

EXPANDING THE APPLICATIONS OF “Y-SHAPED” VEIN GRAFTS IN MICROSURGERY

Dear Editor,

Vein graft interposition is a well recognized and safe technique in microvascular reconstruction.^{1,2} Jones et al. were the first to describe “Y-shaped” vein grafts (YVG) in microsurgery, while performing multiple-digit replantations.³ The concept of obtaining an additional arterial source has subsequently been used in lower limb reconstruction. Here, interposition of an YVG allows free tissue transfer to be performed with simultaneous restoration of a damaged artery.⁴

In recent years, we have found the use of YVG to provide a number of additional practical solutions in the management of complex microsurgical cases. Specifically, we have appreciated its benefits while performing free flap surgery in vessel-depleted areas. Depletion or inadequacy of recipient vessels is not an uncommon finding for the microsurgeon, and can occur for a number of reasons including radical tumor resection, prior free tissue transfer, extensive trauma, and radiotherapy.^{5,6}

Here, we present four specific reconstructive scenarios where we successfully utilized YVGs to overcome such problems.

1. In simultaneous reconstruction with two free flaps; for example, in composite head and neck defects.⁷

- In these cases, application of an YVG allows an additional free flap to be performed, in spite of the presence of a single recipient artery (Fig. 1a).
2. Similarly, in cases where bipedicle free flaps are required, for example, in breast reconstruction with large DIEP flaps (Fig. 1b). In 2002, Li et al. described an alternative method for performing a bipedicle flap, when utilizing a single recipient artery.⁸ They proposed anastomosis of the two pedicles to both antero- and retrograde limbs of the internal mammary artery. We have also previously used this approach in our unit. However, we often found anastomosis to be technically challenging. In addition, the ability to maneuver and shape the flap was significantly restricted when the retrograde limb of the internal mammary artery was used. In these circumstances, additional vessel length provided by the interposition of an YVG not only facilitates microsurgical anastomosis, but also offers more flexibility during flap inset.
 3. For venous-outflow augmentation: when a single venous outflow and two recipient veins of smaller caliber are present (Fig. 1c). Using an YVG in this case, not only increases the venous drainage but also serves to address anastomotic size discrepancy.
 4. For arterial-inflow augmentation: when a single flap artery and two low-flow recipient arteries are present (Fig. 1d). This is a rare event encountered when free jejunum flaps are transferred to a previously irradiated neck.

Intestinal flaps display high-metabolic demands and revascularization with arteries arising from irradiated fields carries a risk of partial flap necrosis.

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*Correspondence to: Hung-Chi Chen, M.D., M.H.A., F.A.C.S., Department of Plastic Surgery, China Medical University Hospital, Taichung City, Taiwan. E-mail: D19722@mail.cmuh.org.tw

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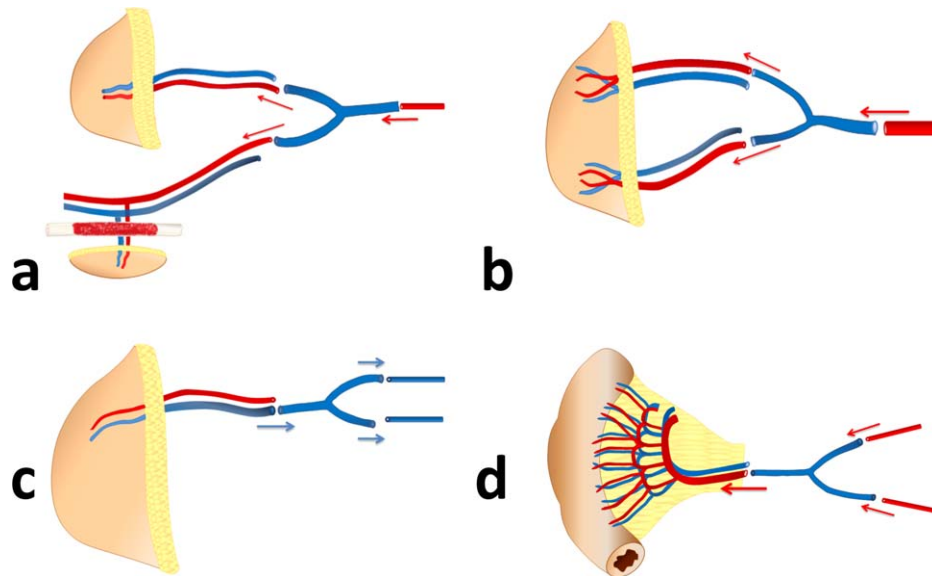


Figure 1. Application of YVG for: **a**) Double free flaps (one recipient artery – two donor), **b**) Bipedicle flaps (as previous), **c**) Outflow augmentation (two recipient veins – one donor), and **d**) Inflow augmentation (one jejunal – two recipient arteries).

Experimental studies have demonstrated that augmenting the arterial inflow of a free flap improves flap survival area.⁹ In esophageal reconstruction, this is of extreme relevance and importance, as partial flap necrosis can result in potentially fatal complications. Ideally, in these circumstances an additional anastomosis should be performed using a second flap artery.¹⁰ However, when performing intestinal flap reconstruction this is not always possible due to the small size of secondary jejunal branches. In these cases, the interposition of an YVG can, however, enable inflow to be augmented with a second recipient artery. The senior author has now used this method in five cases of free jejunum transfer. All cases were successful.

To our knowledge, the applications of YVG we describe here have not been previously reported in the literature. We believe the use of YVG can provide excellent support in such scenarios where circumstances are unfavorable, and thus contribute toward improving outcomes in microsurgery.

**GEORGIOS ORFANIOTIS, M.B.Ch.B., M.R.C.S. (Eng.),
MICHELE MARUCCIA, M.D., BULENT SAKAK, M.D.,
PEDRO CIUDAD, M.D., ASLING LIMA, M.D., AND
HUNG-CHI CHEN, M.D., M.H.A., F.A.C.S.***

*Department of Plastic Surgery,
China Medical University Hospital,
Taichung City, Taiwan*

REFERENCES

1. Biemer E. Role of vein grafts in reconstructive microsurgery. *Microsurgery* 1998;18:237–241.
2. Zhang F, Ho PR, Chin BT, Ozec C, Bunckle HJ, Lineaweaver WC. Effect of vein grafting on the survival of microvascularly transplanted muscle flaps. *Microsurgery* 1996;17:512–516.
3. Jones NF, Jupiter JB. The use of Y-shaped interposition vein grafts in multiple digit replantations. *J Hand Surg Am* 1985;10:675–678.
4. Tsao CK, Chen HC, Chen HT, Coskunfirat OK. Using a Y-shaped vein graft with drain-out branches to provide additional arterial sources for free flap reconstruction in injured lower extremities. *Chang Gung Med J* 2003; 26:813–821.
5. Hanasono MM, Barnea Y, Skoracki RJ. Microvascular surgery in the previously operated and irradiated neck. *Microsurgery* 2009;29: 1–7.
6. Yazar S. Selection of recipient vessels in microsurgical free tissue reconstruction of head and neck defects. *Microsurgery* 2007;27:588–594.
7. Yazar S, Wei FC, Chen HC, Cheng MH, Huang WC, Lin CH, Tsao CK. Selection of recipient vessels in double free-flap reconstruction of composite head and neck defects. *Plast Reconstr Surg* 2005;115: 1553–1561.
8. Li S, Mu L, Li Y, Xu J, Yang M, Zhao Z, Liu Y, Li J, Ling Y. Breast reconstruction with the free bipedicle inferior TRAM flap by anastomosis to the proximal and distal ends of the internal mammary vessels. *J Reconstr Microsurg* 2002;18: 161–168.
9. Miyamoto S, Minabe T, Harii K. Effect of recipient arterial blood inflow on free flap survival area. *Plast Reconstr Surg* 2008;121:505–513.
10. Sakuraba M, Kimata Y, Hishinuma S, Nishimura M, Gotohda N, Ebihara S. Importance of additional microvascular anastomosis in esophageal reconstruction after salvage esophagectomy. *Plast Reconstr Surg* 2004;113:1934–1939.