Suppression of Voltage-Gated Potassium Channels in Brain Parenchymal Arterioles Following Subarachnoid Hemorrhage-Induced Protein Kinase C Activation

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Subarachnoid hemorrhage (SAH) caused by aneurysm rupture is often associated with decreased cerebral blood flow and the development of severe neuronal deficits in patients. One cause of this disability is intracerebral (parenchymal) artery constriction. This constriction may be due in part to suppression of voltage-gated potassium (K_V) channels causing membrane potential depolarization, enhanced Ca^{2+} influx and vasoconstriction. Previous studies have shown that protein kinase C (PKC) is activated following SAH and that K_V currents are suppressed in myocytes of larger diameter cerebral arteries from SAH model animals. Here, we examined PKC involvement in SAH-induced K_V current suppression in parenchymal arterioles using the conventional whole cell patch clamp technique. We found that K_V currents were suppressed in myocytes obtained from SAH model rats compared to cells obtained from control animals. We also observed that the PKC activator 1,2-dioctanoyl-glycerol suppressed K_V currents in control but not SAH myocytes, indicating PKC may be maximally active following SAH. The PKC inhibitor chelerythrine did not have a significant effect on K_V channel activity in control or SAH myocytes, possibly because the target of PKC is already phosphorylated under the conditions of the experiment. In summary, our data indicate that PKC activity is increased following SAH and contributes to suppression of K_V channels. Supported by the National Institutes of Health (NIH; P01-HL095488), the Totman Medical Research Trust, the University of Vermont Summer Internship Grant and the Peter Martin Fund.