

# Experience With Neovaginal Construction Using the Full-Thickness Skin Graft in Vaginal Agenesis

Selçuk Akın, MD

**Abstract:** The correction of vaginal agenesis requires the creation of a neovaginal cavity that is dissected between the bladder and the rectum. To protect the length of the cavity, it is necessary to ensure the complete epithelialization of the apex of the neovaginal cavity. The author prefers to tailor 2 pieces of full-thickness skin grafts longitudinally on a vaginal stent that is molded into bullet shape. Six girls with vaginal agenesis underwent neovaginal construction using this method. The apex of the neovaginal cavity was perfectly epithelialized using this vaginal stent. The length of the neovaginal cavity that is dissected during the operation was protected. The follow-up period ranged from 24 to 93 months (median, 57.2 months). Postoperative stricture or contracture of the neovagina did not occur in all patients. As a result, full-thickness skin graft is an efficient method for vaginal construction in patients with vaginal agenesis.

**Key Words:** vaginal agenesis, full thickness skin graft, vaginal stent, neovaginal construction

(*Ann Plast Surg* 2004;52: 391–396)

Vaginal agenesis involves congenital absence of the vagina, uterus, and cervix.<sup>1,2</sup> However, the ovaries are normal and there is normal cyclic ovarian function as reflected by circulating hormone levels and ovulation. Therefore, secondary sexual characteristics and female body habitus develop normally.<sup>1–3</sup> These patients present at the age of puberty or later because of amenorrhea or failure to achieve intercourse.<sup>3,4</sup> There is a functioning uterus in less than 10% of the patients with vaginal agenesis. These patients also present with hematometra, hematocolpos at the age of puberty, monthly episodes of abdominal pain, and an increasing

abdominal mass resulting from the accumulation of menstrual products.<sup>3</sup>

Congenital absence of the vagina is the main indication for vaginal construction. Many different methods have been described.<sup>1–25</sup> These methods are the flap technique, the bowel loop technique, and the skin graft technique. The skin graft technique was first described for use in the vagina by Abbe in 1898. Sadove and Horton<sup>5</sup> reported that McIndoe achieved excellent results with split-thickness skin grafts inverted over a stent in the 1930s. Hage and Karim<sup>24</sup> reported that Burian applied a full-thickness skin graft obtained from the medial thigh to reconstruct vaginal agenesis in 1926. Sadove and Horton<sup>5</sup> reported the use of full-thickness skin grafts obtained from the hairless lateral groin area in 1988.

The skin graft methods are simple surgical techniques and are still the most commonly used.<sup>1,2,5,13,15,24,25</sup> However, the split-thickness skin graft method can lead to neovaginal stenosis, contracture, and foreshortening after surgery. It requires stenting for as long as 1 year.<sup>2,13,15</sup> The full-thickness skin graft method does not lead to neovaginal contracture and stenosis, and does not require prolonged stenting or care.<sup>1,5,24,25</sup> Although the full-thickness skin graft method is accepted extensively for neovaginal construction, there are few articles about this method in the literature.<sup>1,5</sup> This report describes using 2 pieces of full-thickness skin grafts molded longitudinally on a stent that is bullet shaped to construct the neovagina. Six patients with vaginal agenesis were operated for neovagina construction using this method.

## MATERIALS AND METHODS

### Operative Technique

A full preoperative bowel preparation was used. Under general anesthesia with the patient in the lithotomy position, a Foley catheter was placed in the bladder to avoid urethral injury during the dissection. First, a triangular-shape inferiorly based flap 3 × 4 cm in size was harvested from introitus mucosa (Fig. 1). A blunt dissection between the bladder and rectum was carried out to form a neovaginal cavity toward the peritoneal sac. Hemostasis of the neovaginal cavity, created approximately 11 to 12 cm in length, was conducted carefully. In the patients whose uterus and cervix were normal,

Received July 15, 2003, and accepted for publication, after revision, August 27, 2003.

From the Department of Plastic and Reconstructive Surgery, Medical Faculty of Uludağ University, Bursa, Turkey.

Reprints: Dr. Selçuk Akın, Uludağ Üniversitesi Tıp Fakültesi, Plastik ve Rekonstrüktif Cerrahi, Anabilim Dalı 16059, Görükle, Bursa, Turkey.

E-mail: sakin@uludag.edu.tr

Copyright © 2004 by Lippincott Williams & Wilkins

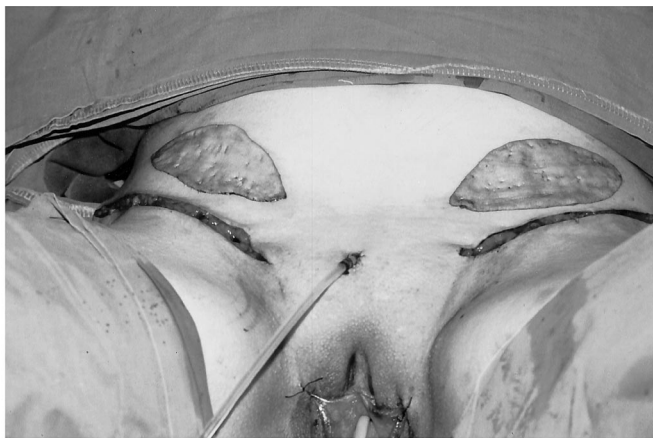
ISSN: 0148-7043/04/5204-0391

DOI: 10.1097/01.sap.0000099707.45860.d7

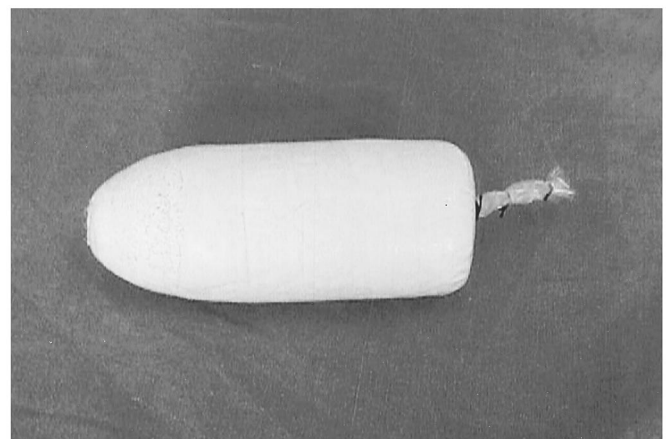


**FIGURE 1.** A triangular-shaped inferiorly based flap designed at the introitus mucosa.

the cavity was 9 to 10 cm in length. Afterward, full-thickness skin grafts (7 cm wide and 15 cm long) were harvested elliptically from both hairless groin areas (Fig. 2). The extra fat was removed from the undersurface of the skin grafts. The donor sites were closed primarily. A 10.5-cm-long and 4.5-cm-diameter vaginal stent made from elastic bandage (11 × 6-cm bandage) was molded into a bullet shape and was placed in a condom (Fig. 3). The end of the condom was ligated. Two pieces full-thickness skin grafts were draped longitudinally inside-out on the vaginal stent and were sutured together using continuous 4–0 chromic catgut sutures. The distal end of the vaginal stent was covered with the skin grafts but the proximal end of the vaginal stent was left open. The harvested triangular flap of introitus mucosa was turned inward into the neovaginal cavity and was sutured as cephalad as possible. The skin graft-covered stent was inserted meticulously into the neovaginal cavity. The free edges of the skin grafts were sutured to the vaginal mucosa and the triangular flap with 4–0 chromic catgut sutures. The labia minores were sutured together to secure the skin grafts and the vaginal stent in position. The Foley catheter was then removed. Suprapubic urinary drainage was used instead of urethral catheter drainage because of pressure necrosis of the urethra resulting from the vaginal stent pressing on the urethral catheter. A soft gauze dressing was put over the external genital area. After 10 days of bed rest, the vaginal stent was removed in the operating room with the patient under general anesthesia. The neovaginal cavity was cleaned and irrigated. The full-thickness skin grafts were inspected. A new vaginal stent made in the previously mentioned fashion was placed in the neovaginal cavity. The labia minores were not resutured. Patients were discharged on the following day. After examination at the outpatient clinic, the patients were given instructions regarding vaginal stent removal and daily irrigation of the neovaginal cavity with a vaginal douche. The



**FIGURE 2.** Elliptical full-thickness skin grafts harvested from both groin areas.



**FIGURE 3.** A 10.5-cm-long and 4.5-cm-diameter vaginal stent made from an elastic bandage is molded into a bullet shape and is then placed in a condom.

**TABLE 1.** Patient Characteristics

Patient No.	Age, y	Uterus	Follow-up, mo	Marital Status	Stenosis or Contracture	Neovaginal Depth, cm	Neovaginal Width, cm
1	38	—	93	Married	None	10.4	5.2
2	23	—	66	Married	None	10.1	4.9
3	14	+	65	Single	None	10	4.4
4	21	—	59	Married	None	10.3	4.7
5	14	+	36	Single	None	9.8	4.4
6	25	—	24	Married	None	10.2	5.0

+, present; —, absent.

vaginal stent was kept in place all day for the first 3 months and at night only for the second 3 months. Complete removal of the vaginal stent was suggested 6 months after surgery.

### Patients

From September 1995 to June 2001, 6 girls with vaginal agenesis underwent neovaginal reconstruction using the full-thickness skin graft method (Table 1). Their age at the time of surgery ranged from 14 to 38 years (average age, 22.5 years). On examination, their body habitus was for a normal woman except for absence of the vagina. There was a small vaginal dimple where the introitus should be. Endocrine tests and chromosome studies were normal. Four patients experienced primary amenorrhea. Their abdominal ultrasonography revealed no abnormality in the urinary system other than the absence of a uterus, tubes, and vagina. Two 14-year-old patients had serious pelvic pain associated with cyclic recrudescence. These patients presented with hematometra and hematosalpinx. One of the 2 patients had normal ovaries, tubes, and uterus. The other patient had duplication of the uterus. In these patients, the neovagina was connected with a functioning uterus. These patients also had no abnormality in the urinary system.

### RESULTS

The follow-up period ranged from 24 to 93 months (median, 57.2 months). Neither graft loss nor fistula formation was noted in all patients. No infections related to neovaginal construction were seen during the early and late postoperative periods. Postoperative stricture or contracture of the neovagina did not occur in all patients (Fig. 4). Of the 6 patients, 4 were sexually active, 2 were married, and 2 had been previously married. The other 2 patients were young and unmarried, and had no regular sexual partner. The 4 patients who were married had a satisfactory sex life. During the postoperative examination, all patients had normal-appearing external genitalia with a sufficient neovaginal depth and width (Fig. 5A). The neovaginas were fully dilated with a vaginal speculum (Fig. 5B). The neovaginal depth ranged from 9.8 to 10.4 cm (average, 10.1 cm). The neovaginal width ranged from 4.4 to 5.2 cm (average, 4.8 cm). The

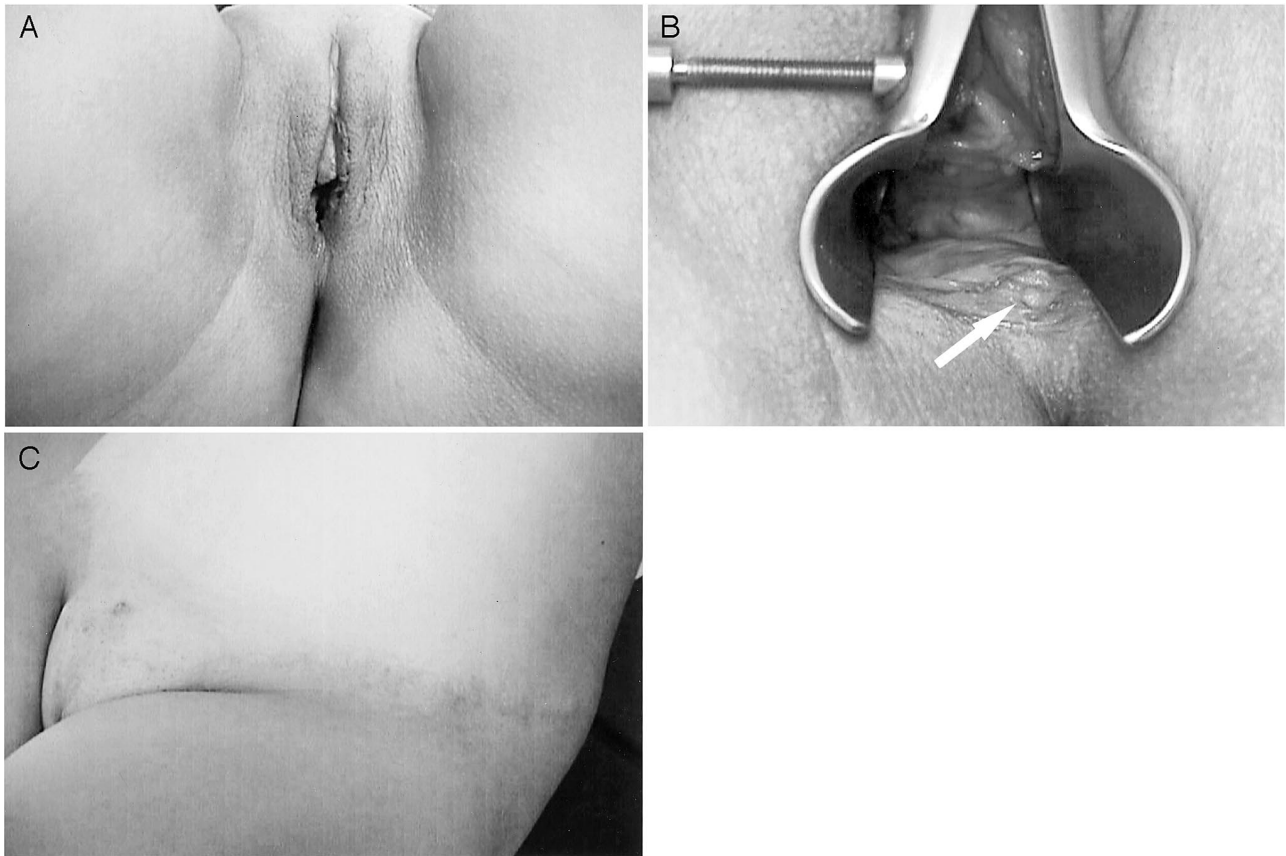


**FIGURE 4.** Postoperative appearance of the wall of the neovaginal cavity at 66 months after surgery (Patient 2).

neovagina was dry 4 to 5 months after surgery, so we recommended the application of boric Vaseline before sexual intercourse. At the 6-month postoperative examination the patients had sufficient vaginal lubrication for intercourse. The linear groin scars were relatively well-accepted by the patient (Fig. 5C). All patients were pleased with their neovaginal construction. In the patient with the duplicated uterus, 1 of the 2 uteruses was removed. This patient is now menstruating regularly. The patient with a normal uterus underwent hysterectomy because of infection.

### DISCUSSION

The correction of vaginal agenesis requires the creation of a cavity that is dissected between the bladder and the rectum. This cavity is usually created at 10 to 12 cm in length and 4 to 5 cm in diameter.<sup>1,2,17,22,23</sup> To line the cavity, fasciocutaneous, musculocutaneous, and bowel flaps, and skin grafts have been used in the literature.<sup>1-25</sup> If flaps are used to line the cavity, they fill the neovaginal cavity and make the neovaginal cavity narrower because of their bulkiness. In terms of sexual satisfaction, the patient who is



**FIGURE 5.** Postoperative appearance of the neovagina 24 months after surgery (Patient 6). (A) Appearance of the neovagina. The full-thickness skin graft technique does not lead to any damage at the perineal area. (B) The neovaginal cavity can be fully dilated with a vaginal speculum. The depth of the neovaginal cavity was 10.2 cm. The arrow shows the triangular flap. (C) The donor site scar was well accepted.

operated with flaps may not achieve successful intercourse because the length and diameter of the cavity are reduced. Musculocutaneous and fasciocutaneous flaps are best reserved for vaginal reconstruction after ablative surgical treatment or secondary vaginal obliteration.<sup>8,10,12,14,20</sup> Besides, the complexity of surgery and the unsightly, conspicuous donor site scar are disadvantages.<sup>1</sup> Bowel flaps, however, bear the advantage of a mucosal lining.<sup>1,4,9,16,17,18,21</sup> However, the need for laparotomy, the morbidity of intestinal surgery, and the persistent, unpleasant secretion and odor with possible mucosal cracking at the time of intercourse are disadvantages.<sup>1</sup> Mucorrhea occurs with the use of all types of bowel except rectosigmoid.

Skin grafts ensure a very thin lining for the cavity. They do not fill the cavity and do not alter the length and diameter of the cavity dissected during the operation. However, split-thickness skin grafts can lead to a reduction in the size of the neovaginal cavity during the contractile phase of healing.<sup>1,5,9,24,25</sup> For this reason, the split-thickness skin graft tech-

nique requires continuously wear of the vaginal stent for many months to prevent contracture and stenosis of the neovagina. Its donor site can also be unacceptable because of pigmented, irregular, hypertrophic scars. Besides, in this technique, the patient is operated just before marriage so that the neovagina is dilated regularly with sexual intercourse.<sup>2,15,20</sup>

Full-thickness skin grafts show less tendency to contract than split-thickness skin grafts during the contractile phase of healing.<sup>26</sup> In addition, they grow successfully in children, whereas the growth of split-thickness skin grafts may be limited.<sup>26</sup> Therefore, the full-thickness skin graft technique allows vaginal construction at an earlier age because of reduced stenosis rates in the absence of consistent sexual intercourse.<sup>1,5</sup> This technique helps to relieve the psychological problem of the patients. Its donor site is also much more aesthetically acceptable than split-thickness donor sites of the thigh or buttocks.<sup>1,3,5,24,25</sup> Sebaceous and sweat glands are more preserved in full-thickness than in split-thickness skin grafts.<sup>26</sup> Lubrication of the neovagina that

is constructed with a full-thickness skin graft can be obtained with secretion of the sebaceous and sweat glands within 4 to 5 months postoperatively.<sup>26</sup> Therefore, lubrication before intercourse may be unnecessary a few months after surgery. In neovaginal construction, the full-thickness skin graft technique has the following advantages:

1. It is a simple surgical technique.
2. The technique does not include laparotomy and intestinal surgery.
3. It has very low morbidity and no mortality.
4. It allows neovaginal construction at an earlier age (13–14 years) because the full-thickness skin graft can grow with the patient.
5. It does not disturb the perineal area and it creates a normal-appearing vaginal vault.
6. The anatomic site of the neovagina is in the correct orientation.
7. It requires only short-term stenting (3–6 months).
8. It has the good donor area cosmesis.
9. It has a lower risk of neovaginal stenosis and contracture.
10. It ensures satisfactory sexual intercourse.<sup>1,3,5,24,25</sup>

Vaginal stenosis or foreshortening after surgery can lead to dyspareunia or failure to achieve sexual intercourse.<sup>25</sup> Dyspareunia from vaginal stenosis is a very distressing problem for a couple.<sup>2,17</sup> Hensle and Reiley<sup>17</sup> reported that De Souza et al stated a 100% incidence of dyspareunia in patients in whom the neovagina was less than 6 cm in length. If the depth and width of the neovaginal cavity are approximately 10 cm and 5 cm respectively after surgery, it may offer the possibility of normal intercourse. The full-thickness skin graft technique provides this criteria. To protect the depth of the cavity, complete epithelialization of the apex of the neovaginal cavity is necessary. The dissected neovaginal cavity is conical. If the distal end of the vaginal stent is flat, this stent does not fill the apex of the cavity. The apex of the neovaginal cavity is then closed because of the lack of epithelialization. Thus, the neovaginal cavity is foreshortened. For this reason we made the distal end of the vaginal stent into a bullet shape. This vaginal stent completely fills the apex of the neovaginal cavity. If 2 pieces of full-thickness skin grafts are displayed longitudinally on the stent, the distal end of the stent is covered with grafts. Thus, the apex of the neovaginal cavity is perfectly epithelialized. We prevented foreshortening of the neovaginal cavity with this method. After surgery, all patients protected the depth of their neovaginal cavities. Orifice stenosis is also important in neovagina construction.<sup>25</sup> The stenosis occurs in the circle between skin graft and normal skin. This stenosis may be prevented by a triangular flap that is harvested from introitus mucosa.<sup>5</sup> The triangular flap is applied easily using the full-thickness skin graft technique. In addition, the full-thickness skin graft is

best connected with a functioning uterus. The cervical canal is not obliterated.

These postoperative results indicate that the patients had no complaints during sexual intercourse. The patients had an adequate-size neovaginal cavity that could admit 2 fingers. The size of the neovaginal cavity remained the same during follow-up periods. In conclusion, the full-thickness skin graft is an efficient method for vaginal construction in patients with vaginal agenesis.

## REFERENCES

1. Chen Y-BT, Cheng T-J, Lin H-H, et al. Spatial W-plasty full-thickness skin graft for neovaginal reconstruction. *Plast Reconstr Surg*. 1994;94:727–731.
2. Alessandrescu D, Peltecu GC, Buhimschi CS, et al. Neocolpopoiesis with split-thickness skin graft as a surgical treatment of vaginal agenesis: retrospective review of 201 cases. *Am J Obstet Gynecol*. 1996;175:131–138.
3. Laub DR, Laub Jr DR. Müllerian and ectodermal vaginal agenesis. In: Smith JW, Aston SJ, eds. *Plastic Surgery*. Boston: Little, Brown and Co; 1991:1375–1392.
4. Sakurai H, Nozaki M, Sasaki K, et al. The use of free jejunal autograft for the treatment of vaginal agenesis: surgical methods and long-term results. *Br J Plast Surg*. 2000;53:319–323.
5. Sadove RC, Horton CE. Utilizing full-thickness skin grafts for vaginal reconstruction. *Clin Plast Surg*. 1988;15:443–448.
6. Moschella F, Cordove A. Vaginal reconstruction with bilateral island “extended” groin flaps: description of a personal technique. *Plast Reconstr Surg*. 1994;94:1079–1084.
7. Kusiak JF, Rosenblum NG. Neovaginal reconstruction after exenteration using an omental flap and split-thickness skin graft. *Plast Reconstr Surg*. 1996;97:775–781.
8. Woods JE, Alter G, Meland B, et al. Experience with vaginal reconstruction utilizing the modified Singapore flap. *Plast Reconstr Surg*. 1992;90:270–274.
9. Ghosh TS, Kwawukume EY. Construction of an artificial vagina with sigmoid colon in vaginal agenesis. *Int J Gynecol Obstet*. 1994;45:41–45.
10. Yii NW, Niranjana NS. Lotus petal flaps in vulvo-vaginal reconstruction. *Br J Plast Surg*. 1996;49:547–554.
11. Sheldon CA, Gilbert A, Lewis AG. Vaginal reconstruction: critical technical principles. *J Urol*. 1994;152:190–195.
12. Hagerty RC, Vaughn TR, Lutz MH. The perineal artery axial flap in reconstruction of the vagina. *Plast Reconstr Surg*. 1989;82:344–345.
13. Roberts CP, Haber MJ, Rock JA. Vaginal creation for Müllerian agenesis. *Am J Obstet Gynecol*. 2001;185:1349–1353.
14. Wang T-N, Whetzel T, Mathes SJ, et al. A fasciocutaneous flap for vaginal and perineal reconstruction. *Plast Reconstr Surg*. 1987;80:95–102.
15. Buss JG, Lee RA. McIndoe procedure for vaginal agenesis: results and complications. *Mayo Clin Proc*. 1989;64:758–761.
16. Novak F, Kos L, Plesko F. The advantages of the artificial vagina derived from sigmoid colon. *Acta Obstet Gynecol Scand*. 1978;57:95–96.
17. Hensle TW, Reiley EA. Vaginal replacement in children and young adults. *J Urol*. 1998;159:1035–1038.
18. Lemberger RJ, Bishop MC. Neovaginoplasty using rectosigmoid colon on a superior rectal artery pedicle. *BJU International*. 2001;87:269–272.
19. Warwick RT, Kirby RS. The construction and reconstruction of the vagina with the colocecum. *Surg Gynecol Obstet*. 1990;170:132–136.
20. Tolhurst DE, Vander Helm TWJS. The treatment of vaginal atresia. *Surg Gynecol Obstet*. 1991;172:407–414.
21. Radhakrishnan J. Colon interposition vaginoplasty: a modification of the Wagner-Baldwin technique. *J Pediatr Surg*. 1987;22:1175–1176.
22. O’Brien B, McC, Mellow CG, MacIsaac IA, et al. Treatment of vaginal agenesis with a new vulvovaginoplasty. *Plast Reconstr Surg*. 1990;85:942–948.
23. Okada E, Iwahira Y, Maruyama Y. Treatment of vaginal agenesis with

- an expanded vulval flap. *Plast Reconstr Surg.* 1996;98:530–533.
24. Hage JJ, Karim RB. Abdominoplastic secondary full-thickness skin graft vaginoplasty for male-to-female transsexuals. *Plast Reconstr Surg.* 1998;101:1512–1515.
25. Morley GW, DeLancey JOL. Full-thickness skin graft vaginoplasty for treatment of the stenotic or foreshortened vagina. *Obstet Gynecol.* 1991;77:485–489.
26. Rudolph R, Ballantyne Jr DL. Skin grafts. In: McCarthy JG, May Jr JW, Littler JW, eds. *Plastic Surgery*. Philadelphia: WB Saunders; 1990:221–274.