The role of micro-rheological investigations in musculocutaneous and adipocutaneous flap ischemia-reperfusion follow-up studies

Zsuzsanna Magyar¹, Abel Molnar¹, Robert Tamas², Zoltan Klarik¹, Norbert Nemeth¹
¹Department of Operative Techniques & Surgical Research, Faculty of Medicine, University of Debrecen; ²Department of Plastic and Burn Surgery, Medical Centre of Hungarian Defense Forces

In reconstructive surgery various pedicled flaps can be used for covering tissue defects. During their preparation, transposition and (auto)transplantation, the flaps may suffer from hypoperfusion and/or ischemia-reperfusion (I/R) that can influence flap survival and wound healing. In the department several models have been used for investigating the microcirculatory and micro-rheological effects of I/R. Here we aimed to overview three flap models. (1) In a canine study the latissimus dorsi muscle (LDM) flap ischemia was 1 hour. (2) In a rat model of latissimus dorsi - cutaneous maximus (LDCM) musculocutaneous flap 2-hour ischemia was provided. (3) In the groin flap (GF) adipocutaneous model on rats the ischemic time was 1 hour. In all cases a 2-week postoperative (p.o.) period was examined. Besides hematological, microcirculatory and morphological investigations, red blood cell (RBC) aggregation and deformability were determined. In the LDM flap model RBC aggregation significantly increased in the first 30 minutes of reperfusion, and in the 1st p.o. week. In LDCM flap models the microcirculatory parameters markedly decreased after ischemia, RBC aggregation and deformability also worsened over the 1st week. In the GF model these alterations were seen mostly on the 3rd-5th days. In conclusion, I/R have different effect on various flaps also depending on ischemic time and tissue ischemic tolerance. Monitoring of micro-rheological parameters can be informative in flap studies.