

## Abstract

**Introduction:** The success of free tissue transfer is critically dependent on the quality of microvascular anastomosis. Currently, end-to-end (ETE) venous anastomosis using mechanical couplers is commonly used and has favorable outcomes. However, some situations warrant use of end-to-side (ETS) venous anastomosis, which may influence flap complications and outcomes. This study describes a clinical experience in ETS vs. ETS venous anastomosis outcomes in head and neck microvascular free-flap reconstruction. The decision to perform a coupled end-to-end (ETE) or end-to-side (ETS) venous anastomosis in head and neck free tissue transfer has not been thoroughly evaluated in a large multisurgeon setting.

**Design and Methods:** Retrospective chart review of all patients who underwent microvascular reconstruction of head and neck defects between January 2006 and September 2018 at an academic tertiary care center. Data were collected by demographic information, flap type, recipient vessels, coupler size, coupler orientation, complications, and reconstruction results.

**Results:** 249 free flap cases were identified with a total of 330 microvenous anastomoses performed. Of these, 98 (29.7%) ETS microvenous anastomoses were performed in 85 patients and 232 (70.3%) ETE microvenous anastomoses were performed in 163 patients. Patients with a prior history of radiation were more likely to undergo ETS anastomosis versus ETE anastomosis ( $p=0.009$ ). Patients with a prior history of neck dissection were also more likely to undergo ETS anastomosis versus ETE anastomosis ( $p=0.006$ ). The most frequently used vessel for was the internal jugular vein (93.9%) in ETS cases and the common facial vein (35.8%) in ETE cases. Flap failure and flap thrombosis in the ETS versus ETE venous anastomosis groups were 8 and 10 respectively; which was not statistically significant ( $p=0.256$ ). Coupler specific complications included broken coupler, rings falling off, foreign body sensation, and host rejection with an overall incidence of 5.8% and 1.9% in the ETS and ETE groups respectively ( $p=0.133$ ).

### Conclusions and Relevance:

There is no significant difference in rate of flap failure and thrombosis between groups. The most common situations warranting ETS anastomosis are for patients with history of radiation and/or neck dissection.

## Introduction

- The use of microvascular coupling devices has become mainstream for venous anastomosis of free flaps in head and neck reconstruction.
- The decision making process for choosing ETE or ETS venous anastomosis depends on several clinical and perioperative factors.
- Where there is no clear advantage, it is unclear whether one of the techniques is associated with improved or worse outcomes
- This study evaluates the outcomes of microvascular procedures in a large multisurgeon setting, focusing on ETE vs ETS arterial anastomoses.

## Methods

- Retrospective review of all patients undergoing head and neck tissue transfer from 2006 to 2018.
- Primary outcomes included flap failure and flap thrombosis. Secondary outcomes were coupler specific complications, total ischemia time, patient surgical history, patient radiation history, and other post-operative complications.
- Fisher test and Chi square test were used for statistical analysis of categorical variables. Student t-test were used for continuous variables.

## Results

**Table 1 . Population Characteristics.**

Population Characteristics (n=249)	
Age (years)	Mean: 62.1± 14.1 Range: 22-94
Sex	Male: 160 (64.2%) Female: 80 (32.1%)
Type of Free Flap Reconstruction	Anterolateral Thigh: 101 (40.6%) Fibular: 62 (24.9%) Radial Forearm: 57 (22.9%) Latissimus Dorsi: 13 (5.2%) Scapular: 13 (5.2%) Lateral Arm: 2 (0.8%) Other: 1 (0.4%)
Vessel Orientation	ETE: 232 (70.3%) ETS: 98 (29.7%)
Anastomosis Type	Coupler Device: 286 (86.7%) Suture: 44 (13.3%)
Ischemia Time (minutes)	123.7± 42.2

**Table 2 . Microvascular Anastomosis Characteristics.**

Microvascular Anastomosis Characteristics (n=249)			
	ETE	ETS	p-value
Coupler Size (mm)			
1.5	2	1	
2.0	7	5	
2.5	37	7	
3.0	47	21	
3.5	48	16	
4.0	62	34	
5.0	0	1	
Recipient Vessel			
Internal Jugular	32	80	
Common Facial	65	3	
External Jugular	45	1	
Anterior Jugular	4	0	
Transverse Cervical	3	0	
Superficial Transverse	9	0	
Other	5	1	
History of Neck Dissection	21 (13.4%)	24 (28.2%)	$p=0.006^*$
History of Radiation	57 (36.3%)	45 (52.9%)	$p=0.009^*$

## Free Flap Related Complications (n=242)

Complication	ETE	ETS	p-value
Broken coupler	0	0	
Rings fell off	0	0	
Foreign body sensation	0	3	
Host rejection	0	1	
Venous thrombosis	3	1	
<b>Total Coupler Related Complications</b>	<b>3 (1.9%)</b>	<b>5 (5.8%)</b>	<b><math>p=0.133</math></b>
Wound Infection	19	10	
Hematoma	7	9	
Free Flap Failure	7	7	
Free Flap Loss	3	4	
<b>Total Other Free Flap Complications</b>	<b>36 (22.0%)</b>	<b>21 (24.7%)</b>	<b><math>p=0.641</math></b>

## Discussion and Conclusions

- ETE and ETS venous anastomosis have comparable low complications rates with no significant difference between flap failure and venous thrombosis rates.
- Patients with a history of previous neck dissection or head and neck radiation were more likely to undergo ETS anastomosis – this could be due to the altered neck anatomy and scar tissue making the ETE approach more difficult.
- ETS venous anastomosis is a safe and effective approach to microvascular repair in patients undergoing head and neck free tissue transfer.
- Choice of anastomotic technique in free tissue transfer should be made according to individual patient characteristics and surgeon preference

## References

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