Supplementary Online Content


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This supplementary material has been provided by the authors to give readers additional information about their work.
eFigure 1. Relationship between hemoglobin concentration and cerebral tSO₂.

The correlation coefficient $r^2 = 0.08$. 
eFigure 2. Relationship between lactate concentration and cerebral tSO₂.

The correlation coefficient $r^2 = 0.02$. 

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eFigure 3. Relationship between thigh tSO₂ and cerebral tSO₂.

The correlation coefficient $r^2 = 0.12$
Sex: male; Age: 54 months
Diagnosis: *P. falciparum* malaria with positive test for histidine-rich protein and LDH malaria antigen
Level of consciousness on arrival: No stupor, no coma, no history of seizures
Hemoglobin: 20g/L; Lactate: 14.4mM
Blood Pressure: 79/54 mmHg; Pulse: 125/minute; Respiratory rate: 50/minute
Arterial O₂ saturation (finger oximeter): 100%
Initial cerebral tSO₂: 61%; Initial extraction ratio: 56%
Final cerebral tSO₂: 84%
Area Under Curve during transfusion: 1359
2nd transfusion of RBCs: Yes. 10mL/kg additional RBCs were given due to persistent tachycardia at hour4.
30 day follow-up: good health
eFigure 5: Child with sickle cell disease, initial cerebral hypoxemia (tSO₂ <65%) and excellent response to transfusion.

Sex: male; Age: 27 months
Diagnosis: Sickle cell disease without malaria; Other diagnosis: initial hypoglycemia; bacterial pneumonia
Level of consciousness on arrival: stupor, no coma, no history of seizures
Hemoglobin: 29g/L; Lactate: 13.6mM
Blood Pressure: 133/93 mmHg; Pulse: 149/minute; Respiratory rate: 68/minute
Arterial O₂ saturation (finger oximeter): 85%
Initial cerebral tSO₂: 46%; Initial extraction ratio: 65%
Final cerebral tSO₂: 93%
Area Under Curve during transfusion: 3241
2nd transfusion of RBCs: no
30 day follow-up: good health
eFigure 6: Child with sickle cell disease, initial cerebral hypoxemia (tSO$_2$ <65%).

Note that the cerebral tSO$_2$ at the completion of transfusion fails to reach 75%.

Sex: male; Age: 14 months
Diagnosis: Sickle cell disease without malaria; Other diagnosis: bacterial pneumonia
Level of consciousness on arrival: no stupor; no coma; history of seizures
Hemoglobin: 31g/L; Lactate: 20.7mM
Blood Pressure: 94/51 mmHg; Pulse: 163/minute; Respiratory rate: 46/minute
Arterial O$_2$ saturation (finger oximeter): 100%
Initial cerebral tSO$_2$: 49%; Initial extraction ratio: 73%
Final cerebral tSO$_2$: 66%
Area Under Curve during transfusion: 1119
2$^{nd}$ transfusion of RBCs: no
30 day follow-up: good health
The cerebral oximeter tracing was continued during a second transfusion of RBCs. Each transfusion was given as 10mL/kg of RBC concentrate over 120 minutes. Note the rise in cerebral tSO₂ with each transfusion. Even though the cerebral tSO₂ was >75% after the first transfusion, the subsequent further increase in cerebral tSO₂ following the second transfusion suggests that the first transfusion alone was insufficient to maximize cerebral oxygenation.

Sex: female; Age: 30 months
Diagnosis: P. falciparum malaria with 2+ parasitemia
Level of consciousness on arrival: No stupor, no coma, no history of seizures
Hemoglobin: 28g/L; Lactate: 5.1mM
Blood Pressure: 114/65 mmHg; Pulse: 152/minute; Respiratory rate: 56/minute
Arterial O₂ saturation (finger oximeter): 100%
Initial cerebral tSO₂: 72%; Initial extraction ratio: 40%
Final cerebral tSO₂: 76% after first transfusion
Area Under Curve during transfusion: 487
2nd transfusion of RBCs: Yes. 10mL/kg additional RBCs were given due to persistent low hemoglobin (<50g/L when tested two hours following completion of first transfusion).
30 day follow-up: good health
The child presented in coma and regained consciousness after transfusion and treatment of malaria. Despite a low initial arterial O$_2$ saturation, note the very high cerebral tSO$_2$ values (>85%) and the lack of separation between cerebral and thigh tSO$_2$ readings. The high cerebral tSO$_2$ values and low oxygen extraction ratio may be the result of very low oxygen demand during coma.

Sex: male; Age: 41 months
Diagnosis: *P. falciparum* malaria with 1+ parasitemia and positive test for histidine-rich protein and LDH malaria antigen
Level of consciousness on arrival: coma with prior seizures
Hemoglobin: 40g/L; Lactate: 15.9 mM
Blood Pressure: 105/67 mmHg; Pulse: 170/minute; Respiratory rate: 38/minute
Arterial O$_2$ saturation (finger oximeter): 82%
Initial cerebral tSO$_2$: 82%; Initial extraction ratio: <5%
Final cerebral tSO$_2$: 88%
Area Under Curve during transfusion: 740
2nd dose of RBCs: no
30 day follow-up: good health
The child presented with a normal level of consciousness in severe respiratory distress with a critically low initial cerebral tSO$_2$ (<50%). Despite transfusion, the child expired at 100 minutes into treatment. Note the terminal decline in cerebral tSO$_2$.

Sex: male; Age: 10 months
Diagnosis: Sickle cell anemia without malaria; Other diagnosis: Pneumonia
Level of consciousness on arrival: No stupor, no coma, no history of seizures.
Hemoglobin: 59g/L; Lactate: 12.3mM
Blood Pressure: 108/69 mmHg; Pulse: 165/minute; Respiratory rate: 62/minute
Arterial O$_2$ saturation (finger oximeter): 98%
Initial cerebral tSO$_2$: 42%; Initial extraction ratio: 81%
Final cerebral tSO$_2$: 32%
Area Under Curve during transfusion: 737
2$^{nd}$ dose of RBCs: no
30 day follow-up: not applicable; child died at the 100 minute mark.