

# Tailoring through Technology: A Retrospective Review of a Single Surgeon's Experience with Implant-Based Breast Reconstruction before and after Implementation of Laser-Assisted Indocyanine Green Angiography

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## ABSTRACT:

**Background:** Reported complication rates of implant-based breast reconstruction in the literature exceed 50%, with mastectomy skin flap necrosis reported to occur in up to 25% of cases. Laser-assisted indocyanine green angiography (LA-ICGA) technology allows the surgeon to optimize preservation of the mastectomy skin flap while avoiding skin necrosis.

The purpose of this study was to determine if outcomes of breast reconstruction are beneficially affected by using LA-ICGA. A total 269 consecutive women (467 breast reconstructions) undergoing implant-based breast reconstruction from 2008 to 2013 were examined.

The complication rates of those who underwent reconstruction prior to the implementation of LA-ICGA were compared with those who were reconstructed after implementation of LA-ICGA. A total of 254 consecutive breast reconstructions were performed prior to implementation of LA-ICGA, and 213 breasts were reconstructed with the use of LA-ICGA. After implementation of LA-ICGA System, the rate of mastectomy skin flap necrosis decreased by 86% (6.7% versus 0.9%,  $p = 0.02$ ). The overall complication rate prior to LA-ICGA was 13.8% compared with 6.6% with the use of LA-ICGA ( $p = 0.01$ ). After LA-ICGA was incorporated, the percentage of patients undergoing single-stage reconstruction increased from 12% to 32% ( $p = <0.001$ ).

Implementation of LA-ICGA provides the surgeon with an objective assessment of mastectomy flap perfusion resulting in a trend toward overall reduction in complications as well as an 86% decrease in the rate of subsequent skin necrosis. The objective assessment of mastectomy flap perfusion allows the surgeon to tailor breast reconstruction intraoperatively, in real-time, adjusting for the individual patient's mastectomy flap perfusion.

## KEY POINTS:

1. This study is a retrospective, single institution, comparative analysis performed on consecutive patients undergoing implant-based reconstruction from 2008 to 2013.
  - a. A total of 269 consecutive women (467 breast reconstructions) underwent implant-based breast reconstruction.
    - i. The cohort was divided into those reconstructed without the aid of LA-ICGA, a total of 254 breasts in 149 patients, and those reconstructed with the use of LA-ICGA, a total of 213 breasts in 120 women.
    - ii. There was no difference in the distribution of patients undergoing skin-sparing mastectomy compared with nipple-sparing mastectomy.
2. Accurate prediction of skin flap viability with clinical judgment intraoperatively is a challenging task that often relies on subjective parameters including color, capillary refill, and dermal edge bleeding.
  - a. Assessment of skin flap perfusion with intraoperative (LA-ICGA allows for real-time visualization of skin perfusion providing the surgeon with an objective marker to facilitate surgical decision making.
3. After implementation of LA-ICGA, the number of women undergoing direct-to-implant reconstruction increased significantly to 32% ( $n = 68$ ) compared with only 12% ( $n = 30$ ) prior ( $p < 0.0001$ ).
4. Prior to LA-ICGA 13.8% ( $n = 35$ ) of patients experienced at least one complication compared with 6.6% ( $n = 14$ ) with the use of LA-ICGA, this difference was found to be significant ( $p = 0.015$ ).
5. The incidence of mastectomy flap skin necrosis prior to LA-ICGA was 6.7% (17 reconstructions) compared with two with the use of LA-ICGA and/or incidence of 0.9%.
  - a. This difference was found to be significant ( $p = 0.002$ ).
6. Overall, the use of LA-ICGA resulted in a 52% reduction in all complications with a remarkable 87% reduction in mastectomy skin flap necrosis alone.
  - a. Furthermore, reconstructive failure as defined by need for flap salvage was substantially reduced (4.7% versus 0.9%,  $p = 0.026$ ).

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