

Vasomotor Function of the Descending Genicular Artery

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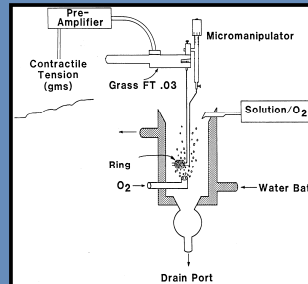
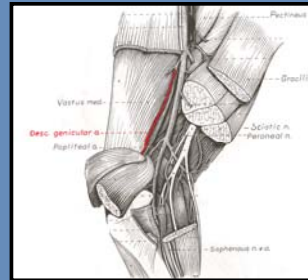
Abstract

Purpose: To characterize the vasomotor function of the descending genicular artery that supplies blood to the synovial knee joint. **Methods:** Arteries were harvested from the left knees of 6 sedentary and 5 exercise trained adult female Yucatan pigs. Segments of the artery were mounted on myographs to examine vasomotor function in vitro. Artery segments were constricted with 3×10^{-5} M prostaglandin F₂. Vasorelaxation was assessed via recording responses to increasing doses of ADP (1.0×10^{-9} to 1.0×10^{-4}) and bradykinin (1.0×10^{-11} to 1.0×10^{-6}) (endothelium-dependent dilators), while endothelium independent function was assessed via responses to sodium nitroprusside (1.0×10^{-10} to 1.0×10^{-4} .) Vasorelaxation responses were performed in the presence and absence of L-NAME [$300 \mu\text{M}$], indomethacin [$5 \mu\text{M}$ (INDO)], L-NAME + INDO to assess the relative contributions of nitric oxide synthase generated NO and cyclooxygenase generated prostacyclin to the vasorelaxation responses. **Results:** Our results show that exercise-trained pigs have higher endothelium-dependent vasorelaxation than sedentary pigs, and physical inactivity seems to result in decreased vasorelaxation by the cyclooxygenase/prostaglandin pathway.

Purpose

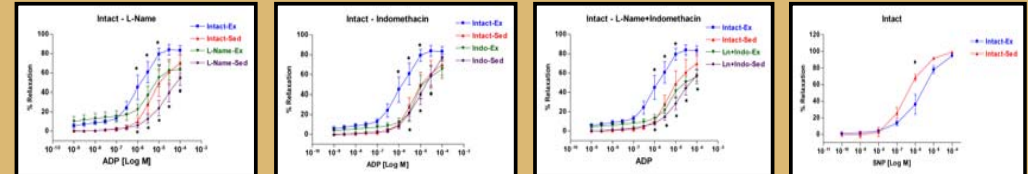
The purpose of this study was to determine whether physical inactivity would cause a decrease in endothelium-dependent vasorelaxation of the descending genicular artery of the pig, and to assess the relative contributions of nitric oxide synthase generated NO and cyclooxygenase generated prostacyclin to the vasorelaxation responses.

Methods



11 female Yucatan pigs of about 1 year of age were divided into two groups. One group engaged in daily exercise training of increasing intensity over a one week period (Con EX; n=5), while the other group was restricted to cage activity (Con SED; n=6.) Exercise training was performed on a treadmill. Pigs were anesthetized and the descending genicular artery isolated from the left hind limb. The arteries were divided into 3 mm rings, mounted on artery myographs (See Figure) at 37 C, and pre-constricted with prostaglandin F₂ α (3×10^{-5} M.) Vasorelaxations were produced by increasing doses of ADP (endothelium-dependent), BK (bradykinin; endothelium-dependent), and SNP (sodium nitroprusside; endothelium-independent.)

Results



Vasomotor responsiveness data are summarized in the Figures. With regard to ADP induced vasorelaxation, intact exercise vessels displayed significantly higher percent relaxation than intact sedentary vessels ($p=0.001$), indicating that physical inactivity does indeed produce a decrease in endothelium-dependent vasorelaxation. Both L-name treated vessels showed lower relaxation than the intact vessels. These results indicate that vasorelaxation in this vessel is largely nitric oxide-mediated. In vessels treated with both L-name and Indo, no difference was found between groups, indicating that nitric oxide and cyclooxygenase collectively mediate the relaxation of the vessel with minimal contributions from other pathways. In addition, no statistically significant difference was found between groups in Indo treated vessels. Therefore a decrease in the cyclooxygenase/prostaglandin pathway appears to be responsible for the decrease in the vasorelaxation of these vessels in sedentary animals. In terms of endothelium-independent relaxation, the results show a significantly higher vasorelaxation at one dose of SNP in the intact sedentary vessels. Therefore, the decrease in vasorelaxation induced by inactivity appears to be entirely endothelium dependent. Indeed, a mechanism by which exercise decreases the sensitivity of vessel smooth muscle may be indicated.

Conclusions

1. Exercise-trained pigs have higher endothelium-dependent vasorelaxation than sedentary pigs.
2. Vasorelaxation of the descending genicular artery seems to be substantially mediated by endothelial release of nitric oxide and prostacyclin in exercise trained pigs.
3. In Sedentary pigs, vasorelaxation of the descending genicular artery is mediated by endothelial release of nitric oxide but minimally by the cyclooxygenase/prostaglandin pathway.
4. Thus, physical inactivity seems to result in decreased vasorelaxation by the cyclooxygenase/prostaglandin pathway.

Acknowledgements:

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