

# Does Increased Experience with Tissue Oximetry Monitoring in Microsurgical Breast Reconstruction Lead to Decreased Flap Loss? The Learning Effect

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**Background:** Early studies have shown that near-infrared monitoring with tissue oximetry shows promise in providing earlier detection of free flap vascular compromise. However, large-scale clinical evaluation of this technology on flap outcome has not previously been established. This study examines the effect of tissue oximetry on flap reexploration rates and salvage over a 10-year period. The learning curve for this new technology is also assessed.

**Methods:** A retrospective review was performed of prospectively maintained data on all microsurgical breast reconstructions performed at an academic institution from 2004 to 2014. Patients were divided into two separate cohorts—standard clinical monitoring and standard clinical monitoring plus tissue oximetry—and rates of reexploration and flap salvage were compared. Subgroup analysis (tertiles) was performed to assess outcomes with increasing experience.

**Results:** A total of 380 flaps (36.2 percent) received standard clinical monitoring, and 670 flaps (63.8 percent) received additional tissue oximetry monitoring. The rate of flap salvage before implementation of tissue oximetry monitoring was 57.7 percent and increased to 96.6 percent ( $p < 0.001$ ). The number of complete flap losses decreased from 11 (2.9 percent) to one (0.1 percent) with the use of tissue oximetry ( $p < 0.001$ ). Subgroup analysis demonstrated significantly fewer reexplorations in the third tertile.

**Conclusions:** Inclusion of continuous tissue oximetry in the postoperative monitoring protocol of microsurgical breast reconstruction is associated with significantly improved salvage rates and fewer flap losses. Furthermore, learning curve assessment demonstrates that use of tissue oximetry can decrease the rate of reexploration over time. (*Plast. Reconstr. Surg.* 137: 1093, 2016.)

Decreasing the rate of flap loss and increasing the success of salvage operations are universal goals among reconstructive microsurgeons. Despite meticulous technique and advanced surgical skill, 5 to 25 percent of free flaps still require reexploration because of circulatory compromise.<sup>1-8</sup> The optimal method of monitoring these flaps, however, is still evolving. Ideally,

the most useful monitoring technique is 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> The time to detection of flap compromise is a significant predictor of flap salvage outcome.<sup>11</sup> Thus, earlier detection of vascular compromise of a free flap allows earlier exploration and improved opportunity for salvage.<sup>2,11</sup>

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