

Perioperative Outcomes and Management in Midface Advancement Surgery: A Multicenter Observational Descriptive Study from the Pediatric Craniofacial Collaborative Group

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ABSTRACT

Background/Aim: The aim of this observational study was to utilize data from the multicenter Pediatric Craniofacial Surgery Perioperative Registry (PSCPR) to present outcomes in children undergoing midface advancement with distraction osteogenesis.

Methods: We queried the PSCPR for children undergoing midface advancement involving distractor application from June 2012 to September 2016. Data extracted included demographics, perioperative management, complications, fluid and transfusion volumes, and length of stay.

Results: The query yielded 72 cases from 11 institutions: 49 children undergoing Le Fort III and 23 undergoing Monobloc procedures. Monobloc patients were younger, weighed less, and more likely to have tracheostomies along with elevated intracranial pressure. Greater transfusion was observed in the Monobloc group for nearly all of the transfusion outcomes evaluated. ICU and hospital LOS were longer in the Monobloc group. Perioperative complications occurred in 18% of patients in the Le Fort III group and 30% in the Monobloc group.

Conclusions: We present a comprehensive description of demographic and perioperative outcomes following Le Fort III and Monobloc procedures with distraction osteogenesis. Monobloc procedures were associated with greater transfusion and longer ICU and hospital length of stay. Perioperative complications are described and were more prevalent in the Monobloc group.

BACKGROUND

Midface hypoplasia results in aesthetic and functional problems such as exophthalmos, upper airway obstruction, and obstructive sleep apnea. Reconstruction with long term stability is possible via Le Fort III or Monobloc distraction osteogenesis (1).

The LeFort III procedure is a subcranial advancement while Monobloc advancement includes elements of LeFort III combined with procedures along the supraorbital rims and frontal bones (2-4).

There is relatively little data comparing perioperative variables with osteogenic distraction using the Le Fort III or Monobloc technique. The Pediatric Craniofacial Surgery Perioperative Registry (PSCPR) is a multicenter, prospective observational data registry that contains perioperative data describing the hospital course in children undergoing craniofacial surgery.

The aim of this descriptive observational study was to utilize the PSCPR to describe the perioperative management, outcomes, and complications in children undergoing Le Fort III and Monobloc distraction procedures across a group of institutions in the U.S., and present comparisons of perioperative characteristics of these two patient groups.

METHODS

We queried the Pediatric Craniofacial Surgery Perioperative Registry (PSCPR) for subjects undergoing midface advancement surgeries involving application of a distractor device. Midface advancement surgery included Le Fort III procedures and Monobloc advancements.

Data extracted included demographic and surgical data, fluid and transfusion volumes, intensive care unit (ICU) and hospital length of stay (LOS), perioperative management, and complications.

The study was conducted in accordance with the STROBE guidelines.

RESULTS

Table 1. Perioperative Outcomes

Outcome	LeFort III (n=49)	Monobloc (n=23)	P value ^a	Mean (Median Difference (95%CI)) ^b	Relative Risk (95% CI) ^c
Intraoperative RBC-containing products^d (mL/kg)	17.0 ± 15.0	50.6 ± 50.5	0.005	33.6 (12.4, 55.8)	
>40 mL/kg	6%	52%	<0.0001		8.5 (2.7, 27.3)
>60 mL/kg	2%	35%	<0.0001		17.0 (2.3, 128.3)
>80 mL/kg	0%	17%	0.002		+
Total perioperative blood products^e (mL/kg)	21.3 ± 19.1	70.3 ± 89.9	0.02	49.1 (9.9, 88.3)	
Total perioperative blood donor exposures	2 (1.4)	4 (2.5)	0.61	2 (0.5, 3.5)	
Transfusion-free hospital course	7 (14%)	1 (4%)	0.21		0.3 (0.0, 2.3)
Duration of Surgery (min)	366 ± 162	390 ± 146	0.53	24 (-53, 101)	
ICU Length of Stay (days)	4 (3, 5.75)	6 (5, 9)	0.002	2 (0.5, 3.1)	
>6 days	24%	52%	0.02		2.1 (1.1, 4.0)
Hospital Length of Stay (days)	7 (5, 9)	10 (7, 15)	<0.0001	3 (0.5, 5.5)	
>8 days	27%	65%	0.002		2.5 (1.4, 4.3)

The registry query yielded 72 subjects from 11 institutions

- 49 - Le Fort III
- 23 - Monobloc advancement.

Patients in the Monobloc group were transfused significantly more RBC-CP^f intraoperatively compared to the Le Fort III group for all blood components.

Median ICU LOS was less in the Le Fort III group (4 vs. 6 days).

Blood conservation techniques were not commonly employed. Use of antifibrinolytics was the most common method seen.

RESULTS

Table 2. Blood conservation technique data and Outcomes

	Le Fort III (n=49)	Le Fort III (n=23)
Antifibrinolytic:	25 (51%)	19 (83%)
Aminocaproic acid	10 (20%)	10 (43%)
Tranexamic acid	15 (31%)	9 (39%)
None	24 (49%)	4 (17%)
Cell saver	3 (6%)	2 (9%)
Debrinate system^g	8 (16%)	1 (4%)
Prospective systemic aprotinin^h	1 (2%)	0 (0%)
Acute preoperative normovolemic hemodilution	0 (0%)	0 (0%)
Thromboelastography	0 (0%)	0 (0%)
Transfusion Thresholds/Protocols:		
Intraoperative RBC	9 (18%)	8 (35%)
Postoperative RBC	12 (24%)	10 (43%)
Difficult airwayⁱ	7 (14%)	4 (17%)
Vasovagal drug infusion		
Dopamine	2 (4%)	2 (9%)
Phenylephrine	1 (2%)	0 (0%)
Nitroglycerin	0 (0%)	1 (4%)
Postoperative tracheal intubation and mechanical ventilation (excludes Time of extubation in cases of postoperative tracheal intubation:	22/42 (52%)	13/15 (73%)
>26 hours postoperatively	6 (27%)	2 (18%)
>26 hours postoperatively	16 (73%)	9 (82%)

Table 3. Perioperative Fluid and Transfusion Data^a

	Le Fort III (n=49)	Monobloc (n=23)	p value	Mean Difference	Relative Risk (95% CI)
Fluids Received	N (%)	Volume (mL/kg)	N (%)	Volume (mL/kg)	
Crystalloids	49 (100%)	67.2 ± 38.4	23 (100%)	78.4 ± 42.8	0.29
RBC concentrate	40 (82%)	20.8 ± 14.0	21 (91%)	55.4 ± 50.3	0.005
PRBCs	30 (61%)	19.7 ± 12.2	16 (70%)	49.7 ± 58.0	
Reconstituted Whole Blood	2 (4%)	53.3 ± 6.1	4 (17%)	61.7 ± 19.6	
FFP^b	14 (29%)	15.1 ± 7.6	12 (52%)	36.0 ± 51.4	0.05
Platelets	0 (0%)	n/a	3 (13%)	36.3 ± 20.3	0.01
Cryo	0 (0%)	n/a	2 (9%)	11.0 ± 12.8	0.04
Postoperative Period					
PRBCs	8 (16%)	11.4 ± 2.8	4 (17%)	13.9 ± 6.3	0.83
FFP	3 (6%)	13.3 ± 2.6	0 (0%)	n/a	0.24
Platelets	2 (4%)	7.4 ± 5.4	0 (0%)	n/a	0.34

CONCLUSIONS

- In this multicenter assessment of management and outcomes in children undergoing midface advancement, we found transfusion was common in both the Le Fort III and Monobloc groups, with the Monobloc group commonly experiencing **massive transfusion**.
- Both groups had significant ICU and hospital lengths of stay, with longer stays observed in the Monobloc group.
- Major perioperative complications occurred in both groups; the prevalence was greater in the Monobloc group.
- Opportunities for improvement in perioperative management of these children were identified; specifically, **broader use of antifibrinolytics, utilization of thromboelastography to guide hemostatic blood component administration, and implementation of restrictive perioperative transfusion thresholds**.

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