Abstract

Introduction

About 1.7 million people in America are affected by traumatic brain injury (TBI) each year. Numerous long term problems can result from a TBI. There is an increase in vascular permeability in mesenteric arteries after TBI which can lead to problems such as bacteremia and sepsis; the mechanism for this increase in permeability is unknown. One mechanism of altered vascular permeability is endothelial dysfunction. This is typically measured by determining the vasodilatory response to the muscarinic agonist acetylcholine (ACh). Endothelium-dependent dilations of small mesenteric arteries are largely dependent on hyperpolarization due to nitric oxide (NO) and EDHF, with both components depending on TRPV4 channel activity, and EDHF absolutely requiring SK/IK channel activity. We hypothesized that TBI would cause a change in the activity of these channels, resulting in a change in vasodilatory function.

Methods

We performed a series of diameter measurements of isolated mesenteric arteries to determine the relative contribution of eNOS-mediated NO production and IK/SK-dependent EDHF activity to endothelium-dependent vasodilation of normal and TBI arteries.

Results

There was a significant difference between the percent dilation of control versus TBI vessels at 100nM Ach. In the presence of LNNA, a nitric oxide synthase blocker, TBI vessels showed a lower percent dilation at 100nm ACh. A significant difference in GSK dilations was also observed. TBI vessels showed a smaller percent dilation at 10nM GSK than control vessels.

Conclusions

When the NO dilation response is blocked by LNNA, we still see a difference in dilation between TBI and control vessels. Therefore, there must be changes that occur in the dilatory mechanism of EDHF. Since there was a decrease in dilation by GSK, a TRPV4 channel agonist, in TBI vessels, there must be changes occurring in the TRPV4 channels.