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CASE REPORT

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Biliary atresia and posterior fossa bleed: Chance or causality. A case report and review of the literature

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Key Clinical Message

A newborn with a rare form of biliary atresia had posterior fossa bleed and subarachnoid hemorrhage despite vitamin K prophylaxis, indicating biliary atresia is a causality rather than chance.

Abstract

Biliary atresia frequently causes surgical jaundice, resulting in delayed vitamin K deficiency. We report a 28-day-old newborn diagnosed with a rare form of biliary atresia presented with an unusual association of posterior fossa bleed and subarachnoid hemorrhage despite vitamin K prophylaxis. Thus, biliary atresia remains causality rather than chance.

KEYWORDS

biliary atresia, posterior fossa bleed, subarachnoid hemorrhage

1 | INTRODUCTION

Biliary atresia is a rare progressive fibro-obliterative cholangiopathy of unclear etiology.[1] The Japanese Association of Pediatric Surgeons divided biliary atresia into three groups: type 3 is the commonest, and type 2 is the rarest form.[2] Classical presenting features of neonatal cholestasis are prolonged jaundice, acholic stool, high-colored urine, and hepatomegaly.[3] Biliary atresia, although rare, confounds one of the significant secondary causes for delayed Vitamin K deficiencies resulting in bleeding, among which skin and GI bleeding are commonly seen, followed by intracranial hemorrhage presenting at a mean age of 54.2 days of life.[4] Due to the small space, any lesions in the posterior fossa leads to compressive effect, especially involving the fourth ventricle and brainstem. An array of clinical manifestations includes the abrupt onset of headache, nausea, vomiting, truncal ataxia, vertigo, dysarthria, nuchal rigidity, loss of consciousness, or altered mental status, with signs of raised intracranial pressure.[5] Despite a successful Kasai operation, liver transplantation is the ultimate need.[6] We report a 28-day-old baby with rare congenital extrahepatic biliary atresia and obstructive hydrocephalus due to posterior fossa bleed, a rare association.

2 | CASE REPORT

A previously healthy newborn female at 28 days of life presented with loose stool and vomiting for 3 days and abnormal body movement for 1 day. There were multiple episodes of loose stool, which was nonmucoid and nonblood stained. The loose stool was also associated with multiple

vomiting episodes, which were nonbilious, nonblood-stained, and nonfoul-smelling. In addition, the baby also had abnormal body movements with uprolling of eyes and frothing from the mouth lasting for nearly 3 min. Then, after, the baby became irritable with an inconsolable cry.

There was no significant antenatal history. The baby was born at 41 weeks of gestation, weighing 2.6 kg via emergency lower segment cesarean section (LSCS) for fetal bradycardia. As a part of the routine protocol, prophylactic intramuscular vitamin K was given to the baby at birth. The baby cried immediately after birth, and both mother and child were healthy postnatally. The child is exclusively breastfed and has received age-appropriate vaccination per the national immunization schedule.

On general examination, the baby was irritable and crying. There was a bulging anterior fontanelle along with a setting sun sign. Clinically, there were no signs of meningitis. The child showed no facial dysmorphism. Her vitals included a blood pressure of 80/40 mm of Hg, a temperature of 97 °F, a pulse rate of 114 bpm, a respiratory rate of 45 bpm, oxygen saturation at 96% in room air, capillary refill time <3 s, and occipitofrontal circumference of 37.5 cm.

Laboratory investigations showed anemia (Hb- 10 g/dL), hyponatremia (129 mEq/L), mild leukocytosis (12,500/mm^3), normal platelet count with prothrombin time (PT) of 80 s, and activated prothrombin time (aPTT) of 170 s and negative serology. Cerebrospinal fluid (CSF) analysis showed a total leucocyte count of 20/mm^3, polymorph 5%, lymphocyte 95%, microprotein 117 mg/dL, and red blood cells 10,000/mm^3, and was sterile.

A real-time neuro sonogram was performed, which showed mildly dilated lateral and third ventricles (17 mm at atrial level) with a suspicious mass lesion in the posterior fossa in the region of the cerebellum. Furthermore, a contrast-enhanced computed tomography (CECT) head was performed, which showed a nonenhancing hyperdense lesion with perilesional edema in the cerebellum predominantly involving the central vermis with significant mass effect resulting in compression of the fourth ventricle anteriorly and moderate upstream dilation of the supratentorial ventricular system (moderate obstructive hydrocephalus)—suggestive of acute cerebellar hematoma. Hyperdense extra-axial collection in subarachnoid spaces in the tentorial region, posterior interhemispheric fissure, and bilateral occipital convexities were present, which suggests subarachnoid hemorrhage (Figures 1 and 2).

During the hospital stay, the child was managed with intravenous medications such as cefotaxime, amikacin, levetiracetam, vitamin K, ranitidine, dexamethasone, 3% NaCl, midazolam, blood transfusion, and intravenous fluids. After administering vitamin K, there was an improvement in bleeding tendency. The baby developed apnea, for which she underwent endotracheal intubation and was managed in the neonatal ICU. A few days later, when her health improved, she was extubated, and feeding started. Ommaya drain for

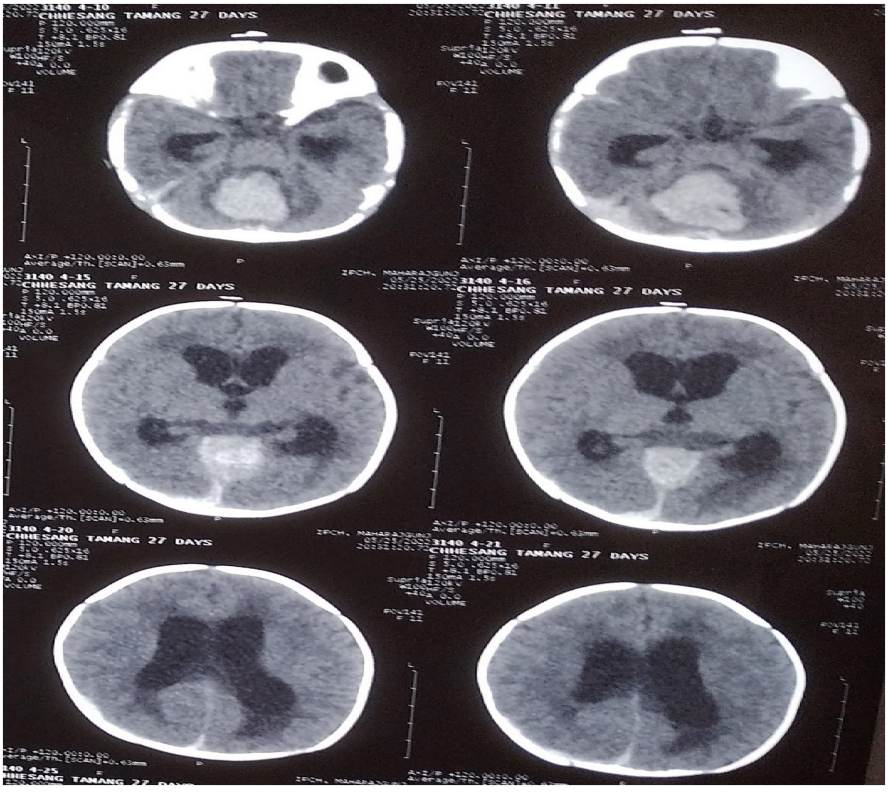

FIGURE 1 Plain computed tomography scan showing a hyperdense mass in the posterior fossa arising from the cerebellum, causing obstructive hydrocephalus.

external ventricular drainage was kept. She did well until her mother noticed yellowish discoloration, high-colored urine, and clay-colored stool 4 days after the drain placement.

On further investigation, conjugated hyperbilirubinemia, hypoalbuminemia, and raised liver enzymes were seen. Ultrasonography of the abdomen and pelvis showed a tubular gall bladder and irregular mucosal lining. The common hepatic, common bile, and cystic duct were not visualized, suggesting type IIB biliary atresia. Hepatobiliary scintigraphy showed a mildly enlarged liver with preserved hepatocyte function with nonvisualization of gut activity up to 24 h suggestive of biliary atresia (Figure 3A,B).

Biopsy was taken from the liver as well as the common bile duct. A biopsy report from the common bile duct showed chronic inflammation with fibrosis (Figure 4), and a sample from the liver showed stage 3 fibrosis and extrahepatic biliary atresia (Figure 5).

With the histopathological reports, a diagnosis of biliary atresia was made, and she underwent a Kasai hepatoportoenterostomy procedure. The patient showed improvement and was discharged for outpatient care. One month follow-up at the neurosurgical clinic revealed complete resolution of posterior fossa bleeds without evidence of hydrocephalus seen on the CT scan, and the patient was playful and active.

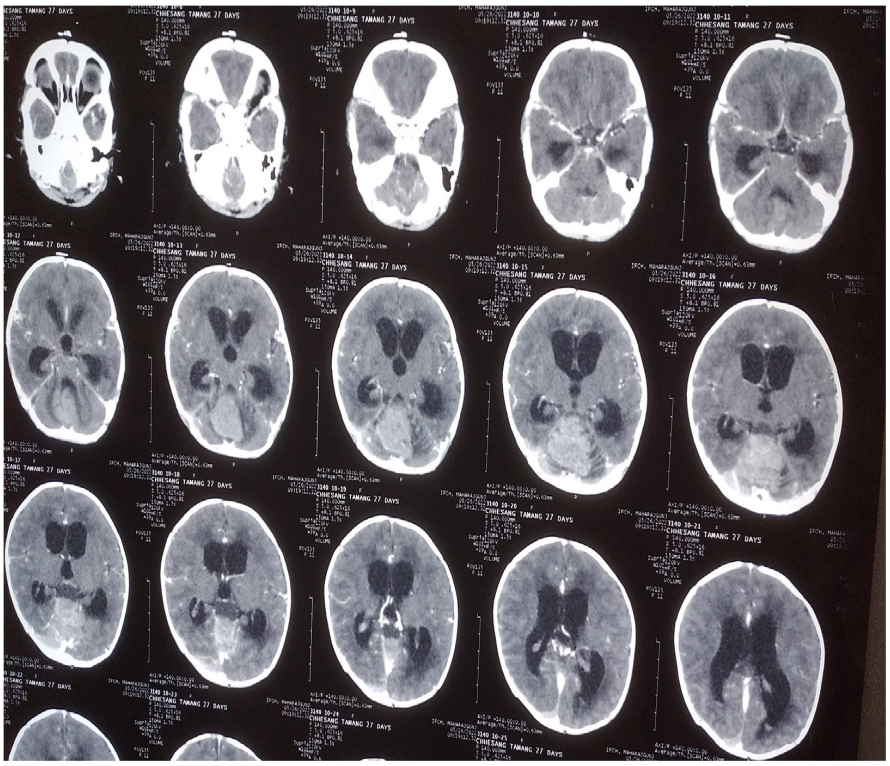

FIGURE 2 Contrast-enhanced computed tomography (CECT) shows a nonenhancing posterior fossa lesion with hyperdense collection in the tentorial, posterior interhemispheric fissure, and bilateral occipital convexities suggesting subarachnoid hemorrhage.

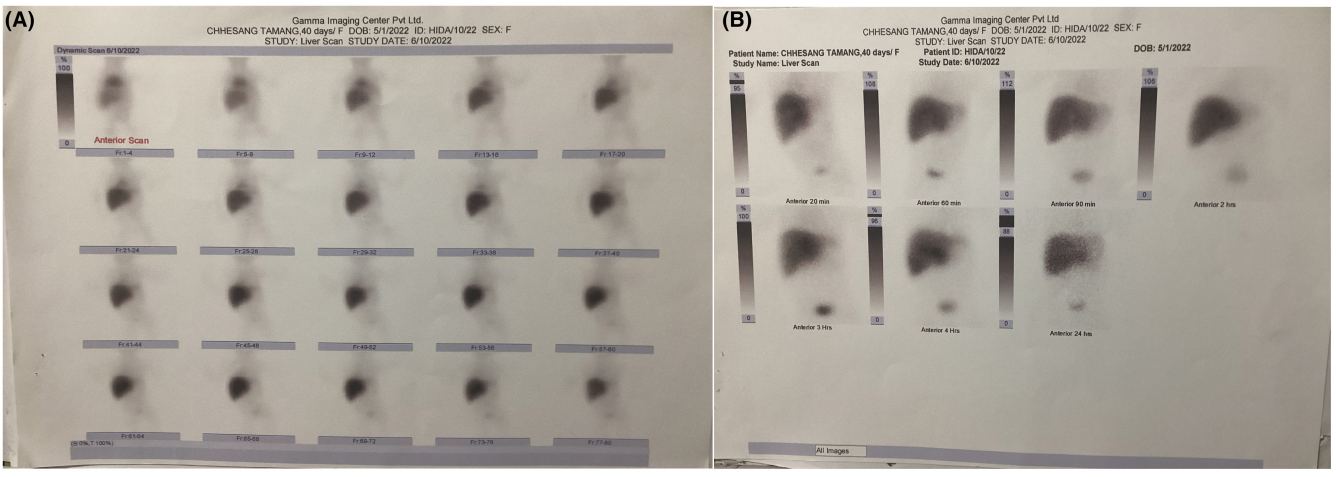

FIGURE 3 HIDA scan showing mildly enlarged liver with preserved hepatocyte function with nonvisualization of gut activity up to 24 h.

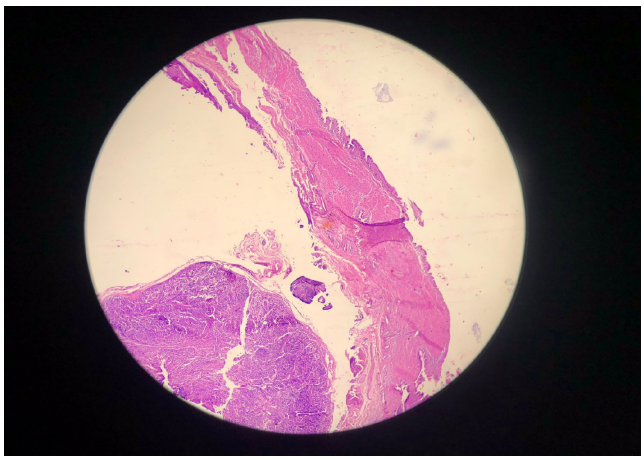

FIGURE 4 Bile duct biopsy showing chronic inflammation with fibrosis.

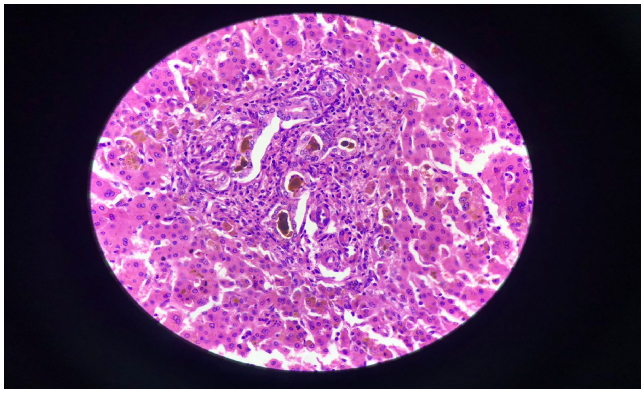

FIGURE 5 Liver biopsy stage 3 fibrosis and extrahepatic biliary atresia.

3 | DISCUSSION

Biliary atresia (BA) is a rare obliterative cholangiopathy involving intra- and extra-hepatic bile ducts. It is a rare disease with worldwide incidence varying from 5/100000 to 32/100000 live births, showing female predominance.[7] Although the etiology of BA remains unknown, there are four groups defined: syndromic BA, cystic BA, cytomegalovirus-associated BA, and isolated BA, where syndromic and cystic BA are grouped under developmental BA. The Japanese Association of Pediatric Surgeons divided biliary atresia into three groups based on the proximal level of the extrahepatic biliary tree occlusion. Our patient had type 2 BA, rare among the three groups.[2]

Biliary atresia is the most common cause of neonatal cholestasis. The classical features of neonatal cholestasis are prolonged jaundice, acholic stool, high-colored urine, and hepatomegaly. Like our case, most patients with BA have no signs and symptoms during the 1st month of birth.[3] BA is reported to be associated with polysplenia, situs inversus, intestinal malrotation, cardiopulmonary dysplasia, and other anomalies, and rarely with intracranial bleeding.[8,9] Difficulty in diagnosis occurs due to the overlapping features between BA and the other cause of neonatal cholestasis. Laboratory parameters such as bilirubin, gamma GGT, 5′ nucleotidase level, and serum transaminase are elevated in BA. Imaging modalities helpful in the diagnosis include ultrasonography, hepatobiliary scintigraphy, endoscopic retrograde cholangiopancreatography (ERCP), duodenal intubation magnetic resonance imaging, magnetic resonance cholangiopancreatography (MRCP), liver biopsy, etc. However, these methods are either time-consuming, expensive, or invasive, hence not suitable for all patients.[10] Zhou et al.'s analysis in 2015 concluded that triangular cord sign and gallbladder abnormalities could improve diagnostic sensitivity for BA and even reduce the need for liver biopsies and hepatobiliary scintigraphy for infants suspected to have biliary atresia.[11] In our case, ultrasonography, hepatobiliary scintigraphy, and liver biopsy confirmed the diagnosis of biliary atresia. Early diagnosis, ideally earlier than 30–45 days, followed by the Kasai procedure, results in better outcomes.[12] In our case, the Kasai operation was performed on the 40th day of life.

Regarding intracranial bleeding, cerebellar hemorrhage accounts for approximately 9%–10% of all intracranial hemorrhage. This is most commonly due to chronic hypertension in middle-aged populations; hence, it is highly unusual among children. Other causes of cerebellar hemorrhages include coagulopathy, biliary atresia, hemorrhagic transformation of ischemic stroke, arteriovenous malformation, dural venous fistula in tentorium, cerebral amyloid angiopathy, neoplasm, trauma, aneurysm, remote hemorrhages, etc.[5,8,13] In our case, due to the atypical location, rare association, and delayed diagnosis of biliary atresia, initially, the patient was even suspected of an intramural bleed harboring posterior fossa tumor, but follow-up after 1 month revealed complete resolution of the bleed, which proved by itself of it being simply blood rather than any tumor.

The cause of secondary vitamin K deficiencies is chronic diarrhea, long-term antibiotic use, and hepatobiliary lesions such as BA. BA, although rare, confounds one of the significant secondary causes for delayed vitamin K deficiencies, resulting in intracranial bleeding at a mean age of 54.2 days of life. In a 5-year prospective study by Alzuhairy et al. involving 47 children diagnosed with late vitamin K deficiency, the most common bleeding sites at presentation were skin and GI tract (40%), followed by an intracranial hemorrhage (ICH) (32%). There were 18 patients with ICH, of which only one had parenchymal hemorrhage with subarachnoid bleeding. Contrarily, in our case, the parenchymal hemorrhage was located in the

cerebellar parenchyma with subarachnoid hemorrhage, suggesting an atypical location of hemorrhage.[4] Deranged prothrombin time followed by improved bleeding tendency after intravenous vitamin K suggests the likely diagnosis of vitamin K deficiency-related bleeding.[8]

Generally, it is believed that primary vitamin K deficiency has decreased due to the administration of prophylactic vitamin K immediately after birth, and prophylaxis has not affected the incidence of secondary deficiency. As in our case, despite intramuscular vitamin K prophylaxis, secondary vitamin K deficiency due to BA led to intraparenchymal bleeding.[8] Furthermore, the concurrent occurrence of cerebellar and subarachnoid hemorrhage, as seen in our case, is rare.[5,6,8]

Due to the small space, any lesions in the posterior fossa lead to compressive effects, especially involving the fourth ventricle and brainstem. The patient presents with abrupt onset of headache, nausea, vomiting, truncal ataxia, vertigo and dizziness, dysarthria, nuchal rigidity, loss of consciousness or altered mental status, and signs of raised intracranial pressure.[5] Interestingly, our patient presented with diarrhea, vomiting, and seizures followed by irritability. The cerebellar hemorrhage was seen in the cerebellar vermis associated with subarachnoid hemorrhage.

Small hemorrhage requires only observation, while larger hemorrhage, that is, more than 3–4 mm, requires neurosurgical interventions and evacuation.[14] Due to the small bleed size, our patient was treated by placing an Ommaya reservoir external CSF drainage without subjecting to hematoma evacuation via major suboccipital craniectomy.

By norms, an untreated child with BA will not survive above 3 years and succumb to either liver failure or cirrhosis. Kasai operation and liver transplantation are the modalities of treatment for BA. Despite proper drainage of bile, there is a need for liver transplantation, without which only 20%–30% of patients survive beyond 20 years. In the long run, more than 50% of patients with intracranial bleeding due to vitamin K deficiency have shown neurological manifestations regarding developmental delay, mental retardation, and epilepsy.[6] Hence, long-term follow-up with a multidisciplinary treatment strategy should be the goal of therapy. Our patient was lost to follow-up after 1 month.

4 | CONCLUSION

Biliary atresia causes cholestatic vitamin K deficiency, resulting in spontaneous bleeding despite vitamin K prophylaxis. Hence, a newborn presenting with intracranial bleeding in the neonatal period must be looked for secondary causes of bleed, especially biliary atresia. Although early surgical treatment of biliary atresia has good outcomes, in the long run, the patient succumbs to liver failure, cirrhosis, or various neurological manifestations, demanding liver transplantation and long-term multidisciplinary support.

AUTHOR CONTRIBUTIONS

Susmin Karki: Writing – original draft; writing – review and editing. **Vikash Chand:** Writing – original draft; writing – review and editing. **Asmita Parajuli:** Writing – original draft; writing – review and editing. **Sushil Kumar Shilpakar:** Supervision; writing – review and editing. **Prakash Regmi:** Writing – review and editing. **Kabi Raj Bhusal:** Writing – review and editing.

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CONFLICT OF INTEREST STATEMENT

The author(s) declare(s) that there is no conflict of interest regarding the publication of this paper.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available online.

ETHICS STATEMENT

Our institution does not require ethical approval for reporting individual cases.

CONSENT

Written informed consent was obtained from the patient's mother to publish this report in accordance with the journal's patient consent policy.

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