Vascular anastomosis in free-flap transfer is highly important and largely determines the postoperative success. Therefore, preparation for vascular anastomosis should be performed accurately and quickly. The flap pedicle length determines the tension placed on the area of anastomosis, and thus, an appropriate length should be selected. Until now, the length of the pedicle of a flap has been mostly determined by the clinical experience of the microsurgeon, with some microsurgeons measuring the length by using a ruler, a suture thread, or other methods. However, the pedicle of a flap passes through 3-dimensional structures, particularly in head and neck reconstructions, and because of the difference in body shapes between individuals, even experienced microsurgeons may misjudge the required distance. To date, no easy method to counteract this problem has been reported. Accordingly, we have developed a technique for estimating the required pedicle length necessary for safe vascular anastomosis, as well as the distance necessary for separation of the artery and vein, by using a flap model with vascular tapes. Between June 2014 and April 2016, we applied our technique to 12 patients undergoing head and neck reconstruction and 1 patient undergoing breast reconstruction. In the 13 cases in which the present technique was used, we could estimate the length of each pedicle smoothly and efficiently. Furthermore, considerable excess or deficiency did not occur in the vascular anastomosis. The present technique is recommended as it allows the effective tailoring of the flap pedicle in free-flap surgery. (Plast Reconstr Surg Glob Open 2016;4:e1161; doi: 10.1097/GOX.0000000000001161; Published online 28 November 2016.)

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Summary: In free-flap surgery, if the appropriate length of the pedicle and the distance necessary for separation of the artery and vein are determined earlier during flap elevation, the operative time and the stress placed on the flap pedicle can be reduced. However, the pedicle of a flap passes through 3-dimensional structures, particularly in head and neck reconstructions, and because of the difference in body shapes between individuals, even experienced microsurgeons may misjudge the required distance. To date, no easy method to counteract this problem has been reported. Accordingly, we have developed a technique for estimating the required pedicle length necessary for safe vascular anastomosis, as well as the distance necessary for separation of the artery and vein, by using a flap model with vascular tapes. Between June 2014 and April 2016, we applied our technique to 12 patients undergoing head and neck reconstruction and 1 patient undergoing breast reconstruction. In the 13 cases in which the present technique was used, we could estimate the length of each pedicle smoothly and efficiently. Furthermore, considerable excess or deficiency did not occur in the vascular anastomosis. The present technique is recommended as it allows the effective tailoring of the flap pedicle in free-flap surgery.
Next, vascular tape is prepared with corresponding colors and number of pieces and is firmly fixed using a suture thread or staples behind the thick material (Fig. 1). In perforator flaps, the vascular tape is positioned corresponding to the region where the vessel passes to the skin. After positioning the patient appropriately for vascular anastomosis, the flap model is fitted to the surgical defect, and the vascular tape is advanced to the area of vascular anastomosis through the tunnel (Fig. 2A). We control the length and position of the vascular tape in accordance with the anastomotic positions of the recipient vessels and mark the anastomotic position with the vascular tape using a ministapler. We also determine the distance necessary for separation of the artery and vein. The present techniques are applied to each vessel anastomosis; a model of the flap with vascular tape is then placed beside the harvested flap, and we decide the length of each pedicle vessel based on the position marked with the ministapler (Fig. 2B). We recommend making the actual cut 1 to 2 cm beyond the marked position to allow for the possibility of marginal trimming and vessel shrinking. It is easy to apply the present techniques to an existing defect; furthermore, the approximate length of the pedicle can be measured in an undetermined defect with only an existing tunnel.

RESULTS AND DISCUSSION

The present technique was used in 13 cases. We could estimate the length of each pedicle smoothly and efficiently. Furthermore, considerable excess or deficiency did not occur in the vascular anastomosis.

In free-flap transfer, harvesting a longer pedicle than necessary requires additional time to dissect and separate the vessels and imparts unnecessary surgical stress. On the other hand, harvesting a pedicle shorter than that required applies tension to the vascular anastomosis, induces vascular thrombosis, and may require a subsequent vein graft in some cases. Thus, determining the appropriate length of the pedicle is important in free-flap surgery; however, this is not always easy, particularly in head and neck reconstructions. By using the present techniques, the length of each pedicle vessel can be easily determined. In free-flap surgeries with short pedicles, these techniques may assist in positioning the flap in some cases. Moreover, the arteries and veins of vessel anastomosis may be located far apart, particularly in head and neck reconstructions, and the present techniques can assist microsurgeons in determining the distance necessary for separation of the artery and vein; thus, our technique may reduce the operating time and the stress placed on the flap pedicle. With practice, constructing the flap model with the vascular tape is simple and efficient.

Table 1. Cases of Flap Surgery Performed Using Our Technique

| Reconstruction Site | Flap Selection | No. of Cases |
|---------------------|---------------|-------------|
| Tongue              | RF            | 5           |
|                     | RA            | 2           |
|                     | ALT           | 1           |
| Oral floor          | RF            | 1           |
|                     | RA            | 1           |
| Oropharynx          | ALT           | 1           |
| Buccal mucosa       | RA            | 1           |
| Breast              | RA            | 1           |

ALT, anterolateral thigh; RA, rectus abdominis; RF, radial forearm.

Fig. 1. Free radial forearm flap transfer after hemiglossectomy. A model of the flap was made using thick gauze. Red vascular tape, radial artery; blue vascular tape, radial comitant vein; yellow vascular tape, cephalic vein.

Fig. 2. A, Vascular tape was introduced to the vascular anastomosis through the tunnel. Vascular anastomoses: radial artery—red arrow, superior thyroid artery (end-to-end suture), radial comitant vein—blue arrow, external jugular vein (end-to-end suture), cephalic vein—yellow arrow (under sternocleidomastoid), and internal jugular vein (end-to-side suture). B, A flap model with vascular tape was placed beside the harvested flap, and we determined the length of each pedicle vessel based on the position marked with the ministapler. We also determined the distance necessary for separation of the artery and vein.
tape requires only several minutes. We recommend the present technique to effectively tailor the flap pedicle in free-flap surgery.

**CONCLUSION**

We developed a technique for estimating the required pedicle length necessary for safe vascular anastomosis and the distance necessary for separation of the artery and vein, by using a model of the flap with vascular tapes, and showed its efficiency.

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