System for measuring oxygen, carbon dioxide and temperature in tissues.

Published date: Nov. 27, 2018

Technology description

System for measuring oxygen and carbon dioxide in tissues
Hemorrhage is responsible for more than 35% of pre-hospital deaths and greater than 40% of deaths within the first 24 hours of arrival to a trauma facility. These numbers can reach 90% in the military environment. Traditional vital sign measurements, systolic blood pressure and oxygen saturation, fail to provide sufficient advanced warning of hemorrhage until after the onset of cardiovascular collapse. Clearly earlier recognition of hemorrhage will be beneficial in allowing intervention before the onset of circulatory shock.

Technology description
·Reduction in peripheral tissue oxygenation and increased carbon dioxide is an indicator of reduced central blood volume in the presence of stable vital signs.
·Oxyphor-based micro-sensors were designed:
oBased on Pd-tetrabenzoporphyrin modified with generation-3 polyarylglycine dendrons and coated with a layer of polyethylene glycol.
oTeflon AF chambers sequester the Oxyphor solution from contact with the body.
oProvides for measurement of oxygen pressure by phosphorescence quenching.
·The sensor’ sin vitromeasurement response time is less than one minute, readings are stable for greater than 16 hours with less than 2% change, and has a signal to noise ratio of ~40, which declines over 16 hours to ~20.
·In vivoexperiments in peripheral leg muscle of pigs:
oInsertion via 21 gauge needle
oSignal was stable and without changes in signal-to-noise ratio for up to 6 hours.

Advantages

·Robust, quickly inserted and minimally invasive device for advanced warning of hemorrhage.
·Data can be transmitted to a central computer system via a wireless transmitter.
·Allows for continued monitoring of trauma patients.

·Calibration is absolute; no on site calibration is required.
oProvides rapid deployment and easy replacement of sensors.
·Sufficiently rapid response time for measuring physiological changes in oxygen pressure.
·Long lifetime and fidelity of measurement and ease of replacement results in little required maintenance.
·Sensors can be stored without affecting sensitivity.
·In vivoproof-of-concept data obtained.

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