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Case Report

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The first preterm neonatal case report with pyogenic liver abscess caused by *Acinetobacter baumannii*

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Abstract

Acinetobacter baumannii is an opportunistic bacterial pathogen associated with health care-associated infections. Neonatal liver abscess is extremely rare. It has a high mortality rate due to difficulties in diagnosis and treatment. Hematogenous dissemination of infection, umbilical venous catheterization, abdominal surgery, sepsis, and immunodeficiencies have been accepted as potential risk factors. In many cases, gram-positive bacteria, particularly *Staphylococcus aureus*, and gram-negative bacteria, specifically *Escherichia coli*, are the main pathogens. In the present newborn case, *Acinetobacter baumannii* was isolated as the causative microorganism from liver abscess culture, blood culture, and subcutaneous abscess culture. To our knowledge, neonatal pyogenic liver abscess due to *Acinetobacter baumannii* has not been previously reported in the literature.

Keywords: *Acinetobacter baumannii*, infection, liver abscess, newborn.

Neonatal liver abscess is an uncommon clinical condition with a high mortality rate.[1] Hematogenous dissemination of infection, umbilical venous catheterization, abdominal surgery, sepsis, and immunodeficiencies have been accepted as potential risk factors.[2] More than half of neonates with a liver abscess showed umbilical vein catheterization (UVC) as a potential risk factor. Due to its rarity and lack of clinical suspicion, neonatal liver abscess can be difficult to diagnose and manage. It can also present as persistent sepsis without localized signs.[3] This paper discussed the first case of liver abscess due to *Acinetobacter baumannii (A. baumannii)* in a preterm neonate and briefly reviewed the literature and management.

CASE REPORT

A male infant of a gestational diabetic mother was born at 35 weeks and 4 days of gestational age by emergency cesarean section due to preterm labor and preterm premature rupture of membranes, with a birth weight of 3740 g and Apgar score of 9 and 10 at 1 and 5 min, respectively. The infant was intubated due to severe respiratory failure and then transferred to the neonatal intensive care unit (NICU). A UVC was inserted, and total parenteral nutrition was started. A chest radiograph showed ground-glass appearance compatible with respiratory distress syndrome in both lungs, and the umbilical venous catheter tip was visualized terminating at the level of the 10th thoracic vertebra (Figure 1). Surfactant treatment was administered for respiratory distress syndrome. Then, nitric oxide treatment was started due to the pulmonary hypertension on echocardiography and continued for two days. Ampicillin and cefotaxime

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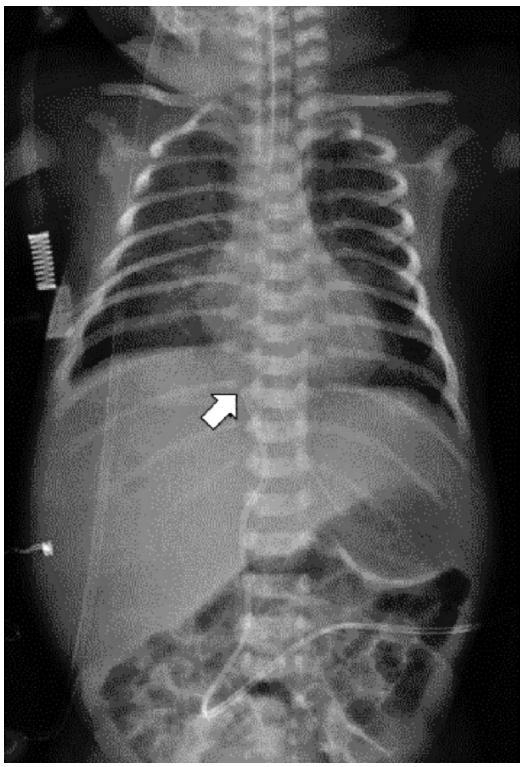

Figure 1. Radiographic image of the patient's umbilical venous catheter.

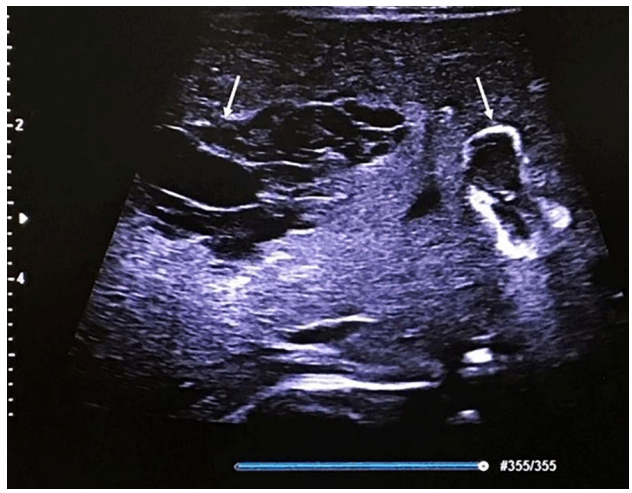

Figure 2. Appearance of abscesses on ultrasound (50 × 29 mm at the junction of segments 8 and 5 of the liver, and 20 × 10 mm in segment 4A).

treatment were initiated for septic appearance and elevated procalcitonin level (98 ng/mL; normal value < 0.5 ng/mL). The first blood culture showed no growth. On the seventh day of life, abdominal distension and erythema, elevated temperature, and right upper quadrant tenderness were observed. Abdominal ultrasonography (US) showed a prominent diffuse septal collection (abscess formation) in the anterior of the liver. The umbilical venous catheter was removed, and peritoneal drain were performed near bedside. As a high amount of purulent fluid drained, the patient was taken to operation room. A subcapsular liver abscess was detected on the anterior part of the right lobe and was drained. Peritoneal fluid showed chylous character (fluid triglyceride: 1435 mg/dL; cell count > 80% lymphocyte). Ultrasonography was performed again on the fourth postoperative day, revealing an abscess of 50 × 29 mm at the junction of segments 8 (anterior superior) and 5 (anterior inferior) of the liver, as well as a 20 × 10 mm abscess in segment 4A (superior medial) (Figure 2). Antibiotics were revised as meropenem, colistin, metronidazole, and vancomycin. *Acinetobacter baumannii* complex was detected in the abscess (100,000 cfu/mL) and blood cultures. The antibiograms of all isolates were identical; they were sensitive to colistin and tigecycline but resistant to imipimen, meropenem, third generation cephalosporins, amikacin, and ciprofloxacin. Tuberculosis culture of the peritoneal fluid and tuberculosis polymerase chain reaction were negative. *Toxoplasma*, rubella, cytomegalovirus, and herpes simplex virus immunoglobulin M antibodies were negative. Nitroblue tetrazolium test, CD panel, and immunoglobulins were in the normal range for age. In the postoperative serial abdominal US follow-up, the size of the abscess in the liver gradually decreased. On the sixth postoperative day, swelling and erythema on the anterior surface of the abdomen were consistent with subcutaneous abscess and were drained. The patient remained intubated for two weeks. Antibiotics were continued for three weeks, and the patient was discharged on the 31st day of life. The patient remained well at the 16-month follow-up with sonographic evaluation. Written informed consent was obtained from the parent of the patient.

DISCUSSION

Acinetobacter baumannii is an aerobic, nonmotile, and pleomorphic gram-negative bacillus. As it is an opportunistic bacterial

pathogen, it leads to health care-associated infections in NICUs and causes many clinical infections such as pneumonia, infections of urinary tract, cutaneous infections, bacteremia, and meningitis.[4] Neonates are at high risk for health care-associated infections in the NICU due to immature barrier protective of the immune system, skin, and gastrointestinal tract, and invasive diagnostic and treatment operations.[5] *Acinetobacter baumannii* is normally found in the skin flora and can spread through contaminated hands of health care personnel in outbreaks.[6] The fact that the patient's UVC level was at the level of the 10th thoracic vertebra (below the junction of the right atrium and the inferior vena cava) and that the peritoneal fluid drained after the development of clinical symptoms on the seventh postnatal day had a chylous character suggested that this clinical presentation was a complication of UVC and that the *A. baumannii* infection developed as a result of a health care-associated infection.

Liver abscess presents in the early infantile period with nonspecific symptoms and laboratory results. Hepatomegaly or right hypochondrial tenderness on examination needs to be carefully performed, but its absence does not exclude liver abscess. In the neonatal case series published by Simeunovic et al.,[3] in patients followed up with liver abscess hepatomegaly, intestinal distension with ileus, intractable fever, nonspecific findings of sepsis, and elevated infection markers were found as clinical findings. In the present patient, ampicillin and cefotaxime were started due to septic appearance during the first day of life, but there was no bacteremia in the first blood culture. Unfortunately, on the seventh day of life, the patient had abdominal bloating and erythema, elevated temperature, right upper quadrant tenderness, and elevated procalcitonin level. A prominent diffuse septal collection in the anterior of the liver was detected, and *A. baumannii* was isolated in both blood culture and abscess culture, suggesting hematogenous spread.

In previously reported literature, sepsis proven by blood culture,[7] umbilical catheters,[8] central catheters,[9] necrotizing enterocolitis,[10] prematurity, and previous surgical interventions[11] were determined as predisposing factors in pyogenic liver abscesses in the neonatal period. Despite UVC being shown as a predisposing factor in most cases of liver abscess, there are some cases in which no underlying risk factor has been reported in the literature.[12,13] In our case, the UVC was placed on the first postnatal day and was removed after the liver abscess was diagnosed. The UVC was in the right place, and the abscess was in the anterior part of the liver. Therefore, we assumed that the UVC itself was not the causative factor, but it was a risk factor for health care-associated bacteremia. In addition, no immunodeficiency or intrauterine infection was detected etiologically.

The sensitivity of US is 80 to 90%. On the contrary, the sensitivity of computed tomography with findings of liver abscess was reported to be 97%.[1] However, diagnosis of liver abscess in newborns with US is more widely used than computed tomography. Since US can be portable, there is no need for extra preparations in sick babies. Moreover, it is easily accessible and inexpensive. Serial US is also used for the evaluation of treatment response. For solitary liver abscesses, it can be used as a guide during percutaneous procedure.[2] In our case, abdominal US performed after the development of clinical findings revealed a liver abscess. Afterward, percutaneous abscess drainage and open surgical drainage were performed.

Pyogenic liver abscesses may develop in any part of the liver lobe. Although the cause is not fully explained, abscesses usually develop in the posterior part of the right lobe, probably due to the portal venous flow pattern.[14] Additionally, liver abscesses may be multiple and may accompany abscesses in other organs.[10] In contrast, in our case, preoperative US identified the anterior surface of the right lobe of the liver. Postoperative US revealed an abscess of 50 × 29 mm at the junction of segments 8 and 5 of the liver and a 20 × 10 mm abscess in segment 4A.

Several microbiological agents have been reported in the etiology of liver abscess in the literature. *Staphylococcus aureus*, methicillin-resistant *Staphylococcus aureus*, Group A Streptococcus, gram-negative bacilli, *Klebsiella, Stenotrophomonas maltophilia, Enterobacter cloacae, Serratia*, anaerobic microorganisms, and fungal agents (such as Candida) are examples of pathogens

identified in cultures.[1] Congenital tuberculosis,[15] listeriosis,[16] and congenital syphilis[17] have also been described in the newborn. In the present case, *A. baumannii* complex (100,000 cfu/mL) was isolated in the intraoperative abscess culture, blood culture, and subcutaneous abscess culture, and it may be the first case of liver abscess due to *A. baumannii* secondary to systemic sepsis in a preterm newborn.

In 1938, open surgical drainage was recommended for the treatment of pyogenic liver abscesses.[18] Later, percutaneous catheter drainage was demonstrated to be safe and effective and began to be used in newborns.[18] One of the advantages of percutaneous drainage versus open operation is the absence of the requirement for general anesthesia and its risks. Medical treatment was reported to be the only option for multiple and diffuse neonatal liver abscesses.[19] In our case, an abscess was detected by US and purulent fluid was drained by percutaneous drainage, and open surgical drainage was performed on the same day. Empirical medical treatment for liver abscess was started in the postoperative period and continued for three weeks as recommended.[20]

Pyogenic liver abscess is a severe disease. It is fatal in newborns when left untreated. Complications consist of bacteremia and perforation of the peritoneal cavity. Septic embolism in the brain, glomerulonephritis, and portal vein thrombosis are other rare complications.[1] In our case, on the sixth postoperative day, percutaneous drainage was required due to a subcutaneous abscess on the anterior abdominal surface.

In conclusion, pyogenic liver abscess is an uncommon but highly fatal disease in the neonatal period if left untreated. To the best of our knowledge, this is the first case of a hepatic abscess due to *A. baumannii* in a late preterm neonate in the literature. Early diagnosis and treatment have a positive effect on prognosis. Therefore, we recommend that all preterm newborns with persistent severe sepsis or necrotizing enterocolitis unresponsive to long-term antibiotic treatment should be diagnosed with detailed abdominal US for potential hepatic abscesses.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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