Impact of Diabetes on Microvascular PO$_2$ in the Rat Soleus After Chronic Femoral Artery Ligation

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**Background:** Diabetes causes metabolic and vascular derangements that disrupt the normal balance between oxygen delivery (QO$_2$) and oxygen utilization (VO$_2$) in skeletal muscle resulting in changes in the microvascular PO$_2$ (PO$_{2mv}$). Vascular insufficiency (as modeled by femoral artery ligation) results in the development of collateral circulation and restoration of distal muscle blood flow. It is not known how diabetes impacts the collateralization process and the restoration of QO$_2$.

**Aim:** To determine the effect of diabetes on the restoration of PO$_{2mv}$ in the rat soleus muscle after femoral artery ligation.

**Methods:** Female Sprague Dawley rats were randomly divided into two groups: 1) Control femoral artery ligated (CFL, n = 12) and 2) Diabetic femoral artery ligated (DFL, n = 12). Diabetes was induced with streptozocin (50 mg/kg). Two wks later, the left femoral artery was double ligated in all rats. Experiments were performed 6 wks later. After anesthesia, the soleus was exposed and PO$_{2mv}$ (phosphorescent quenching method; oxyphor G2) was measured at rest and during the rest-to-contraction transition (1 Hz, 6 V) for 3 minutes.

**Results:** Diabetes results in a marked decrease in body weight (245 ± 8 vs 287 ± 5 g) and soleus muscle weight (143 ± 10 vs 188 ± 8 mg). Blood glucose was greater in DFL (441 ± 30 vs. 109 ± 2 mg/dl). At rest, PO$_{2mv}$ in DFL soleus was less than in CFL (43 ± 3 vs 52 ± 2 mmHg; P<0.05). During contractions, DFL demonstrated a smaller fall in PO$_{2mv}$ than CFL (-7 ± 2 vs -13 ± 2 mmHg; P<0.05) over a similar mean response time (DFL, 45 ± 5; CFL, 42 ± 3 s). After contractions ceased, PO$_{2mv}$ returned towards initial levels in both CFL and DFL (50 ± 3 and 40 ± 4 mmHg; P<0.05). However, the rate of recovery for PO$_{2mv}$ was slower in DFL compared to CFL (0.10 ± 0.02 vs. 0.23 ± 0.03 mmHg/s).

**Conclusion:** Although resting PO$_{2mv}$ in the soleus muscle of the DFL group was lower than in controls, the diabetic rats showed relatively good recovery of resting PO$_{2mv}$ and responses to muscle contraction and recovery, reflecting collateralization. The faster PO$_{2mv}$ kinetics previously reported in skeletal muscle of diabetic rats was not apparent after femoral ligation. (Supported by Graduate Program Committee, KCOM – ATSU)

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