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Caroli's Disease in a Child: A Rare Case Report

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ABSTRACT

Introduction: Caroli's disease is a rare hereditary condition. It is characterized by segmental dilatation of the large intrahepatic bile duct with a cyst-like appearance. Caroli's disease is often found on typical imaging without specific symptoms. It can lead to progressive bile duct obstruction and cirrhosis. Therefore, early diagnosis and appropriate treatment are necessary for optimal outcomes and prognosis.

Case presentation: A 12-month-old girl presented to the outpatient clinic of Dr. Soetomo General Academic Hospital, Surabaya, with complaints of jaundice, abdominal distension, pale stools dark tea-colored urine, hematemesis, pallor, and weight loss. She was malnourished and had anemic conjunctiva, icteric sclera, abdominal distension with hepatosplenomegaly, varicose veins on the abdominal wall, and edema in both lower extremities. Laboratory examination showed anemia (hemoglobin 7.3 g/dL), liver function abnormalities (Aspartate aminotransferase 191 U/L, Alanine aminotransferase 41 U/L, and Gamma-glutamyl transferase 148.3 U/L), hypoalbuminemia (albumin 2.47), cholestasis (total bilirubin 18.90 mg/dl and direct bilirubin 12.5 mg/dl), non-reactive HBsAg and reactive Cytomegalovirus Immunoglobulin G (IgG). Abdominal ultrasound showed cystic dilatation of right and left intrahepatic bile ducts consistent with Caroli's disease (Todani classification) with hepatomegaly. MRCP showed Caroli's disease with multiple cystic dilatations of the right and left intrahepatic bile duct (IHBD), multiple peripheral small bile ductal dilatations, and hepatosplenomegaly.

Conclusion: Appropriate imaging is critical in establishing the diagnosis due to the nonspecific clinical presentation of Caroli's disease. Caroli's disease can result in biliary cirrhosis. Therefore, early diagnosis is necessary for the improvement of the outcome and prognosis of Caroli's disease.

KEYWORDS: Choledochal cyst, children, congenital anomaly.

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INTRODUCTION

A choledochal cyst is a congenital cystic dilatation of the extrahepatic and/or intrahepatic duct. The term choledochal malformation is often used to describe the varying biliary tree involvement of choledochal cysts.[1] Type V choledochal cysts, also known as Caroli's disease, represent 20% of choledochal cysts and involve intrahepatic and extrahepatic biliary trees.[2] Caroli's disease is a rare inherited disorder. It is identified by a segmental dilatation of the large intrahepatic bile ducts, which are visible as cysts.[3] Treatment strategies for Caroli's disease remain controversial and depend mainly on clinical findings and the site of biliary abnormalities. Caroli's disease is often found on typical imaging without a family history or specific symptoms.[4]

Given the cryptic clinical presentation, appropriate imaging is essential to diagnose choledochal cysts.[2] Complications such as cholangitis, malignant transformation, cholelithiasis, and pancreatitis may occur due to variable age presentation and delayed diagnosis.[5] Choledochal cysts, including Caroli's disease, can lead to progressive obstruction of the biliary tract and biliary cirrhosis. Therefore, for an optimal outcome and good prognosis, early diagnosis and appropriate treatment are necessary.[2]

CASE REPORT

A 12-month-old girl presented to the outpatient clinic of Dr. Seotomo General Academic Hospital, Surabaya with a chief complaint of jaundice. At the age of 10 months, the patient complained of an enlarged abdomen and frequent bloating.

Pale stools and dark tea-colored urine, weight loss, edema in both lower extremities, hematemesis, and pallor followed the jaundice complaint. There was no fever, nausea, vomiting, bleeding, or previous history of illness. There were no similar complaints in the family. There is no family history of liver disease or hepatitis.

The patient is the first child, born Caesarean Section on the indication of a mother with a narrow pelvis, full-term, birth weight 3500 grams, length 53 cm, crying immediately. The patient consumed breast milk mixed with formula from birth to 3 months of age, followed by formula and complementary food since 6 months of age, and family food since 1 year of age. Routine immunization history is complete according to age. Currently, the patient can sit and stand by holding on.

The patient was compos mentis, with a body weight of 7300 gr, body length of 67 cm, head circumference of 41.5 cm, an abdominal circumference of 50 cm, and upper arm circumference of 12 cm. Anthropometric status showed Weight for Age Z-score -2 to -3 SD (underweight), Length for Age Z-score <-3 SD (severely stunted), Weight for length Z-score <-3 SD (severely wasted). Vital signs are stable. Physical examination revealed anemic conjunctiva, icteric sclera, no cyanosis, and no dyspnea. On abdominal examination, distended with venectasized veins in the abdominal wall, palpable hepatomegaly with size 10 cm x 8 cm x 5 cm, and splenomegaly (Figure 1).

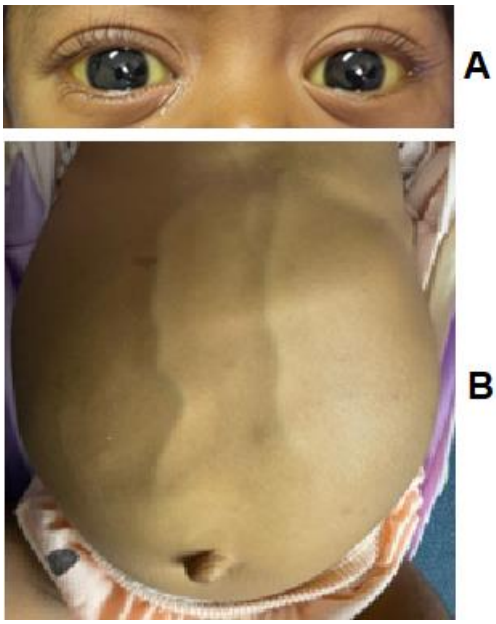

Figure 1. Clinical manifestation of the patient (A. Sclera icteric; B. Abdominal distended with venectasized veins in the abdominal wall)

Laboratory examination showed Hemoglobin 7.3 g/dL, Hematocrit 24.6%, White blood cell 10.77 103/µL, Platelet 268 103/µL, Aspartate aminotransferase (AST) 191 U/L, Alanine aminotransferase (ALT) 41 U/L, Gamma-glutamyl transferase (GGT) 148.3 U/L, Alkaline Phosphatase (ALP) 256 U/L, Lactate Dehydrogenase (LDH) 472 U/L, Albumin 2.47 g/dL, Plasma Prothrombin Time (PPT) 12.7 sec, Activated partial thromboplastin time (APTT) 30.8 sec, Total bilirubin 18.90 mg/dl, Direct bilirubin 12.5 mg/dl, Blood Urea Nitrogen (BUN) 8.8 mg/dl, Serum Creatinine 0.4 mg/dL, Na 136 mmol/l, K 4.5 mmol/l, and Cl 111 mmol/l. Urinalysis sediment examination obtained cloudy yellow urine color, BJ 1032, pH 6.5, protein 2+, glucose negative, ketone negative, bilirubin 3+, erythrocytes 2+, urobilinogen normal, leukocytes negative, nitrite negative, ACR ≥300, PCR ≥0.50, Albumin 150. Immunologic examination obtained non-reactive HBsAg, non-reactive Toxoplasma Immunoglobulin G (IgG), non-reactive Toxoplasma IgM, Grayzone Rubella IgG, non-reactive Rubella IgM, Reactive Cytomegalovirus (CMV) IgG, and non-reactive CMV IgM.

A two-phase abdominal ultrasound revealed a liver with the anteroposterior diameter size +/- 10.2 cm, sharp angle, flat edge, echo intensity of parenchyma appears normal homogeneous, no dilation seen in the intrahepatic bile duct (IHBD)/ extrahepatic bile duct (EHBD), portal vein diameter +/- 0.8 cm (normal < 1.3 cm) with portal vein velocity difficult to evaluate (normal > 16 cm/s), v. hepatica appeared normal, multiple cystic dilatations were seen in the right intrahepatic bile duct with the largest diameter of +/- 1.4 cm and the left intrahepatic bile duct with the largest diameter of +/- 1.3 cm. Gall bladder with size +/- 2.16x1.22x1.45 cm (pre-prandial), no wall thickening, no stone/nodule/sludge visible. Spleen with size +/- 7.4 cm, echo intensity of parenchyma appears normal, no mass/cyst, v. lienalis +/- 0.3 cm. Abdominal ultrasound showed cystic dilatation in the right and left intrahepatic bile ducts suggesting a type V choledocal cyst (Caroli's disease, Todani Classification) with hepatomegaly (Figure 2).

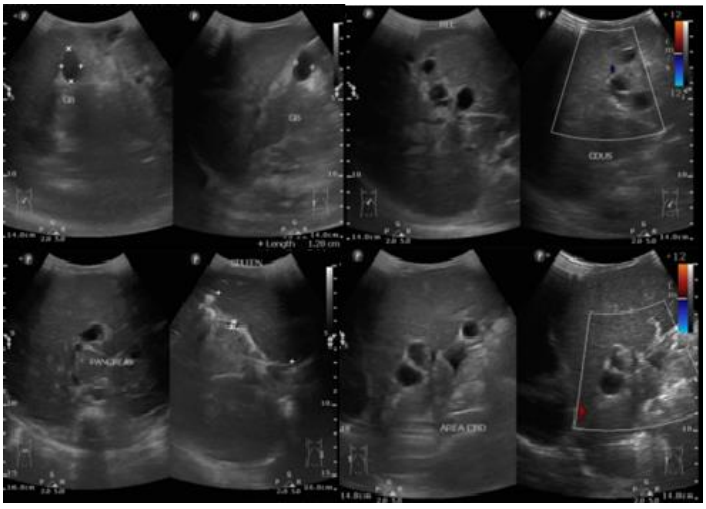

Figure 2. Ultrasonography showed multiple cysts in the liver Magnetic Resonance Cholangiopancreatography (MRCP)

showed multiple cystic dilatations of right and left IHBD with the largest size of +/- 1.5 cm in left IHBD and +/- 0.8 cm in right IHBD, accompanied by multiple small bile duct dilatation in the periphery. There was a small bile duct

dilatation in the periphery, which appeared hypointense on T1WI and hyperintense on T2WI, on contrast administration no visible contrast enhancement. The liver was enlarged with midclaviculocraniocaudal length +/- 11.6 cm with a picture of kissing lien (+), the gall bladder was normal size, with no wall thickening, and no stone. The spleen was enlarged with craniocaudal length +/- 11.6 cm, normal intensity, no visible nodules/masses/cysts. Based on MRCP, there was multiple cystic dilatation of right and left IHBD with the largest size +/- 1.5 cm in left IHBD and +/- 0.8 cm in right IHBD, and multiple small bile duct dilatation in the periphery. MRCP with contrast showed type II Caroli's disease with multiple cystic dilatations in the right and left IHBD, multiple small bile duct dilatations in the periphery, and hepatosplenomegaly (Figure 3).

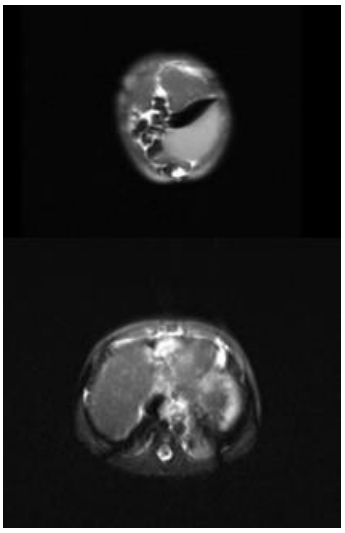

Figure 3. Magnetic resonance cholangiopancreatography (MRCP) of Caroli's disease showed multiple cystic lesions

The patient was hospitalized with a diagnosis of Choledocal Cyst type V (Tordani Classification), with portal hypertension, hypoalbuminemia, anemia, severely stunted, and severe malnutrition. During hospitalization, the patient was given intravenous fluids as a supportive therapy, adequate nutrition, Packed red cell (PRC) and albumin transfusion, furosemide injection, propanolol per oral, spironolactone per oral, ursodeoxycholic acid per oral, and vitamin supplementation. A surgical operation could not be performed in this patient's condition. There was no liver transplant facility and a referral was planned but the family refused. The patient received supportive therapy.

DISCUSSION

First described by Vater and Ezler in 1723, choledochal cysts are rare congenital disorders.[6] The incidence of choledochal cysts is one in 100,000-150,000 live births in Western countries. The highest incidence in Asia is one in 1000 live births.[7] Most children with choledochal duct cysts are female.[8] In this case, the patient was female.

Choledochal cysts are rare anomalies. However, they often pose a diagnostic dilemma. Choledochal cysts have nonspecific clinical manifestations. The study mentioned that most of the complaints (77.7%) in choledochal cysts were jaundice, and 33% were clay-colored stools.[9] In this case, the patient complains of jaundice, an enlarged abdomen, frequent bloating, pale stools, dark tea urine, hematemesis, pallor, edema in both lower extremities, and weight loss. Hepatosplenomegaly with venectasized veins in the abdominal wall was found in this case.

Clinical manifestation of choledochal cyst varies with age.[5] When a child presents with jaundice, abdominal pain, and a palpable abdominal mass, a high index of suspicion for choledochal cysts should be considered.[2] None of the choledochal cyst patients presented with the classic triad of abdominal pain, jaundice and right upper quadrant mass. The older children had nausea and vomiting as well as abdominal pain. Infants had more abdominal masses than older children.[5]

Choledochal cysts are considered to be benign disorders. However, severe late complications such as malignant transformation, cholangitis, pancreatitis, and cholelithiasis can occur due to their variable clinical presentation in different age groups and delayed diagnosis.[5] Choledochal cysts are diagnosed by multimodality imaging including ultrasonography, computed tomography, and MRCP.[6]

There are five types of choledochal cysts, based on the Todani classification method, according to the anatomical location of the cyst. Type I, which occurs in 90 percent of cases, is a cyst located in the extrahepatic bile duct. Type II is a congenital sac arising from the bile ducts. Type III cysts lie within the duodenal wall. Type IV consists of two subgroups: IVA - cysts in the intrahepatic and extrahepatic bile ducts, and IVB - multiple cysts in the extrahepatic ducts, which occur rarely. Type V, which is a combination of intrahepatic cysts and extrahepatic disease, is also known as Caroli's disease.[2] Multiple cystic dilatations in the right and left intrahepatic bile ducts were found in abdominal ultrasound and MRCP suggesting a type V choledochal cyst (Caroli's disease, Todani Classification) and hepatosplenomegaly.

In this case, the patient presented with anemia, cholestasis (total bilirubin 18.90 mg/dL, direct bilirubin 12.5 mg/dL), elevated AST (191 U/L), GGT (148.3 U/L), and ALP (256 U/L), but normal ALT (41 U/L), followed by hypoalbuminemia (albumin 2.47 g/dL) and normal coagulation factor. In choledochal cysts the pattern of laboratory parameters is varied. It has been observed that PTT is prolonged in infants than in older children with choledochal cysts. However, total and direct bilirubin levels and liver function markers (ALP, AST, and ALT) were higher in infants than in children. In another study, there was no difference in these laboratory values between infants and older children with choledochal cysts.[5] Hypoalbuminemia is one of the most characteristic features of chronic liver failure.[10] This patient already suffered from a complication of a choledochal cyst.

There is hepatosplenomegaly followed by hypoalbuminemia which tends to portal hypertension and liver failure. During hospitalization, the patient received supportive therapy, such as PRC and albumin transfusion, furosemide injection, oral propanolol, oral spironolactone, oral ursodeoxycholic acid, and vitamin supplementation.

Portal hypertension is defined as an elevation of the pressure or difference in pressure between the portal veins and the inferior vena cava.[11] Clinical manifestations of portal hypertension in children include thrombocytopenia, anemia, splenomegaly, gastrointestinal bleeding, portal biliopathy (jaundice, elevated alkaline phosphatase, increased GGT), and growth failure.[11] In this case, portal hypertension was diagnosed based on clinical manifestations, including hematemesis, splenomegaly, venectasized veins in the abdominal wall, and anemia. The endoscopic examination could not be performed due to the patient's unstable condition. Oral propanolol and spironolactone were given in this case. The combination of propranolol and spironolactone can reduce the hepatic venous pressure gradient more than propranolol alone by up to 20% of the initial pressure, thus playing a role in secondary prophylaxis of variceal bleeding.[12]

Hypoalbuminemia and ascites may occur with a prolonged duration of disease and liver dysfunction.[11] Fluid may leak into the peritoneal cavity because of portal hypertension and decreased plasma oncotic pressure due to hypoalbuminemia. Intravenous albumin administration aims to increase plasma volume, improve cardiac preload and cardiac output, and induce arterial vasoconstriction at the level of the splanchnic microcirculation. Albumin is a potent antioxidant and plays an important role in transporting physiological substances and removing toxic substances. Because of its beneficial effects on microcirculation, exogenous albumin may be helpful.[10]

Surgical management of choledochal cysts is varied, such as cyst excision with Roux-en-Y hepaticojejunostomy, resection with hepaticoduodenostomy, liver resection, and liver transplantation.[8] The treatment of Caroli's disease depends on the extent of the disease, the localization of the pathological bile ducts, and the presence of complications.[14] Studies mention that Caroli's disease has a variable presentation, ranging from incidental findings to the presence of symptoms of liver damage.[13] For localized Caroli disease, especially left-sided Caroli disease, radical surgery is the treatment of choice. [14] Most individuals with Caroli's disease can be adequately treated with resection, but patients with Caroli's disease require transplantation because of associated liver fibrosis.[13] In this case, the disease is too extensive for surgery. Liver transplantation was not available and a referral was planned, but the family refused due to financial limitations.

CONCLUSION

Caroli's disease is rare. However, it is still a health challenge, especially in countries with limited liver transplantation facilities. Caroli's disease is often found on typical imaging modalities without any specific symptoms. It can lead to progressive biliary obstruction and liver cirrhosis. Early diagnosis and appropriate treatment are necessary for optimal outcome and prognosis.

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