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Ability of Near Infrared Spectroscopy to Isolate Muscle Compartments of the Upper Extremity Ashley Cole, MPH; Athens, GA Richard Herman, Jr, BS; Augusta, GA Jonathan Heimlich, BS; Augusta, GA Sahir Ahsan, BS; Augusta, GA Brett Freedman, MD; APO, Armed Forces Europe Michael Shuler, MD; Athens, GA**

Objectives:

Near infrared spectroscopy (NIRS), a non-invasive means for monitoring muscle oxygenation, may be useful in the diagnosis of acute compartment syndrome (ACS). We hypothesize that placement of NIRS sensors on the forearm will produce perfusion values specific to each muscle compartment, allowing for the potential of continuous ACS monitoring.

Methods:

Alteration of muscle oxygenation via exercise was employed to validate the anatomic placement of NIRS sensor pads over the compartments of the forearm. 63 uninjured volunteers had NIRS sensor pads placed over the volar (V), dorsal (D), and mobile wad (MW) compartments of one forearm. 49 participants also had the contralateral forearm monitored, which served as an internal control. Participants performed a series of three exercises designed to activate the muscles of each compartment sequentially. Each exercise was separated by a washout period to allow muscle oxygenation to return to baseline. Mean changes in NIRS (percent oxygenation) values of each compartment, recorded during muscle activation, were calculated from baseline values. Mean changes in tissue oxygenation were compared across compartments for each exercise.

Results:

Mean NIRS values decreased significantly from baseline during muscle activation (V = -26.1, D = -34.4, MW = -26.8 percentage point change; $p<0.0001$ for all compartments); whereas mean NIRS values of muscle compartments which remained at rest showed little or no change (mean change = -5.1 to 1.1 percentage points). Mean changes observed in NIRS values of the contralateral arm, which remained at rest during the entire data collection period, were also minimal (mean change = 0.8 to 1.5).

Discussion/Conclusion:

During muscle activation of a given compartment, NIRS values of that compartment decreased significantly, while values of neighboring compartments remained stable. These results suggest that NIRS can provide values that are both sensitive and specific to muscle compartment of the forearm.