Factors associated with length of stay in Intensive Care Unit in children undergoing spinal fusion for neuromuscular scoliosis: A retrospective analysis

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INTRODUCTION

Patients with neuromuscular scoliosis often have complex medical histories. Posterior spinal fusion (PSF) in these patients are associated with massive blood loss and fluid shifts

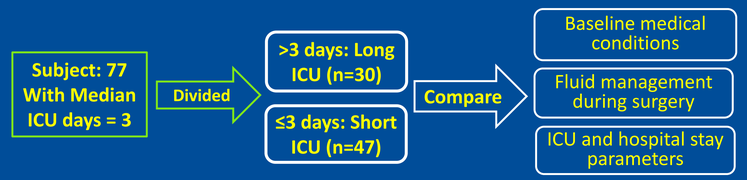
As a result, their post operative course can be complicated by prolonged mechanical ventilation, deranged coagulation, systemic inflammatory response leading to prolonged stay in ICU and subsequently in the hospital

Studies in the past have analyzed either preoperative medical condition or fluid management during surgery as separate determinants of outcome

The primary objective of our study was to determine the wider perioperative factors associated with length of ICU stay in children undergoing scoliosis surgery for neuromuscular scoliosis

METHODS

This is a retrospective study and data was collected from EMR after an IRB approval. Patients with neuromuscular scoliosis due to spastic cerebral palsy who undergone PSF from 2013 to 2016 were included in the study



Objective: Identify independent factors associated with long intensive care unit stay

Data description: Data were described by mean (SD) for quantitative variables and % of incident for categorical variables. % of Blood volume loss was evaluated categorically by >61% and ≤61% incident count (61%=Median)

Data analysis: The statistical analysis involved primary chi square and t-test to determine explanatory correlations and followed by regressions to determine independent contribution. P value less than 0.05 was used to indicate statistical significance

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RESULTS

Demographic and baseline medical conditions between long and short ICU groups

	Long ICU (> 3 days)	Short ICU (≤3 days)	P Value
	(n=30)	(n=47)	
Age (Year)	15.6±3.2	16.3±3.4	0.357
Weight (Kg)	39.8±11.5	40.7±11.1	0.729
Gender	18 M, 12 F	22 M, 25 F	0.350
Degree of Scoliosis	79.9±17.8	71±16.7	0.049
G Tube	80%	53%	0.028
Nissen	50%	23%	0.025
Dysphagia Swallowing	40%	28%	0.321
Chronic Lung Disease	70%	47%	0.061
Seizures	83%	64%	0.076
Asthma	77%	51%	0.032

Results: G-tube, degree of scoliosis, history of Nissen and asthma were associated with prolonged ICU stay (P<0.05) . Univariate Analysis used to compare groups

Fluid management during surgery between long and short ICU groups

	Long ICU (> 3 days)	Short ICU (≤3 days)	P
Duration of Surgery	501.6±146	521.6±147.9	0.562
Pre op Hemoglobin	13.7±1.6	13.8±1.5	0.690
% Estimated blood volume loss (EBVL)	100.9±71.3	55.4±29.9	0.000
Crystalloid per kg	87.9±50.4	69.2±23.1	0.030
Platelets mls	283.6±269.2	95±187.8	0.001
FFP Ratio	0.9±0.3	0.8±0.5	0.439
Crystalloid Colloid Ratio	1.3±0.6	2.1±1.6	0.009
Urine Output	614.2±553.2	497.2±363.1	0.266
Lowest PH	7.4±0.1	7.4±0.1	0.966
Lowest Base deficit	3.3±2.3	3.3±2.4	0.935
Highest Lactate	2.8±1.1	2.4±1.1	0.142
Lowest Hgb in OR	10.3±1.5	10.6±1.6	0.354
First Hgb in PICU	12.7±2.1	13.1±1.5	0.389
Prothrombin Time	11.2±0.9	11.4±0.6	0.322
Partial Thromboplastin Time	28.2±2.5	28.7±2.7	0.435

Results: %EBVL , crystalloid, Crystalloid Colloid Ratio and platelets received during the surgery were associated with long ICU stay (P<0.05). Univariate analysis used to compare groups *Note: Blood loss was correlated with fluid and blood products receiving during the surgery.*

RESULTS

ICU and hospital stay parameters between long and short ICU groups

	Long ICU (> 3 days)	Short ICU (≤3 days)	P
Extubated at OR	33%	83%	0.000
SIRS in PICU	80%	32%	0.000
Vasopressors PICU24 hours	80%	15%	0.000
Hospital Stay>10 days	70%	30%	0.001
Hospital Stay (days)	18.4±14.4	9.6±6.7	0.000

Results: Patients in long ICU group were less likely extubated at OR, more likely to have SIRS and receive vasopressor and longer hospital stay comparing with short ICU

Logistic regression analysis of ICU >3 days vs. ≤3 days groups:

	Estimated Coefficient	P	Odds Ratio
G-tube	0.286	0.6770	1.331
Nissen	1.418	0.0310	4.129
Asthma	1.42	0.0270	4.138
EBVL* (>61%)	1.601	0.0080	4.959
Constant	-2.917	0.0000	0.054

*Estimated Blood Volume Loss

Results: Odds with long ICU increased by 4.129, 4.138, 4.959 folds if patients had history of Nissen and asthma and intra-operative EBVL> 61%, respectively. Therefore, Nissen, asthma and EBVL> 61% independently and significantly predicted ICU stay outcome . Logistic regression used to predict independent variables.

DISCUSSION

Our study demonstrates that certain preoperative medical conditions and severity of blood loss during the surgery had significant impact on the length of ICU stay.

The patients who had history of Nissen fundoplication and Asthma had higher odds of staying longer in ICU. Our practice didn't demonstrate other medical conditions such as bladder dysfunction, seizures and presence of baclofen pump affect the length of ICU stay.

Among the intraoperative factors, higher estimated blood volume loss (%) increased the odds of longer ICU stay. The patients with higher blood loss had higher transfusion rates with subsequently higher incidence of SIRS in ICU.

In conclusion, in addition to optimization of preoperative medical condition, optimization and management of blood loss may have significant impact on the length of recovery in this patient population.

REFERENCES

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