Craniosynostosis Surgery: Impact of Timing of Intraoperative Blood Transfusion on Post Operative Course

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Abstract

Background/Objectives
Cranial vault remodeling for craniosynostosis is known to result in significant blood loss. Many centers pharmacologically increase hematocrit pre-operatively, use blood conservation strategies intra-operatively, -and then tolerate very low hematocrit levels post-operatively in order to avoid blood transfusion (1,2). However, inadequate oxygen delivery secondary to reduced oxygen carrying capacity and hypotension can precipitate multi organ dysfunction. These hemodynamic and physiological derangements have been shown to prolong recovery and discharge. The aim of this study is to determine how the timing of intraoperative blood transfusion can influence post-operative metabolic disturbances and recovery.

Methods
A retrospective chart review was conducted on 82 children with craniosynostosis who underwent either bifrontal or biparietal-occipital calvarial vault remodelings. Variables tracked included: age, length of stay, operative times, time of first blood transfusion and results of lab values. Patients were separated into two groups: patients who received blood transfusions within the first 30 minutes of surgery (before 30min group) and patients that received blood transfusions after the first 30 minutes of surgery (after 30min group). Primary outcome was maximum lactate level. Secondary outcomes included minimum hemoglobin level, length of stay, and days in the PICU.

Results:
Of the 73 patients that met inclusion criteria, 36 patients received blood before 30min, and 37 patients received blood after 30min. The maximum lactate level was similar between the two groups (1.51 mg/dL v. 1.52 mg/dL, $P>0.05$) as shown in table 1. There was a significant difference in the hemoglobin nadir for patients with transfusion before 30min (8.81g/dL v. 8.13g/dL, $P<0.05$). There was a trend in patients transfused before 30 minutes to have a shorter length of stay (3.97 day v. 4.28 days, $P>0.05$) and is presented in Graph 1.

Discussion
Timely intraoperative transfusion within thirty minutes of surgical incision is correlated with a higher nadir hemoglobin level and a shorter length of stay following cranial vault remodeling. Lactate level was not found to be a useful indicator of post-operative complications, and further investigation will target other metabolic markers. Our findings show that early blood transfusion for open cranial vault remodeling surgery can reduce length of stay, and should be considered.

References
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Disclosure/Financial statement
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Graph 1: Distribution of Length of Stay Between Group

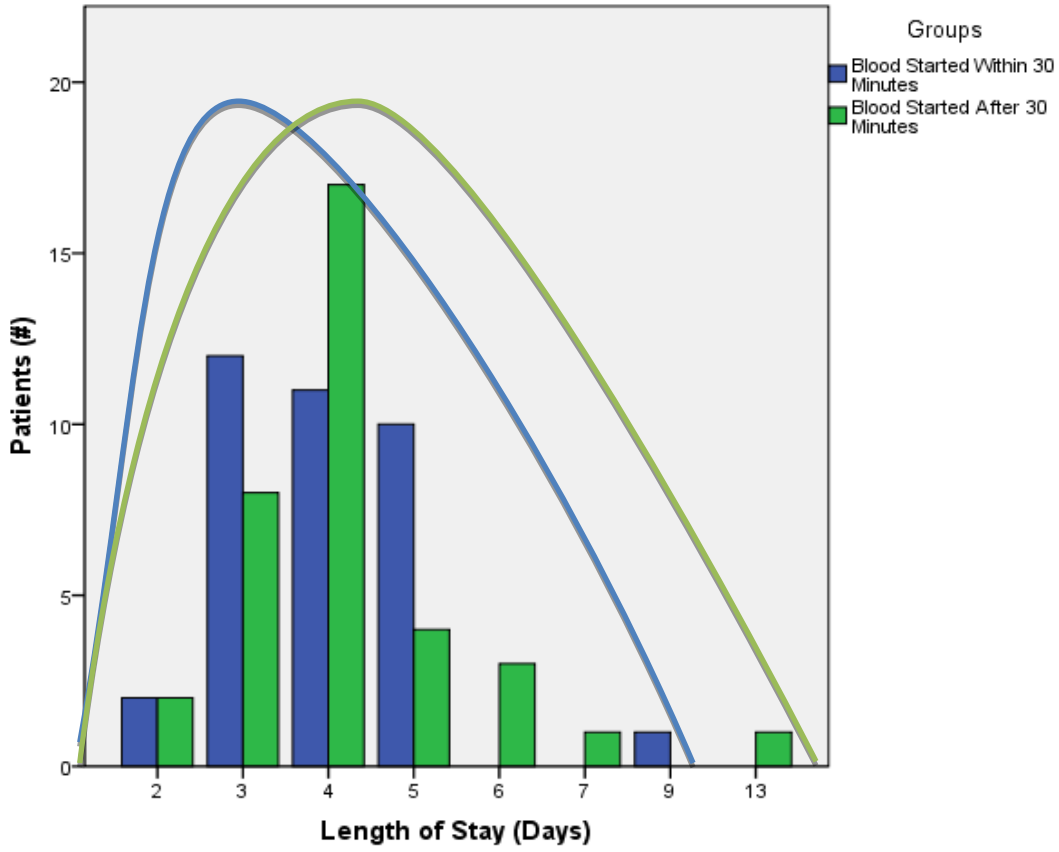

Table 1: Descriptive statistics of primary and secondary outcomes

Outcomes	N	Blood Transfusion Before 30min	N	Blood Transfusion After 30min	*P*-value*
Primary Outcomes					
Maximum Lactate Level	36	1.51 (0.81, 2.21)	37	1.52 (0.16, 2.88)	0.95
Secondary Outcomes					
Minimum Hemoglobin Level	36	8.82 (7.45,10.19)	37	8.14 (6.70,9.58)	0.04†
LOS *[days]*	36	3.97 (2.75,5.22)	36	4.28 (2.43,6.13)	0.41
PICU *[days]*	36	1.56 (0.75,2.37)	35	1.97 (0.23,3.71)	0.19

Means (-1Standard deviation, +1Standard deviation) are given for continuous measures. LOS = length of stay, PICU = pediatric intensive care unit

*Two-sided Mann-Whitney U test was used for continuous measures. †P<0.05, statistically significant difference.