Case Report

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VACTERL Syndrome Combined with Choledochal Cyst: A Case Report

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In VACTERAL syndrome (vertebral defect, anal atresia, cardiac defects, tracheo-esophageal fistula [TEF], renal anomalies, and limb anomalies), patients may present with multiple congenital anomalies. However, a VACTERL syndrome case in combine with congenital hepatobiliary anomalies is relatively rare. A full-term female neonate with initial presentation as large amount of amniotic fluid found in her mouth and shortness of breath with cyanotic lips that soon observed after birth was highly suspected of this disease. Based on clinical manifestations and imaging findings, a diagnosis of VACTERL syndrome (hemivertebrae on the second & third thoracic vertebra [T2-3] and hemivertebrae on the seventh to ninth vertebra [T7-9], cardiac atrial septal defect [secundum type], aortopulmonary window [APW], and type D trachea-esophageal fistula) combined with choledochal cyst was confirmed. The baby received surgery in order to correct type D trachea-esophageal fistula and cardiac aortopulmonary window. In routine post-operation outpatient clinical appointments, this baby revealed normal growth and development as the same age children. In patients with VACTERL syndrome, clinicians should consider the presence of choledochal cyst in these patients.

Key words: VACTERL syndrome, type D trachea-esophageal fistula, esophageal atresia, aortopulmonary window, choledochal cyst

Introduction

VACTERL syndrome is characterized as the presence of at least three of the six congenital malformations: vertebral defects, anal atresia, cardiac defects, tracheo-esophageal fistula (TEF) with/without esophageal atresia, renal anomalies, and limb anomalies. Furthermore, the condition is confirmed not only by the presence of these malformations but also by the exclusion of other conditions that share similar features of VACTERL syndrome either based on clinical or laboratory evidence.[1]

The incidence of VACTERL syndrome is very rare and occurs in approximately 1 in 10,000 to 1 in 40,000 live-born infants. The

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cause of VACTERL syndrome may be related to multiple factors which include nongenetic factors and genetic factors, such as mitochondrial anomalies. In terms of nongenetic factors, maternal diabetes mellitus, maternal alcohol consumption, antiepileptic medication usage, and intrauterine hypoxia have been reported to be related to VACTERL syndrome. In addition, VACTERL has been observed in multiple birth.[1] Furthermore, familial inheritance on a molecular basis has been reported as a possible cause of VACTERL syndrome and a group of risk factors has also been reported.[1,2] In addition, patients may present with other congenital anomalies, such as respiratory and cerebral abnormalities, other than the main features of VACTERL syndrome. However, VACTERL syndrome combined with hepatobiliary anomalies is rare.[3] Furthermore, to the best of our knowledge, VACTERL syndrome in combined with a choledochal cyst has scarcely been reported. Therefore, we report a case of a 1-day-old female newborn with VACTERL syndrome presents with cardiac aortopulmonary window (APW) combined with choledochal cyst. In addition, we provide a summary of cases in the current literature on VACTERL syndrome with hepatobiliary disorders.

Case Report

A female neonate was born through vaginal delivery at 38 weeks and 6 days and her Apgar score was 9 and 10 at 1 and 5 minutes respectively. Smaller estimated fetal body weight was noted by antenatal sonography and her birth weight was 2,184 g, indicating small for gestational age (asymmetric). Her mother was a 29-year-old gravida 1 para 1 female who had a history of acute viral pharyngitis present with mild fever and diarrhea during pregnancy. There was no family history of congenital malformations or history of consanguineous marriages. A large amount of amniotic fluid buildup was observed in this baby's mouth when she was born. Shortness of breath with cyanotic lips developed shortly after birth and has occurred twice. Due to the failure of orogastric tube insertion, decompression could not be accomplished. According to physical examination and imaging findings, esophageal atresia was suspected and examinations for other coexisting malformations were performed swiftly. Chest imaging showed an asymmetric thoracic cage and vertebral fusion was suspected. Absence of ribs and hemivertebrae (T2-3 & T7-9) were also noted. Laboratory examinations revealed aspartate aminotransferase (AST): 43 U/L, alanine aminotransferase (ALT): 10 U/L, direct bilirubin: 0.83 mg/dL, total bilirubin: 14.72 mg/dL, C-reactive protein (CRP): 15.90 mg/dL, WBC: 156,000/μL, neutrophil: 68.2%, eosinophil: 4.3%, lymphocyte: 20.8%, basophil: 0.2%, and monocyte: 6.5%.

Cardiac echography disclosed anomalies as the following: secundum type atrial septal defect (ASD), including two defects of 3.6 mm and 2.1 mm respectively, and four chamber dilation. Computed tomography (CT) revealed tracheal bronchus (Fig. 1A), type D trachea-esophageal fistula (TEF) with esophageal atresia (Fig. 1B), and cardiac APW (Fig. 1C). Furthermore, computed tomography revealed a congenital choledochal cyst (Fig. 1D).

Based on the presence of vertebral anomalies, type D trachea-esophageal fistula with esophageal atresia, and cardiac defects including ASD and APW, VACTERL syndrome combined with choledochal cyst was diagnosed. The baby underwent surgical correction for type D trachea-esophageal fistula on the third day of life and cardiac corrective surgery for APW on the seventh day of life. Due to stable post-operative status, she was discharged successfully. In her routine pediatric outpatient visits, normal growth and development was obtained. Here, we have demonstrated the feasibility of esophagoplasty in the repairment of type D trachea-esophageal fistula with esophageal atresia and corrective surgery of APW in

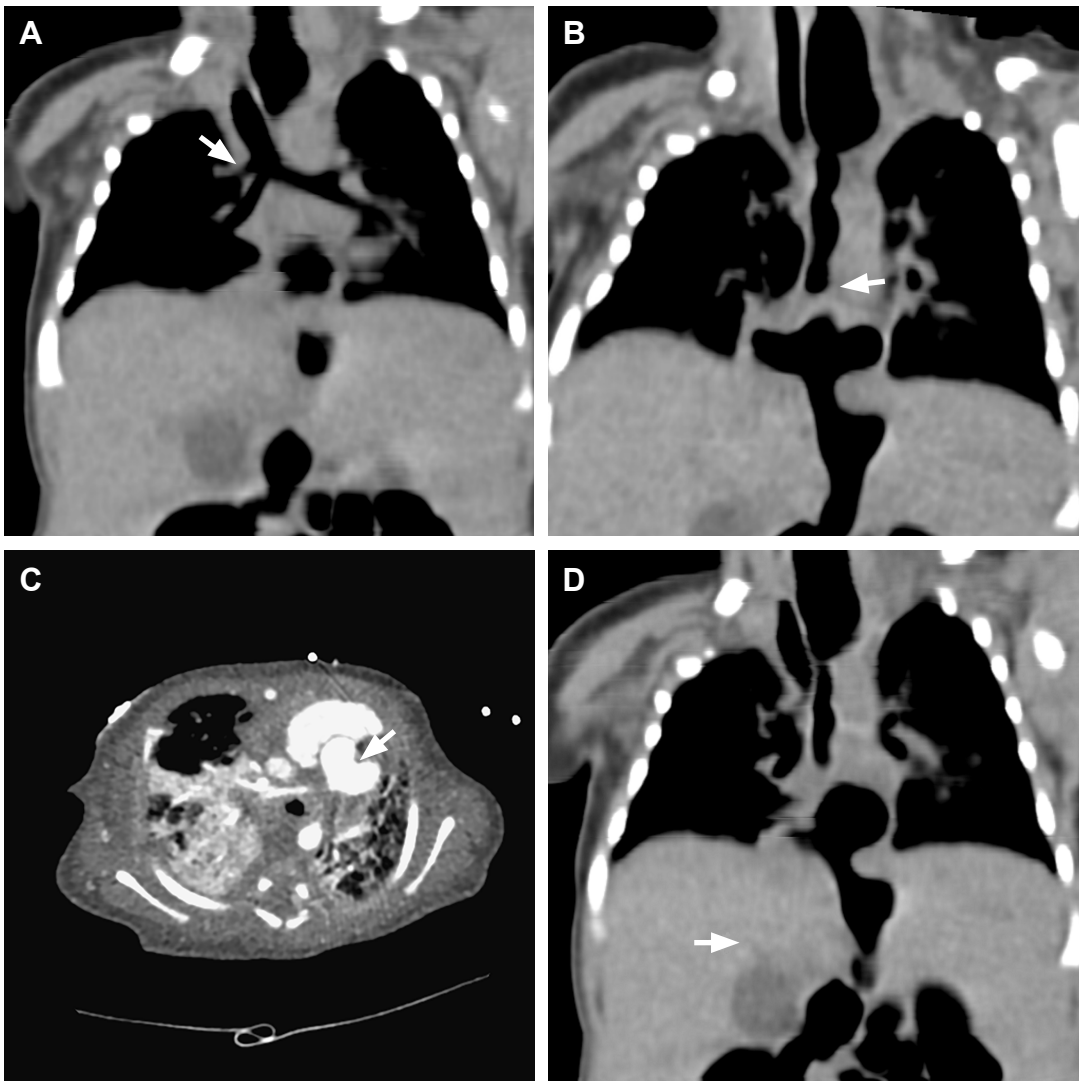

Fig. 1 Computed tomography (CT) of a 1-day-old girl with VACTERL syndrome (A) (coronal view) shows the tracheal bronchus (arrow). (B) (coronal view) shows type D trachea-esophageal fistula with esophageal atresia (arrow). (C) (axial view) indicates an abnormal connection between the aorta and pulmonary trunk (arrow) which is diagnosed as aortopulmonary window. (D) (coronal view) reveals a round hypodense cyst located in the common bile duct which is connected to right and left hepatic duct (arrow) and the size of choledochal cyst is about 1.4 cm in diameter.

a newborn with VACTERL syndrome for the first time.

Discussion

VACTERL syndrome involves congenital anomalies of multiple organs. A previous study has reported that among 142 infants with esophageal atresia, 70 (63%) cases had at least one or more then one feature of VACTERL syndrome.[4] In addition, about 60% – 80% of patients with VACTERL syndrome had spinal anomalies, 55% – 90% had anal atresia, 40% – 80% had cardiac deformities, 50% – 80% had trachea-esophageal fistula anomalies, 50% – 80% had renal anomalies, and 45% – 50% had limb anomalies. There are statistically significant differences in the prevalence of the six components of VACTERL syndrome; in other words, some congenital features are more common than others.[3,4] Since there are six main features in VACTERL syndrome, co-occurrence of two features was evaluated in previous study. However, there is no statistical evidence that reveal higher probability of the co-occurrence of two features (for example:

vertebral defects & anal atresia versus vertebral defects & cardiac defects) according to pairwise Pearson correlation coefficients.[3]

During embryogenesis, the anatomical development of VACTERL syndrome does not occur before 23 days after conception. These anatomies could occur between 23 – 56 days after conception. Also, we understand embryonic development of hepatobiliary system happened around the same period of time. Due to the possible time overlapping, it could take account to the anomalies in hepatobiliary system (intrahepatic duct anomalies) coexist with VACTERL syndrome.[5] Solomon et al. reported that when physicians encounter patients with the features of VACTERL syndrome, they should evaluate the possibility of overlapping conditions with various features. Hepatobiliary anomalies should be considered, although they may be uncommon.[3] According to our knowledge, this patient with VACTERL syndrome who presented with APW and combined with choledochal cyst is unique to the literature.

In addition to the core features of VACTERL syndrome, patients may have other congenital anomalies. Previous studies have reported airway anomalies in patients with VACTERL syndrome, including bridging bronchus, airway malacia, and complete tracheal rings, as well as tracheal bronchus.[6] Central nervous system anomalies, including hypoplasia of the cerebellum, pons, and corpus callosum, as well as kinking of the diencephalon and mesencephalon and congenital arachnoid cysts, have also been reported in patients with VACTERL syndrome.[7] In addition, congenital diaphragmatic hernia has been reported.[8] Furthermore, ophthalmic anomalies, such as disc drusen and peripapillary subretinal neovascular membrane, amelia and hemifacial macrosomia, and congenital corneal anesthesia, have been reported.[9] Auricular anomalies, such as atresia of the right external auditory canal, have been reported in patients with VACTERL syndrome as well.[10]

Anal atresia, esophageal atresia, and duodenal atresia are accounted for the most gastrointestinal anomalies in patients with VACTERL syndrome. In addition, malrotation, microgastria, and Meckel's diverticulum have been reported in terms of gastrointestinal anomalies in patients with VACTERL syndrome.[3]

This female neonate was threaten by fatal congenital anomalies (type D trachea-esophageal fistula with esophageal atresia and complex congenital cardiac defects [secundum type atrial septal defect and aortopulmonary window]). She underwent serious of critical surgery to correct the defects. Both of her parents did not agree to put her through another surgery for choledochal cyst correction. Therefore, she did not receive any surgery for the choledochal cyst. However, she presented with normal growth and development in serious of post-operation outpatient follow-ups. We keep close observation in this case in order to make prompt management if any choledochal cyst complication occurs.

Conclusions

This case report describes a rare case with VACTERL syndrome who presented with type D trachea-esophageal fistula with esophageal atresia and cardiac aortopulmonary window combined with choledochal cyst. We highlight the importance of investigating the presence of hepatobiliary anomalies in patients with VACTERL syndrome.

Author Contributions

YLC, YNY, PJK and KJH contributed to the literature research. YLC, CHY and JYP contributed to providing the relevant images. YLC and YNY contributed to collecting the clinical data and editing the figures. YLC and KJH contributed to drafting the manuscript.

YLC contributed to revising the manuscript. All authors have approved the final version of the manuscript.

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Institutional Review Board Statement

Institutional Review Board in E-Da Hospital approved that case report is exempt from formal ethical approval.

Informed Consent Statement

Written informed consent was obtained from patient guardian for publication of this case report and any accompanying images.

Data Availability Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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Conflicts of Interest

The authors declare no conflict of interest.

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