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After scoliosis surgery, what risks are associated with postpartum systemic inflammatory response syndrome in young individuals with developmental disabilities

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AUTHORS' CONTRIBUTION: (A) Study Design · **(B)** Data Collection . **(C)** Statistical Analysis · **(D)** Data Interpretation · **(E)** Manuscript Preparation · **(F)** Literature Search · **(G)** No Fund Collection

ABSTRACT

Postsurgical critical care unit patients are known to experience complications from systemic inflammatory response syndrome. The majority of cerebral palsy patients who receive posterior spinal fusion for neuromuscular scoliosis exhibit SIRS in the intensive care unit, according to our observations. Literature on the effects of intraoperative causes of postoperative SIRS and subsequent effects in these individuals is scarce. The goal of the study was to better understand the risk factors for SIRS in children undergoing PSF for neuromuscular scoliosis. Children who had PSF for neuromuscular scoliosis were included in this retrospective, case-control study. Patients with tracheotomy, osteogenesis imperfecta, and idiopathic scoliosis were eliminated. Depending on whether SIRS had been identified in the intensive care unit, the subjects were split into two study groups. To pinpoint factors, descriptive statistical analysis was employed. In order to further assess the independent and substantial influence of these parameters on SIRS, a regression analysis was utilised. The demographic and other preoperative characteristics did not significantly differ. However, the SIRS group received considerably more blood products overall than the non-SIRS group. When compared to the non-SIRS group, the percentage of patients who remained intubated was higher in the SIRS group. According to the regression model, patients who were not extubated had a 7.467-fold higher chance of developing SIRS than those who had been extubated. Patients who were not extubated at the conclusion of PSF surgery have a considerably greater incidence of SIRS. Additional prospective studies are required to examine the elements that hinder extubation. These individuals following their operation Cerebral palsy patients undergoing posterior spinal fusion for neuromuscular scoliosis frequently have serious co-morbidities include seizures, chronic lung disease, poor nutrition, and recurrent UTIs.

Keywords: Scoliosis; Neuromuscular; Systemic inflammatory response syndrome; Spinal fusion; Postoperative extubation; Children

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INTRODUCTION

Preoperative optimisation has significantly improved in the last ten years in terms of lung function, diet, and seizure control. When compared to PSF for idiopathic scoliosis, postoperative morbidity in this cohort remains significant despite advancements in anaesthetic management and surgical technique. Children with neuromuscular scoliosis who undergo posterior spinal fusion often have severe blood loss as a result of poor nutrition that causes a lack of coagulation factors and abnormalities in the vascular con nective tissue. As a result, large volume transfusions are frequently used in intraoperative fluid control. of blood products and crystalloids. With the restriction of crystalloid, balanced transfusion of blood products with a larger ratio of fresh frozen plasma, packed red blood cells, and the use of anti-fibrinolytic to prevent excessive blood loss, transfusion practises have improved recently. While these actions have improved the intraoperative course, nothing is known about how they may affect the morbidity and death rates in the immediate postoperative course [1]. A systemic inflammatory response syndrome is characterised by two or more of the disorders listed below: tachycardia is characterised by a mean heart rate that is more than two standard deviations above the age-related average, a mean respiratory rate that is more than two standard deviations above the age-related average, or mechanical tachycardia. Leukocyte counts that are raised or decreased for age-immature neutrophils and ventilation for an acute pulmonary process [2]. After cardiac surgery and in children who have emergency intestinal procedures, the diagnosis of SIRS and its effects on the postoperative course have been thoroughly characterised. Patients who undergo major surgery are more likely to develop SIRS at this time due to the interaction of substantial fluid shifts, blood transfusions, and surgical tissue stress [3]. In the community of patients with neuromuscular spine fusion admitted to the paediatric critical care unit, we have observed an increase in the diagnosis of SIRS. In this study, the incidence of SIRS throughout the postoperative period was investigated in relation to preoperative patient characteristics and intraoperative anaesthetic care. We sought to look back and assess the effect on length of stay in the PICU of fluid management, transfusion practises, the choice to extubate, and the development of SIRS [4]. A mean respiratory rate that is more than two standard deviations over the age-appropriate norm; a leukocyte count that is high or low for the age; or a percentage of immature neutrophils [5].

To fully understand the influence of the intraoperative and preoperative factors over the incidence of SIRS in the ICU, the time for SIRS diagnosis was restricted to 48 hours [6]. Categorical variables were expressed as a percentage of an outcome in a group, while continuous variables were expressed as means standard deviation [7]. The preoperative, intraoperative, and postoperative differences between the SIRS and non-SIRS groups were compared using a univariate approach. To assess statistical significance between the two groups, the chi-square contingency test was used for categorical data and the t-test for continuous variables [8]. Prior to transformation, continuous variables with wide distributions were converted raw means were calculated and displayed in the findings, but no p values were obtained from the analysis. Additionally, a logistic regression analysis was performed to find risk factors that contribute on their own to SIRS development [9]. The regression model comprised variables that were significant in univariate analysis or important to the SIRS outcome. The SPSS statistical software system was used for the statistical analysis, which was deemed significant [10].

MATERIAL AND METHODS

1. **Study design:** The study design could be retrospective or prospective, depending on the availability of data and the research objectives. A retrospective study would involve reviewing medical records and data from a previous period, while a prospective study would involve collecting new data from participants.
2. **Participant selection:** Participants would include young individuals with developmental disabilities who have undergone scoliosis surgery and subsequently experienced postpartum SIRS. The inclusion criteria would specify the age range, type of developmental disability, and history of scoliosis surgery.
3. **Data collection**: Relevant data would be collected from medical records and patient charts. This would include demographic information, details of the scoliosis surgery, postoperative complications, presence of postpartum SIRS, and any other relevant variables.
4. **Risk assessment:** Statistical analysis would be conducted to assess the association between scoliosis surgery and postpartum SIRS in young individuals with developmental disabilities. This may involve calculating odds ratios, relative risks, or conducting regression analysis to control for potential confounding factors.
5. **Ethical considerations**: Ethical approval would be obtained from the appropriate research ethics board or committee to ensure participant privacy, informed consent, and compliance with ethical guidelines.

RESULTS

Invariable analysis of variables between SIRS and non-SIRS. After the electronic medical records of the intraoperative anesthesia and intensive care documentation were reviewed, a total of 77 patients met the criteria and were included in the study. The patients were divided into 2 groups based on the incidence of SIRS in the intensive care unit. We had 34 patients in the SIRS group and 43 patients in the non-SIRS group **[Fig.1].**

The SIRS and non-SIRS groups had similar demographic and clinical conditions preoperatively. No significant differences were found in terms of degree of scoliosis, type of surgery, feed status, and seizures or on medication for suspected seizures **[Tab.1.].**

The percent of patients with GMFCS Score ≥5 was 85.3% in the SIRS group, which was higher but not significantly when compared with the non-SIRS at 69.8% (Table 1; p=0.091). On the other hand, 17.6% patients in the SIRS group had intact verbal function comparing with 34.9% in the non-SIRS group, but the difference was not significant

DISCUSSION

In the context of young individuals with developmental disabilities who have undergone scoliosis surgery, the risks associated with postpartum SIRS may be influenced by several factors. These can include: Surgery-related factors: The type of scoliosis surgery, its invasiveness, duration, and

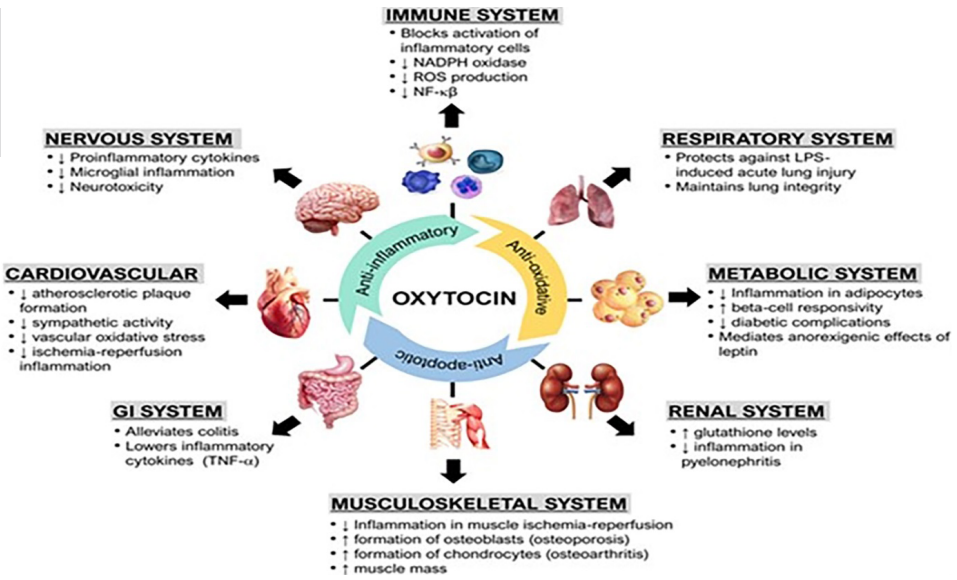

Fig.1. Frontiers oxytocin and related peptide hormones: candidate anti-inflammatory therapy in early stages of sepsis.

Tab.1. Comparison of patient's extubated and not extubated in the operating room.

Non-Extubated (N=18)	Extubated (N=59)	P Value	
Demographic, medical conditions variables:			
Gender (M/F)	10-Aug	23/36	0.166
Age	12.2±2.5	13.3±3.2	0.203
Weight	34.6±14.1	35.9±11.0	0.688
Unit rod surgery %	61.1% (11)	52.5% (31)	0.358
% with Kyphosis	44.4% (8)	33.9% (20)	0.294
GMF Score ≥5 %	94.4% (17)	71.2% (42)	0.035
Verbal %	16.7% (3)	30.5% (18)	0.2
G Tube %	72.2% (13)	57.6% (34)	0.203
Intra-operative variables:			
Surgery time (Minutes)	472.4±164.7	341.0±121.2	0.001
Estimated blood loss (ml/Kg)	51.8±27.8	30.7±21.7	0.001
Total blood products (mg/Kg)	74.8±39.9	33.3±23.5	<0.001
Total crystalloid (mg/Kg)	102.0±44.4	69.0±28.3	0.001
% Received Platelets	72.2% (13)	11.9% (7)	<0.001
PRBC (ml/kg)	30.8±18.5 (17)	16.2±11.1 (37)	0.001
FFP (ml/kg)	28.6±13.9 (16)	13.9±8.5 (54)	<0.001
FFP/PRBC Ratio	1.1±0.5 (16)	1.1±0.6 (34)	0.762
Cell saver (ml/kg)	18.6±10.5 (14)	11.0±7.5 (50)	0.003
Lowest Hgb in OR	9.3±1.7	10.2±1.5	0.03
% Vasopressor in OR	55.6% (10)	28.8% (17)	0.038
Post-operative and ICU variables:			
% Bolus Crystalloid 24	77.8% (14)	49.2% (29)	0.029
SIRS	83.3% (15)	32.2% (19)	<0.001
% PRBC transfusion POD 1 and/or POD2	16.7% (3)	16.9% (10)	0.644
% Transfusion 48 hours and discharge	16.7% (3)	10.1% (6)	0.351
Circulatory support with inotropes	66.7% (12)	11.9% (7)	<0.001
Intubated ≥1 day*	94.4% (17)	3.4% (2)	<0.001
ICU >2 days (range:0.5-15 days)	83.3% (15)	33.9% (20)	<0.001
Hospital days >8 (range: 2-85 days)	72.2% (13)	42.4% (25)	0.025
Wound infection at discharge	11.1% (2)	5.1% (3)	0.332

any complications during or after the procedure can impact the overall stress on the body and potentially contribute to an increased risk of postpartum SIRS. Developmental disabilities: Individuals with developmental disabilities may have unique physiological and immunological characteristics that can affect their response to surgery and subsequent postpartum period. Their underlying conditions may also contribute to an altered immune response or predispose them to a higher risk of SIRS. Postpartum care: The management of the postpartum period, including monitoring for signs of SIRS, providing appropriate pain management, and addressing any complications or infections, are crucial in minimizing the risk of postpartum SIRS.

CONCLUSION

TIS in children with early-onset scoliosis manifests as a history of prominent respiratory symptoms, chest deformity on physical examination, abnormal chest X-ray and CT findings and changes in pulmonary function. A potential therapeutic goal for this syndrome is to restore chest function and volume during growth. Although some patients exhibit good spine growth with growth-friendly surgery, there is still a subset of patients with poorer lung outcomes in adulthood. Future research must continue to focus on classification results based on the specific diagnoses of EOS patients. Due to the repetitive nature of prolonged surgery, treatment remains challenging and complication rates are high. Accordingly, more research is needed to further reduce complications and improve outcomes after EOS. Successful treatments that encourage the growth of the spine and chest will lead to good outcomes for EOS patients. With the increase of curvature, EOS patients can lead to structural changes in the chest cavity, causing severe complications such as restrictive lung disease, cardiovascular complications and respiratory failure. However, the treatment of children with EOS is customized according to specific diseases. Although lack of treatment has been proved to lead to an increase in mortality, extensive early and definite fusion may lead to thoracic insufficiency. Delaying definite surgery and using increasing instruments may be beneficial to keeping lungs healthy.

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