# A New Technology for Detecting Cerebral Blood Flow: A Comparative Study of Ultrasound Tagged NIRS and $^{133}$Xe-SPECT

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There is a need for real-time non-invasive, continuous monitoring of cerebral blood flow (CBF) during surgery, in intensive care units and clinical research. We investigated a new non-invasive hybrid technology employing ultrasound tagged near infrared spectroscopy (UT-NIRS) that may estimate changes in CBF using a cerebral blood flow index (CFI). Changes over time for UT-NIRS CFI and $^{133}$Xenon single photon emission computer tomography ($^{133}$Xe-SPECT) CBF data were assessed in 10 healthy volunteers after an intravenous bolus of acetazolamide. UT-NIRS CFI was measured continuously and SPECT CBF was measured at baseline, 15 and 60 min after acetazolamide.

We found significant changes over time in CFI by UT-NIRS and CBF by SPECT after acetazolamide (P B 0.001). Post hoc tests showed a significant increase in CFI (P =0.011) and SPECT CBF (P < 0.001) at 15 min after acetazolamide injection. There was a significant correlation between CFI and SPECT CBF values (r = 0.67 and P B 0.033) at 15 min, but not at 60 min (P C 0.777). UT-NIRS detected an increase in CFI following an acetazolamide bolus, which correlated with CBF measured with $^{133}$Xe-SPECT. This study demonstrates that UT-NIRS technology may be a promising new technique for non-invasive and real-time bedside CBF monitoring.

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