Liver Abscess in Preterm Newborns Following Umbilical Venous Catheters

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Abstract
Neonatal liver abscess carries a high mortality and is difficult to diagnose. We report three cases of preterm infants with liver abscesses related to umbilical venous catheters. Our aim is to highlight the possibility of liver abscess in neonates and advocate extreme care in placement of umbilical venous catheters.

We retrospectively reviewed records of 3 cases diagnosed as liver abscess. All cases were preterm babies admitted to the Neonatal Unit-Maternity Hospital-Kuwait. All abscesses were related to insertion of umbilical venous catheters. One case was suspected due to persistence of elevated inflammatory markers despite good general condition. The other 2 cases were suspected when abdominal X-ray taken for abdominal distension and suspected NEC (necrotizing enterocolitis) showed gas shadow within the liver. Liver abscesses were treated successfully with antibiotics without surgical drainage.

Key Words: Liver abscess – Preterm – Umbilical venous catheters – Outcome.

Introduction
NEONATAL liver abscess is uncommon, carries a high mortality and is difficult to diagnose. Its diagnosis requires a high degree of suspicion [1]. We report three cases of liver abscesses in preterm infants. All cases were related to insertion of umbilical venous catheters and blood cultures were negative. The three cases were diagnosed by ultrasound and confirmed by CT scan of the liver. Liver abscesses were treated successfully with antibiotics without surgical drainage.

Case 1:
A preterm baby, boy of 28 weeks gestation weighing 1.3kg was delivered normally. The baby needed mechanical ventilation for 3 days and NCPAP for 2 days. UAC (umbilical arterial catheter) and UVC (umbilical venous catheter) were inserted on first day of life. UAC was removed on fourth day of life.

Nasogastric tube feeding was introduced on sixth day, but was not tolerated. The baby was treated conservatively as a case of early NEC, started on Tazocin (piperacillin+tazopactam), which was continued for 14 days. On attempting to remove UVC on day 12, a gush of turbid fluid came out. The baby was seen by Pediatric surgeon, who advised to continue conservative management for the NEC. Ultrasound abdomen done on day 13 showed an ill defined irregular echogenic mass 3cm x 2.5cm at posterior part of right lobe of the liver suggesting hematoma with moderate to severe ascites.

The clinical condition of the baby improved, nasogastric tube feeding was started and tolerated, but CRP was persistently elevated. Ultra sonography was repeated on day 29 showed a multiloculated mass 2.1 x 2.35cm with another small mass 1.1 x 0.5cm with no ascites and a diagnosis of liver abscess was considered. CT abdomen on day 32 confirmed the diagnosis of liver abscess (Fig. 1). The baby received meropenem for 21 days and metronidazole for 7 days. Follow-up ultrasonography showed gradual decrease in the size of the liver abscess. His general condition was good and he was discharged home on day 60. Last U/S before discharge showed two hyperechoic lesions in the right lobe of the liver measuring 1.15 x 0.7cm and 1 x 0.74cm.

Case 2:
A preterm baby, boy of 29 weeks gestation and weighing 1.620kg was delivered normally by a
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primigravida mother. The mother had prolonged rupture of membranes for 4 days before delivery. She was suspected as a case of chorioamnionitis and she was on antibiotics (ampicillin + gentamycin). The baby was ventilated for 2 days.

UAC and UVC were inserted in first day of life soon after admission. UAC was removed on day 4 and nasogastric tube feeding was started. On the same day, he passed blood stained meconium, so feeds were discontinued. On day 9, he had abdominal distension with bilious aspirate, so Tazocin was started and kept NPO. On day 11, the abdomen was tense and abdominal X-ray showed air pockets in the hepatic area. UVC was removed and tip was sent for culture. CRP was 48 which subsequently increased to 96. Blood and UVC tip cultures were negative. Ultrasound abdomen showed a large cystic lesion with thick, irregular wall measuring 4 x 3 x 3cm in the liver suggesting a liver abscess. CT abdomen was done on day 13 confirmed the diagnosis (Fig. 2). Tazocin was stopped after 5 days and he received meropenem for 26 days along with metronidazole for 7 days. Follow up ultrasound showed reduction of the size of liver abscess. He was discharged on day 51 and came for follow-up twice after discharge. Last follow-up ultrasound showed that the size of the lesion 1.7 X1.4cm with an echoic area suggesting degeneration.

Case 3:
A preterm baby girl of 29 weeks gestation weighing 1kg was born by emergency LSCS. She was ventilated for 2 days. UAC and UVC were inserted soon after admission to NICU.

UAC was removed in day 4 and nasogastric feeding was started next day. Feeds were tolerated and the baby was doing well.

On day 8 of life, there was metabolic acidosis and mild abdominal distension. On day 10 the abdominal distension increased and CRP was 48. X-ray abdomen showed air pockets within the liver, so UVC was removed and feeds were discontinued. Ultrasound abdomen done showed an echogenic lesion in the right lobe of the liver measuring 4.2 x 2.7 x 3 m suggesting a liver abscess. CT abdomen done on day 12 showed a well defined hypodense multiloculated area 3.7 x 2.9 x 2.1 cm in right hepatic lobe extending to hepatic capsule confirming the diagnosis of a liver abscess (Fig. 3). Tazocin and metronidazole were continued for 14 days. Repeat ultrasound after one week showed 2 echogenic lesions in the right hepatic lobe measuring 1.2 x 0.9cm and 1 x 0.9cm. Serial ultrasound showed decrease in size of liver abscesses. She was clinically stable and was discharged home on day 50 of life.

Fig. (1): CT scan abdomen of case 1 showing abscess in right lobe of liver, 2.7x 2.1x1.9 cm with irregular outer margin.

Fig. (2): CT scan abdomen of case 2 showing liver abscess measuring 4x 3.5x 3.8 cm, with irregular borders in right lobe of the liver.

Fig. (3): CT scan abdomen of case 3 showing liver abscess measuring 3.77x 2.93x 2.1 cm in right lobe of the liver.
Discussion

Liver abscess is a rare condition in neonates and its diagnosis requires a high degree of suspicion. The classical presentation of liver abscess with fever, hepatomegaly and right upper abdominal pain is generally not present in neonates. The diagnosis of liver abscess in the neonate cannot be established from the clinical picture alone. The signs and symptoms are nonspecific and are essentially those of sepsis [2].

The hepatic abscesses can be either multiple or solitary. Multiple liver abscesses are multiple, small in size, not drainable, usually not due to umbilical infection and have a fulminant course. Whereas, solitary liver abscesses are larger, well localized, can be drained by surgical methods and have a subacute course [3]. In our cases, two cases had solitary abscess and the third case had two small abscesses.

Previous reports in the literature have identified risk factors for the development of liver abscess as, blood culture proven sepsis, umbilical catheterization, central parenteral nutrition catheters, necrotizing enterocolitis, surgery and prematurity. Very low birth weight preterm infants are at greater risk of liver abscess due to the decreased adherence and chemotaxis of their neutrophils [4]. Also the use of a venous line for infusion of hypertonic or acidic solutions, such as parenteral nutrition solutions, may provide a necrotic focus for abscess formation [5]. Prematurity, umbilical catheterizations and parenteral nutrition solutions are consistent findings in all our babies.

Bacteria can reach the liver by four routes, (1) direct invasion from contagious infection; (2) the hepatic artery; (3) the biliary ducts and (4) the portal vein. The latter may result from any focus of infection in the area drained by the portal vein. The umbilical vein is the most frequent source in the neonate [5]. The blood cultures were negative in all our cases. This could be explained by that all our babies were on antibiotics at the time of diagnosis or shortly before.

The diagnosis of hepatic abscess based on clinical findings has remained difficult. Also, laboratory investigations were not helpful. Liver function tests may or may not be normal [3]. In our cases, persistently elevated inflammatory markers despite adequate antimicrobial therapy in one case resulted into more investigations such as the abdominal ultrasound to search for the cause. The other two cases were suspected, when abdominal X-ray done for abdominal distension showed round-ed air filled shadows within the liver. Liver enzymes were normal in all cases. One baby had hypoalbuminemia and ascites.

Over the last years, abdominal ultrasound has become an impressive diagnostic tool. An abdominal CT scan can be used for confirmation and usually similar abscess localizations and sizes are found. All our patients were diagnosed initially by abdominal ultrasound and later confirmed by CT scan.

Therapy for solitary liver abscess is controversial. Options include antibiotic therapy only or antibiotics and percutaneous drainage or open surgical drainage [4]. Antibiotic therapy for 2 to 3 weeks is necessary and should target anaerobic, gram negative pathogens and staphylococcus species unless cultures demonstrate a specific pathogen [5]. All our babies were successfully treated with antimicrobials alone. Successful conservative treatment of a solitary liver abscess in a premature baby was also reported by others [3,6]. Serial ultrasounds are required to document adequate resolution of liver abscess. In our cases weekly ultrasound examinations were done and they documented decrease in the size of liver abscesses with antimicrobial therapy.

In view of the high mortality and difficulty in diagnosis, prevention should be the primary objective. Mal-positioning of umbilical venous catheter in the liver increases the risk of this life-threatening complication [1]. Therefore, unreserved caution should be exercised in placement and use of umbilical venous catheter in neonates due to associated risks with this procedure [6].

Conclusion:

Neonatal liver abscess is rare and if untreated, the outcome remains fatal. However, it is associated with good outcome if diagnosed early and appropriately treated. Its diagnosis requires a high degree of suspicion. Ultrasound and CT scan are the most sensitive diagnostic modalities for detecting hepatic abscesses. Caution should be exercised in performing umbilical cannulation in neonates due to associated risks with the procedure.

References
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