

**Fig. 1.** Arthroscopic shaver handpiece with 4.0-mm blade cannula tip (*above*); manual traction and placement of shaver into the axilla, with debridement (500 rpm) and aspiration (50 mm Hg) of the undersurface of the axillary flap. Treatment is terminated with direct visual confirmation and palpable change in consistency of the flap from “pebbly” to “smooth” (*below*).

with a “blade” rather than a “serrated” shaver tip. Drains are routinely used, and in fact, small perforations produce an additional pathway for the egress of fluid.

3. A majority of North American plastic surgeons work in multispecialty hospital operating rooms or day-surgery centers. I extrapolate the use of an orthopedic arthroscopic shaver with standard blade tip, routinely utilized for joint surgery; this equipment can be borrowed from our orthopedic colleagues. Certainly, liposuction and curettage tools are also readily available equipment and can produce acceptable results; however, this technique combines these two separate modalities with a single, readily available device, allowing a definitive endpoint to therapy via palpation of the axillary flap. In addition, resource utilization was at a minimum, with only 46 minutes of surgical time required.

In conclusion, my coauthors and I view our technique as minimally invasive, with excellent subjectively mea-

sured treatment outcomes. It should be considered as a preferred surgical option for treating primary hyperhidrosis of the axilla.

DOI: 10.1097/01.prs.0000291614.29714.54

**Jugal S. Arneja, M.D.**

Section of Plastic Surgery  
Children’s Hospital of Michigan  
Wayne State University  
3rd Floor Carls Building  
Detroit, Mich. 48201  
arneja@med.wayne.edu

#### DISCLOSURE

*The author has no conflict of interest associated with the preparation or submission of this communication.*

#### REFERENCES

1. Wagner, D. S., and Alfonso, D. R. The influence of obesity and volume of resection on success in reduction mammoplasty: An outcomes study. *Plast. Reconstr. Surg.* 115: 1034, 2005.
2. Arneja, J. S., Hayakawa, T. E., Singh, G. B., et al. Axillary hyperhidrosis: A 5-year review of treatment efficacy and recurrence rates using a new arthroscopic shaver technique. *Plast. Reconstr. Surg.* 19: 562, 2007.
3. Klein, J. A. Tumescence technique for local anesthesia improves safety in large-volume liposuction. *Plast. Reconstr. Surg.* 92: 1085, 1993.

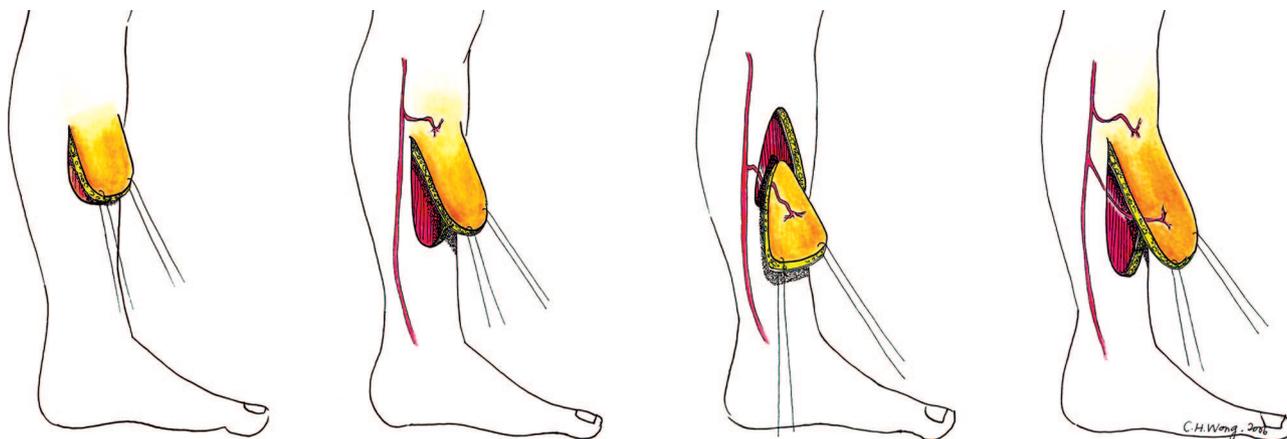
#### Perforator-Plus Flaps or Perforator-Sparing Flaps: Different Names, Same Concept

*Sir:*

**W**e congratulate Dr. Mehrotra on his thoughtful article (*Plast. Reconstr. Surg.* 119: 590, 2007). We have independently described a flap of very similar design that we call the perforator-sparing flap,<sup>1,2</sup> and we would like to share our experience in light of this article.

The first issue pertains to that of terminology, which has caused considerable confusion in the era of perforator flaps.<sup>3</sup> Calling these flaps perforator-plus flaps has the advantage of stressing their additional blood supply from the preserved perforator. However, it may potentially add to the current terminological confusion. We have called our flaps perforator-sparing flaps because this is essentially what they do, spare the perforator encountered at the tip of the flap and mobilize it to its origins to allow it to move freely with transposition or rotation of the flap. Terminology aside, our philosophy for this flap design is in line with that proposed in this article: the sacrifice of muscle such as the soleus in the lower limb is associated with definite functional impairment. For this reason, use of the fasciocutaneous flap is preferable. However, the vascularity of the fasciocutaneous flap in the leg is unreliable. Thus, the perforator-sparing flap is the logical solution (Fig. 1).<sup>1</sup>

In cadaveric specimens and clinical cases, we found that it is technically feasible to raise such flaps in most instances, except in some areas, such as the distal third of the leg. It has better vascularity com-



**Fig. 1.** The evolution of local skin flaps in the lower limb. (Left) Early local flaps were random flaps raised without regard to any known blood supply. These flaps had limited reach because they were guided by strict length-to-width ratios and were unreliable because they depended solely on the subdermal plexus. (Second from left) Ponten introduced and popularized the concept of fasciocutaneous flaps that stress inclusion of the deep fascia, preserving cutaneous perforators at the base of the flap when possible, and inclusion of sensory nerves and veins with the flap. His flaps had a longer survival than could be predicted for random flaps of comparable size. In essence, this flap has evolved into a neurovenocutaneous flap, with its axially based on these structures. (Second from right) Local perforator island-type flaps based solely on the skin perforator were developed with the advent of perforator flaps. (Right) The perforator-sparing local fasciocutaneous flap is a hybrid flap designed with the intention of creating a local flap with an optimal blood supply. In addition to raising the flap as described by Ponten, the preserved perforator located near the tip of the flap increases the reliability of this flap. It has better vascularity than the local island-type perforator flap because it has a “dual” supply from the incorporated perforator as well as a neurovenocutaneous circulation.

pared with conventional flaps of similar design without the “extra” perforator. The concept of favorable, neutral, and unfavorable configurations pertains to the ease of transposing the flap without tension on the preserved perforator and should be borne in mind when using this flap.<sup>1</sup> Some maneuvers can be used to increase success, such as full mobilization of the perforator to its origin to maximize length. If necessary, one can also create a more direct path from the vessel’s origin to the flap by cutting a trough in the muscle. In rare cases, however, this design cannot be used successfully and one can either divide the perforator or island the flap to convert it into a pure perforator flap.

We agree that one of the main problems with island perforator flaps in the lower limb, particularly in the setting of trauma, is venous congestion. Doppler ultrasonography can reliably locate the position of sizable perforators but gives little information about the adequacy and even the integrity of the venae comitantes that accompany the perforator. The perforator-sparing flap is a safer flap in this respect. Furthermore, its better vascularity also has the advantage of better promoting healing and fighting infection in infected wounds.

Mehrotra has successfully extended this concept to muscle flaps. However, one important anatomical feature distinguishes skin from muscle flaps. The subdermal plexus, which is a significant component of the “duality” of the blood supply in skin flaps, is absent in muscle flaps. The soleus flap described in the article

should perhaps be more appropriately described as simply a muscle perforator flap.

DOI: 10.1097/01.prs.0000291615.67831.b3

**Chin-Ho Wong, M.R.C.S.(Ed.)**

**Bien-Keem Tan, F.R.C.S.(Ed.)**

Department of Plastic, Reconstructive, and  
Aesthetic Surgery  
Singapore General Hospital  
Singapore

Correspondence to Dr. Wong  
Department of Plastic, Reconstructive, and Aesthetic  
Surgery  
Singapore General Hospital  
Outram Road  
Singapore 169608  
wchinho@hotmail.com

#### DISCLOSURE

*The authors did not receive any funding for this work and declare no conflict of interest in the work presented.*

#### REFERENCES

1. Wong, C.-H., and Tan, B.-K. Perforator-sparing transposition flap for lower limb defects: Anatomic study and clinical application. *Ann. Plast. Surg.* (in press).
2. Wong, C.-H., Tan, B.-K., and Song, C. Perforator-sparing buttock rotation flap for coverage of pressure sores. *Plast. Reconstr. Surg.* 119: 1259, 2007.
3. Blondeel, P. N., Van Landuyt, K. H., Monstrey, S. J., et al. The Gent consensus on perforator flap terminology: Preliminary definitions. *Plast. Reconstr. Surg.* 112: 1378, 2003.

**Reply****Sir:**

I appreciate the comments and observations of Drs. Wong and Tan. It appears that their approach has its beginnings in raising random flaps with perforator sparing contributing an additional source of blood supply. My approach, however, was conversely developed from raising islanded perforator flaps in lower extremity trauma. Utilizing the “cut as you go” approach for flap margins, I spared part of the flap base if inseting was possible after perforator dissection and flap mobilization. In most cases, it is possible to retain a flap base of varying length. The flap is primarily surviving on the perforator in most cases, and the retained base is the additional and secondary supply.<sup>1</sup> Hence the term perforator plus would emphasize that the perforator is the primary source of blood supply.

The flaps raised by the perforator-plus approach would be reasonably assumed to undergo significant necrosis if based only on the random blood supply from the base. Completely islanding the flap would still ensure survival, albeit with venous congestion and edema. The base possibly acts not so much as an important source of arterial input but rather as a source for venous and lymphatic drainage. The relative contribution of the perforator and the retained base to the overall vascular input of the flap is based on flap design, axiality along the vascular source, the retained flap base, and perforator dimensions and is a contentious issue. However, it is the concept of raising flaps with preservation of dual or maximum possible vascular inputs that is important and the key to a successful outcome.

I fully agree with the philosophy of preserving muscle in lower extremity trauma. In an already traumatized limb, all attempts should be made to retain residual functional tissue. I used the soleus perforator-plus flap because no other regional option was available. A hemisoleus perforator-plus flap was raised after

available regional and free tissue transfers were considered and the perforator-plus flap appeared to be relatively less morbid. With circumferential degloving, a fasciocutaneous free flap would have been impractical. A free muscle flap would also have resulted in sacrifice of a functioning muscle elsewhere. The use of islanded soleus flaps is well described.<sup>2</sup> Since the tibial fracture in the lower third could be covered by rotating the soleus based on its available perforator without detaching the distal insertion, the term muscle perforator-plus flap was used.

The concept of favorable, neutral, and unfavorable options in perforator-“sparing” flaps would be a practical addition to developing these flaps. A nomenclature for perforator-plus flaps has been proposed.<sup>1</sup> As it was true then, even now it would require a concerted effort to have a holistic classification. It may be pertinent to let the froth settle on the issue.  
DOI: 10.1097/01.prs.0000291616.67831.68

**Sandeep Mehrotra, M.S., D.N.B., M.Ch.**

Reconstructive Surgery Centre  
Command Hospital (Eastern Command)  
Alipore, Kolkata  
West Bengal, India  
smehrotra@sify.com

**DISCLOSURE**

*The author declares that there is no potential or actual personal, financial, or political interest in the communication being submitted.*

**REFERENCES**

1. Sharma, R. K., Mehrotra, S., and Nanda, V. The perforator “plus” flap: A simple nomenclature for locoregional perforator-based flaps. *Plast. Reconstr. Surg.* 116: 1838, 2005.
2. Yajima, H., Tamai, S., Ishida, H., and Fukui, A. Partial soleus muscle island flap transfer using minor pedicles from the posterior tibial vessels. *Plast. Reconstr. Surg.* 96: 1162, 1995.