Title

Early detection of complete venous occlusion in a rodent and swine pedicle flap model using modulated imaging, a new novel multispectral imaging technique

Journal

Journal of the American College of Surgeons, 209(3)

ISSN

1072-7515

Authors

Pharaon, Michael R
Scholz, Thomas
Bogdanoff, Scott
et al.

Publication Date

2009-09-01

DOI

10.1016/j.jamcollsurg.2009.06.190

Early detection of complete venous occlusion in a rodent and swine pedicle flap model using modulated imaging, a new novel multispectral imaging technique

Michael R Pharaon MD, Thomas Scholz MD, Scott Bogdanoff, David Cuccia PhD, Anthony J Durkin PhD, David B Hoyt MD, FACS, Gregory RD Evans MD, FACS
University of California, Irvine, Orange, CA

INTRODUCTION: Venous occlusion after a tissue transfer flap is a devastating complication that can lead to complete flap loss. We used a new noncontact, noninvasive imaging device developed at the Beckman Laser Institute to monitor flaps.

METHODS: In this study, bilateral pedicle groin flaps based on the inferior epigastric vessels were prepared in Wistar Rats (400–500 g), and Yorkshire Pigs (25–30 kg). The flaps were imaged at baseline for 10 minutes, followed by selective complete venous occlusion in the experimental flap and imaging for 55 minutes. The contralateral flap served as a control. The results were analyzed using a Wilcoxon signed rank *t* test, as well as a 2-way ANOVA with Bonferroni post-test to analyze the differences between the control and experimental flaps over the entire time course.

RESULTS: Baseline measurements showed stable results for oxygenated hemoglobin, deoxygenated hemoglobin, total hemoglobin, and tissue saturation. There were no statistical differences for each of the above parameters between the control and experimental flaps

prior to venous occlusion. All 4 measured parameters in both the rodent and swine models became statically different between the control and experimental flaps over the time course of the experiment ($p < 0.05$).

CONCLUSIONS: Modulated imaging can be used to quantify and detect the expected physiological changes that occur after venous occlusion in tissue transfer flaps. This portable, noncontact, noninvasive device may have a high clinical applicability in monitoring postoperative patients. Further studies are needed to evaluate the predictive potential of this technique.