Editorial

Considerations for secondary vaginoplasty

Maia Shoham[1]^, John Henry Pang[2], Thomas Satterwhite[2]

[1]Stanford University School of Medicine, Stanford, CA, USA; [2]Align Surgical Associates, San Francisco, CA, USA

Correspondence to: Thomas Satterwhite, MD. Align Surgical Associates, 2299 Post Street, Suite 207, San Francisco, CA 94145, USA.
Email: tsatterwhite@alignsurgical.com.

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In this single-institution, retrospective cohort study of patients who required revision after undergoing penile inversion vaginoplasty, Abboud *et al.* describe their technique for secondary vaginoplasty with a meshed skin graft to re-line the vaginal canal. An abdominal skin graft is harvested through an elliptical incision and meshed to expand its surface area. The graft is shaped around a dilator and placed into the neovaginal space to line the re-established cavity. The resulting donor scar is aesthetically favorable, resembling that of an abdominoplasty.

This examination into revisional, or secondary vaginoplasty surgery is timely—as the number of vaginoplasty cases continues to increase worldwide, the need for revision surgery rises as well. As expected, the examined cohort is of similar age and has similar follow-up times to other single-institution reviews in the literature (1,2). Several active smokers and diabetics were included in the patient cohort; the screening protocol for evaluating these patients is not discussed in the paper, but would be beneficial to know. As per protocol in many surgical practices, including ours, active smoking and a hemoglobin A1c (HgbA1c) of 7% or greater is a contraindication to surgery. The authors report a complication rate of 28.6%, which is lower than a prior study reporting a 44% overall complication rate for secondary skin graft vaginoplasty (i.e., vaginoplasty revision using skin graft to construct the neo-neovagina) (2). This paper reports a restenosis rate of 22.9% compared to a previously-reported 16%, and a fairly higher rate of postoperative rectovaginal fistula formation compared to prior literature (8.6% here *vs.* 6.3% previously), though this is confounded by other reports grouping together multiple revision techniques including intestinal and myocutaneous flap approaches (3). This group does not report intraoperative complications.

Generally, vaginoplasty has high rates of revisions, with reports ranging from approximately 27% to 60% depending on study design, for indications ranging from cosmetic to functional (usually secondary to neovaginal stenosis, though inadequate depth or, more seriously, fistula formation and prolapse are possible) (4-8). The current state of revision or secondary vaginoplasty is actively evolving, with more discussion on a variety of grafting materials and approaches that include intra-abdominal peritoneal flaps. We disagree with the author's assessment that the sigmoid vaginoplasty is the current gold standard for secondary vaginoplasty, as several methods are accepted (including autologous grafts, xenografts & peritoneal grafts/flaps) with described relative advantages and disadvantages.

There is no reported literature on relative risks and benefits of skin graft sites, but scrotal and perineal skin has been used to augment vaginal canal length in primary vaginoplasty cases where penile skin was insufficient. While the groin is a common donor site due to the graft shape it offers, infragluteal folds have also been used successfully in cisgender women with Müllerian agenesis (9). This approach may be less advantageous in patients with posterior thigh hair burden necessitating permanent hair removal prior to surgery. The need for laser hair removal or electrolysis in abdominal grafts is not discussed here, though prevention of hair growth in the neovaginal canal

^ ORCID: 0000-0003-4599-1015.

is an important consideration for surgical approach and preoperative patient counseling. In our practice, few skin grafts are used due to our experience with them leading to high rates of scarring, fibrosis and stricture.

A common revision vaginoplasty approach is with the use of a segment of bowel or colon to construct the neovaginal canal. This offers the distinct advantages of self-lubrication and a texture most similar to cis-vaginas, but carries with it the unpleasant side effects of malodor and mucorrhea, as well as risks of bowel injury, adhesions, bowel obstruction, anastomotic leak, intraabdominal abscess formation, sepsis, and rectal perforation (10-13). A dedicated colorectal surgeon panel is needed during the case, and patients may require monitoring and care for diversion colitis postoperatively. Lifelong cancer screening of the transplanted colon is also required. This intraabdominal approach, like any surgery violating the peritoneal cavity, will form lower pelvic adhesions and carry with it the theoretical risks and complications associated with history of intraabdominal surgery.

Peritoneal flaps can also be used in primary or revision vaginoplasty. Though this requires violation of the peritoneal cavity and carries with it all associated risks as described above, it conceals the graft donor site, has a lower possibility of rectal injury and avoids the issue of neovaginal hair growth/need for hair removal (14). This approach also requires a trained robotic surgeon's assistance and is not appropriate for patients with extensive histories of abdominal surgery. Reapproach in the case of complications is an open question, and nothing is reported yet about revising primary peritoneal vaginoplasty.

A previous study comparing intestinal *vs.* skin graft revision vaginoplasty had several instances of rectal perforation (19% in the skin graft group), though no fistulae, and a 16% rate of restenosis in the skin-graft group compared to 5% introital-only stenosis in the intestinal group (2). Recently, a group described their experience with the use of robotic peritoneal flap revision vaginoplasty in a small 18-patient cohort. No fistulae or rectal injuries were reported, though the indications for revision in that cohort were broader than in this paper, which included labia and clitoral revision and dyspareunia separate from neovaginal inadequacy (1). Other work has shown a relatively lower incidence (2.4%) of rectovaginal fistula formation with secondary rectosigmoid vaginoplasty (10). An intra-abdominal approach may allow for better visualization and careful dissection of the fibrotic and anatomically-distorted pre-rectal space, thus decreasing the chance of rectal injury and subsequent fistula formation.

Nevertheless, a skin graft as described here can be considered for patients who are suboptimal candidates for intraabdominal operations, e.g., due to a history of laparoscopies/laparotomies, or who do not have extensive fibrotic tissue. After all, skin grafts are a ubiquitous tool in the plastic surgeon's arsenal for other indications; this study proposes to add vaginoplasty to the list of operations for which skin grafts may be useful.

Lastly, whether the patient truly needs revision should be considered. All patients in this study underwent revision because of neovaginal stenosis or inadequate depth, but reasons for the development of these primary complications are not discussed. In our practice, we find that stenosis often results when patients do not dilate regularly; conservative management with resumption of dilation, use of a smaller dilator, triamcinolone or other steroid injections into scar tissue, silicone ointment application to scar tissue, and perineal massage can all be considered and attempted before the decision is made to return to the operating room. Patient comfort with dilation should be optimized to prevent stenosis recurrence. If they are experiencing pain or spasms (which, notably, can be associated with a history of sexual trauma), this can lead them to stop dilation. Pelvic therapy should also be considered for patients who may be struggling with dilation.

Patients should be thoroughly evaluated to ensure they are an appropriate candidate for revision surgery. All factors, including medical, social, and psychological, must be assessed and optimized to prevent stenosis from re-occurring. Thorough discussion with patients who need revision or who present with complications should include social factors like their support system, daily schedule, and ability to care for themselves and their neovagina. Dilation compliance is essential prior to correction of stenosis. There may be an organic component that predisposes some people to develop fibrosis and stenosis more than others, which could, in turn, contribute to the relatively high re-stenosis rate reported here. Nonetheless, behavioral factors should be considered when counseling a patient about revision, as the priority is to ensure success for all involved. The patient's history of follow-up with their multidisciplinary healthcare team should be considered, as should be the stability of any known psychiatric issues [depression, attention-deficit hyperactivity disorder (ADHD), medication regimens, etc.]. Notable comorbidities associated with further postoperative complications in this study include human immunodeficiency virus (HIV)

infection and depression, which may compromise intrinsic wound healing ability and compliance with postoperative instructions, respectively. There is no substitute for strong multidisciplinary patient support and astute surgical candidate selection, though technique optimization is also necessary for every surgeon in the management of complications.

Looking forward, we further ask what other graft materials may be useful in this situation. Other literature has reported the use of acellular dermal matrix, placental tissue, tilapia skin and other allograft materials in vaginoplasty (15-18), though the limited availability, limited data and higher cost of these materials may preclude their integration into current routine practice. It is even possible that engineered tissue with lab-grown vaginal mucosa or other autologous cells seeded onto acellular matrix may eventually replace autologous tissue grafts.

The technique reported in this study is a viable addition to the list of options the surgeon can consider when evaluating a patient for revision vaginoplasty. Patients should be adequately counseled about the benefits and disadvantages of various revision options and referred elsewhere if the surgeon is unable to accommodate the patient's preference after an in-depth discussion. The surgeon should consider their operative experience, operating room team, institutional and local resources and, most importantly, the individual patient's circumstances when deciding how to proceed.

We echo the sentiments of Salibian *et al.* that "*the ideal neovaginal lining should be a moist, distensible, hairless epithelium with a donor site that is sufficient to resurface the neovagina and results in minimal morbidity*" (19). With promising innovations in tissue engineering and surgical materials, and new research emerging to educate clinicians about novel approaches to common and frustrating surgical problems, we look forward to seeing the field of gender-affirming genital surgery closer to that ideal each day.

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