September 22nd, 2023 09:00 - 11:00

PARALLEL SESSION 20 - LUNG 4

ID 765. FiO2 in the early hours of life predicts NIPPV failure in Infants with RDS

Doctor Mustafa Senol Akin[1], **Doctor Aslihan Kose Cetinkaya**[1], Doctor Ismail Cagrı Aciksoz[1], Professor Evrim Alyamac Dizdar[1], Professor Fatma Nur Sari[1]
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Background: Nasal intermittent positive pressure ventilation (NIPPV) has been widely used as the initial respiratory support in preterm infants with respiratory distress syndrome (RDS). Despite appropriate non–invasive strategies, many infants are still exposed to the unfavorable effects of intubation. In this study, we aimed to identify the impact of a fraction of inspired oxygen (FiO2) on NIPPV failure and determine the morbidities associated with NIPPV failure.

Methods: This prospective study included preterm infants between 230–316 weeks of gestational age with signs of respiratory distress and managed initially with NIPPV. Infants were grouped as successfully managed on NIPPV (NIPPV–S) or failed and intubated within 72 h of life (NIPPV–F). Predictors of NIPPV failure were evaluated, and clinical outcomes were compared between the groups.

Results: Of 440 infants included in the study, NIPPV failure was observed in 164 (37.3%) infants. Infants who failed on NIPPV were more likely at lower gestational age and birth weight. Surfactant administration, bronchopulmonary dysplasia and mortality were more pronounced in the NIPPV–F group. FiO2 requirements in the delivery room, in the first and second hours of life, were significantly higher in the

NIPPV–F group (all p <0.001). In the multivariate analysis, gestational age and FiO2 in the first and second hours of life were found to be predictive. The threshold for FiO2 in the first hour of life was 0.30 (AUC 0.72;p<0.001), with a sensitivity of 73% and a specificity of 62%, whereas FiO2 in the second hour of life was 0.29 (AUC 0.72;p<0.001), with a sensitivity of 80% and a specificity of 45%.

Conclusion: FiO2 in the early hours of life represents a reliable predictor of NIPPV success. FiO2 threshold over 30% in the first hour and 29% in the second hour of life seem to be independent factors determining NIPPV failure.

None declared

ID 418. NON-INVASIVE LUNG GAS OXYGEN DETECTION IN HEALTHY TERM INFANTS - GASMAS FEASIBILITY STUDY

Mr Jurate Panaviene[1,2,3], Konstantin Grygoryev[4], Andrea Pacheco[4,5], Pranav Lanka[4,5], Sanathana Konugolu Venkata Sekar[4,5], Roberto Chioma[1], David Healy[1,2,3], Vicki Livingstone[1,2], Professor Stefan Andersson-Engels[4,5], Professor Eugene Dempsey[1,2,3]
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Background: Infants admitted to neonatal unit, especially if born preterm, often have underlying respiratory problems necessitating respiratory monitoring. Gas in scattering media absorption spectroscopy (GASMAS) enables non-invasive oxygen (O_2) gas quantification by measuring O_2 light absorption within the lung.

Objective: Assessment of the feasibility of GASMAS for the detection of O_2 and determination of optimal probe positioning.

Design/methods: Healthy full-term (>37 weeks gestational age (GA)) neonates were recruited in Cork University Maternity Hospital over 7-month period. Measurements were performed using GASMAS (Neola Alpha 2, NEOLA Medical, Sweden) with near-infrared laser sources of 760 and 935 nm, specific for O_2 and H_2O absorption bands. The light source probe and photodetector were placed in 5 locations on each side of the infant's chest (Figure 1a). O_2 detection was defined using multiple signal quality criteria.

Results:

One-hundred healthy infants of 1–5 days age were enrolled. The mean (SD) GA was 39(1) weeks and the mean (SD) birth weight 3.6 (0.5) kg. A total of 1000 GASMAS measurements were performed. 98 of 100 infants had O_2 signal detected with at least one thoracic measurement. Interim analysis was performed after the recruitment of first 55 infants with following implementation of user interface changes for the next 45 infants. The mean percentage of measurements with detected O_2 signal across all locations had improved from 39(2)% to 75(2)%. No significant relationships were found between mean O_2 detection and infant (n=45) birth weight (p=.35), sex (p=.75), age (p=.8), mode of delivery (p=.57), respiratory rate (p=.41). O_2 signal was less likely to be detected on the left side for the first (p=.02), second (p=.04), and third (p=.01) probe locations compared to the right (Figure 1b).

Conclusions: This cohort study has demonstrated the feasibility of GASMAS use for non-invasive lung O_2 detection in neonates. 98% of healthy term-born infants had good quality O_2 signal detected at least once using GASMAS. The O_2 detection rate was lower for the anterior left side of the chest (second, third, and fourth intercostal space) likely due to the location of the heart, suggesting more optimal lateral and posterior locations of the probe placement.

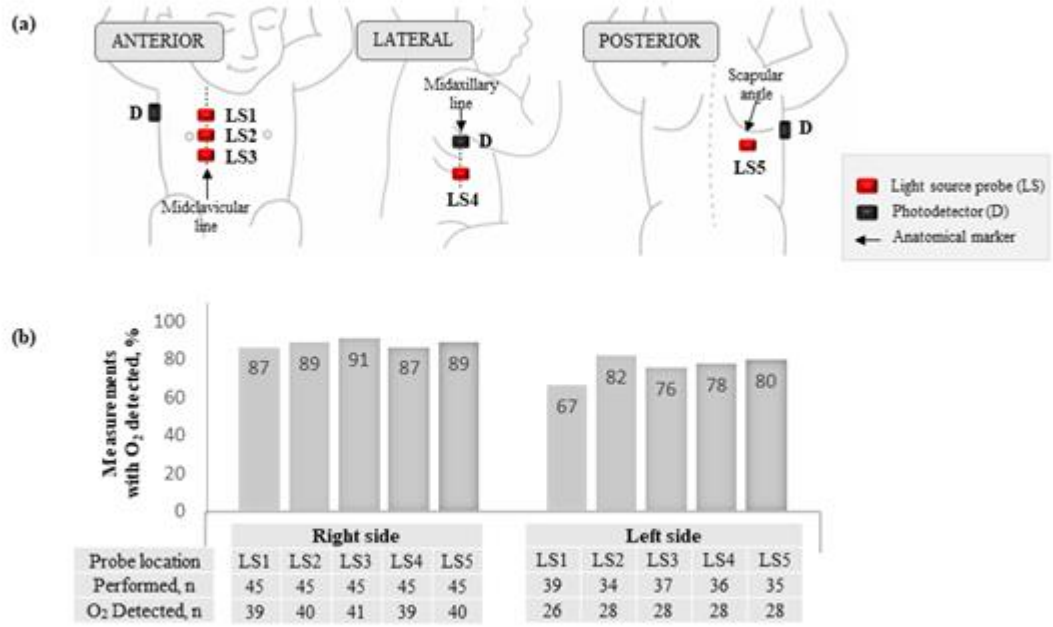

Figure 1. (a) Light source (LS) and photodetector (D) positioning. Right and left side measurements were performed in anatomically corresponding locations. (b) Percentage of GASMAS measurements with O_2 detected.

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None declared

ID 590. Congenital Diaphragmatic Hernia (CDH): Artificial Intelligence for automatic lung and liver segmentation in Magnetic Resonance images, and liver herniation classification

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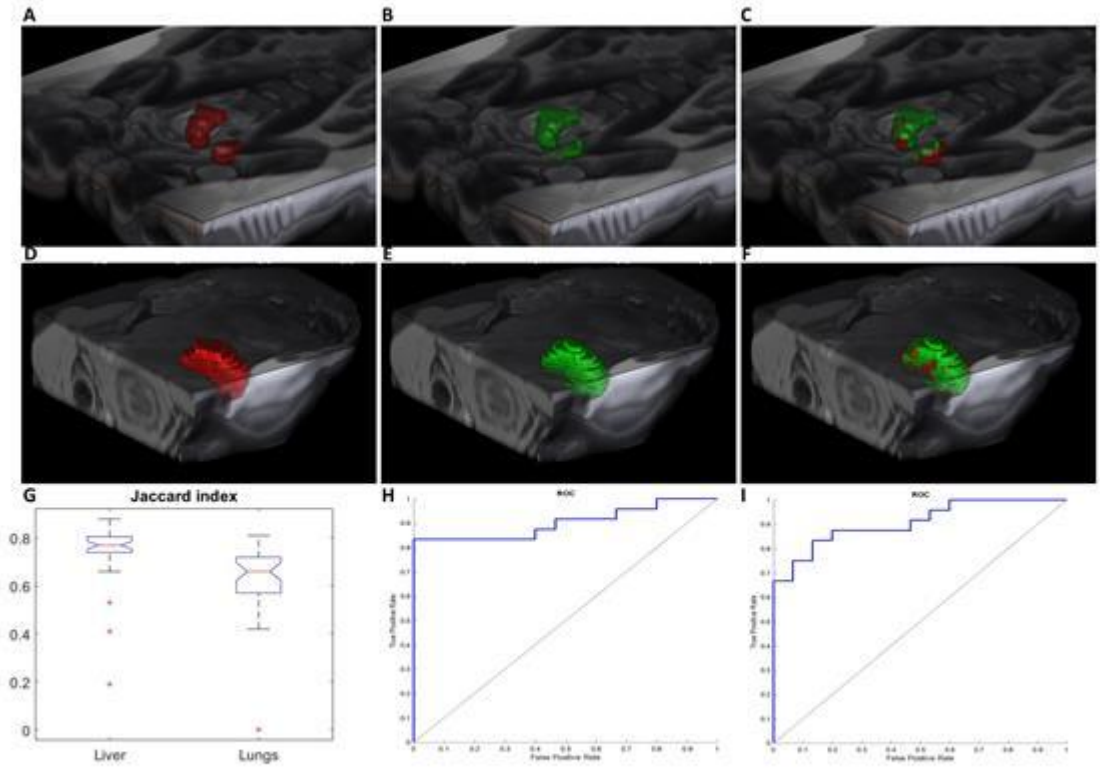
Background: Congenital Diaphragmatic Hernia (CDH) is a rare malformation characterized by a diaphragmatic defect that allows intrathoracic herniation of abdominal viscera, affecting lung development and leading to lung hypoplasia and postnatal pulmonary hypertension. Fetal MRI is a reliable technique for prenatal CDH evaluation, since it allows the assessment of several factors impacting neonatal survival, mainly lung size and liver position. However, manual segmentation of MRI sections is time–consuming and prone to errors. Recently, Artificial Intelligence–

based technologies have been utilized in the neonatal field to support medical data analysis. The purpose of this study was to automate lung and liver segmentation in MRI so as to enable reliable automatic prediction of prognostic factors in newborns affected by this severe disease.

Methods: We proposed the use of nnU–Net, a free and user–friendly deep–learning automatic segmentation system, for the automated contouring of lungs and liver in 39 MR images of CDH–affected fetuses. Segmentation quality was assessed by the Jaccard coefficient, a measure of similarity defined as the size of the intersection of the manual and the automatic regions of interest (ROIs), divided by the size of their union: values close to 1 indicate fully overlapped regions. We also built a Machine Learning (ML) classifier system to predict liver herniation based on Pyradiomics shape features computed from the manual and automatic segmentations of lungs and liver.

Results: nnU–Net yielded good automatic segmentations, with most Jaccard coefficients around 0.60–0.70 for the lungs and 0.75–0.80 for the liver. Pyradiomics features were partly reproducible in the manually and automatically segmented ROIs, which is a sign of reliability of the automatic segmentations. The ML procedure for liver herniation prediction, based on nnU–Net segmentations, gave high ROC AUC values (0.91) similarly to those based on manual segmentations (see figure).

Conclusions: To the best of our knowledge, this work is the first attempt at the automatic segmentation of lungs and livers in MRI of fetuses affected by CDH. The study suggests that the automatic segmentation approach is feasible, with promising results, and can be useful in ML applications such as predicting liver herniation.



Lung (1st row) and liver (2nd row) segmentation results: manual (A, D), automatic (B, E), overlaps (C, F), Jaccard coefficients (G). ROC curves for liver herniation prediction (H:manual, I:automatic ROIs).

Lung (1st row) and liver (2nd row) segmentation results: manual (A, D), automatic (B, E), overlaps (C, F), Jaccard coefficients (G). ROC curves for liver herniation prediction (H:manual, I:automatic ROIs).

None declared

ID 637. Safety and efficacy of high doses nebulized salbutamol compared with placebo on Transient Tachypnea of the Newborns (TTN): a triple blind phase II/III parallel randomized controlled trial

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Abstract:

Objective: To evaluate the safety and efficacy of nebulized salbutamol in 2.5 and 1.25 doses on Transient Tachypnea of the Newborn (TTN) compared to the placebo.
Design: Triple blind phase II/III parallel randomized controlled trial. Registered as: IRCT20190328043133N1

Setting: Two university-affiliated hospitals with neonatal intensive care units (nICU)
Participants: Newborns with a confirmed diagnosis of TTN, with gestational age >35 weeks and gestational weight >2 kg. Cases of asphyxia, meconium aspiration, and persistent pulmonary hypertension (PPHN) were excluded.

Methods: 90 eligible patients were randomly allocated in three intervention groups (2.5mg salbutamol, 1.25 salbutamol, and placebo), and a single dose nebulized product was prescribed 6 hours after the birth. Safety outcomes included post-intervention tachycardia, hyperglycemia, hypokalemia, and changes in blood pressure measured. To evaluate the efficacy, the duration of post-intervention tachypnea, TTN clinical score, and clinical and para-clinical respiratory indices were assessed. Parents, Outcome assessors, and data analyzer were blind to the intervention.

Results:

There was no adverse reaction, including tachycardia, hypokalemia, and jitteriness. Both groups of salbutamol recipients showed significant improvement regarding respiratory rate, TTN clinical score, and oxygenation indices compared to the placebo (p-values<0.001). Non-statistically significant higher hospital stay was observed in the placebo group. Single 2.5mg salbutamol nebulization showed a little better outcomes than the dose of 1.25, although we could not find statistical superiority.

Conclusion:

The newly-applied single high-dose of 2.5mg nebulized salbutamol is safe in treating TTN and leads to notable faster improvement of respiratory status without any considerable adverse reaction.

Keywords:

Transient Tachypnea of the Newborn, Respiratory outcomes, Salbutamol, Tachypnea, Safety outcomes

None declared