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DISCLOSURE

The authors have no financial interest to declare in relation to the content of this communication.

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One versus Two Venous Anastomoses in Microvascular Free Flap Surgery

Sir:

We read with great interest the article by Hanasono et al., which very nicely demonstrated flow changes within the vascular pedicles of a free flap in cases where a single or double venous pedicle is used.¹ Although their results are a very useful contribution to the literature, we would like to caution the authors with regard to the conclusions drawn in their article, and offer our experience, which indicates a conflicting conclusion.

The authors conducted a theoretical study that looked only at flow in the venous pedicles of free flaps, with the lower velocity state in flaps with two venous pedicles leading the authors to conclude that “performing anastomoses of both venae comitantes cannot be made” and that “dissection of a second recipient vein and performing an anastomosis of a second vena comitans increases operative time unnecessarily.” We feel that such conclusions cannot be so definitively made in a theoretical study, and do not take into account potential changes in pedicle diameter and flow postoperatively, or changes in intraflap vasculature that may accommodate flow changes.

More importantly, however, is the published clinical evidence that actually suggests the opposite—that *two* venous anastomoses improve outcomes, particularly in deep inferior epigastric artery perforator (DIEP) flaps. Our findings, published last year, compared one versus two venous anastomoses in 564 consecutive DIEP flaps, and demonstrated that the

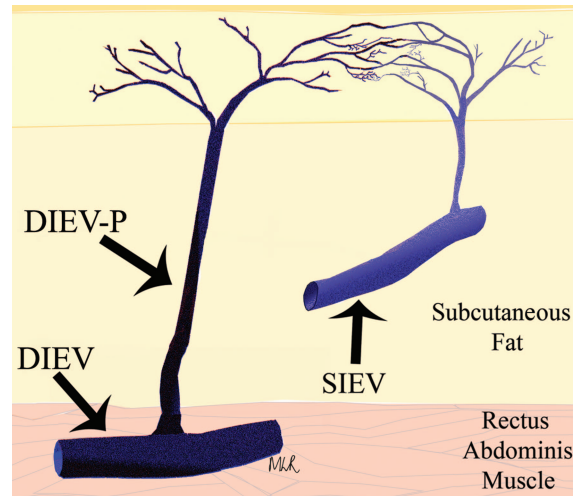


Fig. 1. Representation of the venous anatomy of the anterior abdominal wall, with the subcutaneous tissues drained by both superficial and deep venous systems, the superficial inferior epigastric vein (SIEV) and the deep inferior epigastric vein (DIEV), respectively, through deep inferior epigastric vein perforators (DIEV-P). (Reproduced with permission from Enajat M, Rozen WM, Whitaker IS, Smit JM, Acosta R. A single center comparison of one versus two venous anastomoses in 564 consecutive DIEP flaps: Investigating the effect on venous congestion and flap survival. *Microsurgery* 2010;30:185–191.)

use of two venous anastomoses resulted in a significant reduction in the number of cases of venous congestion to zero (versus seven; $p = 0.006$). All other outcomes were similar between groups and, notably, the use of a secondary vein did not result in any significant increase in operative time.²

Previous experimental studies have also highlighted “supercharging” techniques to improve flap survival, with venous superdrainage shown to be of benefit in reducing reoperative rates.^{3–5} Particularly in the DIEP flap, the use of both the deep inferior epigastric vein and superficial inferior epigastric vein to augment venous drainage of the lower abdominal wall integument can better capture venous territories within the flap. Not only do the superficial inferior epigastric vein and deep inferior epigastric vein have different venous territories (Fig. 1), perforator zones within the flap (venosomes) may be better drained through multiple adjacent venous outflow routes.

Given our clinical findings, we would actually advocate the use of two venous anastomoses in DIEP flap surgery and potentially for other free flaps. Perhaps a broader study that includes both thrombotic outcomes and flow measurements combined could further improve our understanding of this important clinical question.

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Reply: One versus Two Venous Anastomoses in Microvascular Free Flap Surgery**Sir:**

We thank Rozen et al. for their interest in our article and congratulate them on their article, which contributes additional data regarding the routine performance of either one or two venous anastomoses.¹ In their article, they report a lower rate of venous congestion requiring reoperation in deep inferior epigastric perforator (DIEP) flaps performed with two venous anastomoses ($n = 291$) compared with DIEP flaps performed with one venous anastomosis ($n = 273$) (0 percent versus 2.6 percent, respectively; $p = 0.006$). The mean operative time for both operations was virtually identical ($p = 0.57$). They conclude that DIEP flap breast reconstructions should routinely include two venous anastomoses because of lower flap failure rates and equivalent operative times.

Our findings support the practice of performing a single venous anastomosis in cases where two venae comitantes are present, based on superior blood velocity, theoretically decreasing the chance of thrombosis.¹ Velocity and flow are often confused in

the literature, but they are different. Low blood velocity (measured in centimeters per second), along with turbulence and intimal injury, results in thrombosis. These three conditions are commonly referred to as Virchow's triad, after the German pathologist Rudolf Virchow, who detailed the pathophysiology behind pulmonary embolism. Blood flow (measured in milliliters per second) represents the volume of blood entering and exiting an organ, or flap in this case. Both are critical to flap survival; in simplified terms, inadequate blood velocity results in thrombosis, whereas inadequate blood flow results in unsatisfactory tissue perfusion.

As we acknowledged in the Discussion section of our article, the question of whether a second venous anastomosis of a separate system of veins, rather than a second anastomosis of a vein draining the same venous system (a second vena comitans), is needed to maintain adequate blood flow (not velocity) in some flaps remains unanswered by the data we have presented.² The DIEP flap is an example of a flap that usually includes two systems of draining veins: a superficial system that empties into the superficial inferior epigastric vein, and a deep system that empties into the venae comitantes of the deep inferior epigastric artery. In their study, the vast majority (92.1 percent) of DIEP flaps that had two venous anastomoses were flaps that included one vein from the superficial system and one vein from the deep system, rather than two veins from the deep system. It is possible, then, that the difference in venous complications they noted was because some of the flaps that had only one venous anastomosis were not satisfactorily drained by a single venous system, which is a problem of flow rather than velocity. Therefore, our findings do not necessarily contradict the findings by Rozen et al. However, given the very low rate of venous complications they experienced in their series (1.2 percent of all flaps), a much larger sample would be required to obtain satisfactory statistical power to clarify the question of whether the problems they observed were problems of inadequate flow or inadequate velocity.

In summary, we support performing a second venous anastomosis of a separate venous drainage system, such as the superficial inferior epigastric vein in the DIEP flap, when signs of venous insufficiency are present, as we suggested in the Discussion section of our article and as Rozen et al. described in the Methods section of their article. The only argument that we can see for performing two venous anastomoses of a single venous system (i.e., both venae comitantes of the deep inferior epigastric artery) is to have a “backup” vein should one of the veins thrombose, for example, because of imperfect technique, distal pedicle or recipient vessel injury, size mismatch, or awkward pedicle geometry with a risk of later kinking or twisting.

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