Breast Reconstruction Using the Superficial Circumflex Iliac Artery Superficial Branch Perforator Flap

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Summary: The deep inferior epigastric perforator flap is the standard for autologous breast reconstruction. One downside is its risk of postsurgical herniation and bulging due to the opening of the rectus fascia and intramuscular dissection of the rectus abdominis muscle. In addition, this part of the surgery is time-consuming. While the superficial inferior epigastric artery perforator flap has been thoroughly described for total autologous breast reconstruction, use of the superficial circumflex iliac artery (SCIA) perforator flap in this field is limited. The authors introduce the use of an extended SCIA perforator flap nourished solely by perforators of the superficial branch of the SCIA for total autologous breast reconstruction. Superficial preparation over the abdominal wall was performed without incising the rectus fascia, dissecting the superficial branch of the SCIA and its accompanying veins and the superficial inferior epigastric vein for additional venous drainage. Four patients underwent successful autologous breast reconstruction with this extended SCIA perforator flap variation. The authors introduce the term SCIA superficial branch perforator flap to standardize the surgical technique for using only perforators of the superficial branch of the SCIA as free flaps. The SCIA superficial branch perforator flap is safe and viable for total autologous breast reconstruction, particularly for women with small to medium-sized breasts and with superficial dominance of the abdominal vascular system. *(Plast. Reconstr. Surg.* 155: 777, 2025.)

The deep inferior epigastric perforator (DIEP) flap is the standard for autologous breast reconstruction, but it has limitations, including risk of postsurgical herniation and bulging due to opening of the rectus fascia and intramuscular dissection of the rectus abdominis muscle, as well as being time-consuming. While the superficial inferior epigastric artery (SIEA) perforator flap has been described thoroughly for total autologous breast reconstruction, use of the superficial circumflex iliac artery (SCIA) perforator flap in this field is limited. We introduce the use of an extended SCIA perforator flap nourished solely by perforators of the superficial branch of the SCIA for total autologous breast reconstruction.

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Received for publication January 10, 2024; accepted October 7, 2024.

DOI: 10.1097/PRS.0000000000011812

SURGICAL TECHNIQUE

The patients were prepared similar to a standard DIEP breast reconstruction procedure. First, the superficial inferior epigastric vein (SIEV), which plays a major role in venous drainage of the flap, was identified and dissected to the longest possible length, ligated or clipped, and then preserved. Approximately 3 to 5 cm laterally to the SIEV, the

Disclosure statements are at the end of this article, following the correspondence information.

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superficial branch of the SCIA and its accompanying vein were identified and dissected (Fig. 1) until their origin (Fig. 2). This area has high anatomic variability; sometimes, there is a short common trunk of the deep and superficial branches of the SCIA (approximately 5 mm in length), which can be additionally dissected to gain a larger diameter for microvascular anastomosis. However, in cases where the diameter of the perforator already surpassed 1.5 mm before the common trunk, further dissection was not found to be necessary.

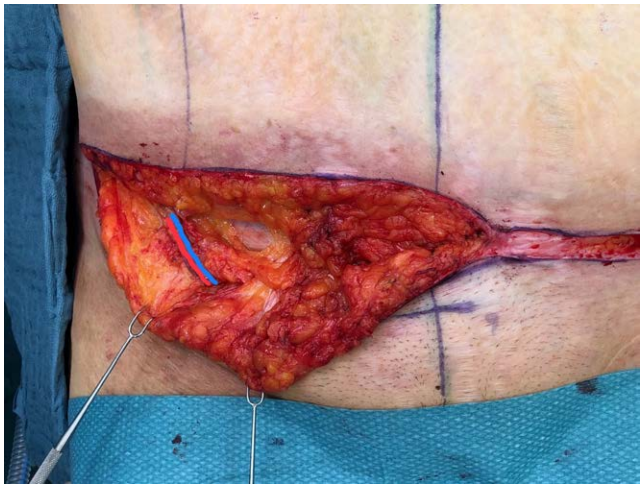

Fig. 1. Intraoperative view during pedicle preparation of the superficial branch of the SCIA and its accompanying vein.

The conventional DIEP perforators were then identified on the ipsilateral side. Depending on breast size, the flap was designed and isolated on conventional DIEP perforators and vessels of the superficial branch of the SCIA. According to clinical observations during the procedures, the maximum size with a reliable blood supply is about the size of hemi-DIEP (Fig. 3).

After the flap was isolated, the conventional DIEP perforators were blocked using Acland clamps for a few minutes, and blood supply to the flap through the superficial branch of the SCIA was observed. In 3 of the 4 cases, the SIEV played a major role in venous drainage. Venous congestion developed in the flap during observation. After release of the SIEV ligation, excessive venous outflow was observed, and the congestion disappeared. After evaluating good inflow and outflow, a decision was made to ligate the clamped DIEP perforators, and the flap was harvested with the

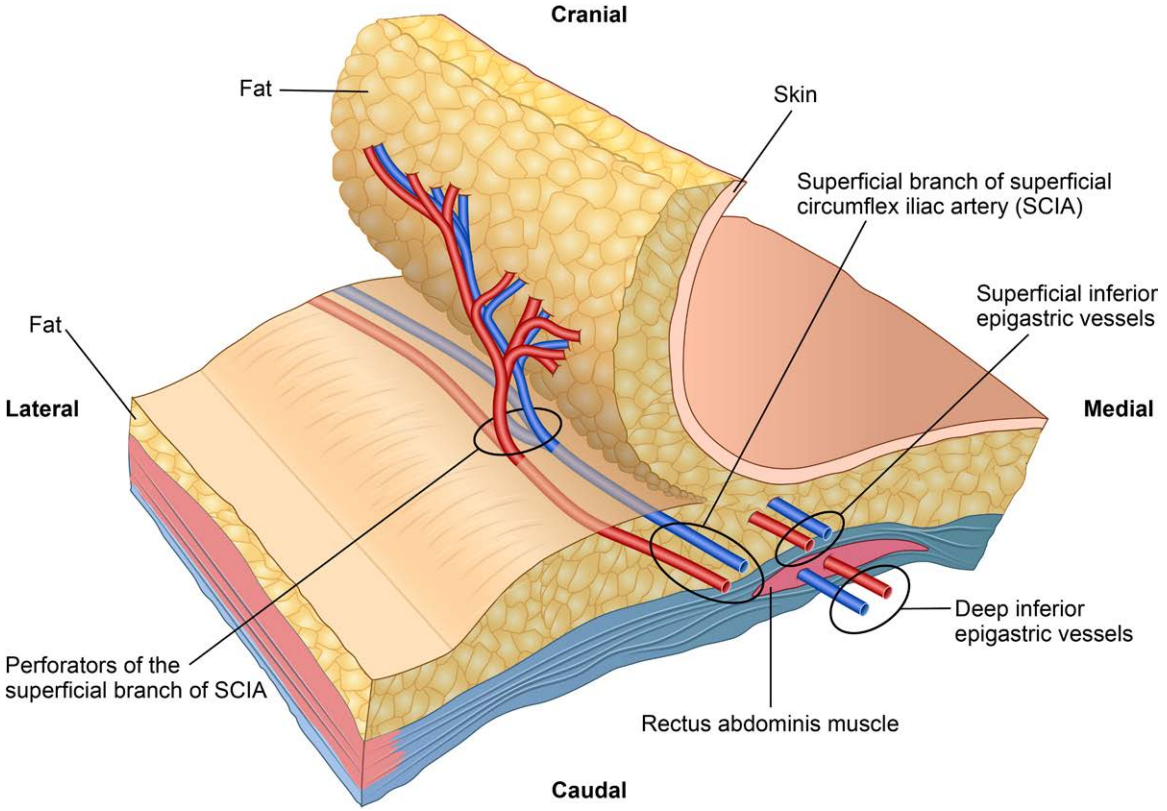

Fig. 2. Anatomic illustration of the lower abdomen with the superficial circumflex iliac, superficial inferior epigastric, and deep inferior epigastric perforator vessels.

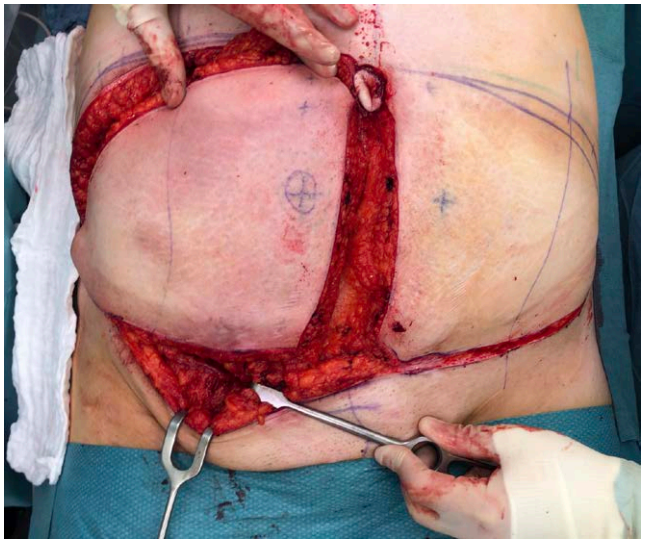

Fig. 3. Intraoperative view showing the dimensions of the harvested SCIA superficial branch perforator (*SCISP*) flap. The flap shows venous congestion while the SIEV was clamped.

SCIA perforator vessels. Microsurgical anastomosis was performed in a standard fashion, end-to-end to the internal mammary vessels. For venous anastomosis, we used a microvascular anastomotic system (Synovis) with coupler size ranging from 1.5 to 2.0 mm. After successful anastomosis, the surgery was completed as in every other DIEP breast reconstruction procedure.

This technique was used in 4 patients with satisfactory aesthetic results (Fig. 4), with no free flap loss and only 2 minor complications: 1 delayed wound healing and 1 partial flap necrosis, which was limited to the most lateral fourth of the flap, measuring approximately 4 cm in length. Neither altered the aesthetic outcome. (**See Table, Supplemental Digital Content 1**, which shows patient characteristics and an overview of the transplanted flaps, including flap size, vessels used for anastomosis, and complications. Venous super drainage with the SIEV and SCIV was used in 3 out of 4 cases, ***http://links.lww.com/PRS/H573***.)

DISCUSSION

An increasing percentage of patients seek breast reconstruction after mastectomy,[1] with adipocutaneous flaps from the lower abdomen, particularly the DIEP flap, as an established standard. However, in addition to the DIEP flap being a time-consuming step, a limiting factor of the DIEP flap can arise when the superficial vascular system of the abdominal wall is dominant, which is observed in some patients. This means that the DIEP perforators are small and the SIEA and SCIA perforator (SCIP) vessels are larger compared with those in other individuals. For these cases, flaps based on the superficial system of the abdominal wall might be indicated with the SIEA flap. Despite their advantages compared with DIEP flaps, however, SIEA flaps have been associated with more arterial complications, including arterial thrombosis and necrosis.[3,4] In addition, superficial inferior epigastric vessels are absent in 35% of patients.[5]

Fig. 4. A 54-year-old woman with multicentric invasive breast cancer underwent a skin-sparing mastectomy (780 g), breast reconstruction with the SCIA superficial branch perforator (*SCISP*) flap, and nipple reconstruction, and underwent immediate postoperative radiation therapy.

Fig. 5. Preoperative imaging with CT angiography showing the superficial branch of the SCIA (*red circles*) in a patient receiving a SCIA superficial branch perforator (*SCISP*) flap.

While SIEA flaps have been broadly used for autologous breast reconstruction, another vessel of the superficial system—the SCIA, with its according vein and perforators—has been overlooked for this purpose, although the SCIP flap has benefits compared with the SIEA flap. For instance, anatomic and clinical studies highlight that the superficial branch of the SCIP is present in 100% of patients.[5]

With this study, we highlight the feasibility of the extended SCIP free flap pedicled solely to the perforators of the superficial branch for total autologous breast reconstruction. Salibian et al.[7] used a similar approach with their free superficially based low-abdominal mini flap based either on the SCIP or the SIEA; however, compared with our approach, their use was limited to partial breast reconstruction. Our approach is best suited for thin women with small to medium breast size. For women with low abdominal fat but extended breast volume, the flap can be extended to a stacked hemiabdominal extended perforator flap pedicled on the DIEP and SCIP, as described by Beugels et al.[8]

Our preoperative patient selection process is as follows. Up to now, our workhorse for abdominal flap autologous breast reconstruction has been the DIEP flap. All patients receive preoperative abdominal computed tomographic (CT) angiography to depict the number, size, course, and location of perforating arteries for preoperative selection of the best artery. Cases in which radiologists deem the perforators of the deep inferior epigastric vessels to be weak in caliber qualify for a SCIP free-flap breast reconstruction (Fig. 5). (**See Figure, Supplemental Digital Content 2**, which shows a corresponding coronary section of the CT image in Fig. 5, showing the superficial branch of the SCIA marked by *red arrows*, ***http://links.lww.com/PRS/H574***.) Within a period of 6 months, this scenario was present in 4 out of 21 women, in whom a DIEP breast reconstruction was not a good option, and the SCIP flap was superior due to its increased vascular caliber compared with the DIEP vessels.

To perform SCIP flap breast reconstruction, we recommend sparing the ipsilateral SIEV during the dissection, as it played a major role in most of our cases for venous drainage. In addition, venous superdrainage, consisting of the SCIV and SIEV, is a viable option. Although Yamamoto and Yamamoto[9] performed successful autologous breast reconstructions with an extended SCIP flap, they supercharged the superficial branch of the SCIA with its concomitant deep branch. A similar approach was applied by Yano et al.,[10] who used the SCIP as a vascular pedicle to supercharge the SIEA flap as an option for autologous breast reconstruction. In the field of autologous breast reconstruction, the SCIP flap seems to be a superior alternative to SIEA flap autologous breast reconstruction in cases of superficial dominance due to the aforementioned reliable expression.

The feasibility of the extended SCIP flap based solely on its superficial branch has been verified by covering defects after various indications, primarily in the extremities and head and neck region.[6] Although the same perforators have been used for the extended SCIP flap, the free flap tissue of the extended SCIP flap, as described by Fernandez-Garrido et al.,[6] differs. Whereas their free flap covered an area medial and cranial to the anterior superior iliac spine and parallel to the iliac crest, our extended SCIP flap contained adipocutaneous tissue of the ventral abdominal wall, comparable to a standard DIEP flap harvest. This warrants further investigation on the exact angiosome of the superficial branch of the SCIA and encourages further anatomic studies for clarification. The routine use of fluorescein or indocyanine green could provide further clarification and illustrate the extent of the distinct vessels intraoperatively.

Although we appreciate the superiority of the DIEP flap for most patients, an advantage of the SCIP flap is its associated decreased abdominal donor-site morbidity. In addition, its superficial course enables faster preparation and minimizes the risk of abdominal hernias and bulging, as the abdominal fascia can be spared.[2]

Our technique has limitations. First, although the consistent anatomic expression of the superficial circumflex iliac vessels is acknowledged, this does not ensure that the perforator is always of practical benefit, as the caliber is sometimes too small to nourish the flap. We observed that an arterial diameter greater than 1.5 mm provides a reliable blood supply. Fernandez-Garrido et al.[6] also confirmed that a caliber of up to 1.5 mm could be achieved if deep dissection from the superficial femoral artery to its origin was performed. Owing to this deep preparation, one can simultaneously obtain a longer pedicle. With this, we achieved a pedicle length of approximately 8 cm, which was sufficient to provide anastomosis at the recipient side to the internal mammary artery without complications in all cases. In addition, we suggest locating both the SCIP and DIEP perforators. With this approach, one can easily rely on the deep vascular system and harvest a DIEP flap if the superficial perforators are of minimal size or are injured during dissection.

We noticed that the term "SCIP flap" is broadly used and rather an umbrella term for all flaps nourished by SCIA branches. Without further information, the term does not encompass whether the perforator stems from the superficial or the deep branch of the SCIA. Precise terminology offers major advantages, simplifying comparability between published outcomes and enhancing the reproducibility of the described techniques. Therefore, we introduce the term SCIA superficial branch perforator (SCISP) flap, to be applied when the free flap is solely nourished by perforators of the superficial branch of the SCIA.

Despite the small case load of our study, we believe that the SCISP flap holds potential advantages for autologous breast reconstruction. We plan to conduct further clinical and anatomic studies to verify the safety and efficacy of the SCISP flap.

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DISCLOSURE

The authors declare they have no financial relationships or conflicts of interest to disclose.

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