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Greetings from Micro Labs Limited. We are happy to bring you "PEDIA COMPANION" which contain latest and interesting news in the field of Paediatrics.

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Impact of nasal high-frequency oscillatory ventilation on hemodynamics in moderate and late preterm neonates

Introduction

Premature neonates frequently suffer from one of the most prevalent medical disorders, neonatal respiratory distress syndrome (NRDS). NRDS usually occurs in pre-term infants within 6 hours of birth which may aggravate and even cause respiratory failure, resulting in death.¹ Neonates with respiratory distress syndrome (RDS) often require respiratory support, with invasive mechanical ventilation (IMV) being a common but potentially harmful intervention. Non-invasive ventilation (NIV) methods such as nasal continuous positive airway pressure (NCPAP), nasal intermittent positive pressure ventilation (NIPPV), high flow nasal cannula (HFNC), and more recently, nasal high frequency oscillatory ventilation (NHFOV) have emerged as alternative to IMV. When it comes to delivering gentle ventilation and reducing atelectotrauma and volutrauma which were known to contribute to ventilator-induced lung injury and adverse long-term morbidities—NHFOV may be preferable than NIPPV.² Hence, this study aimed to evaluate cardiorespiratory effects of NHFOV as an initial mode of NIV in moderate and late preterm infants with moderate and severe RDS.

Nasal high frequency oscillatory ventilation demonstrated effectiveness in reducing the need for invasive ventilation

Methods

This was a randomized clinical trial conducted on moderate to late preterm infants with RDS. Patients were randomized into two groups with the ratio 1:1. Infants were randomly assigned to undergo treatment with either NHFV (n=50) or NCPAP (n=50) as primary modes of NIV. Primary outcome includes assessment of left ventricular output while patients were on maximally recorded Mean airway pressure (MAP). Secondary outcomes include other hemodynamic parameters, duration of NIV, need for IMV, and short term complications such as air leak syndromes, pulmonary hemorrhage, and neurological complications. Kaplan–Meier survival plot was used to demonstrate time course of NCPAP and NHFOV failure.

Results

Out of 152 assessed infants, 100 were included in this study and randomly assigned to NHFOV and NCPAP groups (50 allocated in each group). Primary respiratory outcomes show that NHFOV group had a lower need for intubation, a shorter duration of NIV or oxygen support, a lesser maximally achieved fraction of inspired oxygen (FIO₂), a shorter time to reach FIO₂ ≤30%, and a lower Oxygenation saturation index (OSI) at 2 hours, all of which p values are 0.001*, whereas the maximally reached MAPs were greater in NHFOV group (P <0.001). Over the period of the first 72 hours, it was seen that infants in the NHFOV-group had significantly lower FIO₂ requirements and higher oxygen saturation (SPO₂) at various evaluation time

points. When ABGs were taken two hours after the start of NIV and again after 12 hours, PCO₂ values were found to be significantly lower in the infants in the NHFOV group. Hemodynamic properties assessed via echocardiography, showed significant difference favouring NHFOV, including higher EF and FS. It was also found that resistance index (RI) of Anterior cerebral artery (ACA) was higher in NHFOV group. In NCPAP group, episodes of apnea, bradycardia, and desaturations were significantly more while, respiratory secretions were higher in the NHFOV group. Secondary outcomes showed favourable outcomes for NHFOV group in terms of feeding initiation, hospital stay duration and complications. Figure 1 demonstrated the time course and failure rate of NCPAP and NHFV-groups.

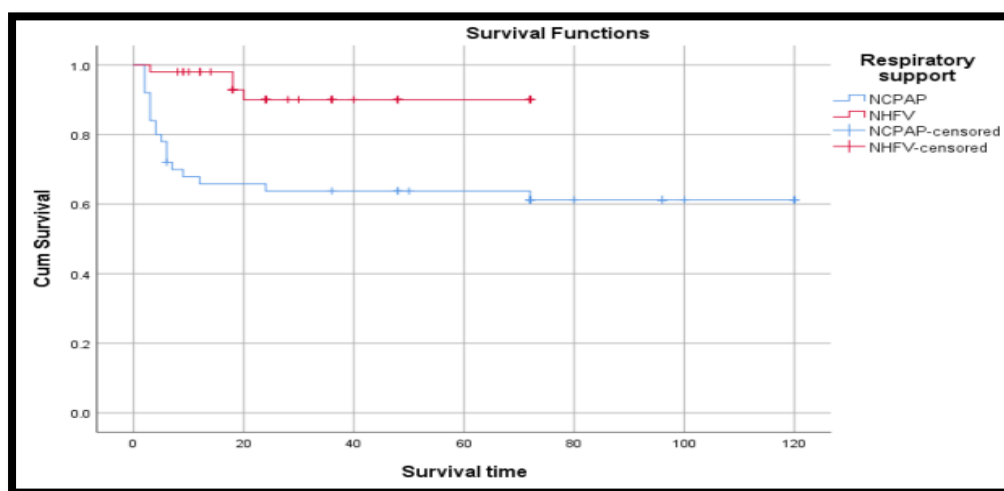


Figure 1. Time course and failure rate of NCPAP and NHFV groups

Discussion

These study findings highlighted the effectiveness of NHFOV in reducing the need for intubation, shortening NIV duration, and improving CO₂ removal. LV function was assessed by measuring FS, EF and LVO which showed that NHFOV group did not adversely affect LVO. LVO values in both group were within the normal range.² Simma et al., showed a significantly reduced LVO.³ In this study, the author evaluated RI of ACA as an indicator for cerebral blood flow with low values indicated luxurious cerebral perfusion. In NHFOV group, RI was significantly lower than NCPAP group with median (IQR) 0.79 (0.74–0.80) and 0.80 (0.77–0.82), respectively.² Similar results were shown in Ayoub et al. where there was a significant reduction in RI of both anterior and middle cerebral arteries following the switch to HFOV which concluded cerebral perfusion was not compromised during invasive HFOV.⁴

Conclusion

NHFOV can be used as an effective and promising tool of non-invasive-ventilation which can be used as a primary modality in preterm infants with respiratory distress syndrome without causing any detrimental effects on hemodynamics or significant respiratory complications.

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Association between Kawasaki disease risk scores and baseline coronary artery Z-scores with coronary artery aneurysms

Introduction

Kawasaki disease (KD) is a vasculitis primarily affecting medium sized arteries, particularly the coronary arteries, with significant implications for children under 5 years old. Coronary artery aneurysms (CAAs) are a severe complication affecting around

Patients with a baseline Z-score ≥ 2 are at higher risk for coronary artery aneurysms

25% of untreated patients.¹ In Japan, there was increase in incidence rate from 218.6 per 100,000 in 2008 to 243.1 and 330.2 in 2011 and 2015 respectively. In the United States, KD-associated hospitalization rate for children < 5 years of age was 18.1 per 100,000.² Treatment with intravenous immunoglobulin (IVIG) reduces this incidence to 3-5%. Various risk scores have been developed globally to predict IVIG resistance and CAA development, but their applicability outside specific population remains uncertain.¹ This study aimed to evaluate the association between KD risk scores and baseline coronary artery Z scores with CAAs at one, two and six months.

Methods

This was a historical cohort study conducted on KD patients who were treated with IVIG infusion at a dose of 2 g/Kg within 10 days from the fever onset. Data were collected on demographics, clinical symptoms, treatments and cardiac findings. Outcomes were assessed at one, two and six months. Logistic regression analyses were used to assess association between risk scores, baseline Z scores and CAAs adjusting for relevant factors.

Results

Out of 89 diagnosed patients, 77 were included in this study. In this study population 26 (34%) patients had a baseline Z-score ≥ 2 , and 22 (29%) had a baseline Z-score ≥ 2.5 . Ten (13%)

patients had at least one CAA at the one-month follow-up, 8 (10%) at the two-month follow-up, and 4 (5%) at the six-month follow-up (Figure 1). Patient with Z score ≥ 2 were younger than patients with a normal baseline Z-score. It was found that baseline Z-score ≥ 2 was associated with CAA development at one month and two months but not at six months. A baseline Z-score of ≥ 2.5 was positively correlated with the development of aneurysms at one and two months, but not at six months. San score showed association with CAAs at one and two months, but not at 6 months. Other scores did not exhibit significant associations.

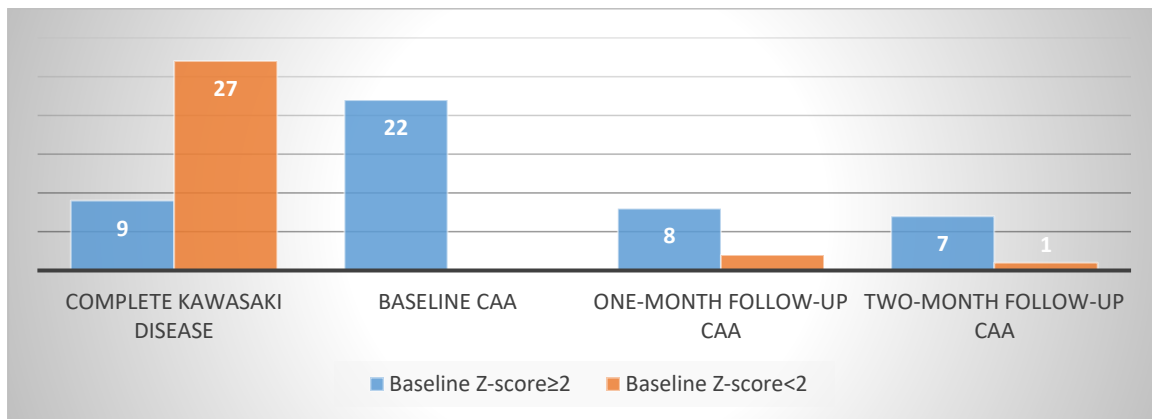


Figure 1. Comparison of clinical data, coronary artery aneurysms at one, two months by baseline Z-score ≥ 2 and < 2 .

Discussion

This study finding showed a strong association of initial Z-score ≥ 2 and ≥ 2.5 with CAAs at one and two months of illness, with higher ORs of the baseline Z-score ≥ 2 .¹ Similar results were found by Son et al. which showed high predictive utility of baseline Z score ≥ 2 for CAA development.³ According to the study results, the baseline Z-score was the strongest predictor of the development of CAAs, and patients with a baseline Z-score of ≥ 2 were at higher risk of developing CAAs. It was observed that 34% of our patients had baseline Z-score ≥ 2 and 29% had a baseline CAA. While comparing the incidence of coronary artery dilatation and aneurysm it was found that present study results were higher than one found by son et al. (29% and 19% respectively)⁴ but lower than one found by Dallaire et al. (65% and 33.5% respectively).⁵

Conclusion

Patients with a baseline Z-score ≥ 2 were at higher risk for CAAs emphasizing the importance of vigilant monitoring and potentially more aggressive treatment strategies. While San score showed some promise its utility should be further explored in larger population.

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Impact of the Early Onset Sepsis (EOS) calculator in reducing the Use of Intravenous Antibiotics in Neonates Born ≥ 35 Weeks' Gestation

Introduction

Neonatal early onset sepsis (EOS) poses a significant risk to newborns, often leading to morbidity and mortality. In Australia, EOS was typically defined as infection occurring during the first 48 hours of life, commonly caused by pathogens like Group B streptococcus (GBS), and *Escherichia coli*.¹ The incidence of EOS was reported to vary between 0.5 to 1 in 1000 live births in full-term (term) newborns (≥ 37 week's gestational age) and 3% to 4% at 22 to 24 week's gestational age (GA).² Diagnosing EOS was challenging due to subtle clinical signs, leading to empirical antibiotic treatment based on risks factors. However, use of antibiotics can have long term adverse effects and contribute to antibiotic resistance highlighting the need for more targeted approaches to treatment. This study aimed to evaluate the effectiveness of the Early Onset Sepsis calculator (EOSc) in reducing the rate of inappropriate antibiotic use in neonates born ≥ 35 weeks' gestation.

Early onset sepsis calculator resulted in a significant reduction in empirical intravenous antibiotics use in neonates born ≥ 35 weeks of gestation.

Methods

This study was conducted at a tertiary care centre involving a multidisciplinary team across various departments and utilized a quality improvement (QI) framework, Plan-do-study-act (PDSA) cycles to implement changes in antibiotic prescribing practices for EOS. The plan involved using a standard QI model, guided by evidence based practices to overcome barriers and achieve sustainable changes. Baseline data on EOS rates and antibiotic use were collected through retrospective audits, informing the development and implementation of interventions.

Results

The rate of empiric IVABs use decreased from 13.3% (1119/8411) to 8.8% (276/3136) in the Learning period and EOSc period, with a further reduction to 8.3% (61/734) in the EOSc period

only, marking a 37% reduction in the rate of IVABs (Figure 1). The overall rate of blood culture (BC) collection in the first 4 days of life also decreased, from 14.4% to 11.2% in the Learning period and EOSc period, with a rate of 11.9% (87/734) in the EOSc period only. The LOS in otherwise uncomplicated neonates decreased by 11% during the EOSc period. Compliance with EOSc use increased over time, with attempted completion of the EOS risk score stamp rising from 85% to 88% and correct completion rising from 55% to 74%. The average blood culture (BC) volume increased to 1.1 mL after PDSA cycle 1, compared to a baseline volume average of 0.6 mL.

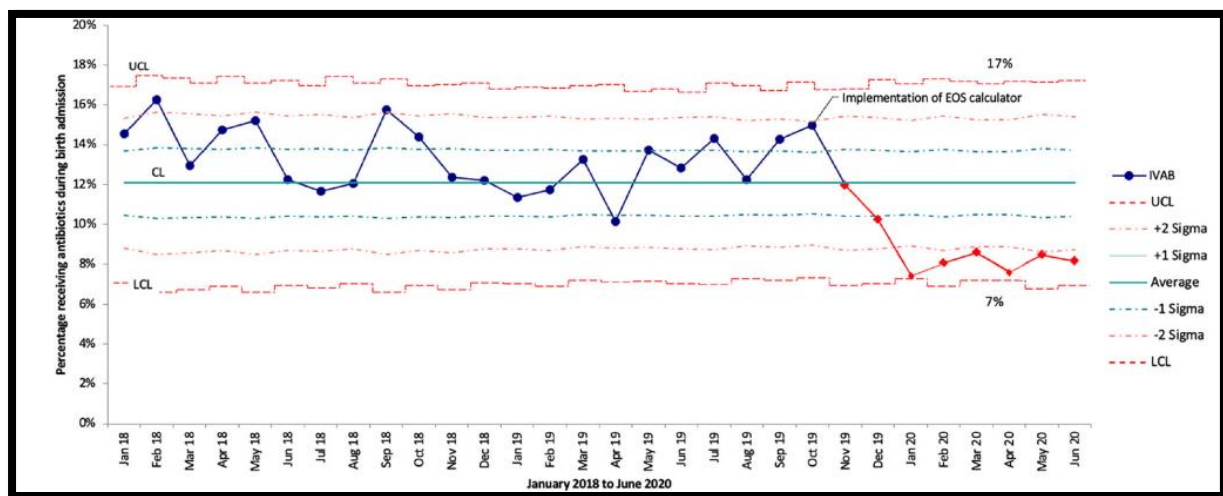


Figure 1. Rate of antibiotic use in neonates born ≥ 35 weeks' gestation during initial birth admission

Discussion

This study found that the implementation of the Early Onset Sepsis calculator (EOSc) led to a significant reduction in intravenous antibiotic (IVAB) use for neonates born ≥ 35 weeks' gestation. This reduction was observed from the beginning of the learning period, with a 37% decrease in IVAB use after the implementation of EOSc. Additionally, there was a decrease in the rate of blood culture investigations, as well as in the number of full blood examinations and blood gas assessments collected. This study also noted that the volume of blood collected for blood cultures was optimized, and there were no cases of missed early onset sepsis. This reduction in investigation and treatment for Early Onset Sepsis risk resulted in reduced length of stay and associated costs.¹ Similar findings have been reported in other studies, such as by Strunk et al. in an Australian neonatal unit, which showed rates of empiric IVABs in the same population decreased 12% to 7.6%, without an increase in the incidence of EOS.³

Conclusion

Implementation of early onset sepsis calculator resulted in a significant reduction in empirical intravenous antibiotics use in neonates born ≥ 35 weeks of gestation. This led to immediate

benefits such as reduced exposure to early life antibiotics, fewer painful IV procedures, and a decrease in length of stay and associated healthcare costs.

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Case report on Sturge-Weber syndrome

Introduction

Sturge-Weber syndrome (SWS), or encephalo-trijeminal angiomatosis is defined as a rare disease characterized by facial, leptomeningeal, and choroidal angiomas. It was mainly diagnosed in patients with epileptic seizures, which affects more male population.¹ The frequency of SWS was thought to be between 1: 20,000 and 1: 50,000 live births. Following neurofibromatosis and tuberous sclerosis, it was the third most prevalent neurocutaneous syndrome.² This report described a case of a child who was suspected to have SWS due to presence of a facial and leptomeningeal angioma.

Congenital facial port-wine stain and a capillary-venous leptomeningeal angioma are the common symptoms of Sturge-Weber syndrome

Case presentation

A 11 years old female child had history of congenital facial plane angioma of purplish color, good psychomotor development, notion of convulsive seizure at the age of 3 years placed on valproic acid stopped after 1 year by the parents and intellectual delay (Figure 1). The patient's illness started 4 days ago with an unexplained fever, swelling of the right eyelid, and purulent secretions. On the day of admission, patient experienced a partial convulsive attack of the right upper hemibody, which subsided after an intrarectal valium injection without coma or post-ictal deficit. A brain computerized tomography (CT) showed orbital cellulitis with subcortical cortical atrophy and gyriform calcifications suggestive of Sturge Weber syndrome and a CRP value of 195.3. The patient showed good clinical and biological improvement after starting IV antibiotic therapy. The EEG showed the presence of global cerebral distress with bursts of slow

waves, and diffuse slow spikes predominant in bilateral temporo-occipital regions. A brain Magnetic resonance (MR) angiography showed widening of the subarachnoid spaces and cortical sulci, with signal gyriform anomaly (Figure 2). Further, ophthalmological examination showed glaucoma, the abdominal ultrasound showed homogeneous hepatomegaly and ETT was normal. Based on the above condition patient was diagnosed with sturge weber syndrome and was prescribed with carbamazepine and beta blocking eye drops with good clinical progress and regular ophthalmological monitoring.



Figure 1. Angioma of the face

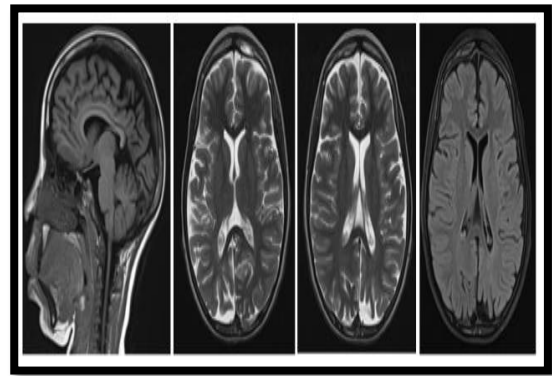


Figure 2. MRI angiogram showing widening of subarachnoid spaces and cortical sulci, as well as bilateral leptomeningeal enhancement

Discussion

This case report described the sturge weber syndrome type according to roach. The most predominant symptom observed was the presence of convulsive seizures which was associated with mild mental retardation.¹ In this disease condition, the main neurological symptoms were epilepsy, affecting 75 and 90% of patients, which was generally early and severe. Motor deficit was seen in 50% of the cases.³ For the diagnosis of this condition, magnetic resonance imaging and computed tomography were crucial. As demonstrated in this case, the most common electroencephalographic abnormality was an asymmetry, characterized by a decrease in amplitude and slowing of background activity in one or both hemispheres related to cerebral distress. Treatment includes symptomatic therapy with use of antiepileptic drugs to control seizures. To prevent stroke and reduce brain atrophy low doses of aspirin was used. Physiotherapy may be recommended for motor deficits.

Conclusion

Sturge Weber syndrome is still a rare disease which must be considered in front of a facial angioma in order to start early antiepileptic treatment and look for ophthalmological complications.

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