

Peran Pengukuran Saturasi Oksigen Regional Otak Menggunakan Near Infrared Spectroscopy (Nirs) Serebral pada Renjatan Anak dan Hubungannya dengan Parameter Hemodinamik Non Invasif = Measurement of Regional Oxygen saturation using Cerebral Near Infrared Spectroscopy in Pediatric Shock and Its Correlation with Noninvasive Hemodynamic Measurements

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Abstrak

Latar Belakang: Morbiditas dan mortalitas akibat renjatan pada anak di seluruh dunia dilaporkan masih tinggi. Pengenalan dini dan tatalaksana yang tepat penting untuk menurunkan morbiditas dan mortalitas akibat renjatan. Indikator penting untuk mendeteksi hipoksia jaringan global adalah pengukuran saturasi oksigen *mixed vein* ($S_{mv}O_2$) dari kateter arteri pulmonal atau vena sentral namun kedua pemeriksaan ini sulit dan invasif sehingga tidak rutin dilakukan. *Near infrared spectroscopy* (NIRS) merupakan alternatif pemeriksaan non invasif, *real time*, kontinu dan praktis untuk mengukur saturasi oksigen regional sekaligus menggambarkan saturasi oksigen vena global.

Tujuan: Mengetahui kenaikan nilai NIRS serebral pascarenjatan teratasi serta korelasinya dengan perubahan parameter hemodinamik non invasif.

Metoda: Penelitian potong lintang pada anak usia 1 bulan-18 tahun yang mengalami renjatan di RSUPN Cipto Mangunkusumo, RSUD Pasar Rebo dan RSUD Tarakan pada bulan Maret-Juni 2019. Terhadap subjek yang mengalami renjatan dilakukan pengukuran NIRS serebral, MAP, serta pengukuran non invasif *Cardiac Index* (CI), *Systemic Vascular Resistance Index* (SVRI), *Delivery Oxygen* (DO_2), *Inotrophy Index* (INO), *Stroke Volume Index* (SVI) menggunakan *Ultrasonic Cardiac Output Monitoring* (USCOM) pada saat renjatan dan diulang ketika renjatan teratasi. Uji korelasi dilakukan untuk menilai hubungan antara perubahan nilai NIRS serebral dan parameter hemodinamik non invasif.

Hasil: Dari 32 subjek yang diteliti ditemukan peningkatan nilai NIRS serebral sebesar 27,7% pascarenjatan teratasi. Parameter hemodinamik, kecuali untuk SVRI, juga mengalami peningkatan pasca renjatan namun tidak berkorelasi dengan peningkatan nilai NIRS.

Simpulan: Hasil pengukuran NIRS serebral menggambarkan perfusi dan oksigenasi ke jaringan perifer namun tidak berkorelasi dengan parameter hemodinamik non invasif pada penelitian ini.

Kata kunci: *Near infrared spectroscopy*; parameter hemodinamik non invasif; renjatan; USCOM

Background: Pediatric shock accounts for significant morbidity and mortality worldwide. Early recognition and timely intervention are critical for successful treatment of pediatric shock. A strong indicator of global tissue hypoxia by measuring mixed venous oxygen saturation from pulmonary artery catheter (PAC) or central vein catheter (CVC) is rarely used due to its highly invasive character. *Near infrared spectroscopy* (NIRS) is a noninvasive, real time, continuous and practical modality is a safe

alternative for regional and global oxygen saturation measurement.

Objective: To evaluate the increment of cerebral NIRS post-resuscitation in pediatric shock and its correlation with noninvasive hemodynamic measurements.

Methods: This cross sectional study was conducted at Cipto Mangunkusumo Hospital, Pasar Rebo Hospital and Tarakan Hospital between March and June 2019. Children whose age ranged from 1 month to 18 years admitted to Emergency Department (ED) or Pediatric Intensive Care Unit (PICU) due to shock were included. Measurement of cerebral NIRS, MAP, as well as Cardiac Index (CI), Systemic Vascular Resistance Index (SVRI), Delivery Oxygen (DO_2), Inotrophy Index (INO), Stroke Volume Index (SVI) using Ultrasonic Cardiac Output Monitoring (USCOM) were performed on admission and after resuscitation when the shock has resolved and the patients were stable. Correlation between cerebral NIRS and other noninvasive hemodynamic parameters were then analysed.

Results: There were 32 subjects participated in this research. Following resuscitation, cerebral NIRS measurements showed an increment of 27,7% compared to cerebral NIRS in shock state. All non invasive hemodynamic parameters, except for SVRI, were also increased after resuscitation but no correlation observed between these parameters to cerebral NIRS ($p > 0,005$).

Conclusion: Cerebral NIRS is a sensitive parameter of peripheral perfusion but showed not correlation with hemodynamic parameters in this research.