequent RFFF donor site size while decreasing urologic complications of phalloplasty such as stricture or fistula formation.[29,30] More research is needed to understand if these modifications lead to meaningful reductions in donor site size and improved overall aesthetics [**see Video (online)**].

Regardless of donor site closure method, it has been previously documented that transgender and gender nonconforming individuals believe that there is a relative tradeoff in the consideration of potential donor site morbidity and the construction of a neophallus that supports their goals. Many individuals have demonstrated a willingness

Fig. 6. Photograph of a patient who received STSG only after one round of fat grafting to improve donor site cosmesis and volume fill. Overall improvement in forearm contour was achieved.

to accept some level of discomfort at the donor site.[19] Therefore, provider-patient counseling should reflect a shared decision-making paradigm in which the patient's goals direct donor site closure method, including one- versus two-stage closure, as well as fat grating at a later date.

This study is not without limitations, including those inherent to a single-center cohort study. Given that volume differences were measured after the operation using donor site and contralateral arms, we could not account for baseline differences between forearm volume. It remains possible that disuse atrophy of the donor site forearm may contribute to greater volume deficits; however, clinically, we did not observe this in our cohort. Additionally, a small sample size restricts analysis to descriptive statistics. Although the minimum follow-up time allowed for qDASH, POSAS, and volume measurements was 3 months after skin graft placement, we could not account for temporal differences between patient follow-ups. It remains possible that patients with longer follow-up time may have different outcomes. A prospective study in the future would allow for blinded allocation of cohorts and preoperative scanning of the operative arm to control for any differences in forearm size or contour. Finally, our small cohort size limits conclusions; therefore, the results of this study are suggestive but not definitive in decision-making moving forward regarding the benefits of immediate versus delayed closure.

However, we do feel that there is benefit to identifying differences between the use of BTM/STSG, Integra/STSG, or STSG alone, along with a detailed understanding of areas with greatest volumetric deficit. Results of this study can guide physicians in the use of fat grafting as a modality to improve donor site aesthetics and restore volume deficits, creating a more aesthetic donor site. Reproducibly deficient areas found on our volumetric analysis can be future targets for fat grafting.

CONCLUSIONS

The addition of a dermal matrix (BTM or Integra) to the treatment algorithm for RFFF phalloplasty did not show significant improvement in donor site patient-reported functional outcomes (qDASH), aesthetic outcomes (POSAS), or volume deficits. The areas of greatest volume deficit after flap harvest include the distal forearm volar side overlying the FCR tendon and dorsally overlying the outcropping muscles. The authors recommend an STSG to the donor site at the time of the phalloplasty. Targeted fat grafting to volume deficient areas may improve donor site aesthetics and restore like-with-like.

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DISCLOSURE

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

PATIENT CONSENT

Patients provided written consent for the use of their images.

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