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Is long-term post-operative monitoring of microsurgical flaps still necessary?



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Summary Autologous microsurgical flap reconstruction has become commonplace in most plastic surgery units, and the success rates of this procedure have markedly increased over recent years. However, the possibility of flap failure still needs to be considered. A review of the literature reveals that the critical period for flap-threatening complications is the first 24–48 post-operative hours; however, the window for the onset of these complications remains open for up to 7 days post-operatively. In this study, we focus on the timing of flap complications, aiming to elucidate the time period over which meticulous flap monitoring can positively contribute to flap salvage rates.

The relevant literature on the study topic was collated and reviewed in conjunction with the senior author's case series, which consisted of a total of 335 free flaps used during a 2-year period for breast and head and neck reconstruction or limb trauma. Patients' series were then divided into groups according to the complications timing. The correlation between the timing of complications and the flap salvage rate was investigated among the groups.

Overall analysis of both the literature and our own data on 335 free flaps showed a progressive reduction in flap salvage rate during post-operative days; the correlations between the times of complication onset and the flap salvage rates in all groups were significant up to the third post-operative day. The correlations between salvage rates and later complications were not significant. Our results suggest that hourly flap monitoring should be compulsory during the first 48 post-operative hours, but clinical monitoring four times daily should be sufficient thereafter.

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Introduction

Microsurgical reconstruction using autologous flaps has become one of the pillars of plastic surgery. Today, the success rate of microsurgical reconstruction is approximately 95%.^{1–4} However, despite improved outcomes, the risk of flap failure is not yet negligible.^{5–7}

There is no consensus in the literature regarding the duration of the high-risk post-operative period for flap vascular complications. Previous studies have shown that complications can develop up to 7 days post-operatively, but that the critical window of time for complications is 24–48 h.^{8–11} Flap-threatening complications that may develop include vascular thrombosis, pedicle kinking, venous congestion and arterial spasm.⁹ The probability of flap salvage is inversely related to the duration of ischaemia, and flap salvage becomes almost impossible after 12 h at the onset of the ‘no-reflow’ phenomenon.^{4,10}

Microvascular flap reconstruction is expensive in terms of time and resources. Appropriately skilled personnel are needed to perform regular post-operative monitoring, with the aim of detecting early signs of flap failure.^{4,8,10,12} Several post-operative protocols have been described; most of them require hourly assessments of relevant clinical parameters, and some require the use of expensive equipment.^{4,13}

In this study, we report our series of recent microsurgical cases and the results of a literature review on flap salvage. We aimed to determine the time period for which frequent post-operative monitoring is required to prevent avoidable flap failures. To the best of our knowledge, there have not been any previous studies with the same aim.

Patients and methods

Data collection

After approval by our institutional review board, we conducted a retrospective analysis of the senior author’s cases. The study included consecutive patients who underwent microsurgical reconstruction using autologous flaps between January 2013 and November 2015.

In accordance with our institution’s post-operative monitoring protocol, all flaps were checked hourly for the first 48 h after surgery and, subsequently, every 2–3 h until patient discharge. The following assessments were performed and recorded: capillary refill, skin colour, cutaneous temperature and arterial Doppler signal. If a vascular complication was identified, the duration of ischaemia was determined, starting from the time of the previous flap assessment to after clamp release following re-exploration.

The PubMed, Scopus, Embase and Cochrane Library databases were used to identify the relevant literature. The following keywords were used in the search: flap monitoring, flap salvage, flap failure, flap re-exploration and microvascular thrombosis. The complete text of every work pertaining to the study topic was analysed, with a focus on the time to early-onset complications and salvage rate. Studies that did not report the onset times of the post-operative complications and the outcomes of the salvage

procedures were excluded. Adverse events not related to flap surgery were not considered.

Data synthesis and statistical analysis

All data obtained from the literature and the review of our cases were standardised according to time of complication onset and flap salvage rate. The complication onset times were grouped into 24-h blocks of post-operative time for purposes of analysis. The data were analysed by one-way analysis of variance (ANOVA), followed by the F test, using the SPSS version 22 software (IBM Corporation, USA). A *p* value < 0.05 was considered statistically significant.

Results

A total of 335 free microsurgical reconstructions were performed; their details are reported in Table 1. No pedicle flaps were included in the study. Vascular complications developed in 31 (9.2%) flaps, and 14 of them could not be salvaged, resulting in an overall salvage rate of 52.8%. Table 2 shows the distribution of complications over time, with associated flap salvage and failure rates in our patients.

Table 3 shows a summary of the data from the literature review. The time to onset of complications in our case series was similar to the data reported in the literature. The overall analysis of our data and literature data found a significant correlation between the times of complication onset and the flap salvage rates, up to the third post-operative day (*p* < 0.05). Probably because of the small

Table 1 335 free flaps description: type of flap, indication and recipient site.

| Indication | Recipient site | Flap | No. of flaps (%) |
|------------|----------------|------------|------------------|
| Trauma | Upper limb | ALT | 2 (0,6) |
| | | Lower limb | ALT |
| | | DIEP | 1 (0,3) |
| | | Gracilis | 2 (0,6) |
| | | Forearm | 6 (1,7) |
| Oncology | Head and neck | ALT | 27 (8,1) |
| | | LD | 2 (0,6) |
| | | Gracilis | 3 (0,9) |
| | Breast | DIEP | 182 (54,4) |
| | | SGAP | 48 (14,4) |
| | | PAP | 9 (2,7) |
| | | TUG | 18 (5,3) |

Table 2 Number of complications by time and flap salvage rate; literature data.

| Our experience | 24 h | | | 48 h | | | 3 days | | | >3 days | | |
|------------------------|------|----|---|------|---|---|--------|---|---|---------|---|---|
| | TF | S | F | TF | S | F | TF | S | F | TF | S | F |
| 31 flaps were explored | 18 | 12 | 6 | 9 | 5 | 4 | 2 | 0 | 2 | 2 | 0 | 2 |

TF = total flap; S = saved flap; F = failed flap.

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