

# A Novel Free Flap Monitoring System Using Tissue Oximetry with Text Message Alerts

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## Abstract

**Background** The time to detection of vascular compromise is a significant predictor of free flap salvage outcomes as early reexploration improves salvage rates. Continuous transcutaneous near-infrared tissue oximetry is an objective, quantitative method of detecting flap vascular compromise and has been shown to allow earlier reexploration and higher salvage rates than clinical assessment alone. We designed a novel text messaging system to improve communication using tissue oximetry monitoring.

**Methods** A retrospective review was performed of a prospectively collected database of all microsurgical breast reconstructions from 2008 to 2015. A novel text messaging system was introduced in 2013 and programmed to send text messages alert when the tissue oximetry readings suggested potential flap compromise based on established thresholds. Patient demographics and complications, including rate of reexploration and flap loss were assessed.

**Results** There were 900 autologous microsurgical breast free flaps during the study period: 614 were monitored with standard clinical monitoring and tissue oximetry compared with 286 flaps with the additional text messaging system. There were 27 unplanned returns to the operating room in the tissue oximetry group and 5 in the text messaging group with 1 complete flap loss in each group. Reexploration occurred sooner as a result of these text message alerts (17.5 vs. 26.6 hours postoperatively), however, it did not achieve statistical significance.

**Conclusions** We were able to demonstrate the use of a novel text messaging system for tissue oximetry. This alert system shows promise in identifying impending flap loss with rapid notification of the surgical team.

## Keywords

- ▶ microsurgery
- ▶ tissue oximetry
- ▶ flap monitoring

The incidence of free flaps requiring reexploration due to circulatory compromise has been reported to be 5 to 25%.<sup>1–8</sup> For microsurgeons, earlier identification of struggling free flaps is paramount to decrease the rate of flap loss and increase the success of salvage. However, the optimal method of flap monitoring is still evolving and currently there are many potential monitoring options.

An ideal monitoring system would be noninvasive, accurate, quantitative, sensitive, easy-to-use, harmless to the patient and flap, rapidly responsive, reliable, applicable to all types of flaps, and capable of providing continuous information.<sup>9,10</sup> One method of flap monitoring which has proven benefit in flap monitoring is transcutaneous tissue oximetry. Given the continuous nature of these devices, flap

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