

Perfusion Index – A Useful Tool to Assess Changes in Extremity Perfusion Following Major Trauma.

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Introduction

Perfusion Index (PI) is an assessment of the pulsatile strength at a specific monitoring site and represents an indirect and noninvasive measure of peripheral perfusion. The Masimo Signal Extraction Technology (SET) is emerging as the leading modality for the assessment of PI, as well as non-invasive hemoglobin (SpHb), and the Plethysmograph Variability Index (PVI), a measure of the dynamic changes in PI. We present two cases of major extremity trauma in which the Masimo SET Radical-7 pulse oximeter was used for the perioperative monitoring of PI to evaluate end tissue perfusion.

Case Report 1

A previously healthy 10 y/o, 40kg female presented for repair of an open right supracondylar humerus and radius fractures following a 10-foot fall from a waterslide. On physical exam, her right hand was pink and warm to touch and a faint radial pulse was present. General endotracheal anesthesia (GETA) with opioid supplementation was administered. Surgical exploration revealed a contused brachial artery and lacerated brachial veins. The surgeons noted poor perfusion in the distal forearm and hand. Doppler interrogation showed a weak radial artery signal but the ulnar artery signal was vigorous. A non-operative course was recommended by the vascular surgery service. The fractures were repaired, the wound closed and a splint was applied. The patient was extubated and transferred to PACU. Upon arrival in the PACU, 2 Masimo Rainbow SET® Radical 7 probes were applied to bilateral index fingers and simultaneous measurements performed. A ten-fold decrease in PI (0.66 vs. 6.3) was noted between the injured extremity and the normal extremity. Additionally, the Plethysmograph Variability Index (PVI) was noted to be 22 in both extremities. A fluid bolus of 5 ml/kg was given and PVI decreased to 16. The patient was transferred to the floor and was discharged the following day.

Case Report 2

A previously healthy 9 y/o, 45 kg child presented for irrigation and debridement of a complex degloving injury of the right lower extremity following a motor-pedestrian collision. Except for a mild anemia of 8.5g/dl, no other medical problems were present. GETA with opioid supplementation was administered. Masimo Rainbow SET® Radical 7 probes were attached to both lower extremities and the PI, PVI, and SpHb monitored. A ten-fold decrease in PI (0.59 vs. 5.5) was noted on the injured extremity compared to the non-injured extremity. Except for the transfusion of a unit of packed red blood cells, the rest of the anesthetic was uneventful. The response to the transfusion was monitored non-invasively. The patient was extubated and transferred to PACU and transferred to the inpatient floor.

Discussion

These two cases demonstrate the emerging utility of non-invasive technology in clinical anesthetic practice. PI monitoring may be a useful tool in assessing the efficacy of therapeutic interventions in the management of low perfusion states associated with traumatic vascular or soft tissue injury. Remarkably, in both cases, the PVI was similar in both extremities despite the markedly decreased PI in the injured extremity. The clinical significance of this needs to be further elucidated. Whether PI values and trends have any prognostic value in the setting of extremity injury with possible vascular compromise remains to be determined and should be studied further.