

Photobiomodulation With Polychromatic Light Increases Zone 4 Survival of Transverse Rectus Abdominis Musculocutaneous Flap

Mert Calis, MD, FEBOPRAS,¹ Tugrul Tolga Demirtas, PhD,² Gokhan Sert, MD,¹ Gulseren Irmak, MSc,² Menemse Gumusderelioglu, PhD,³ Ayten Turkkani, MD,⁴ Ayse NurCS akar, MD,⁴ and Figen Ozgur, MD

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¹Department of Plastic Reconstructive and Aesthetic Surgery, Hacettepe University Faculty of Medicine, Ankara, Turkey

²Bioengineering Department, Hacettepe University, Ankara, Turkey

³Chemical Engineering and Bioengineering Departments, Hacettepe University, Ankara, Turkey

⁴Department of Histology and Embryology, TOBB University, Ankara, Turkey

Objective: The aim of this study was to evaluate the effect of relatively novel approach of application of polychromatic light waves on flap survival of experimental musculocutaneous flap model and to investigate efficacy of this modality as a delay procedure to increase vascularization of zone 4 of transverse rectus abdominis musculocutaneous (TRAM) flap.

Methods: Twenty-one Wistar rats were randomized and divided into 3 experimental groups ($n=7$ each). In group 1 (control group), after being raised, the TRAM flap was sutured back to its bed without any further intervention. In group 2 (delay group), photobiomodulation (PBM) was applied for 7 days as a delay procedure, before elevation of the flap. In group 3 (PBM group), the TRAM flap was elevated, and PBM was administered immediately after the flap was sutured back to its bed for therapeutic purpose. PBM was applied in 48 hours interval from 10 cm. distance to the whole abdominal wall both in groups 2 and 3 for one week. After 7 days of postoperative follow-up, as the demarcation of necrosis of the skin paddle was obvious, skin flap survival was further evaluated by macroscopic, histological and microangiographic analysis.

Results: The mean percentage of skin flap necrosis was 56.17_23.68 for group 1, 30.92_17.46 for group 2 and 22.73_12.98 for group 3 PBM receiving groups 2 and 3 revealed less necrosis when compared to control group and this difference was statistically significant. Vascularization in zone 4 of PBM applied groups 2 and 3 was higher compared to group 1 ($P=0.001$). Acute inflammation in zone 4 of group 1 was significantly higher compared to groups 2 and 3 ($P=0.025$). Similarly, evaluation of zone 1 of the flaps revealed more inflammation and less vascularization among the samples of the control group ($P=0.006$ and $P=0.007$, respectively). Comparison of PBM receiving two groups did not demonstrate further difference in means of vascularization and inflammation density ($P=0.259$).

Conclusion: Application of PBM in polychromatic fashion enhances skin flap survival in experimental TRAM flap model both on preoperative basis as a delay procedure or as a therapeutic approach.

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