The Effect of Hypothermia on Transfusion Requirement During and Immediately After Pediatric Craniofacial Surgery: A Retrospective Study

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Introduction

- The primary anesthetic consideration in the management of children undergoing craniofacial surgery is intraoperative hemorrhage. According to the Pediatric Craniofacial collaborative group, majority of these patients receive blood transfusion and about 95% of infants were transfused.[1]
- Risk factors that were associated with increased blood loss include total operation time, young age, low weight, and multiple-suture craniosynostosis.[1]
- Hypothermia has been associated with decreased platelet function and prolonged clotting times.
- We identified only one retrospective risk factor analysis for blood loss during pediatric craniofacial surgery in which there was no association found between intraoperative hypothermia and increased blood loss.[2] However, criteria used for hypothermia was temperature nadir under 34° C and the authors suggested that no association existed due to the small sample size in the hypothermic group.[2]

Hypothesis

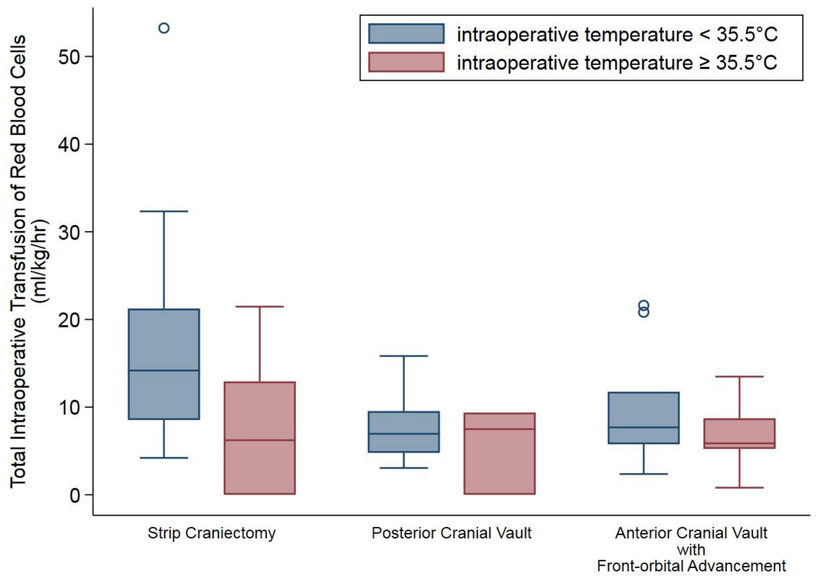
- We hypothesize that there is an association between hypothermia (<35.5 ° C) and intra-operative blood transfusion requirements in craniofacial surgery.

Methods

- After IRB approval was obtained, a retrospective analysis was done which included 86 patients undergoing craniofacial surgery from February 1, 2013 to December 30, 2016 at our institution.
- Demographics analyzed included: patient age, gender, weight and craniosynostosis diagnosis.
- Surgical factors analyzed included: total operative time and the following surgical procedure type: strip craniectomy, anterior cranial vault/fronto-orbital advancement, or posterior cranial vault.
- Primary outcome data was total intraoperative blood transfusion (ml/kg/hr) and the secondary outcomes included: total intraoperative fluid administration (ml/kg/hr), postoperative blood transfusions within twenty-four hours of the procedure (ml/kg).

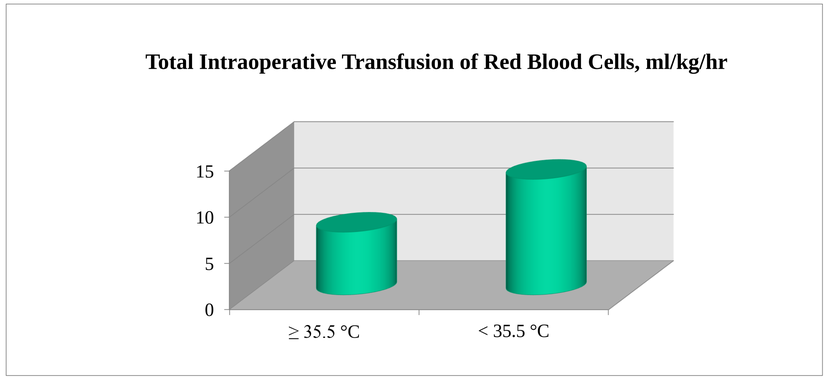
Results

- There were 48 patients in the hypothermic group (intraoperative temperature nadir <35.5 ° C) and 38 patients in the normothermic group (intraoperative temperature nadir ≥35.5° C).
- Multiple linear regression revealed a statistically significant association between intraoperative hypothermia and the primary outcome—intraoperative transfusion of red blood cells.
- A 6.03 ml/kg/hr greater intraoperative transfusion requirement in the hypothermic group compared to the normothermic group (95% C I 2.61-9.46, P=<0.001).
- To evaluate whether intraoperative fluid administration affected intraoperative transfusion requirements, fluid administration was divided into two groups: low (< or equal to 20ml/kg/hr) and high (>20ml/kg/hr).
- Analysis revealed a 34% increase in intraoperative red blood cell transfusion requirement in the hypothermic (<35.5 ° C) group compared to the normothermic (≥35.5° C) group when fluid administration was restricted to 20ml/kg/hr for duration of surgery.
- When fluid administration was greater than 20ml/kg/hr for duration of surgery, the transfusion requirement increased even further to 51% (P-value=<0.001 comparing across all groups.)



Discussion

- In this study of 86 patients undergoing craniofacial surgery, our analysis revealed an association between intraoperative hypothermia and increased intraoperative transfusion of red blood cells.
- The difference between the groups was also a clinically significant amount of 6.03ml/kg/hr.
- This finding corresponds with known associations between hypothermia and coagulopathy, and between blood loss and intraoperative hypothermia in various types of surgery in adults.
- Before the current study, only one study could be found that sought to establish an association between hypothermia and blood loss in pediatric craniofacial surgery and this previous study failed to demonstrate any correlation, likely secondary to small sample size.



Conclusion

- Careful management of temperature at or above 35.5 ° C in pediatric surgery reduces intraoperative red blood cell transfusion requirements and possibly its significant associated morbidities in this patient population.

References

1. Sticker, PA, et al. Anesthesiology 2017;126(2):276-287.
2. Gonzalez-Cardenas, VH, et al. Rev. Colomb. Anesthesiol. Vol 44(3) Bogota July/Sep. 2016.

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