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Static Cerebral Autoregulation is Not Altered in Symptomatic Concussed Athletes During Acute Central Hypervolemia

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Dynamic cerebral autoregulation is impaired in concussed individuals. However, less is known regarding static cerebral autoregulation in symptomatic concussed athletes during a central hypervolemic challenge that increases blood pressure. **PURPOSE:** We tested the hypothesis that static cerebral autoregulation during a central hypervolemic challenge is impaired in symptomatic concussed college athletes (CA) vs healthy controls (HC). **METHODS:** Seven CA (age: 19 ± 2 y, 5 females) and ten HC (age: 21 ± 2 y, 6 females) completed one study visit. After 5 min of resting baseline, 20 mmHg of lower body positive pressure (LBPP) was applied for 5 min using an airtight chamber. Beat to beat blood pressure (photoplethysmography) and middle cerebral artery blood velocity (MCAv; transcranial Doppler) were recorded continuously. Static cerebral autoregulation was calculated using Fourier transfer function analysis with 3 min segments at baseline and after mean arterial pressure (MAP) stabilized during LBPP. Cerebral vascular resistance (CVR) was calculated as $MAP/MCAv$. Pulsatility index (PI) was calculated as the difference of peak systolic MCAv and end diastolic MCAv, divided by mean MCAv. Values are reported as a change from baseline. **RESULTS:** MAP (CA: 90 ± 6 vs HC: 92 ± 11 mmHg; $P=0.32$), MCAv (CA: 58.7 ± 19.4 vs HC: 62.6 ± 11.1 cm/s; $P=0.30$), gain (CA: 0.7 ± 0.2 vs HC: 0.8 ± 0.2 cm/s/mmHg; $P=0.17$), coherence (CA: 0.5 ± 0.1 vs HC: 0.5 ± 0.1 ; $P=0.21$), CVR (CA: 1.7 ± 0.6 vs HC: 1.5 ± 0.3 mmHg/cm/s; $P=0.21$), and PI (CA: 0.9 ± 0.1 vs HC: 0.9 ± 0.2 ; $P=0.31$) were not different at baseline. The change in MAP was not different between CA (12 ± 6 mmHg) and HC (8 ± 6 mmHg; $P=0.12$). The change in MCAv was greater in CA (CA: 4.8 ± 4.6 vs HC: -4.3 ± 8.7 cm/s; $P=0.01$). There were no differences in the change from baseline for gain (CA: 0.1 ± 0.2 vs HC: 0.1 ± 0.5 cm/s/mmHg; $P=0.49$) or coherence (CA: -0.0 ± 0.1 vs HC: -0.0 ± 0.1 ; $P=0.40$). The increase in CVR was attenuated in CA (CA: 0.0 ± 0.2 vs HC: 0.3 ± 0.3 mmHg/cm/s; $P=0.04$). The decrease in PI was greater in CA (CA: -0.1 ± 0.0 vs HC: 0.0 ± 0.1 ; $P=0.02$). **CONCLUSION:** These data indicate that indices of static cerebral autoregulation are not different between CA and HC during an acute increase in MAP. The blunted increase in CVR and greater decrease in PI appears to allow for a rise in MCAv during an acute increase in MAP in CA.

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