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Meeting abstract

The electrophysiological and hemodynamical effects of pyruvate on diabetic and control rat hearts

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Background

Pyruvate, as an end-product of glycolysis, might influence the electrophysiological parameters of the heart by several mechanisms: Pyruvate enhances the phosphorylating potency of the cytosol; it can facilitate the reduction of inorganic phosphate and finally can influence the cytoplasamatic redox state by decreasing the H^+ concentration. According to the literature, pyruvate enhances the amplitude of the action potential (APA) and also reduces the duration of the action potential (APD); hereby, it might be used to enhance the contractility in case of heart failure. Our aim was to determine the electrophysiological and hemodynamical effects of pyruvate on diabetic and control rat hearts.

Methods

Using conventional microelectrode techniques and the Langendorff system we examined the effects of sodium pyruvate (1, 3, 10 and 30 mmol/L) on electrophysiological and hemodynamic parameters of control (n = 28) and streptozotocin-induced diabetic (n = 29) rat hearts.

Results

Similarly to our previous electrophysiological results, the APD of the right ventricular papillary muscles of diabetic rats' hearts was significantly longer compared to the control animals. In the control group only the highest pyruvate concentration caused significant APD reduction while in the diabetic groups the second and third pyruvate concentrations already significantly reduced the APD. In our Langendorff system both the mean left ventricular pressure (LVP) and the diastolic left ventricular pressure (LVP_D) were significantly higher in the control group. Pyruvate treatment induced significant increase only in the control group (LVP_D at 3, 10 and 30 mmol/L pyruvate; LVP at 10 and 30 mmol/L pyruvate).

Conclusion

Our electrophysiological result mainly correlates with the previously published results. Corresponding to our hemodynamic results we can conclude that in case of diabetic animals higher pyruvate concentrations would be required to achieve the same favorable effect. On account of its beneficial effect on the heart muscle, pyruvate can become a potential drug in the future, one which can open new possibilities in the therapy of cardiogenic shock.

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