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Reconstructive

Superficial Temporal Vein and Alternative Middle Temporal Vein as Recipient Veins for Free-flap Reconstruction

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Summary: The superficial and middle temporal veins (STV and MTV) have been used as recipient veins for free-flap reconstruction; however, the STV is sometimes small and cannot be used, while the MTV is not fully recognized or utilized as a recipient vein. The purpose of the present study was to evaluate the reliability of the STV/MTV as recipient veins and to verify the utility and availability of the MTV by comparing the two veins. Thirty-five consecutive cases of free-flap reconstruction utilizing recipient vessels in the temporal region were retrospectively reviewed. Regarding recipient veins, the STV was the only option in the first 18 cases; the MTV was included among the options in the latter 17 cases. The calibers of the STV/MTV were evaluated at two level points (1: zygomatic arch, 2: palpebral fissure) using the results of preoperative dynamic-enhanced computed tomography (CT). Two cases of severe venous congestion were identified among the first 18 patients. After the adoption of the MTV, the MTV was used in 10 of the 17 cases, and no vascular complication occurred. On CT imaging evaluation, the caliber of the MTV (Point 2) (2.94±0.55 mm) was significantly larger than the calibers of the STV (Point 1) (2.40±0.48 mm) and MTV (Point 1) (2.49±0.43 mm) (both $P < 0.001$). Regarding the recipient veins in the temporal area, the MTV can offer an option with a larger caliber or for additional venous anastomosis when the condition of the STV is inadequate. *(Plast Reconstr Surg Glob Open 2022;10:e4170; doi: 10.1097/GOX.0000000000004170; Published online 8 March 2022.)*

INTRODUCTION

As recipient vessels in free-flap reconstruction of the head region, the superficial temporal artery (STA) and the superficial temporal vein (STV) have been reported to be as reliable as those of the neck region.[1,2] On the other hand, the STV is too small and unusable as a recipient vessel in some cases.[1,3,4] Yano et al reported the middle temporal vein (MTV) as an alternative recipient vein to the STV, reporting that the MTV had a larger caliber than the STV.[3,4] However, the MTV is not fully recognized or utilized as a recipient vein in the temporal area.

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Received for publication December 3, 2021; accepted January 10, 2022.

DOI: 10.1097/GOX.0000000000004170

We retrospectively examined 35 consecutive cases of free-flap reconstruction utilizing recipient vessels in the temporal region (STA/STV/MTV). The purpose of the present study was to evaluate the reliability of the STV/MTV as recipient veins and to verify the utility and availability of the MTV by comparing the two veins.

PATIENTS AND METHODS

This retrospective case series study was approved by the institutional review board of the participating institutions and conducted in accordance with the Declaration of Helsinki on investigation in humans. Informed consent was obtained in the form of an opt-out option on the website.

A retrospective review of the medical records of 35 consecutive patients who underwent free-flap reconstruction using recipient vessels in the temporal area (STA/STV/MTV) from 2010 to 2020 at the National Cancer Center Hospital Japan was conducted. The recipient artery in all cases was the STA. Regarding recipient veins, the STV was the only option until May 2016; the MTV was

Disclosure: *The authors have nothing to disclose. No funding was received for this article.*

included among the options for the recipient vein beginning in June 2016. The indications for MTV usage were dependent on the intraoperative findings. The STA and STV were dissected first, and then the MTV was considered an option when the STV was small and unreliable (STV of <2.5 mm in diameter, or when the tissue around the vessel was associated with considerable scarring). The upper two layers of the fascia (temporoparietal fascia and superficial layer of the deep temporal fascia) were incised 2–3 cm anterior to the STA/STV (Fig. 1A, B). The MTV is usually easily visible in the temporal fat pad,[5,6] just after cutting the second fascia.

In addition, STV/MTV calibers were evaluated using the results of preoperative dynamic-enhanced computed tomography (CT) imaging. Two points for evaluation were set: (1) at the level of the zygomatic arch (upper edge) and (2) at the level of the palpebral fissure (Fig. 2). Both the STV and MTV were evaluated at Point 1; however, only the MTV was evaluated at Point 2 owing to the occasional presence of an STV bifurcation at this level, thereby creating variation among cases. The calibers of the STV (Point 1)/MTV (Point 1)/MTV (Point 2) were compared with sets of paired data using the Wilcoxon signed-rank test. All analyses were performed using the "R" software program (version 4.0.2), and a P value less than 0.05 was regarded as statistically significant.

RESULTS

Patient characteristics and details are summarized in Table 1. For venous anastomosis, a microvascular venous anastomotic coupler (2.0 mm/2.5 mm/3.0 mm) was utilized in most cases. Two cases of severe venous congestion were identified before the adoption of the MTV as an option for the recipient vein. After the adoption of the MTV, the MTV was used as an alternative or additional recipient vein in 10 of the 17 cases.

The results of caliber measurements on CT imaging are as follows (n = 31 [four missing values]): STV (Point 1): 2.40 ± 0.48 mm, MTV (Point 1): 2.49 ± 0.43 mm, MTV (Point 2): 2.94 ± 0.55 mm (Table 1). There was no significant difference between the calibers of the STV (Point 1) and MTV (Point 1). However, the caliber of the MTV (Point 2) was significantly larger than that of the STV (Point 1) and MTV (Point 1) (both $P < 0.001$).

Takeaways

Question: Is the temporal region reliable as a recipient site for free-flap reconstruction? There is concern that the superficial temporal vein (STV) is sometimes small, and the middle temporal vein (MTV) was reported to be usable as an alternative recipient vein.

Findings: The MTV was able to be used when the STV was unreliable. The caliber of the MTV in the distal region was significantly larger than that of the STV/MTV in the proximal region.

Meaning: The MTV offers an option for a recipient vein with greater ease of dissection in cases where the STV is inadequate.

DISCUSSION

The present study is considered to be the first to show that the distal portion of the MTV has a larger caliber than the proximal portion in actual clinical cases,

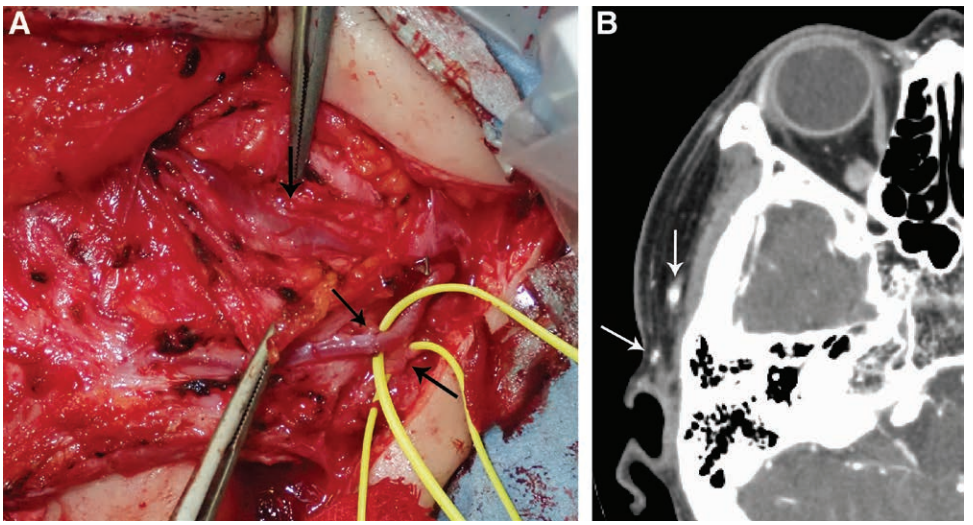

Fig. 1. Findings of the STV and MTV in a patient. A, Intraoperative appearance of the preauricular region after recipient vessel dissection. The STA and STV were separately looped using yellow vessel tape (the STV was looped together with subcutaneous fat). The MTV was visible after the double-layer fascia incision anterior to the STA/V. The MTV had a relatively large caliber at the level of the temporal fat pad. B, CT imaging of the area at the revel of the surgical site. The MTV has a larger caliber than the STA and STV at this level.

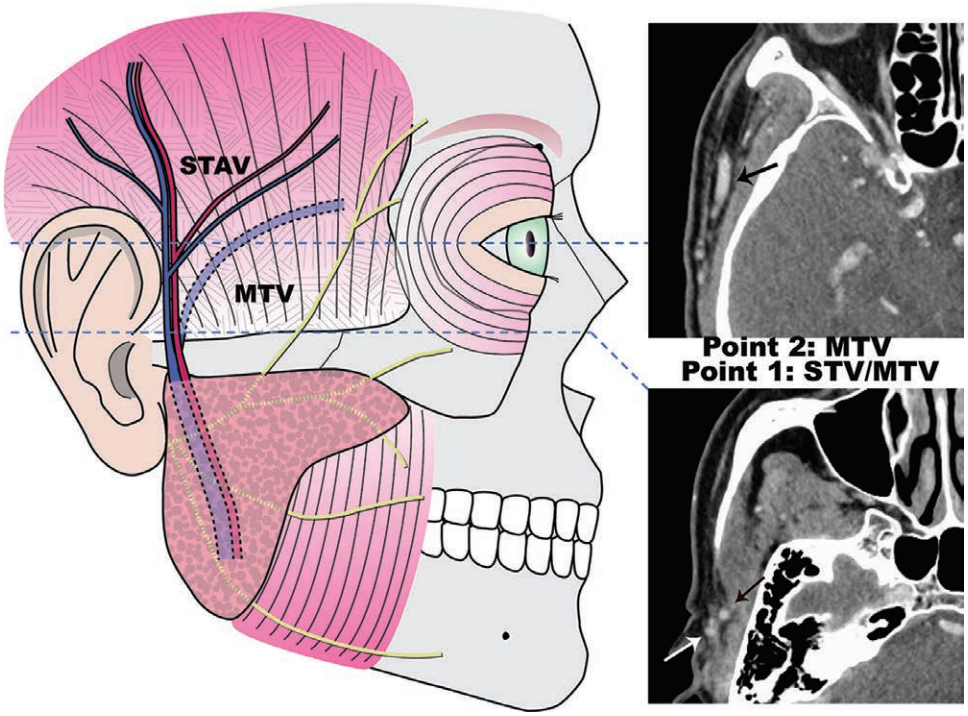

Fig. 2. A schematic illustration and CT image of the STV and MTV at the two points for evaluation. The MTV is located anterior to the STA/V and posterior to the temporal branch of the facial nerve, and lies under the TPF and the superficial layer of the DTF. The two veins join and enter the parotid gland. The two dotted lines represent the two points at which caliber evaluation of STV/MTV were done. Point 1 is at the upper edge of zygomatic arch, and Point 2 is at the palpebral fissure. The right side shows the CT image of the area at the two points for evaluation, in which the calibers of the STV and MTV were measured.

while a past cadaver study revealed the same result.[5] The STV exists alongside the STA.[1,2] As such, when it is in good condition, there is no need for the MTV to be used. However, the MTV offers an option for a recipient vein with a larger caliber[3,4] or additional venous anastomoses in cases where the STV is unreliable. It is easier to dissect the MTV at the distal portion (surrounded by a fat pad[5,6]) in comparison with the proximal portion (surrounded by a cutaneous retaining ligament[6,7]), which makes the merit of the MTV stronger. However, using the recipient artery and vein of a different area (STA and MTV) requires not only dissection of another recipient vein but also separation of the flap pedicle artery and vein, which is associated with some additional labor and time; however, we consider that the merit outweighs the demerit.

Based on the results of the present study, the distal portion of the MTV can hold a venous anastomotic coupler that is one size (0.5 mm) larger than the proximal MTV or STV. Previous studies reported significantly greater rates of postoperative vascular complications when couplers less than or equal to 2.0 mm in size were used,[8] and more than 40% fewer revisions were required for each additional millimeter in coupler size.[9] In addition, several meta-analyses revealed that performing double venous anastomosis reduces venous thrombosis and surgical revision compared with single anastomosis.[10] Therefore, the MTV is considered to be a useful and safe option, which increases the reliability of the temporal area as a recipient site for free-flap reconstruction.

CONCLUSIONS

The present article examined 35 consecutive cases of free-flap reconstruction using recipient vessels of the temporal region (STA/STV/MTV) and compared the STV and MTV. Regarding recipient veins of the temporal area, flap congestion rarely occurs after performing a single STV anastomosis; however, the MTV can offer an option with a larger caliber or for an additional venous anastomosis with greater ease of dissection when the condition of the STV is inadequate, thereby adding reliability to the temporal area as a recipient site.

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Table 1. The Summary of the Patient Characteristics and Details

No.	Age/ Gender	Location /Flap	Caliber STV (mm) Point 1	Caliber MTV (mm) Point 1	Caliber MTV (mm) Point 2	Actual Use of Recipient Vein (Anastomotic Methods)	Vascular Complication
1	79 M	Orbit/RAMC	2.72	2.79	3.17	STV (Coupler2.5)	None
2	74 M	Head/LDMC	1.92	2.12	2.88	STV (hand-sewn)	None
3	76 M	Head/LDMC	2.74	3.01	4.25	STV (Coupler3.0)	None
4	51 M	Maxilla/ALT	2.80	3.27	2.65	STV (Coupler2.5)	None
5	64 M	Head/ALT	Missing value	Missing value	Missing value	STV (Coupler2.0)	None
6	63 F	Head/LDMC	2.09	2.50	2.95	STV (Coupler2.0)	None
7	20 M	Orbit/RAMC	2.32	2.06	2.55	STV (Coupler2.0)	None
8	66 F	Head/LDMC	2.36	2.08	2.80	STV (Coupler2.5)	None
9	67 M	Nose/ALT	2.89	3.01	3.72	STV (Coupler2.5)	None
10	46 M	Head/ALT	2.12	1.87	2.38	STV (Coupler2.0)	None
11	84 F	Head/LDMC	2.21	2.21	3.78	STV (Coupler2.0)	None
12	32 F	Orbit/ALT	2.52	2.10	2.62	STV (Coupler2.5)	None
13	43 F	Head/LDMC	3.11	2.67	2.98	STV (Coupler2.5)	None
14	59 M	Head/ALT	1.87	1.73	2.26	STV (Coupler2.0)	None
15	17 M	Forehead/ PMMC	1.90	2.22	2.81	STV (Coupler2.0)	Congestion/watchful waiting →Epidermal necrosis
16	30 F	Orbit/ALT	Missing value	Missing value	Missing value	STV (Coupler2.0)	None
17	85 F	Head/ALT	2.06	2.26	2.65	STV (Coupler2.0)	None
18	23 F	Head/TDAP	Missing value	Missing value	Missing value	STV (hand-sewn)	Congestion/take-back OPE. →Re-anastomosis
19	32 M	Nasal cavity/ALT	1.99	2.36	2.51	MTV (Coupler2.0) MTVbr. (Coupler2.0)	None
20	57 F	Orbit/ALT	1.56	2.56	2.92	STV (Coupler2.0) MTV (Coupler2.5)	None
21	75 M	Head/LDMC	1.98	2.48	2.73	STV (hand-sewn) MTV (Coupler2.5)	None
22	46 M	Orbit/RAMC	3.20	2.81	2.97	STV (Coupler3.0)	None
23	43 F	Orbit /DIEP	2.39	2.23	2.59	STV (Coupler2.5)	None
24	55 M	Orbit/RAMC	3.17	2.41	2.61	STV (Coupler3.0)	None
25	65 F	Maxilla/ALT	2.03	1.94	2.03	STV (hand-sewn)	None
26	30 F	Head/ALT	2.49	2.79	2.74	STV (Coupler2.5) MTV (Coupler2.5)	None
27	72 M	Nasal cavity/RAMC	3.04	2.88	3.94	STV (Coupler3.0) MTV (Coupler2.5)	None
28	53 F	Head/LDMC	3.10	2.72	2.30	STV (Coupler3.0)	None
29	51 F	Head/LDMC	1.83	2.05	3.02	MTV (Coupler3.0)	None
30	18 F	Maxilla/ALT	1.90	3.02	3.10	MTV (Coupler3.0)	None
31	30 F	Nasal cavity/ RAMC	Missing value	Missing value	Missing value	STV (Coupler2.0) MTV (Coupler3.0)	None
32	32 F	Nasal cavity/ALT	2.02	2.48	2.54	MTV (Coupler3.0)	None
33	30 M	Skull base/ALT	2.34	2.72	3.19	STV (Coupler2.0) MTV (Coupler2.5)	None
34	29 M	Head/LDMC	3.00	3.58	3.99	STV (Coupler3.0)	None
35	72 M	Orbit/ALT	2.77	2.36	3.65	STV (Coupler3.0)	None
	50.5 Av. M: 18 F: 17		2.40 Av.	2.49 Av.	2.94 Av.	MTV use: 10	2 To.

ALT, anterolateral thigh flap; Av., average; Caliber Point 1, caliber of STV or MTV at the level of zygomatic arch on CT imaging; Caliber Point 2, caliber of MTV at the level of palpebral fissure on CT imaging; Coupler, microvascular venous anastomotic coupler device (2.0 mm/2.5 mm/3.0 mm); DIEP, deep inferior epigastric artery perforator flap; F, Feminine; Hand-sewn, Hand-sewn venous anastomosis (end-to-end or end-to-side); LDMC, latissimus dorsi myocutaneous flap; Location, location of reconstruction; M, masculine; MTVbr., branch of MTV; PMMC, pectoralis major myocutaneous flap; RAMC, rectus abdominis myocutaneous flap; TDAP, thoracodorsal artery perforator flap; To., total.

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