Simultaneous Bilateral Breast Reconstruction With Superior Gluteal Artery Perforator (SGAP) Flaps

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Abstract: The superior gluteal artery perforator (SGAP) flap is a useful technique for restoration of the breast after mastectomy. If appropriately planned, the soft-tissue envelope supplied by the superior gluteal artery perforator vessels can be harvested with minimal donor site morbidity and often results in a highly esthetic restoration of the breasts. Dissection of the flap is performed with complete preservation of gluteus maximus muscle function. The resulting vascular pedicle obtained via dissection through the muscle is longer than that of gluteal musculocutaneous flaps and affords the surgeon the luxury of avoiding vein grafts in the anastomotic phase of surgery.

Despite these advantages, use of the SGAP flap is not popular among reconstructive surgeons. Many practitioners are not familiar with the vascular anatomy of the gluteal area and may not be comfortable with the dissection of the parent vessels or lack the desire to practice microsurgery. On the other hand, our group has reported the largest experience to date with this method of breast reconstruction and has found the SGAP flap to be a reliable and safe method of autologous breast restoration in unilateral absence of the breast. Although the indications to perform single-stage gluteal tissue transplantation for bilateral breast restoration are uncommon, they do occasionally arise in clinical practice. We have carried out concurrent bilateral breast reconstruction using SGAP flaps on 6 patients with acceptable overall morbidity. All flaps went on to survive and resulted in highly esthetic restorations of the breast. Though a challenging undertaking, in-unison transfer of bilateral SGAP flaps serves as a useful option for a subset of patients desiring 1-stage bilateral breast reconstruction.

Key Words: breast reconstruction, gluteal, perforator, bilateral

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While Fujino et al[1] were the first to introduce gluteal tissue for breast reconstruction, it was Shaw[2] and Codner and Nahai[3] who championed use of gluteal flaps for breast restoration. The motivation for these techniques was the desire to provide reconstructive options in patients requesting breast restoration when the abdomen was not available. Additionally, our group has advocated use of gluteal tissue as a first-line alternative when abdominal tissue is insufficient or not available because of previous surgery.[4,5] Our preferred method of harvesting this skin–soft tissue envelope is by dissection of perforating arterial branches of the superior gluteal artery.[4] The SGAP flap is nourished by these perforating vessels and can be harvested with the preservation of the underlying musculature and its function. Previous to the description of gluteal perforator flaps, transfer of gluteal tissue was complicated by short pedicles and the necessity for vein grafts, which are associated with higher vascular complications.[2,3] In a recently reported series of 142 gluteal artery perforator (GAP) flaps, 98% of the flaps survived, the vascular thrombosis rate was 5.6%, and no vein grafts were used.[6] Vascular anastomosis was made simpler by the longer pedicles produced with GAP flaps. A small subset of patients has been encountered in our clinical practice requiring bilateral procedures that do not have substantial donor tissues in the abdominal or thoracic regions. Traditionally, these patients would have been managed with implants or a combination of implant with flaps. Based on our previous success with SGAP flaps in unilateral cases, we applied the technique for bilateral breast reconstruction on 6 patients over a 9-year period. All 12 flaps went on to survive, while the overall morbidity for the series was within accepted standards. We detail our experience with the gluteal region as a reliable source of donor tissue for simultaneous bilateral breast reconstruction.

PATIENTS AND METHODS

All patients who underwent breast reconstruction with gluteal artery perforator (GAP) flaps between February 1993 and November 2003 were included for this investigation. A total of 228 patient charts were analyzed. The last 100

TABLE 1. Patient and Flap Data

	Age	OR Time, h	First Flap Ischemia Time, min	Second Flap Ischemia Time, min	Timing	Concurrent Surgery	EBL, mL
1	46	12	58	77	Immediate	Mastectomies	500
2	41	10	56	74	Delayed	Failed implants	450
3	46	9	52	82	Delayed	Failed implants	400
4	34	9	54	70	Delayed	No	300
5	33	8.5	46	64	Delayed	No	300
6	45	8.5	48	65	Delayed	Failed implants	400

patients were studied prospectively. We selected a subgroup of patients undergoing simultaneous bilateral breast reconstruction with the SGAP flaps for this study (Table 1). Six patients (12 flaps) had bilateral reconstruction performed by the senior author (R.J.A.). The goal was to analyze the series for operative time, length of stay, flap weight, flap size, blood loss, transfusion requirements, and return to the operating suite, fat and/or flap necrosis, and overall flap survival.

Flap Design

Markings are placed on the patient in the operative position. The posterior superior iliac spine is palpated and marked, as is the greater trochanter.[4] A line is drawn connecting these 2 points. The artery emerges from the edge of the sacrum about one third the distance from the posterior iliac spine along the previously marked line. Perforators may be identified along this line on the buttock with a Doppler ultrasound probe. The orientation of the flap can vary from angled down along the line or perpendicular to the line. Oblique incisions are associated with contour deformity. A horizontal design produces a more favorable scar (Figs. 1 and 2).[6] Skin flap design may be customized to almost any orientation as long as the outline contains a perforator. It should be noted that perforators positioned laterally from the flap's long axis will produce longer pedicles. The average flap width has been 10 cm, but up to 12 cm maybe closed in this area without undue tension. The flap length is usually between 24 and 26 cm.

Technique

The pertinent anatomy of this flap has been reviewed elsewhere in great detail.[7] The traditional method of harvesting the SGAP flap in unilateral cases involves placing the patient in the decubitus position.[4] Two teams of surgeons prepare the recipient and donor sites simultaneously with the microvascular anastomosis and flap insetting occurring in the supine position. In contradistinction, bilateral reconstructions mandate prone patient positioning to allow for simultaneous flap harvest. However, the recipient vessels must be prepared first; therefore, surgery begins with the patient in the supine position. The chest is prepped and draped, and after the extirpative portion of surgery is complete, the internal mammary vessels are exposed and prepared for anastomosis. A moist gauze sponge is placed in the wounds and the skin is temporarily closed with a stapling device. The wounds are protected with a sterile dressing and the patient is turned to the prone position. Two teams work simultaneously and have adequate room on opposite sides of the operating room table. Flap dissection is begun laterally over the tensor fascia lata muscle, so dissection proceeds rapidly. The gluteal muscle fascia is identified and elevated. This makes visualization of

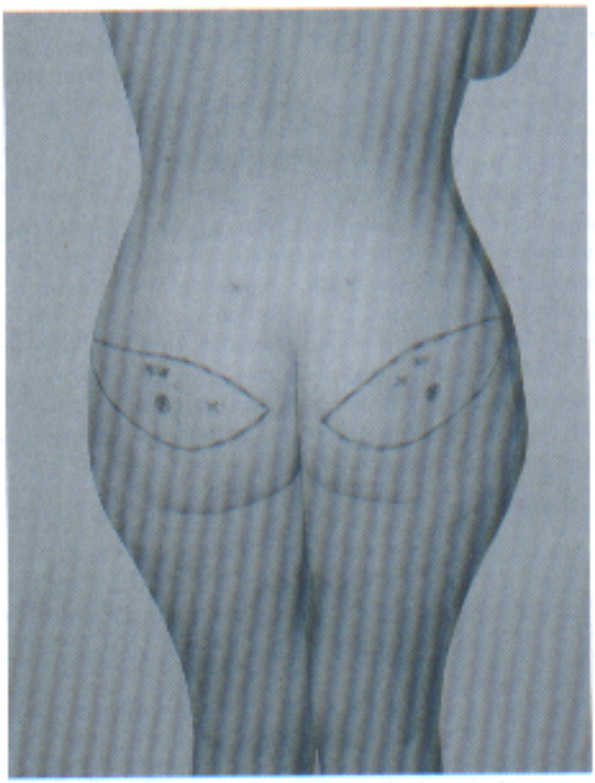

FIGURE 1. Preoperative view of the donor site for simultaneous bilateral GAP flaps in a 32-year-old patient with a BRCA-I gene mutation. The horizontal design is preferred because it leads to fewer problems with contour deformity.

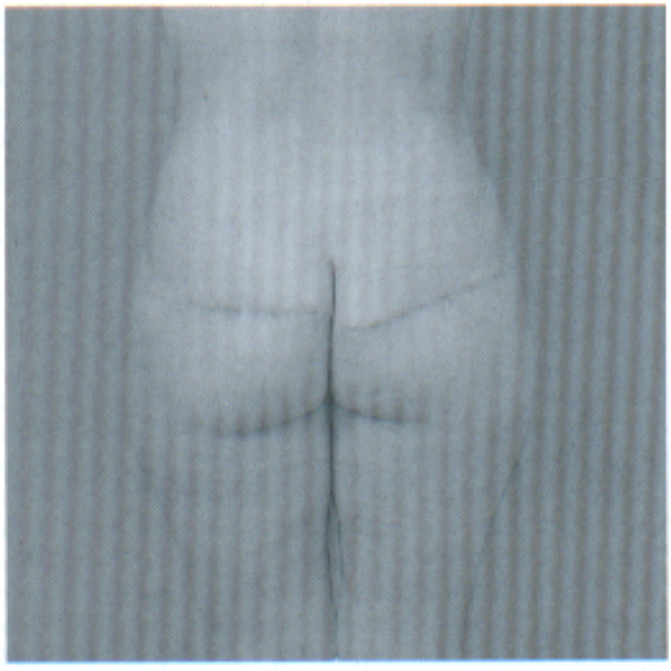

FIGURE 2. One-year postoperative view of the same patient demonstrating a smooth contour at the donor site.

the perforators easier. When the fascicles of the gluteus muscle are encountered, dissection proceeds carefully, incising the perimysium as it inserts into the overlying fascia. A perforator measuring 1 mm is chosen to nourish the flap and followed through the fascia. Occasionally, a second large perforator can be found as dissection proceeds medially. It can be included if it easily joins the first perforator.

Dissection proceeds towards the sacral fascia. Once the fascia is encountered, it is opened to reveal a fatty subfascial recess, containing multiple communicating venous branches. Dissection becomes delicate in an effort to ligate the multitude of branches. Dissection continues until the superior gluteal artery and vein are reached. The pedicle length at this time is usually between 8 and 12 cm. The superior gluteal vein at this level is invariably large enough in diameter to perform microvascular anastomosis without difficulty. However, the determining factor in ending this dissection will be the diameter of the gluteal artery. Once the artery diameter reaches 2 mm or greater, the flap is harvested. The assistant carefully supports the flap while dissection proceeds. The insertion of the pedicle into the flap is delicate, and care in handling is a must in order not to avulse this vessel. Once the flap is passed off the field, the wound is further undermined at the level of the gluteus muscle and closed in multiple layers. A large suction drain is left in the defect to prevent postoperative seroma. This is supplemented with a surgical girdle, which is worn for 2 weeks. At this point, the patient is repositioned supine and the previously dissected recipient vessels are exposed. The microvascular anastomosis is done in the usual fashion, often using the coupler device for the venous anastomosis. For bilateral breast reconstruction, we have used contact surface cooling to avoid ischemia-related complications.[8] We prefer the internal mammary vessels as the recipient vessels of choice for our reconstructions. The vessel match at this level is very good, and the increase in pedicle length allows plenty of room to perform a comfortable anastomosis and increased flexibility in shaping the breast flap.

RESULTS

The average age of this patient population was 41 years. The flap survival rate was 100%. One patient returned to surgery to correct a venous thrombosis with associated hematoma. This patient had delayed healing (>6 weeks) at the inferior part of the breast wound, but the flap was salvaged. The overall complication rate was 33%. One patient developed breast wound dehiscence, which responded to conservative dressing changes. All the patients received 1 unit of autologous blood during surgery. The average blood loss was 392 milliliters. One patient was reconstructed immediately (Fig. 3) after bilateral mastectomy, while the other 5 were done on a delayed basis. Two of the 5 cases required bilateral implant removal and capsulectomies concurrent with reconstruction. Two other patients had not been reconstructed. The last patient had undergone prophylactic mastectomies with implant reconstruction. She developed severe capsule contractures. She had undergone implant removal and capsulectomies elsewhere before coming to our clinic. Two patients received preoperative radiation to the involved breast. The average operating time was 9.5 hours. The first 3 cases averaged 10.3 hours and the last 3 averaged 8.7.

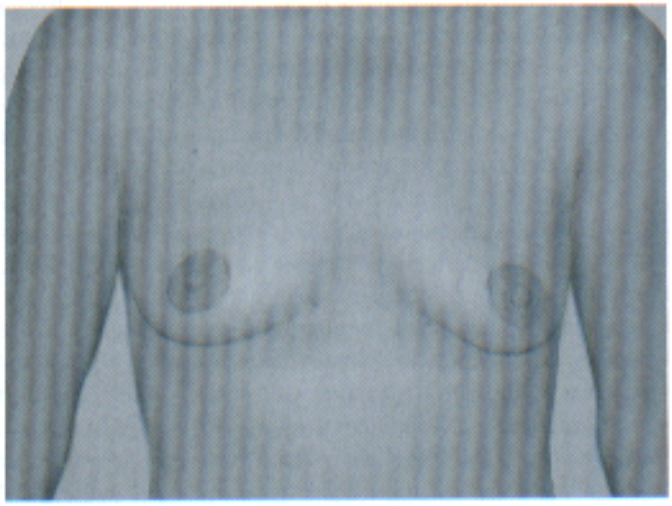

FIGURE 3. Preoperative view of the same patient prior to prophylactic mastectomies.

DISCUSSION

Few series exists specifically dedicated to bilateral breast reconstruction with autologous tissues performed in a single stage.[9–14] In this situation, reconstruction has been commonly performed using the abdomen as a donor site.[9–12] However, substitute donor sites may be required in up to 20% of the postmastectomy population when the abdomen is not available.[2] Implants and expanders are an attractive option in bilateral cases, but autologous tissues provide long-lasting, natural-appearing, and highly esthetic restorations of the breasts.[15] Additionally, implants are associated with inherent complications and limitations.[16,17] For that reason, surgeons turned to the thoracic region when abdominal tissues have not been available.[13,14,18] However, routine use of the latissimus dorsi musculocutaneous flaps is limited by technical factors associated with patient positioning. Recently, modifications in patient positioning have been suggested that allow simultaneous flap harvest and lead to decreased operative times with this procedure.[13] Regardless, use of the latissimus dorsi flap frequently necessitates implants for volume augmentation unless an extended version of the flap is used. A recent review of extended latissimus dorsi flaps demonstrated complication rates on the order of 28% and 38.7% for the breast flap and donor sites.[18] Most of the patients in that study were high-risk individuals, with obesity being a major risk factor for the development of complications. On the other hand, the subset of patients which requires gluteal tissue transplantation is usually made up of thin individuals that do not store significant amounts of fat in the abdomen or thoracic areas.[6] In our series, 2 of 6 (33%) patients experienced major complications. One patient returned to the operating suite for venous thrombosis and hematoma in a breast flap. The flap was salvaged. No arterial thrombosis occurred in this series, and vein grafts were not used. The patient that experienced venous thrombosis suffered a delay in healing at the inferior border of the breast flap. A second patient suffered a wound dehiscence, both responded to conservative wound dressing treatments. No major contour irregularities or seroma formation was seen at the donor site. Two patients underwent minor dog-ear revisions at the time of nipple reconstruction.

Transfer of gluteal tissue to the breast requires microvascular skills and experience. This makes SGAP flaps technically more challenging than pedicled abdominal or thoracic flaps and contributes to their lack of popularity. Additionally, many practitioners lack familiarity with this region or are unaware of this potential donor site. However, the gluteal area is a ubiquitous donor site with good volume, tissue of firm consistency that facilitates shaping of the breast mound, and which has the potential for sensory reinnervation.[19] Our data indicate that bilateral breast reconstruction with SGAP flaps is possible within a reasonable amount of time and low morbidity. In this series, the average operative time was 9.5 hours. Blondeel[19] experienced operative times averaging 11.6 hours with bilateral SGAP flaps for breast reconstruction (4 cases). He stated that ischemic times for his series of 20 sensate SGAP flaps averaged 57.6 minutes but did not specify ischemic time differences between unilateral and bilateral reconstructions and those between the first and second flap in bilateral cases.[19] For our series, the average ischemic time for the first flap was 52 minutes (range, 46–58), while average ischemic time for the second flap was 72 minutes (range 64–82). We did not experience delays in reestablishing flow in our flaps, but as a precaution we recommend contact surface cooling for the second SGAP flap.[8] This technique for prolonging ischemic times has been found to be safe and reliable in free-flap surgery.[8] We agree with Blondeel[19] that change in position from supine to prone and then back to supine, as well as the time spent prepping the patient with each turn, is a major contributor to operative times. In a recently reported series of bilateral deep inferior epigastric perforator flaps, the operative times were 7.3 hours.[20] Similar series on free and pedicled transverse rectus abdominus musculocutaneous flaps reported operative times of 8.6 and 9.6 hours, respectively.[20,21] Our first 2 cases averaged 10.5 hours, while the last 2 averaged 8.7 hours. Operative times were reduced by 17% as our experience grew with the procedure. Use of dual teams and increased coordination with anesthesia and support staff to facilitate turning and prepping of the patient has helped to reduce operative times as well. Use of the internal mammary vessels has become routine. These vessels are exposed after mastectomy or implant removal and before any flap dissection are performed. In our experience, exposure of these vessels is less time consuming than exposure of the thoracodorsal pedicle. Vascular couplers

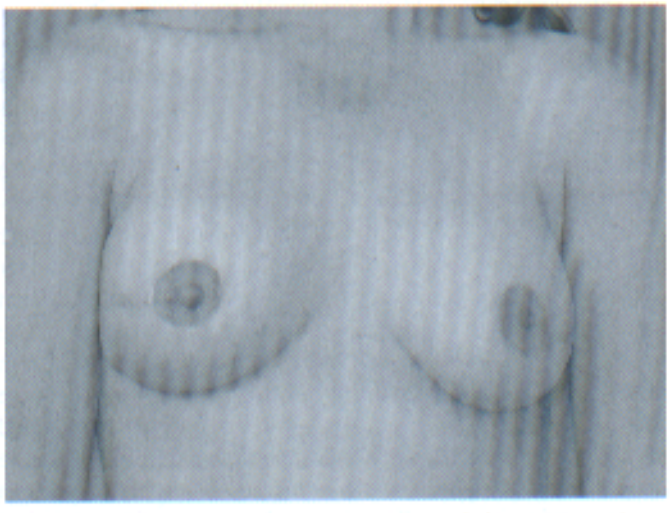

FIGURE 4. One-year postoperative view of the same patient. The nipple-areola reconstruction has been done with the arrow flap.[22]

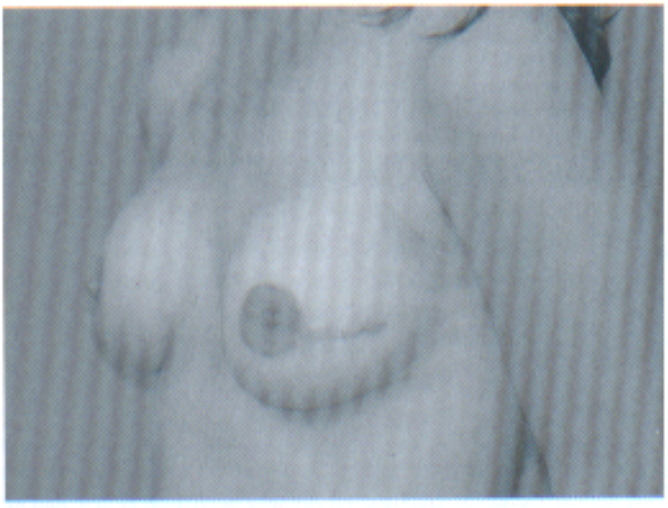

FIGURE 5. One-year postoperative oblique view of the same patient.

(Medical Companies Alliance, Inc., Bessemer, AL) permit a swift and safe venous anastomosis, while the implantable venous Doppler device (Cook Vascular Incorporated, Leechburg, PA) facilitates insetting of the flaps and postoperative monitoring.

Successful and highly esthetic breast restoration can be accomplished with the use of simultaneous SGAP flaps (Figs. 4 and 5). This technique allows for a muscle-sparing dissection which results in preservation of function, longer pedicles, less postoperative pain, and potentially shorter hospital stay.[6] While there are many benefits to using this technique, one can encounter several important disadvantages. In general, use of perforator flaps is a technically demanding undertaking with a steep learning curve. Performing simultaneous bilateral reconstructions significantly increases the complexity of the procedure and places additional demands on the surgical team. Even with our considerable experience in using SGAP flaps for breast reconstruction, we carried out the procedure only 6 times in a 10-year period. Additionally, the first 4 cases were performed between 1994 and 1996. The last 2 cases have been performed over the past year. For a time, concurrent reconstruction fell out of favor to staged bilateral reconstruction. Renewed interest in the procedure grew after several important refinements in technique were made (Table 2). Experience with this technique also helps to reduce operating times. However, experience teaches that patient selection is a critical factor to avoiding complications and lowering the morbidity of autologous breast reconstruction. Patients in this series were chosen for their low incidence of comorbidity and general good health. We recommend use of bilateral SGAP flaps in patients where the benefits of simultaneous breast restoration will outweigh the potential risks. The procedure should be performed by surgeons with considerable experience with microsurgical breast restoration and use of perforator flaps. We believe that careful patient selection will lead to safe and highly esthetic breast restoration with bilateral SGAP flaps.

TABLE 2. Refinements Leading to a Decrease in Operative Time

Increased experience
Increased coordination
Use of 2 teams
Preferred use of the internal mammary artery
Use of the venous coupler
Use of the implantable Doppler

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