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PREOPERATIVE MANAGEMENT OF INFANTS WITH CONGENITAL HEART DEFECTS AND PNEUMONIA

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Abstract: Pneumonia is the most common intercurrent pathology in children with congenital heart defects in the preoperative period and the reason for the forced delay of cardiac surgery. The study proved the possibility of predicting the course of pneumonia in infants with heart defects in order to select the optimal diagnostic and treatment algorithm to shorten the preoperative period.

Keywords: Children, early age, congenital heart disease, pneumonia, risk factors.

INTRODUCTION

The prognosis of infants with congenital heart defects is largely determined by the timeliness of cardiac surgical treatment [3]. Postponement of operations is often due to intercurrent morbidity, mainly pneumonia, which has a complicated course and a high risk of death in infants with heart defects [2]. Previously, anamnestic risk factors for the unfavorable course of pneumonia in infants were established, such as a burdened obstetric history of the mother, prematurity and severe condition of the child at birth, a history of artificial ventilation, intrauterine infection, antibacterial therapy for 3 months preceding hospitalization, later (more than 3 days from the moment of illness) admission to the hospital, as well as a number of concomitant diseases.

MATERIALS AND METHODS

Congenital heart defects are recognized as the most significant modifying factor in the unfavorable course and outcome of pneumonia [3].

The purpose of the study was a comprehensive analysis of the risk of severe, complicated course and fatal outcome of pneumonia in congenital heart disease, depending on unfavorable anamnestic factors, anatomical and morphological characteristics of the defect, the degree of myocardial dysfunction, pulmonary hypertension and arterial hypoxemia, the type of infiltrative changes in the lungs, the severity of systemic inflammatory response.

During the period 2021-2023. 100 infants with hemodynamically significant congenital heart defects were examined at the Children's Infectious Clinical Hospital. The children were referred with a diagnosis of pneumonia; the age of the children ranged from 3 days to 24 months (average age 5.924±0.68 months, sd=6.1). There were 54% boys, 46% girls. The majority (65%) of children were referred from cardiac surgery clinics in Moscow due to the detection of focal changes on a chest x-ray, which was the reason for refusal of surgical treatment of heart disease.

RESULTS AND DISCUSSION

A comprehensive clinical, instrumental and laboratory examination of infants with congenital heart disease and pneumonia (group 1) included the collection and assessment of anamnesis, examinations by a pediatrician, pediatric cardiologist, pulmonologist, and neurologist. A set of modifying risk factors for the unfavorable course and outcome of the disease was analyzed. Unfavorable medical history was taken into account; hemodynamic factors, including hypervolemia of the pulmonary circulation, pulmonary hypertension, arterial hypoxemia; radiological characteristics of the type of infiltrative changes (interstitial infiltration; alveolar

infiltration and its morphological forms); significant concomitant pathology (bronchopulmonary dysplasia, genetic syndrome, multiple malformations, malnutrition of the 2nd—3rd degree, severe perinatal damage to the central nervous system).

Pneumonia was excluded in 21 patients (group 2) with focal radiographic changes and the absence of relevant clinical and laboratory criteria: fever >38°C for 3 days or more, cough with sputum, physical symptoms of pneumonia, leukocytosis (>15•109/l) and/or polymorphonuclear neutrophils >10%. In 5 patients with septal defects against the background of correction of circulatory failure on the 3rd day, a clear positive dynamics of radiological changes was recorded, which made it possible to exclude inflammatory infiltration and regard them as hypervolemic. In 16 (16%) patients, the diagnosis was clarified using high-resolution computed tomography [4], which in all cases made it possible to establish the genesis of focal changes (Table 1).

Table 1. Frequency of registration of radiological signs according to plain radiography (RG) and high-resolution computed tomography (HRCT) of the chest organs (n=16)

Sign	Number of patients with changes in RG	Number of patients with changes on HRCT
Alveolar infiltration	7	1
Tips for reducing pneumatization	16	1
Atelectasis	2	12
Transparency Tricks	4	4
Band seals	1	1
Partial filling of the alveoli with a liquid substrate (“frosted glass”)	0	9
Thickening of the walls of the bronchi	4	6
Bronchiectasis	0	3
Increased segmental artery/bronchus ratio more than 1	0	9
Interstitial infiltration	11	2
Thickening of the interlobular interstitium	0	9
Depletion of vascular pattern in the periphery	5	5
Dilation and deformation of blood vessels	1	4
Vascular bundle expansion	8	8
Effusion	0	0

X-rays confirmed alveolar infiltration in the majority (82%) of patients in the form of focal changes in 23 (29%) children, focal confluent in 24 (30%) and segmental in 16 (20%). Lobar lesions were observed in 2 (2.5%) children.

Unlike most researchers who observed the absence of inflammatory changes in the hemogram in children with congenital heart defects, our laboratory data in children of the main group confirmed the presence of a systemic inflammatory reaction in most cases, while leukocytosis was recorded in 35 (44%) , including 27 - more than 15•109/l and 8 - more than 25•109/l; neutrophilia - in 41 (52%) and increased neutrophil index (>0.2) - in 11 (14%). The absence of an increase in C-reactive protein in the majority (81%) of patients in the main group coincides with the opinion that this criterion is unreliable for the diagnosis of pneumonia [4]. Modern laboratory diagnostics make it possible to establish an etiological diagnosis in no more than 20–

50% of cases, while the features of the clinical and radiological picture cannot be considered "adequately reflecting the etiology of the disease" [3].

CONCLUSION

1. The risk group for unfavorable course and outcome of pneumonia with congenital heart defects are infants with a high concentration of unfavorable anamnestic and hemodynamic factors with segmental or lobar damage to the lung tissue in combination with significant concomitant pathology, such as bronchopulmonary dysplasia, severe damage to the central nervous system, syndromic diseases.

2. In the absence of clinical and laboratory criteria for pneumonia and a systemic inflammatory response in infants with congenital heart defects, high diagnostic information value of high-resolution computed tomography of the chest organs has been established to exclude focal infiltrative changes in the lungs against the background of pulmonary hypervolemia blood circulation

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