ELECTRICAL IMPEDANCE TOMOGRAPHY SYSTEM UTILIZATION FOR DIAGNOSTICS OF NEONATAL LUNGS

Motivation:

Clinical requirements for non-invasive, radiation free and bedside monitoring technique for neonatal intensive-care units (NICU), useful for monitoring of neonatal lungs function and condition and quantitative analysis of bronchopulmonary dysplasia.

Aim:

Utilization of electrical impedance tomography (EIT) system Maltron Sheffield MK 3.5 for measuring tidal volumes, lung density and other parameters depending on changes of electrical resistivity of the lung tissue with frequency (Fig. 1 left). The main goal is monitoring of electrical resistivity of the lungs in patients with bronchopulmonary dysplasia (BPD).

Methods:

This work is focused on neonatal patients with lung dysfunctions because a complex method for lung monitoring is needed. EIT system Maltron Sheffield MK 3.5 is used for monitoring of mechanical ventilation, in our case mostly continuous positive airway pressure (CPAP). Monitoring of selective high frequency jet ventilation was performed using EIT system. The electrical resistivity will be collated with a standard BPD classification and ventilation-to-perfusion ratio as well. Monitoring of tidal volumes and lung density (Fig. 1 right) is also possible. The main limitation of EIT system is data acquisition principle and complicated results interpretation requiring an erudite clinicians and biomedical engineers collaborating.



Fig. 1 – Electrical resistivity changes with different frequency of applied current (left), total and regional lung density measured by EIT system Maltron Sheffield MK 3.5 (right).

Conclusion:

EIT system could be used for monitoring of maturational changes in neonatal lungs. Monitoring of mechanical ventilation is possible. It is necessary to verify the possibility of monitoring of BPD in a combination with measuring of a reduced VQ shunt.



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