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Effects of diabetes and vascular occlusion on adenosine-induced relaxant response of rat common carotid artery

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Abstract:
Background: The aim of this study was to investigate effect of adenosine on isolated rat common carotid artery (CA) submitted to occlusion in non-diabetic or diabetic animals, and to determine whether endothelium denudation or potassium conductance block affects adenosine action.
Methods: Experiments were conducted on Wistar rat CA with or without endothelium. Diabetes was induced by alloxan. Occlusion of CA was performed in randomly selected non-diabetic or diabetic animals anesthetized with urethane. Thus, experiments were performed in four groups of rats: non-operated (control) animals without or with diabetes and operated animals submitted to the occlusion of CA without or with diabetes. Concentration-response curves for adenosine were obtained in a cumulative fashion on precontracted arteries.
Results: Adenosine produced concentration-dependent and endothelium-independent relaxation of CA with comparable maximal effects in all groups. Analysis of pEC_{50} values showed that responsiveness of CA decreased in following order: [diabetes (–) / occlusion (–)] = [diabetes (–) / occlusion (+)] > [diabetes (+) / occlusion (–)] > [diabetes (+) / occlusion (+)]. In the presence of high K^+ maximal relaxant response of CA from non-operated rats without diabetes was reduced. The recorded inhibition was even stronger in animals subjected to CA occlusion. Conversely, in non-operated diabetic animals obtained reduction of adenosine effect was less pronounced in regard to non-diabetic rats.
Conclusions: Adenosine produced equi-effective endothelium-independent relaxation of CA in all groups. Pharmacological potency of adenosine was reduced in diabetic animals solely, but even more in diabetic rats submitted to CA occlusion. The enhanced potassium transmembrane flow has certain protective role on adenosine-induced action in occluded CA from non-diabetic rats. Conversely, diabetes solely inhibited adenosine-evoked cascade connected to increased potassium conductance.

Key words:
adenosine, common carotid artery, occlusion, diabetes, endothelium, potassium channels