

PREDICTION AND PREVENTION OF SKIN AUTOGRAFT FAILURE IN EARLY BURN WOUND CLOSURE

Ochilov U.B.

Bukhara State Medical Institute

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Introduction. Deep burn injury remains a paramount challenge in reconstructive surgery, where prompt restoration of skin integrity determines systemic stabilization and patient survival. Despite advances in early autodermoplasty, acute microvascular impairment and local tissue hypoxia frequently precipitate partial or total autograft breakdown, necessitating secondary surgical interventions. To overcome these limitations, the objective of the study was to improve the results of early burn wound closure with skin autografts by developing a pathogenetically substantiated system for predicting graft failure risk and establishing a differentiated surgical approach for its prevention.

Materials and methods. The prospective clinical investigation was conducted on a cohort of 176 patients admitted with severe deep thermal skin injuries requiring early surgical excision and immediate autologous skin transplantation. In the main cohort of 89 patients, a novel pathogenetic algorithm combining laser Doppler flowmetry and tissue oxygenation profiling was applied to predict graft failure risk, guiding differentiated preoperative surgical preparation.

The control cohort consisted of 87 patients who were managed with conventional surgical protocols, where early necrectomy and skin grafting were executed according to standard clinical routines without preliminary microcirculatory risk stratification. Diagnostic evaluation parameters included local microvascular perfusion dynamics, capillary flow density, histological wound bed readiness, and quantitative autograft engraftment scoring on postoperative days 3, 7, and 14. Preoperative microvascular risk assessment successfully identified subclinical ischemic zones in 38.2% of main group patients, prompting targeted hemodynamic optimization and tissue pre-conditioning prior to graft placement.

Consequently, total autograft failure dropped significantly in the main group compared to controls, with complete primary autograft take observed in a vastly higher proportion of patients.

Accelerated capillary re-vascularization into the transplanted dermal matrix in the main group led to faster wound stabilization and reduced the overall hospitalization period by an average of 5.4 days relative to the control group.



These findings demonstrate that overcoming microvascular hypoxia at the graft-host interface is critical to preventing enzymatic graft lysis and promoting early endothelial alignment.

Differentiated surgical pre-conditioning effectively restores capillary perfusion of the granulating bed, neutralizing local oxidative stress and establishing optimal conditions for skin transplant survival. In conclusion, the integration of a pathogenetically substantiated prediction and prevention framework eliminates microvascular graft failure, significantly improving clinical outcomes in early surgical burn management.

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