

INTRODUCTION

Indocyanine green angiography (ICG-A) is widely recognized as a gold-standard technique for evaluating soft tissue perfusion in high-risk wounds.

Despite its effectiveness, the high cost of dedicated near-infrared laser (NIRL) imaging systems, such as SPY, often limits their use in clinical settings.

This study investigates the feasibility of performing ICG-A using the NIRL capabilities of standard operating microscopes, specifically the Zeiss Kinevo microscope.



MATERIALS & METHODS

12 high-risk wounds were examined using the NIRL within a Zeiss Kinevo microscope (ICG-A Group) at ECU Health.

Outcomes in this group were compared to matched cases (10) in which microscope ICG-A was not available ("No ICG-A" Group).

A chi-square statistical analysis test was conducted, with a p-value of less than 0.05 considered to be statistically significant.

RESULTS

Table 1: Outcomes in Microscope ICG-A Group

	Avoided Amputation (N)	Avoided Marginal Necrosis (N)	Avoided Unplanned Reoperation (N)	Assisted with Reconstruction (N)
Yes	8	10	9	12
No	0	1	3*	0
N/a	4	1	0	0
Totals	100%	91%	75%	100%

*Re-operations were not related to skin necrosis, wound problems.

Table 2: Outcomes without Microscope ICG-A

	Avoided Amputation (N)	Avoided Marginal Necrosis (N)	Avoided Unplanned Reoperation (N)*	ICG could have Assisted with Reconstruction (N)
Yes	4	3	7	10
No	0	7	3	0
N/a	6	0	0	0
Total	100%	30%	70%	100%

*Re-operations were related to wound problems in all three cases.

The rate of marginal necrosis was significantly lower in the ICG-A Group: 9% vs 70% (χ^2 p-value = 0.0041*).

The rate of unplanned reoperation was nearly equivalent in the two groups: 25% with ICG-A vs 30% without (χ^2 p-value = 0.79).

Table 3: Cost Analysis of Indocyanine Green Angiography: Microscope vs. SPY Technology

Cost Component	ICG-A Microscope	SPY
Equipment	\$200,000 - \$500,000	\$100,000 - \$250,000
ICG Dye (per vial)	\$60-\$200	Included in kit
SPY Kit	-	\$550 SPY-PHI \$1000 SPY Elite

DISCUSSION

By utilizing commonly available equipment, the potential for significant cost savings is explored, making ICG-A more accessible.

However, microscope NIRLs lack some of the sophisticated features seen in standalone NIRL devices, including field of view, quantitative features, and portability.

REFERENCES

- Kanuri, A., Liu, A. S., & Guo, L. (2014). Whom should we SPY? A cost analysis of laser-assisted indocyanine green angiography in prevention of mastectomy skin flap necrosis during prosthesis-based breast reconstruction. *Plastic and reconstructive surgery*, 133(4), 448e–454e. <https://doi.org/10.1097/PRS.0000000000000025>
- Varela, R., Casado-Sanchez, C., Zerbakhsh, S., Diez, J., Hernandez-Godoy, J., & Landin, L. (2020). Outcomes of DIEP Flap and Fluorescent Angiography: A Randomized Controlled Clinical Trial. *Plastic and reconstructive surgery*, 145(1), 1–10. <https://doi.org/10.1097/PRS.00000000000006393>

ACKNOWLEDGEMENTS

Special thanks to Dr. Kristopher Katira and the ECU Health Plastic and Reconstructive Surgery team for their invaluable support and mentorship. I am also grateful to the Brody School of Medicine and the SSRP program for providing the funding for this summer research opportunity.