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The 4th Annual National Conference of the Institute of Physics and Engineering in Medicine

Investigation of the Characteristics of Photoplethysmographic Signals in the Human Oesophagus in Anaesthetised Patients undergoing Routine Surgery.

P A Kyriacou, A Gregg, R M Langford, D P Jones

ABSTRACT

The continuous monitoring of arterial blood oxygen saturation in patients with compromised peripheral perfusion is often difficult or impossible, since conventional non-invasive techniques such as pulse oximetry (SpO₂) fail. Measurements of oxygen saturation are unreliable when patients are peripherally cool with low cardiac output or poor peripheral circulation. These clinical situations commonly occur after major surgery including cardiopulmonary bypass. It is suggested that the above difficulties might be overcome if the sensor were to monitor a better perfused central part of the body such as the oesophagus. A reflection probe has been constructed utilising miniaturised opto-electronic devices designed to fit into a transparent oesophageal stomach tube. A system to detect and pre-process the photoplethysmograph (PPG) signals has been developed. The PPG output is sampled and recorded by a data acquisition system and a laptop personal computer. The characteristics of the pulsatile signal in the oesophagus of anaesthetised adult patients undergoing routine elective surgery has been investigated. Preliminary results show that good quality photoplethysmographic (PPG) signals can be measured in the human oesophagus. The oesophageal signal amplitudes were found to be approximately a factor of two greater than the amplitudes of conventional finger PPGs. The characteristics of the PPG signals obtained at various depths in the oesophagus have been studied and the results will be presented. This investigation indicates the suitability of the oesophagus as an alternative site for the reliable monitoring of oxygen saturation (SpO₂) in patients with poor peripheral perfusion.

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