

Background: Free muscle flap transfers, frequently used in plastic and reconstructive surgery, are associated with alternating episodes of ischemia and reperfusion. This phenomenon could be a cause of damage in the transferred flap. Major detrimental effect is usually attributed to the oxidative stress.

Aim: The aim of this study was therefore 1) to develop a clinically relevant experimental model of free muscle flap for musculus latissimus dorsi (MLD), 2) to elaborate a technique allowing, by means of routine laboratory methods, the detection of changes occurring with oxidative stress, and 3) to evaluate the impact of ischemia and subsequent reperfusion on free flap muscle tissue (in terms of oxidative stress).

Methods: In 18 domestic pigs, MLD was prepared on both sides (experimental and control), leaving just the thoracodorsal branch for nutrition. The vascular stalk for the experimental MLD was clamped temporarily (60 min) to mimic ischemia during flap transfer. After the clamp release (corresponds to reperfusion following anastomosis), both arterial, venous blood, and tissue samples were obtained from the ischemic as well as control flaps at timepoints 1, 30, 45, and 60 min. For baseline characteristics, tissue, arterial, and venous blood were sampled prior to clamping. In all samples, lactate, pyruvate, glutathion peroxidase, glutathion, TBARS, creatinkinase, aspartate aminotransferase, and myoglobin were determined.

Results: During the experiment, statistically significant time-dependent changes were observed in potassium levels within arterial blood, ischemic flap venous blood, and control flap venous blood. While arterial blood pyruvate decreased significantly, its ischemic flap venous levels raised significantly and control flap venous levels remained unchanged. Systemic lactate was found to decline while venous levels did not differ significantly. The other determined blood and tissue markers did not show significant changes.