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## SCIENTIFIC ARTICLE

# The prognostic value of cerebral oxygen saturation measurement for assessing prognosis after cardiopulmonary resuscitation



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### KEYWORDS

Cardiopulmonary resuscitation;  
Cerebral oxygen saturation;  
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### Abstract

**Background:** Despite new improvements on cardiopulmonary resuscitation (CPR), brain damage is very often after resuscitation.

**Objective:** To assess the prognostic value of cerebral oxygen saturation measurement (rSO<sub>2</sub>) for assessing prognosis on patients after cardiopulmonary resuscitation.

**Design:** Retrospective analysis.

**Measurements and results:** We analyzed 25 post-CPR patients (12 female and 13 male). All the patients were cooled to a target temperature of 33–34 °C. The Glasgow Coma Scale (GCS), Corneal Reflexes (CR), Pupillary Reflexes (PR), arterial Base Excess (BE) and rSO<sub>2</sub> measurements were taken on admission. The rewarming GCS, CR, PR, BE and rSO<sub>2</sub> measurements were made after the patient's temperature reached 36 °C.

**Results:** In survivors, the baseline rSO<sub>2</sub> value was 67.5 (46–70) and the percent difference between baseline and rewarming rSO<sub>2</sub> value was 0.03 (0.014–0.435). In non-survivors, the baseline rSO<sub>2</sub> value was 30 (25–65) and the percent difference between baseline and rewarming rSO<sub>2</sub> value was 0.031 (–0.08 to –20). No statistical difference was detected on percent changes between baseline and rewarming values of rSO<sub>2</sub>. Statistically significant difference was detected between baseline and rewarming GCS groups ( $p = 0.004$ ). No statistical difference was detected between GCS, CR, PR, BE and rSO<sub>2</sub> to determine the prognosis.

**Conclusion:** Despite higher values of rSO<sub>2</sub> on survivors than non-survivors, we found no statistically considerable difference between groups on baseline and the rewarming rSO<sub>2</sub> values. Since

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**PALAVRAS-CHAVE**

Reanimação  
cardiopulmonar;  
Saturação de oxigênio  
cerebral;  
Prognóstico

the measurement is simple, and not affected by hypotension and hypothermia, the  $rSO_2$  may be a useful predictor for determining the prognosis after CPR.

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### O valor da medida da saturação cerebral de oxigênio para avaliar o prognóstico após ressuscitação cardiopulmonar

**Resumo**

*Justificativa:* Apesar dos novos avanços em reanimação cardiopulmonar (RCP), o dano cerebral muitas vezes ocorre após a reanimação.

*Objetivo:* Avaliar o valor prognóstico de medir a saturação de oxigênio cerebral ( $rSO_2$ ) para estimar o prognóstico em pacientes após a reanimação cardiopulmonar.

*Projeto:* Análise retrospectiva.

*Medidas e resultados:* Foram avaliados após RCP 25 pacientes (12 do sexo feminino e 13 do masculino). Todos os pacientes foram submetidos à hipotermia (temperatura alvo de 33-34 °C). As mensurações da Escala de Coma de Glasgow (GCS), dos reflexos corneanos (RC), dos reflexos pupilares (RP), e do excesso de base (EB) e  $rSO_2$  foram feitas na admissão. Na hipertermia, as mensurações de GCS, RC, RP, EB e  $rSO_2$  foram feitas depois que a temperatura atingiu 36 °C.

*Resultados:* Em sobreviventes, o valor basal de  $rSO_2$  foi de 67,5 (46-70) e a diferença percentual entre o valor basal e a hipertermia de  $rSO_2$  foi de 0,03 (0,014-0,435). Em não sobreviventes, o valor basal de  $rSO_2$  foi de 30 (25-65) e a diferença percentual entre o valor basal de hipotermia de  $rSO_2$  foi de 0,031 (-0,08-20). Não houve diferença estatística nas variações percentuais entre os valores da  $rSO_2$  na fase basal e de reaquecimento. Uma diferença estatisticamente significativa foi observada entre os valores da GCS na fase basal e de reaquecimento dos grupos ( $p=0,004$ ). Não houve diferença estatisticamente significativa entre GCS, RC, RP, EB e  $rSO_2$  para determinar o prognóstico.

*Conclusão:* Embora os valores da  $rSO_2$  tenham sido mais elevados em sobreviventes que em não sobreviventes, não observamos uma diferença estatisticamente significativa dos valores da  $rSO_2$  entre os grupos na fase basal e de reaquecimento. Como a mensuração é simples, e não afetada por hipotensão e hipotermia, a  $rSO_2$  pode ser um indicador útil para determinar o prognóstico após a RCP.

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**Introduction**

Despite recent improvements in resuscitation strategies, brain damage is very often an event after Cardiopulmonary Resuscitation (CPR) and the outcome remains poor.<sup>1-3</sup>

The early assessment of neurological outcomes after CPR is important, and there has been a growing interest to estimate the prognosis after CPR. In recent years, several studies reported the predictors of neurologic outcome in survivors of cardiac arrest submitted to therapeutic hypothermia.<sup>4-8</sup>

Clinical neurologic examinations such as the Glasgow Coma Scale (GCS), Corneal Reflex (CR), and Pupillary Reflex (PR) tests are very simple methods and widely used. Biomarkers and electrophysiological tests are also used, but with complexity. In a recent study,<sup>7</sup> the authors concluded that predicting neurological outcome after cardiac arrest by biomarkers, clinical neurologic examination

and electrophysiological tests can be difficult. In another previous research, the authors reported that absent CR, absent Pupillary Light Reflex (PLR), and absence of motor responses were strongly related with poor neurological outcomes.<sup>9,10</sup> Different studies concluded that clinical examination should be combined with modern technology for early prognostication.<sup>6,7</sup>

Monitoring of the oxygen saturation of the brain is a new method, and previous studies have described that a decrease in the regional cerebral oxygen saturation ( $rSO_2$ ) is a valuable predictor for postoperative cognitive dysfunction, as well as prolonged Intensive Care Unit (ICU) and hospital stays.<sup>11-16</sup> The advantages of this method are that the measurement is not affected by hypothermia or hypotension and that it can gather real-time measurements using near infrared spectroscopy.<sup>8,16</sup>

The aim of this study was to assess the prognostic value of  $rSO_2$  to assess prognosis after cardiopulmonary resuscitation.

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