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Znaczenie radiologicznego obrazu płuca po stronie przepukliny bezpośrednio po urodzeniu oraz po korekcji wady u noworodków z wrodzoną przepukliną przeponową.

Rozprawa na stopień doktora nauk medycznych i nauk o zdrowiu w dyscyplinie nauki medyczne

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SUMMARY

„ Significance of ipsilateral lung radiological findings on the initial and the first after the surgery chest x-ray in newborns with congenital diaphragmatic hernia."

Congenital diaphragmatic hernia (CDH) is a congenital defect in the diaphragm that allows herniation of abdominal viscera into the thorax. Gut is pushed through a defect in the posterolateral region of the diaphragm, causing compression of the ipsilateral lung as well as shifting of the heart and mediastinum to the contralateral side. The resulting abnormal lung development leads to pulmonary hypoplasia and pulmonary hypertension, which are the primary determinants of morbidity and mortality for these patients. In spite of advances made in the medical and surgical management of CDH, the mortality and morbidity remain high, reaching 50%. It is still under consideration if such a severe condition after birth of CDH newborns is caused mainly by the hypoplasia or to the same degree by the compression of the ipsilateral lung.

Defining antenatal predictors of outcome in CDH has been the subject of intense study over the last decades, based on the indirect assessment of fetal lung volume. Prenatal identification of this high-risk cohort is essential for predicting prognosis, improving prenatal counseling for families, and optimizing preparation or delivery and postnatal care of the high-risk CDH infant in tertiary care centre. Despite antenatal imaging 15% of patients with CDH may remain undetected until after delivery. Accurate postnatal risk stratification can inform resuscitative efforts postnatally including initiation of more aggressive antipulmonary hypertensive management, establishing a lower threshold to initiate invasive support, help with resource allocation and to establish limits to care. In such cases, apart from clinical markers as blood oxygenation parameters or ventilation indexes, radiographic findings on chest x-ray reflect the degree of lung hypoplasia as visualized areas of the left and right lung before and after a surgical treatment.

The aim of this study is an attempt to establish if there is a predictive value in the appearance of ipsilateral lung seen on the initial and first after surgery chest radiograph in newborns with congenital Bochdalek's diaphragmatic hernia. Additionally, which factors, apart from the primary pulmonary hypoplasia, connected with lung compression influence its appearance.

From 2007 to 2019, 142 newborns with CDH were treated at the Department of Pediatric Surgery, Medical University of Warsaw. Retrospectively, initial and postoperative anterior-posterior chest x-rays were examined according to ipsilateral lung appearance. The data were compered between groups of patients who survived or died. Initial chest radiographs were reviewed for presence of aerated ipsilateral lung tissue. The examination of postoperative x-ray was based on lung area ratio (LAR) calculation which is an ipsilateral lung size and hypoplasia equivalent. Subsequently, factors that may influence LAR were analyzed.

The results of analysis of initial chest x-ray showed that in the group of patients that survived, significantly more often aerated ipsilateral lung tissue was detected. The results of analysis of postoperative chest x-ray showed a statistically significant correlation between survival rate and the LAR value. Additionally, LAR of value 0,45 was proven to be a cut-off point of estimated prognosis. The analysis of the factors impacting LAR proved statistically significant correlation between LAR value and the size of the hernia defect and hernia sac presence. No statistically significant relationship of LAR value was proven compering liver herniation, nor side of the hernia. The analysis of correlation between ipsilateral lung size and perioperative course, i.e. time of cardiopulmonary stabilization showed that LAR value did not differ significantly between patients that required less than 72 hours of stabilization before the surgery and the group of patients that needed more than 72 hours preoperative stabilization. Statistically significant difference was seen in postoperative stabilization length. LAR value was significantly higher in the group of patients where the extubation was possible before or on the 7^{th} postoperative day, LAR value was significantly lower in the group extubated more than 7 days after the surgery or the extubation was impossible and the patient died. The analysis of correlation between LHR and LAR showed statistically significant proportional convergence when the patients were classified into two groups, with LHR $\leq$ 1.4 and LHR > 1.4. No such convergence was detected when the patients were classified into LHR <1, LHR 1-1.4, LHR > 1.4 groups.

Conclusions: 1. The presence of aerated ipsilateral lung tissue on the initial chest x-ray in CDH newborns is an independent statistically significant prognostic factor of survival. 2. Postoperative visualization of ipsilateral lung and based on that LAR calculation is an independent statistically significant prognostic factor of survival after the surgery in CDH patients. LAR of value 0,45 was proven to be a cut-off point of estimated prognosis. 3. LAR is statistically significantly dependent on the diaphragmatic defect size and presence of hernia sac

but independent of the side of the hernia and liver herniation. 4. No statistically significant correlation between LAR and preoperative stabilization time was detected which may confirm the importance of compression of the ipsilateral lung before the surgery, not only its primary hypoplasia. 5. The analysis showed statistically significant correlation between LAR and postoperative mechanical ventilation time, being the same independent statistically significant prognostic factor of postoperative cardiopulmonary stabilization.

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