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# **INTEGRATION OF SCIENTIFIC AND MODERN IDEAS INTO PRACTICE**

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# INFLUENCE OF HIGH-FREQUENCY CHEST WALL OSCILLATION FOR HEMODYNAMIC INDICATORS IN CHILDREN WITH COMMUNITY-ACQUIRED PNEUMONIA

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**Relevance.** Diseases of the respiratory tract remain an urgent issue in modern pediatrics. Pneumonia is one of the most common forms of damage to the respiratory system and remains the main infectious cause of morbidity and mortality in children throughout the world, in particular in Ukraine [1-3]. High-frequency chest wall oscillation (HFCWO) is a modern method of bronchodrainage that affects the ventilation function of the lungs and improves pulmonary gas exchange in children based on the vibration-compression effect of the Vest Airway Clearance System [4,5]. The Vest device has proven its effectiveness in the treatment of children with cystic fibrosis, bronchial asthma, and bronchiectasis [6,7].

**The aim:** to study the changes in hemodynamic indicators (HI) in children with community-acquired pneumonia (CAP) with an acute and uncomplicated course under the influence of HFCWO.

**Materials and methods.** Peculiarities of HI changes (body temperature, systolic blood pressure (SBP), diastolic blood pressure (DBP), respiratory rate (RR), heart rate (HR), oxygen saturation (SpO<sub>2</sub>)) were evaluated in 110 children aged 6 to 17 years (12.24±0.51 years old), including 66 boys (60%) and 44 girls (40%) at the pulmonology department of the Odesa Regional Children's Clinical Hospital with a confirmed diagnosis of CAP of moderate severity with an acute and uncomplicated course within 10 days of treatment. Children were divided into groups: the first group (FG) consisted of 58 children (37 boys and 21 girls), who were prescribed basic treatment (BT) and additional bronchodrainage procedures using 1-6 modes of The Vest device, model 105 (Hill-Rom, USA) [8,9]. The second group (SG) consisted of 52 children (34 boys and 18 girls), who were assigned only BT. Hemodynamic indicators were evaluated in children at the beginning of treatment and in the dynamics.

**Results.** On the 1st day of therapy, the temperature reaction of the body in FG children was  $37.41 \pm 0.09$  (95% CI 24.23–49.75) in comparison with SG children –  $37.28 \pm 0.06$  (95% CI 23.60–49.80). SBP in children of FG reached  $107.29 \pm 3.03$  (95% CI -1.65–3.79) in comparison with children of SG –  $113.15 \pm 2.42$  (95% CI -1.74–4.0). In FG children, DBP was  $66.0 \pm 1.69$  (95% CI 53.48–78.52) compared to SG children –  $75.15 \pm 1.81$  (95% CI 62.83–86.47). The heart rate in FG children was  $87.0 \pm 1.93$  (95% CI 78.11–95.89) compared to SG children –  $87.5 \pm 1.76$  (95% CI 78.51–96.49).

On the 5th day of treatment, a decrease in body temperature was noted in FG children to  $36.61 \pm 0.03$  (95% CI 23.88–49.34) in comparison with SG children to  $36.6 \pm 0.03$  (95% CI 23.51–49.69). SBP in FG children slightly increased to  $107.90 \pm 2.60$  (95% CI -1.65–3.81) in comparison with SG children to  $113.8 \pm 2.73$  (95% CI -1.74–4.0). In FG children, DBP also slightly increased to  $67.76 \pm 1.75$  (95% CI 55.41–80.11), while DBP in SG children decreased to  $74.1 \pm 2.09$  (95% CI 62.08 – 85.92). A slight decrease in heart rate was found in the children of the studied groups: in the children of FG to  $86.19 \pm 1.85$  (95% CI 76.83–95.17) and in comparison with the children of SG to  $85.26 \pm 1.64$  (95% CI 75.62–94.90).

At the end of the 10-day therapy, body temperature normalization was noted in all children:  $36.54 \pm 0.02$  (95% CI 23.81–49.27) in FG and  $36.54 \pm 0.02$  (95% CI 23.45 – 49.63) in SG. In FG children, SBP was found to increase to  $108.86 \pm 2.62$  (95% CI -1.65–3.83), while in SG children, it was found to decrease to  $112.5 \pm 2.20$  (95% CI -1, 74–4.0). Blood pressure slightly increased in FG children to  $67.85 \pm 1.47$  (95% CI 55.52–80.20) in comparison with SG children, in whom a decrease was noted to  $74.65 \pm 1.99$  (95% CI 62, 83–86,47). Heart rate slightly decreased in FG children to  $84.31 \pm 3.50$  (95% CI 74.7–93.92) compared to SG children to  $84.0 \pm 1.88$  (95% CI 74.04–93, 96).

Changes of RR were found in both studied groups after 10 days of pneumonia treatment. On the 1st day of therapy, RR in FG children reached  $22.43 \pm 0.43$  (95% CI 11.05–32.95) compared to SG children –  $22.3 \pm 0.53$  (95% CI 11.56 –34.44). On the 5th day of treatment, in FG children the normalization of RR to  $19.33 \pm 0.42$  (95% CI 8.63–29.37) in comparison with SG to  $19.8 \pm 0.27$  (95% CI 8, 97–30,63).

After carrying out complex therapy with the inclusion of HFCWO procedures for 10 days, the normalization of RR to  $18.29 \pm 0.29$  (95% CI 7.85 – 28.15) was noted in children of FG compared to children of SG –  $19.21 \pm 0.23$  (95% CI 8.34–29.66).

On the 1st day of therapy in FG children, the level of hemoglobin saturation of arterial blood with oxygen reached  $93.48 \pm 0.25$  (95% CI 86.96–100.0) in comparison with SG children –  $93.66 \pm 0.23$  (95% CI 87.04–100.28). On the 5th day of treatment, the level of oxygen saturation in FG children increased to  $96.38 \pm 0.21$  (95% CI 91.44–101.32) compared to SG children -  $95.25 \pm 0.16$  (95% CI 89.08–100.92). On the 10th day of therapy, the level of oxygen saturation in FG children improved to  $98.20 \pm 0.15$  (95% CI 94.30–101.69) compared to SG children –  $96.0 \pm 0.18$  (95% CI 90.67–101.33).

**Conclusions.** After the treatment, the temperature in children of both studied groups decreased to normal values. At the end of the 10-day therapy, children in both groups had normal body temperature values:  $36.54 \pm 0.02$  (95% CI 23.81–49.27) in FG and  $36.54 \pm 0.02$  (95% CI 23.45–49.63) in SG.

The appointment of oscillation procedures as part of the complex treatment of CAP does not affect hemodynamic indicators. At the end of the treatment, hemodynamic indicators in the children remained within the age norm: in the FG children, SBP was  $108.86 \pm 2.62$  (95%CI -1.65–3.83) compared to children in the SG –  $112.5 \pm 2, 20$  (95% CI -1.74–4.0). DBP in FG children is  $67.85 \pm 1.47$  (95%CI 55.52–80.20) compared to SG children,  $74.65 \pm 1.99$  (95%CI 62.83–86.47). Heart rate in FG children was  $84.31 \pm 3.50$  (95%CI 74.7–93.92) compared to SG children –  $84.0 \pm 1.88$  (95%CI 74.04–93.96).

In FG children, an improvement in RR was found: dyspnea decreased from  $22.43 \pm 0.43$  (95%CI 11.05–32.95) to  $18.29 \pm 0.29$  (95%CI 7.85–28.15) in compared with SG children from  $22.3 \pm 0.53$  (95%CI 11.56–34.44) to  $19.21 \pm 0.23$  (95%CI 8.34–29.66). In children of FG, an improvement of SpO<sub>2</sub> to  $96.38 \pm 0.21$  (95%CI 91.44–101.32) was noted in comparison with SG to  $95.25 \pm 0.16$  (95%CI 89.08–100.92) .

The obtained data show that the appointment of HFCWO as part of the complex treatment of CAP with an acute and uncomplicated course does not have a negative effect on hemodynamic indicators, which after the appointment of bronchodrainage procedures with the use of the HFCWO remain within the age norm. The positive dynamics of hemodynamic parameters in the children of the first group was accompanied by an improvement in RR and a significant increase in Sp O<sub>2</sub>.

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