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Factors Associated with Free Flap Viability at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia

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A B S T R A C T

Introduction: A free flap is part of reconstructive surgery. This technique takes tissue or bone flaps along with their original vascular supply and performs microvascular anastomosis of the pedicle arteries and veins at the recipient site. Several risk factors that influence the occurrence of flap failure are still a major concern, such as age, gender, defect size, duration of surgery, length of tissue ischemic time, nutritional status, etc. This is further associated with higher morbidity, the potential for flap failure, higher costs, and increased length of stay in the hospital. This study aimed to determine the factors associated with free flap viability at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia. **Methods:** Cross-sectional analytic observational study. A total of 33 research subjects participated in this study. Observation of risk factors was carried out using SPSS univariate and bivariate. **Results:** Gender and ischemic time factors are related to free flap viability. Male gender and ischemic time < 60 minutes increase the success of free flap viability. **Conclusion:** Gender and length of ischemic time are associated with free flap viability at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia.

1. Introduction

A free flap is part of reconstructive surgery. This technique takes tissue or bone flaps along with their original vascular supply and performs microvascular anastomosis of the pedicle arteries and veins at the recipient site. Free flaps have many advantages, including being used for the reconstruction of various types of large defects and requiring several tissue components simultaneously (fasiocutaneous, myocutaneous, and osteocutaneous) as well as providing good functional and esthetic results. However, initially, the flap failure rate reached 40-50%. Currently, the free flap technique continues to develop and produces a higher success rate. Microsurgical reconstruction has become a standard procedure in the closure of extensive head and neck defects after tumor resection in developed countries. Thus, advances in anatomical and topographical knowledge of flaps contribute to flap success rates.[1-5]

Despite the progress in the success rate of this technique, vascular thrombosis remains one of the main postoperative complications of free flap microvascular surgery. Intimal trauma, kinking of vessels, and technical problems during the

anastomosis are also common causes of free flap failure. Several risk factors that influence the occurrence of flap failure are still a major concern, such as age, gender, defect size, duration of surgery, length of tissue ischemic time, nutritional status, etc. This is further associated with higher morbidity, the potential for flap failure, higher costs, and increased length of stay in the hospital.[6-10] This study aimed to determine the factors associated with free flap viability at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia.

2. Methods

This study was an analytic observational study with a cross-sectional approach. It used secondary data from medical records obtained at the medical records installation of Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia. A total of 33 research subjects participated in this study, where the research subjects met the inclusion criteria. The inclusion criteria in this study were all patients who underwent microsurgical reconstruction at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia, for the 2017-2022 period and had complete medical record data. This study was approved by the medical and health research ethics committee at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia.

This study observed sociodemographic data and data on factors potentially related to free flap viability, including the cause of the defect, size of the defect, location of the defect, ischemic time, length of operation, nutritional status, and vein graft. Data analysis was carried out using SPSS software version 25. Univariate analysis was performed to present the distribution of data for each test variable, and bivariate analysis was performed to determine the relationship between the test variables and free flap viability, $p < 0.05$.

3. Results

Table 1 presents the frequency distribution of each variable test and an analysis of the relationship between variable tests. As much as 69.7% of subject research shows the success of free flaps. The majority of research subjects were <50 years old and male. The majority of causes of defects are tumors, with the majority tumor size > 30 cm^2, and the majority of defects are capitis. The majority of free flap types used are ALT, with the majority of ischemic time <60 minutes, with the majority of operating time 10-15 hours, with the majority of normoweight nutritional status, and the majority without vein grafts. The study results show that factor gender and ischemic time are related to free flap viability. Male gender and ischemic time <60 minutes increase the success of free flap viability.

4. Discussion

In this study, out of 18 male patients, the average patient was included in the results of a viable reconstruction. Of 15 female patients, 8 patients were included in the viable category. Statistical analysis obtained a p-value = 0.020 ($p < 0.05$), which means that statistically, there is a significant relationship between free flap viability and gender. Research on the relationship between gender and free flap viability is still very limited. In studies of head and neck resection and reconstruction, gender has not been reported to have an effect on prognosis. However, if it is associated with an increased risk of complications, other studies show that the female gender tends to have an increased risk of complications qualitatively and quantitatively. In other surgical specialties, the female gender has been reported to be correlated with the development of complications after major surgical procedures. In a series of 2.129 patients, who had undergone coronary artery bypass grafting, female gender was noted as an independent factor for increased mortality during the first 30 postoperative days. And in conclusion, female gender appears to influence the presence and/or severity of complications after reconstruction of the microvascular free flap in the head and neck region.[11-15]

Table 1. Analysis of the relationship of free flap viability to variables.

Variable	Viable free flap (n)	Non-viable free flap (n)	p-value*
Age			0,777
<50 years	17	7	
50-70 years	5	3	
> 70 years	1	0	
Gender			0,020
Male	16	2	
Female	7	8	
Cause of defect			0,469
Tumor	17	10	
Burns	4	0	
Contracture	1	0	
Parry-Romberg syndrome	1	0	
Defect size			0,605
≤ 30 cm^2	4	2	
> 30 cm^2	19	8	
Defect location			0,521
Capitis	22	9	
Lower extremities	1	1	
Free flaps type			0,798
RFFF	8	3	
FFF	6	4	
ALT	9	3	
Ischemic time			0,021
< 60 minutes	22	6	
≥ 60 minutes	1	4	
Operation duration			0,273
< 10 hours	5	0	
10-15 hours	14	9	
> 15 hours	4	1	
Nutritional status			0,823
Underweight	3	2	
Normoweight	18	7	
Overweight	2	1	
Vein graft			0,145
With vein graft	6	0	
Without vein graft	17	10	

*Chi-square test, p<0,05.

In this study, the mean ischemic time was <60 minutes, and the results of the reconstruction were viable. There were 5 patients with ischemic time ≥60 minutes, 4 patients non-viable, and only 1 patient with viable reconstruction results. Statistical analysis showed a p-value = 0.021 (p <0.05), which means that there is a statistically significant relationship between free flap viability and ischemic time. The ischemic time of the flap is always a concern for the surgeon performing the free flap. It is known that after a certain period of ischemia, irreversible changes occur in the flap that inevitably leads to necrosis and failure, even when the blood supply is re-established. Most microvascular surgeons prefer to maintain ischemic time to maintain a safe margin between revascularization of the flap and the point at which no-reflow can occur. Some argue that an increase in ischemic time may reduce the probability of a successful flap transfer. Another study on the relationship between ischemia time and fibular flap outcome demonstrated that ischemia time of up to 5 hours did not adversely affect the success or improvement of the flap. If a longer ischemia time does not compromise the outcome of the procedure, the surgeon can spend more time on certain stages of the reconstruction, such as shaping and inserting the

fibula into the mandible or adding an osseointegrated dental implant. This length of time reduces the possibility of surgical errors due to rushed procedures.[16-19]

5. Conclusion

Gender and length of ischemic time are associated with free flap viability at Dr. Mohammad Hoesin General Hospital, Palembang, Indonesia.

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