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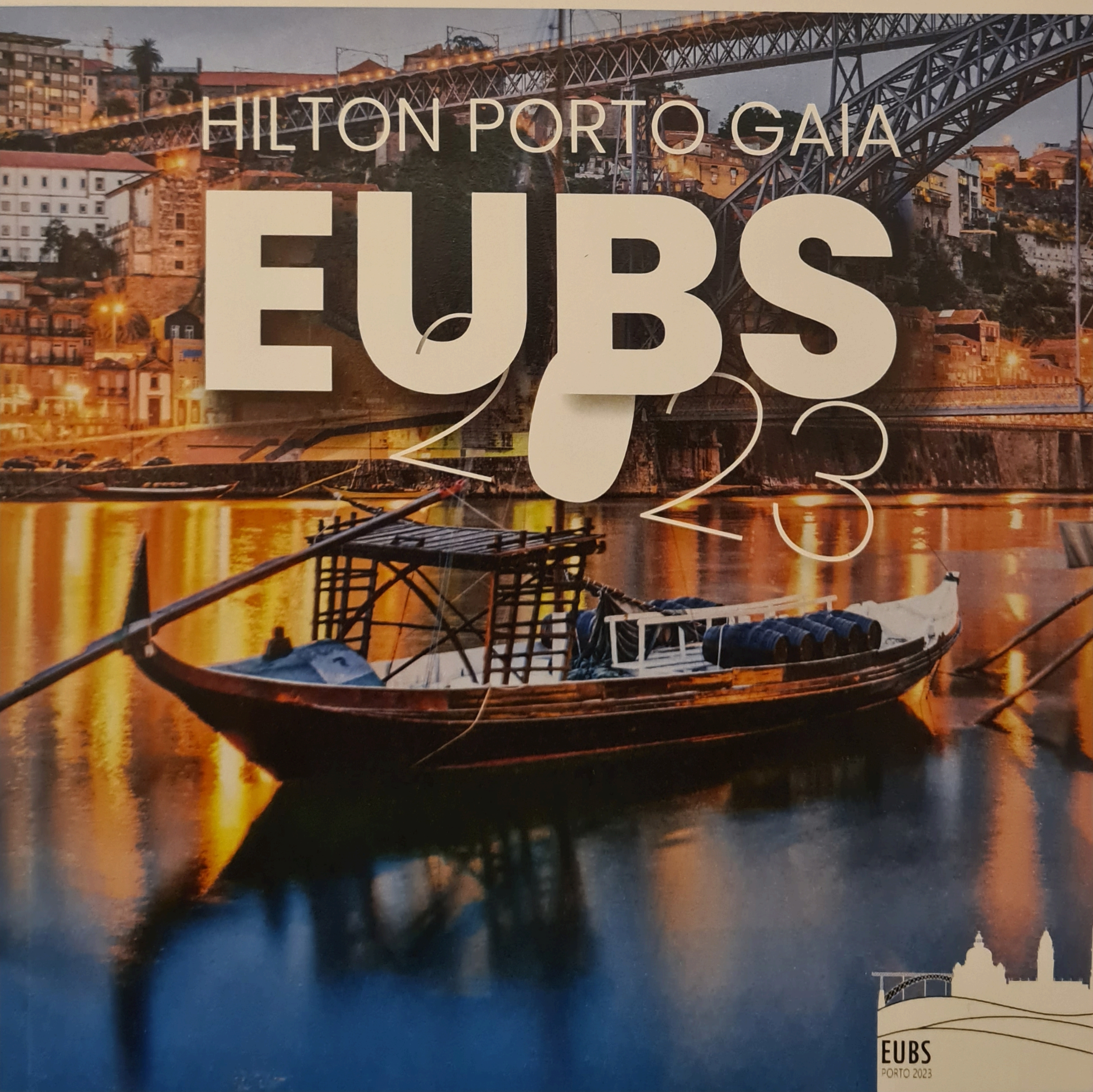
ABSTRACT AND CONFERENCE BOOK



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EUBS – European Underwater and Baromedical Society

eubs.org

LOCAL CO-ORGANIZATION

UAFA – União Associativa para a Formação em Anestesiologia

uafa.pt

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EP - (19361) - HYPERBARIC OXYGEN PRECONDITIONING IN POSTISCHEMIC ACUTE KIDNEY INJURY: POTENTIAL MECHANISMS OF BENEFICIAL EFFECT

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Abstract

Introduction: Renal ischemia/reperfusion injury (IRI) is common cause of acute kidney injury (AKI). In our previous studies we showed beneficial effects of hyperbaric oxygen (HBO) preconditioning in IRI in hypertensive rats, so the aim of this study was to explore potential mechanisms by which HBO achieves its beneficial effects in this experimental setting.

Materials and Methods: The animals (spontaneously hypertensive rats) were randomly divided into three experimental groups: sham-operated rats (SHAM), rats with induced postischemic AKI (AKI) and group with HBO preconditioning before AKI inducing (AKI+HBO). HBO preconditioning was performed by exposing to pure oxygen (2.026 bar) twice a day for two consecutive days for 60 minutes and 24 hours before AKI induction. AKI was induced by removal of the right kidney and atraumatic clamp occlusion of the left renal artery for 45 minutes.

Results: In our previously reported results, we showed that HBO precounditioning is capable to improve renal function and hemodynamics, primarily accompanied by a decrease in the plasma concentration of urea and creatinine or an increase in their clearances, followed with a decrease of novel kidney biomarkers, such as plasma KIM-1, as well as a decrease of NGAL immunohistochemical expression in kidney tissue. Also, classic histopathological features of AKI were diminished after HBO preconditioning. Further, we wanted to explore potential mechanisms.Western blot analysis showed that AKI induction significantly decreased Bax and HIF-1α expression. On the other hand HBO preconditioning, significantly increased Bax, HO-1 and HIF-1α expression, compared to AKI group. Immunohistochemical expression of 3-Nitrotyrosine, oxidative stress biomarker, in kidney tissue was significantly increased in AKI group, while HBO preconditioning significantly decreased its intensity and extent in all observed kidney tissue structures. These results are in agreement with previously reported reduction of 4-hydroxinonenal expression in kidney tissue after HBO preconditioning in same experimental setting.

Conclusions: HBO preconditioning upregulates cytoprotective HO-1 and HIF-1α expression in renal tissue and and reduces levels of oxidative stress.

Also, HBO preconditioning is capable to increase expression of the anti-apoptotic Bcl-2 protein, which can prevent release of mitochondrial cytochrome c, thereby suppressing apoptosis in renal tubule cells induced by hypoxia/reoxygenation. On the other hand, HBO preconditioning normalizes pro-apoptotic Bax protein expression and possible reason for this finding may be very subtle interaction of Bax and Bcl-2 proteins, but also the fact that during the time after the ischemic insult, apoptosis and necrosis distributed in proximal and distal tubules are represented at different extent.

Palavras-chave: hyperbaric oxygen, preconditioning, acute kidney injury, spontanously hypertensive rats