Risk Factors Associated with Free Flap Failure – An Analysis of 2103 Patients

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INTRODUCTION: The use of microvascular free tissue transfer has steadily increased over the years, due to the ability to reconstruct complex defects.[1-4] Fortunately, failure rates have decreased over the past few years, with improvements in surgical technique combined with better pre- and post-operative assessments, including patient selection.[5-7]

The viability of free flaps depends upon various patient-based factors. The objective of this study was to further identify risk factors that are associated with increased incidence of flap failure, especially with regards to specific types of free flaps based on anatomic location.

METHODS: The American College of Surgeons National Surgical Quality Improvement Program database (ACS-NSQIP) was queried for all patients who underwent microvascular free tissue transfer from 2005 through 2012. Patients were identified based upon the following CPT codes: 15756, 15757, 15758, and 19364. Univariate analysis was performed to identify the association between free flap failure and the following factors: age, gender, race, body mass index (BMI), diabetes, smoking, alcohol, hypertension, intraoperative transfusion, functional health status, American Society of Anesthesiologists classification, operative time, and flap location. Factors yielding a significance of $p < 0.20$ were included in multivariate logistic regression models in order to identify independent risk factor significance for flap failure. Furthermore, cases were stratified based upon recipient site (Breast, Head and Neck, Trunk, or Extremity), and analysis was repeated in order to identify risk factors specific to each location.

RESULTS: 1921 of 2103 patients who underwent microvascular free flap reconstruction met inclusion criteria (Table 1). Multivariate logistic regression identified BMI (AOR = 1.07, $p=0.004$) and male gender (AOR = 2.16, $p=0.033$) as independent risk factors for flap failure. Among the “Breast Flaps” subgroup, BMI (AOR=1.075, $p=0.012$) and smoking (AOR=3.35, $p=0.02$) were independent variables associated with flap failure. In “Head and Neck Flaps,” operative time (AOR = 1.003, $p=0.018$) was an independent risk factor for flap failure. No independent risk factors were identified for the “Extremity Flaps” or “Trunk Flaps” subtypes (Table 2).

CONCLUSION: BMI was identified as an independent risk factor for flap failure among all microvascular free flaps and within the “Breast Flaps” subcategory. Smoking additionally was identified as an independent risk factor within “Breast Flaps.” Finally, increased operative time was a risk factor for flap failure among “Head and Neck Flaps.”

REFERENCES:

1. Massey MF, Spiegel AJ, Levine JL, et al. Perforator flaps: recent experience, current trends, and future directions based on 3974 microsurgical breast reconstructions. *Plastic and reconstructive surgery.* 2009;124(3):737-751.
2. Beahm EK, Walton RL. Issues, Considerations, and Trends in Bilateral Breast Reconstruction. *Plastic and reconstructive surgery.* 2009;124(4):1064-1076.
3. Smit JM, Zeebregts CJ, Acosta R, Werker PM. Advancements in free flap monitoring in the last decade: a critical review. *Plastic and reconstructive surgery.* 2010;125(1):177-185.
4. Wei FC, Mardini S. Free-style free flaps. *Plastic and reconstructive surgery.* 2004;114(4):910-916.
5. Hwang JH, Mun GH. An evolution of communication in postoperative free flap monitoring: using a smartphone and mobile messenger application. *Plastic and reconstructive surgery.* 2012;130(1):125-129.
6. Lin SJ, Nguyen MD, Chen C, et al. Tissue oximetry monitoring in microsurgical breast reconstruction decreases flap loss and improves rate of flap salvage. *Plastic and reconstructive surgery.* 2011;127(3):1080-1085.
7. Salgado CJ, Moran SL, Mardini S. Flap monitoring and patient management. *Plastic and reconstructive surgery.* 2009;124(6 Suppl):e295-302.

LEGEND:

Table 1: Frequency of Microvascular Free Flaps Among Each Flap Category

Flap Classifications	n (% of All Flaps)	Age ± SD	Incidence of Failure
Breast Flaps	1313 (68.35%)	50.32± 8.98	1.75%
Head and Neck Flaps	4.72 (24.57%)	61.64 ± 14.60	2.75%
Extremity Flaps	127 (6.61%)	48.73 ± 16.23	2.36%
Trunk Flaps	9 (0.47%)	54.89 ± 8.48	0%
All Cases	1921 (100%)	53.00 ± 12.21	2.03%

Table 2. Multivariate Analysis Indicated Adjusted Odds Ratios for Flap Failure

Flap Classification	Risk Factor	Adjusted OR (95% CI)	Adjusted p-value
All Flaps	Male Gender	2.16 (1.06-4.41)	0.033
	Current Smoker	1.50 (0.66-3.40)	0.34
	Increasing BMI	1.07 (1.02-1.11)	0.004
	Increasing Op Time	1.001 (1.000-1.003	0.253
Breast Flaps	Increasing BMI	1.075 (1.016-1.138)	0.012
	Current Smoker	3.35 (1.21-9.26)	0.020
H&N Flaps	Increasing Op Time	1.003 (1.001-1.006)	0.018
	Alcohol Use	3.026 (0.68-13.48)	0.146
Extremity Flaps	Increasing Age	1.12 (0.99-1.26)	0.077
	Increasing BMI	1.18 (0.97-1.44)	0.099