

# Simultaneous Bilateral Breast Reconstruction With In-the-Crease Inferior Gluteal Artery Perforator Flaps

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**Abstract:** The inferior gluteal artery perforator (IGAP) free flap represents an alternative technique for autogenous breast reconstruction in patients with insufficient abdominal donor tissue. Historically, patients underwent a staged approach for bilateral breast reconstruction with the IGAP because it is technically demanding and can be time consuming. The bilateral simultaneous IGAP can be performed effectively with 2 microsurgeons operating together. This is a retrospective study of 22 patients (44 flaps) who underwent bilateral breast reconstruction with bilateral IGAP flaps in one operation between January 2005 and December 2007. The following parameters were evaluated and compared to our published data with unilateral IGAP flap reconstruction: operating time, blood loss, flap weight, hospital length of stay, and perioperative complications. A follow-up patient survey was also conducted to gauge patient's satisfaction with the donor site and procedure. The flap survival rate was 100%. Complications included 1 patient with 1 flap with partial fat necrosis, 2 patients who required reoperation for venous congestion, 1 patient with a hematoma, 2 patients with delayed buttock wound healing, 2 patients requiring resuturing for buttock wound dehiscence, and 1 patient with resolved paresthesias. The majority of patients were satisfied with the procedure and donor site. In this study, we detail our experience with the inferior gluteal region as a reliable source of donor tissue and the simultaneous bilateral IGAP flap as an efficient method of breast reconstruction.

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The increasing incidence of bilateral mastectomy for breast cancer and premalignant breast disease, as well as prophylactic surgery, based on genetic therapy has increased the demand for bilateral reconstruction.<sup>1–5</sup> Most patients prefer immediate breast reconstruction with many opting for autologous tissue.<sup>6–10</sup> Although breast reconstruction using implants is an excellent option and is relatively easy to perform, many women do not want a prosthetic device that has a high probability of failure over time, particularly with prior irradiation. The abdomen is still our first choice of donor tissue for breast reconstruction. However, gluteal artery perforator (GAP) flaps are an excellent alternative for patients with insufficient abdominal tissue, prior abdominoplasty, or extensive abdominal liposuction. The inferior GAP (IGAP) flap is nourished by the perforating arterial branches of the inferior gluteal artery and can be harvested with preservation of the underlying musculature and function.<sup>4</sup>

In the past, our first alternative to the abdomen was the superior GAP (SGAP) flap.<sup>11</sup> Although the SGAP flap provides sufficient tissue for breast reconstruction, it can disrupt the esthetic unit of the buttock. The superior fullness of the buttock is considered to be a critical component to the esthetics of the buttock. Some patients develop a postoperative area of depression or flatness of the upper buttock and the resultant scar is in a prominent area of the buttock. The IGAP flap is a good alternative in the patient with abundant inferior buttock tissue or “saddle bags.” This procedure can remove the saddle bags while maintaining superior fullness of the buttock. The resultant scar is in a less prominent portion of the buttock: in the inferior buttock crease or where a shadow is cast. The downside of the IGAP flap is the most lateral portion of the scar and sometimes a portion of the inferior scar can be visible in a bikini-shaped underwear or bathing suit. The IGAP flap offers a major technical advantage over the SGAP flap by providing a longer pedicle for ease of inset. The typical IGAP flap pedicle is 8 to 11 cm, compared with 6 to 8 cm in the SGAP flap.<sup>4</sup>

Traditionally, GAP flaps were staged to avoid excessive operating times, which have been reported to be as high as 9 hours for a unilateral procedure.<sup>4</sup> The disadvantage of staging breast reconstruction are 2 major operations, 2 general anesthetics, 2 separate recovery periods, and 2 separate hospital costs. Based on our previous success with IGAP flaps in unilateral cases, we applied this technique for bilateral breast reconstruction in one operation on 22 patients over a 3-year period.<sup>4</sup> All 44 flaps survived, while the overall morbidity for the series was acceptable based on analogous surgery. The purpose of this study is to detail our experience with the inferior gluteal region as a reliable source of donor tissue for simultaneous bilateral breast reconstruction.

## PATIENTS AND METHODS

A series of 22 patients underwent bilateral breast reconstruction with IGAP flaps in 1 operation between January 2005 and December 2007. A retrospective chart analysis was conducted. The patient demographics are listed in Tables 1 and 2. The following parameters were evaluated: mastectomy or implant weight, final flap inset weight, estimated blood loss, operating time, hospital length of stay, flap survival, perioperative complications, and donor site morbidity. The data were compared with the authors' own series of 31 patients undergoing unilateral IGAP breast reconstruction from March to December 2004.<sup>4</sup>

A telephone survey to gauge the patient's satisfaction with the procedure and donor site was conducted by a physician, who was not involved in any of the patient's care. Twenty-one of the 22 patients were available for the survey. The patients rated on a scale of 1 to 5, their satisfaction regarding quality of buttock scars, quality of breast scar, and buttock contour. One denoted terrible to unacceptable, 2 denoted poor, 3 denoted satisfactory, 4 denoted good, and 5 denoted very good to excellent. The final question of the survey was whether the patient would undergo the procedure again or if they would choose an alternative method of reconstruction.

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**TABLE 1.** Indications for Bilateral IGAP Reconstruction

	No. Patients
Unilateral breast cancer/contralateral prophylaxis	9
Bilateral breast cancer	6
BRCA	1
BRCA/breast cancer	3
Ductal carcinoma in-situ	3

BRCA indicates breast cancer gene.

**TABLE 2.** Demographics

No. patients/flaps	22/44
Average follow-up (mo)	23 (range, 7–42)
Average age	43 (range, 33–56)
Average body mass index	24 (range, 19–30)
Smoking	0
Preoperative radiation	2
History abdominal surgery	7
Hysterectomy	3
Cesarean section	2
Abdominoplasty	1
TRAM	1
Failed implant reconstruction	10 implants
Immediate reconstruction	19 flaps
Delayed reconstruction	25 flaps

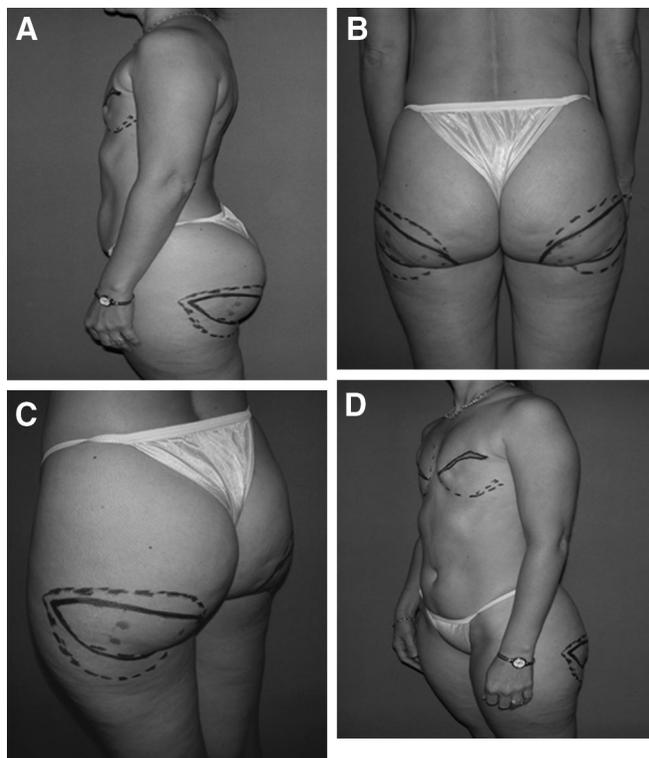
## Flap Design

As previously described,<sup>4</sup> the flap is designed as a horizontal ellipse, with the axis centered above the gluteal crease. The inferior line of the ellipse is drawn 2 to 3 cm below the gluteal crease. A handheld Doppler probe is used to find the strongest perforating vessels to the skin. The superior aspect of the skin island ellipse is marked to capture these perforators. The dimensions of the flap are typically approximately 7 × 18 cm, based on the amount of skin needed (less with a skin-sparing mastectomy) and the amount of excess buttock tissue available. Preoperative markings are shown in Figure 1.

## Technique

The pertinent anatomy of this flap has been reviewed previously in great detail.<sup>4</sup> The traditional method of harvesting the IGAP flap in unilateral cases involves placing the patient in the decubitus position. Two teams of surgeons prepare the recipient and donor sites simultaneously with the microvascular anastomosis and flap inset occurring in the supine position. In contradistinction, bilateral reconstructions are performed in the prone position to allow for simultaneous flap harvest. Due to the necessity of the recipient vessels being prepared first, the patient is initially placed in the supine position. After the chest is prepped and draped and the mastectomies are completed, the implants are removed or the chest otherwise prepared, the internal mammary vessels are exposed and prepared for anastomosis. The skin is then temporarily stapled closed. The wounds are protected with a sterile dressing and the patient is turned into the prone position.

Two teams work simultaneously and the flap dissection is begun laterally over the tensor fascia lata muscle. Incisions are made along the previously drawn marks, and electrocautery is used to divide the fat down to the gluteal fascia. The fat is beveled superiorly and inferiorly to include the maximum amount

**FIGURE 1.** A–D, Preoperative markings of skin paddle and perforators.

of fat and soft tissue in the flap, as deemed necessary. Additional lateral beveling can also be used to obtain more fat from the lateral thigh or saddlebag area. Care is taken to leave sufficient fat medially over the ischium. The fat in this area is denser and slightly lighter in color than the more lateral fat that is incorporated into the flap.

The fascia of the gluteus maximus is incised laterally and the dissection proceeds in the subfascial plane to allow easier visualization of the perforators. Perforators with an artery of at least 1 mm and venae comitantes are considered to supply the flap. The appropriate perforator is selected based on vessel size and location in the flap. The perforator is then followed through the muscle between the muscle fascicles, which are spread apart to allow deeper dissection. On occasion, a second perforator is found during the dissection and is included if it easily joins the first perforator. The dissection proceeds under the muscle until a pedicle of sufficient length and vessel caliber is obtained to allow microsurgical anastomosis with the dissected recipient vessels in the chest. This usually occurs when the perforating vessels join the inferior gluteal artery. Attention is directed to the preservation of the posterior femoral cutaneous nerve of the thigh, which runs alongside the inferior gluteal artery. The nerve is identified and carefully dissected away from the pedicle to obtain adequate exposure of the pedicle. A typical pedicle length is 8 to 11 cm, with an arterial diameter of greater than 2 mm and a vein diameter of 3 to 5 mm. Sometimes, adequate vessel size and length are obtained before entering the inferior gluteal artery and vein, simplifying flap harvest.

The flap is islanded on the one perforator. The pedicle is divided and the flap is harvested when good arterial inflow and venous outflow are confirmed by Doppler, skin edge bleeding, and skin paddle color. The flap is weighed. The buttock wounds are

closed in 3 layers and a suction drain is placed. The closed incision and resultant scar will fall within and extend lateral to the inferior buttock crease. The patient is returned to the supine position for the microvascular anastomosis and flap inset. The preferred recipient vessels are the perforating vessels off of the internal mammary artery and vein due to better vessel size match. If the perforating vessels are not available, the internal mammary artery and vein are harvested at the level of the second or third intercostal space. If more exposure of the vessels is needed, the border of the rib is rongeured, but the rib is usually not entirely resected. The vein is anastomosed with a coupling device, which we believe helps to stent the vein open. The artery is anastomosed in a standard fashion. The flaps are inset and deepithelialized as necessary. Drains are placed at the recipient sites.

Each flap is monitored for an arterial and venous Doppler signal, skin paddle color, temperature, and capillary refill every 15 minutes for the first hour. Subsequently, the flaps are monitored every hour for the first 24 hours, and then every 4 hours until discharge. Patients must stay in the hospital until the fourth postoperative day for the purpose of flap monitoring. Patients are out of bed and ambulatory to the bathroom on the first postoperative day. Subcutaneous heparin 5000 units is administered twice daily for deep venous thrombosis prophylaxis. No limitations are imposed to sitting or stretching movements. The only requirement is no vigorous activity or heavy lifting for 4 weeks after surgery. The recipient site drains are typically removed postoperative day 3 and when the output is less than 30 mL in 24 hours. The donor site drains are typically removed in 10 to 14 days and when the output is less than 40 mL in 24 hours.

Approximately 3 months after the initial surgery, patients are scheduled for nipple reconstruction. During this outpatient procedure, secondary revisions to the donor site are offered. The nipple areola complex is tattooed in the office at approximately 4 to 6 weeks after the nipple reconstruction procedure.

## RESULTS

The inferior gluteal donor site usually allows for an abundance of tissue to match or exceed the size of the removed breast tissue or implant. The average mastectomy weight, removed implant weight, flap harvest weight, and final flap weight after inset are listed in Table 3. For comparison, the weights from the authors' published series of patients undergoing unilateral IGAP flap breast reconstruction are included.<sup>4</sup>

The blood loss and procedure length were not excessive for a bilateral reconstruction. Table 4 shows the average operating time, estimated operative blood loss, and discharge day of patients receiving simultaneous bilateral IGAP flap reconstruction. The data from unilateral IGAP flap breast reconstruction patients are listed for comparison.<sup>4</sup> The average length of stay was the same for a unilateral or bilateral procedure.

**TABLE 3.** Bilateral and Unilateral IGAP Mastectomy,<sup>4</sup> Implant, and Flap Weights

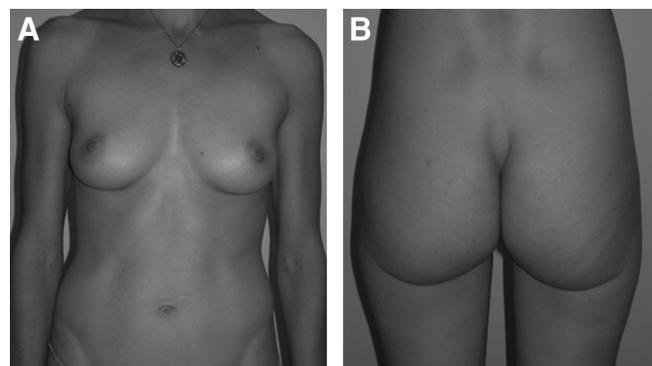
	Bilateral IGAP	Unilateral IGAP <sup>4</sup>
Mastectomy average weight, g	315 (range, 120–549)	305 (range, 156–654)
Removed implant average weight, g	425 (range, 307–692)	510 (range, 129–763)
Harvested flap average weight, g	387 (range, 138–780)	425 (range, 148–833)
Final flap average weight, g	366 (range, 174–684)	407 (range, 137–806)

**TABLE 4.** Bilateral and Unilateral IGAP<sup>4</sup> Operating Times, Estimated Operative Blood Loss, and Discharge Day

	Bilateral IGAP	Unilateral IGAP <sup>4</sup>
Operating time, h	9 (range, 7.5–11)	5.3 (range, 3–9.4)
Estimated operative blood loss, mL	460 (range, 200–750)	317 (range, 150–1000)
Postoperative discharge day	4 (range, 4–5)	4.2 (range, 4–7)

**TABLE 5.** Number of Arterial Perforators and Venous Anastomoses

One perforator	37
Two perforators	6
Three perforators	1
One venous anastomosis	44

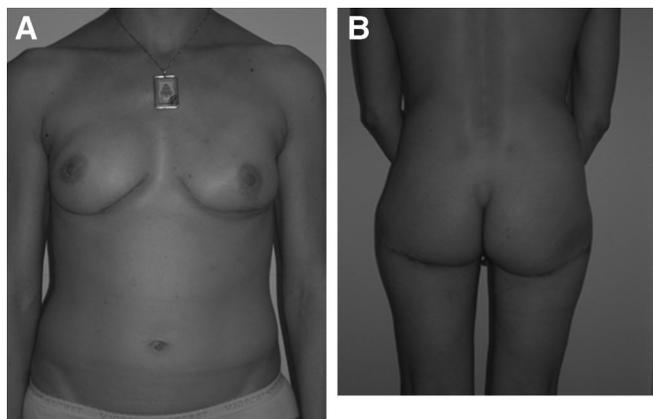


**FIGURE 2.** A, B, Preoperative views of a patient with the breast cancer gene.

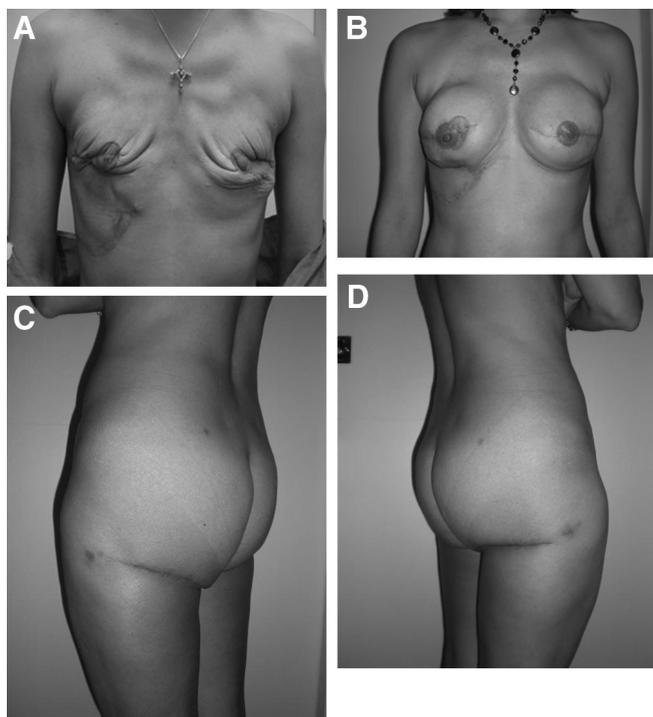
Table 5 shows the number of arterial perforators and venous anastomoses used for each flap. The majority were single perforator flaps. Twenty-seven percents were double perforator flaps. One flap had 3 perforators that lined up and joined early into one perforator off the inferior gluteal artery. All of the flaps drained sufficiently through one venous anastomosis. One of the flaps required a short 2-cm graft (obtained from the internal mammary vein) to the internal mammary artery to decrease the tension on the pedicle.

In this series of 22 patients, all flaps survived (Figures 2–4). One patient had partial flap necrosis of one breast flap and will require revision. Two patients required a reoperation for venous congestion. In the first patient, a 500-mL hematoma was removed and an avulsed venous anastomosis was seen. The venous anastomosis was revised, and the breast flap was inset in a more optimal position to decrease the tension on the vascular anastomosis and pedicle. The second patient with venous congestion had a kink in the pedicle. The venous anastomosis was revised with the pedicle resting in a smoother course. Two patients had delayed wound healing of the buttocks that responded to local wound care. Two patients had postoperative dehiscence of the buttock wound and required resuturing during the first postoperative week. One patient had paresthesias along the posterior thigh. At 7 months follow-up, the paresthesias resolved without any specific treatment.

Only 1 of the 22 patients was unavailable for the survey due to traveling during her summer vacation. This patient did not have



**FIGURE 3.** A, B, Postoperative views of the patient after nipple-areolar sparing mastectomies.



**FIGURE 4.** A–D, Preoperative and postoperative views of a patient after failed implant reconstruction. The right breast reconstruction was complicated by implant extrusion for which the surgeon attempted local flap coverage.

any postoperative complications in the 2 years since her surgery. She was in communication periodically with the surgeon's office staff and reportedly is very satisfied. Table 6 shows the responses for the 21 patients that were available for the survey. The average time of follow-up was 23 months (range, 7–42 months). Patients are offered minor revisions of the donor site with the outpatient nipple reconstruction procedure. Thirteen patients or 62% did not have a secondary revision to the donor site. Four patients had liposuction to smooth the donor site contour. Three patients had “dog ear” excisions of the outpouching of the tissue where the buttock incision ends. One patient had a scar revision for an area of thicker scar from delayed wound healing.

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The patients rated the quality of their buttock and breast scar and postoperative buttock contour on a scale of 1 to 5. The average buttock scar quality score was 2.95 or satisfactory. The average breast scar quality score was 3.85 or good. The average buttock contour score was 3.5 or between good and satisfactory. The majority of the patients (72%) would undergo the procedure again. Three patients verbalized they were happy with their results, but changed their mind and would have preferred the SGAP flap because of the scar showing in a regular bathing suit. Three patients said they would not undergo this procedure or any other type of reconstruction, including implant.

## DISCUSSION

The increasing incidence of bilateral mastectomy for breast cancer and premalignant breast disease, as well as prophylactic surgery, based on genetic testing has increased the demand for bilateral breast reconstruction.<sup>1–5</sup> Gluteal tissue offers a reliable source of abundant tissue for patients who are not a candidate for deep inferior epigastric perforator flaps (DIEP). Traditionally, the inferior GAP flaps were staged due to the increased technical complexity of dissecting the pedicle and to avoid an excessively long operating time. With increased experience and favorable outcomes in our previously published series of unilateral IGAP flap breast reconstruction, we applied this technique to bilateral breast reconstruction in 1 operation.<sup>4</sup>

The results indicate that a simultaneous bilateral procedure provides an efficient method of breast reconstruction, without increased complications. The patients are required to stay in the hospital until postoperative day 4 for the purpose of flap monitoring in both the bilateral and unilateral procedure. In the bilateral procedure, the average operating time of 9 hours and average estimated blood loss of 460 mL was not excessive. In the unilateral IGAP flap study, one flap failed and no patients had partial flap fat necrosis. The bilateral procedure results compare favorably with all the flaps surviving and partial flap fat necrosis in 1 flap in 1 patient.

Two patients in both the unilateral and bilateral studies returned to the operating room for successful treatment of venous congestion. One patient in each study had a hematoma. One patient in the unilateral and 2 patients in the bilateral study had delayed wound healing of the buttock, successfully treated with local wound care. Two patients in the unilateral study with preoperative radiation treatment had delayed wound healing at the recipient site compared with none in the bilateral study. Two patients in the bilateral study required resuturing of the buttock wound for dehiscence during the first postoperative week compared with 1 patient in the unilateral study. This complication occurred from tension on the wound and is usually avoided by superior and inferior undermining to appose the wound edges with less tension. In the bilateral study, one patient had paresthesias of the posterior thigh, which was resolved at 7 months follow-up. This complication is presumably from stretching of the posterior femoral cutaneous nerve during dissection of the inferior gluteal pedicle.

A telephone survey was designed to gauge patient satisfaction with the procedure and donor site. Some patients feel hesitant to criticize aspects of the surgical outcome directly to the surgeon. The survey was administered by a physician not involved with any of the patient care and the patients were informed their responses would be pooled with the other patients' to increase the likelihood of honest responses. A numerical scale from 1 to 5 was created to quantify the patient responses for comparison purposes. The patients rated their buttock scar as satisfactory, the breast scar as good, and the buttock contour between satisfactory and good. The final question of the survey was whether the patient would undergo the procedure again. The majority of patients (72%) would undergo the procedure again.

TABLE 6. Patient Survey

Length Follow-Up, mo	Secondary Revision Buttock	Buttock Scar Quality	Breast Scar Quality	Buttock Contour	Would You Undergo This Procedure Again?	Complication
28	No	2	2	3	Yes	No
18	No	4	5	4	Yes	No
42	No	4	5	5	SGAP (bathing suit coverage)	No
17	No	4	3	1	Yes	No
7	Scar revision	3	3	5	Yes	Thigh paresthesia resolved; delayed buttock wound healing
16	Liposuction	3	5	3	Yes	No
39	No	2	2	4	Yes	No
34	Liposuction	3	5	5	Yes	No
15	Dog ear excision	2	2	3	Yes	No
18	No	4	5	5	Yes	No
36	No	1	2	4	No	Partial flap fat necrosis; buttock wound dehiscence
21	Liposuction	3	5	2	Yes	No
18	No	3	5	3	Yes	Hematoma; venous congestion
20	No	2	3	5	Yes	No
18	No	2	4	2	SGAP (bathing suit coverage)	Buttock wound dehiscence
19	Liposuction	3	4	4	Yes	No
26	No	1	3	2	No (bathing suit coverage)	Venous congestion
17	No	3	4	4	SGAP (bathing suit coverage)	No
13	No	3	4	3	No	Delayed buttock wound healing
33	Dog ear excision	5	5	4	Yes	No
36	Dog ear excision	5	5	3	Yes	No

1 indicates terrible, unacceptable; 2, poor; 3, satisfactory; 4, good; 5, very good, excellent.

Preoperatively, patients who are not candidates for a DIEP flap are informed regarding the tradeoffs of the gluteal flap procedures. Namely, the SGAP flap can disturb the superior fullness of the buttock, the scar is prominent on the buttock, but the scar can be covered by a bathing suit. The IGAP flap removes the saddle bags, a common area of fat deposition in women, the scar is located in a less prominent area of the buttock in the crease or where the shadow falls, but the lateral portion of the scar and sometimes the inferior portion can be visible in a bathing suit. Postoperative, an additional 3 patients (14%) verbally expressed their satisfaction with the surgery, but changed their minds and would have opted for the SGAP due to coverage of the entire incision with a regular bathing suit. The patients were surveyed during the summer and this may have influenced their answers. Some of the patients who answered would undergo the procedure again wear a bathing suit that has a skirt. Other patients wear a regular bathing suit because the scars have faded.

Three patients said they would not undergo this procedure or any other type of reconstruction again. The first patient had partial fat necrosis on one of her flaps and may require revision. The second patient would not undergo this procedure again due to a portion of the scar showing in a regular bathing suit, but would not have chosen another type of reconstruction including implant. The third patient rated her scars and buttock contour as satisfactory to good, but would not have undergone the procedure again due to the breast shape and desire for more breast volume. As shown in Table 3, the buttock usually offers an abundance of tissue to satisfy the patient's desired breast volume. The IGAP flap usually yields a larger amount of tissue compared with the SGAP flap because a greater amount of beveling of adjacent fat can be performed without creating an unsightly donor site. Gluteal flaps have a lower skin to fat ratio and the fat is more globular and dense

compared with abdominal flaps. It can be more challenging to inset the gluteal tissue. The IGAP flap offers a technical advantage over the SGAP flap by providing a longer pedicle for ease of inset. The typical IGAP flap pedicle is 8 to 11 cm, compared with 6 to 8 cm in the SGAP flap.<sup>4</sup>

## CONCLUSION

The IGAP flap offers an excellent alternative for the patient who is not a candidate for the DIEP flap. It reliably offers an abundance of tissue without significant morbidity and can help reconstructive surgeons meet the increased demand for bilateral breast reconstruction. With increased experience, a team of microsurgeons can efficiently and safely perform simultaneous bilateral IGAP breast reconstruction in the appropriately selected patient. The benefits of avoiding 2 major operations, 2 general anesthetics, 2 separate recovery periods, and 2 separate hospital costs justifies the longer, but not excessive operating time.

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