Inspissated Bile Syndrome Mimicking Biliary Atresia: Effectiveness of the Laparoscopic Cholangiography with Therapeutic Saline Lavage Approach

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Abstract

Inspissated bile syndrome (IBS) is a rare cause of infantile cholestasis, often associated with hemolytic diseases or other risk factors. Progression is usually spontaneously favorable, but in rare cases, it can be severe and prolonged and may require surgical intervention when medical management fails. We report a 2-month-old male with cholestatic jaundice due to biliary obstruction from sludge, linked to neonatal hemolysis. Initial medical treatment provided transient improvement. Given the persistence of severe cholestasis during the course of the condition with a negative etiological workup, laparoscopic cholangiography with saline lavage was ultimately required to resolve the obstruction. The patient recovered fully, with normalization of liver function and jaundice resolution. Laparoscopic cholangiography with therapeutic lavage is an effective and minimally invasive approach for managing severe IBS, ensuring prompt resolution and favorable outcomes.

Keywords: Inspissated bile syndrome, Cholestasis, Cholangiography, Saline lavage

Introduction

Inspissated bile syndrome (IBS) is a rare cause of cholestasis in infants, characterized by the thickening of bile within the biliary system that can lead to partial or complete biliary obstruction.[1] Most cases resolve spontaneously within a few days to two weeks, as reported in the literature.[2,3] Rarely, severe cases can progress to complete obstruction of the extrahepatic bile ducts due to solid plugs of inspissated bile or dense bile sludge. Without timely intervention, IBS can lead to serious complications, including liver damage.

This article presents a case of an infant diagnosed with IBS, successfully managed using laparoscopic cholangiography combined with therapeutic saline lavage.

Case Report

We report the case of a 2-month-old male infant admitted for cholestatic jaundice. The infant was born at 42 weeks of gestation via cesarean section to non-consanguineous parents. His birth weight was 3156 g, and his neonatal adaptation was uneventful. During the neonatal period, he was hospitalized for early hemolytic jaundice due to O/A blood group incompatibility. Laboratory analyses at that time revealed hyperbilirubinemia (total bilirubin at 71 µmol/L; normal range<20 µmol/L), a normal conjugated bilirubin

level (11 µmol/L; normal range<4 µmol/L) and a hemoglobin level at 12 g/dL, with a direct Coombs test positive at one cross. The patient did not require phototherapy, and spontaneous improvement was noted initially.

On admission, clinical examination revealed conjunctival pallor, cholestatic jaundice without hepatomegaly, and intermittent stool discoloration. The infant weighed 5 kg and was vitally stable. Laboratory tests confirmed cholestasis with conjugated hyperbilirubinemia (46 µmol/L; normal range<4 µmol/L) and elevated gamma-glutamyl transferase (GGT) at 235 U/L (normal range<160 U/L), with no hepatocellular failure or cytolysis. Serum protein electrophoresis and thyroid function tests were normal (Table 1). Abdominal ultrasound revealed a distended gallbladder (50×10 mm) containing echogenic material and dilation of both intra- and extrahepatic bile ducts (5 mm) proximal to echogenic material obstructing the distal common bile duct (Figure 1). Urine cytobacteriological examination revealed a positive culture for extended-spectrum beta-lactamase-producing *Escherichia coli*.

Table 1: Blood test results.

Test	Value	Reference range
Total bilirubin (µmol/L)	49	<20 µmol/L
Conjugated bilirubin (µmol/L)	46	<4 µmol/L
Gamma-glutamyl transferase (U/L)	235	<160 U/L
Aspartate aminotransferase (U/L)	40	<40 U/L
Alanine aminotransferase (U/L)	36	<45 U/L
Serum cholesterol (mmol/L)	2.66	1-4.8 mmol/L
Thyroid stimulating hormone TSH (mUI/L)	4.2	0.5-8 mUI/L
Urea (mmol/L)	3.6	1-4.2 mmol/L
Creatinine (µmol/L)	20	27-77 µmol/L
C reactive protein (mg/L)	5	<5 mg/L
Hemoglobin (g/dL)	7.2	9.5-13.5 g/dL
Prothrombin Ratio	90%	70%-100%

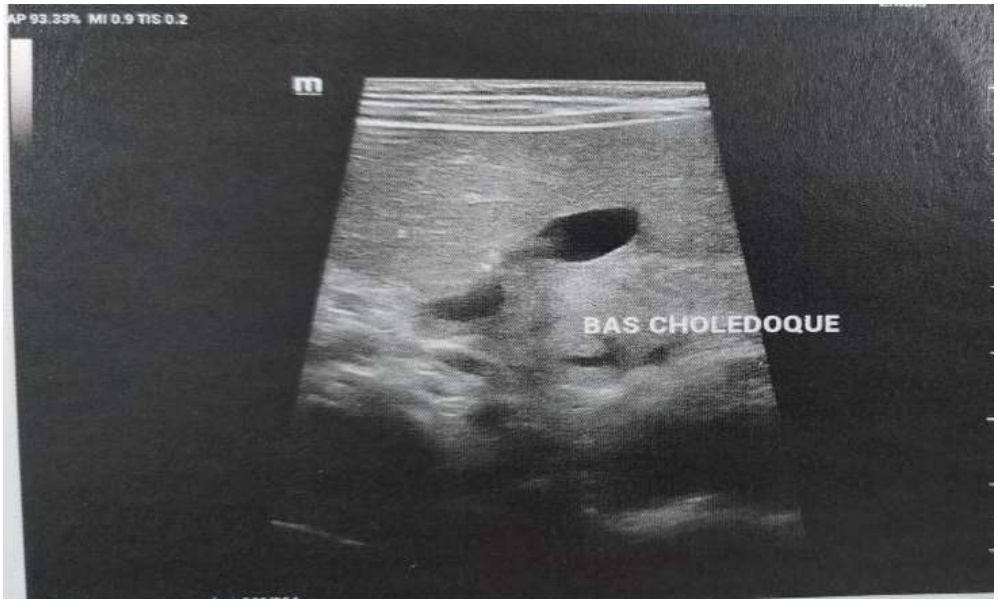

Figure 1: Abdominal ultrasound showing biliary sludge in a dilated common bile duct.

The infant was treated with intravenous cefotaxime for 10 days, in addition to hyperhydration, leading to partial improvement in liver function. Breastfeeding was encouraged, and daily fluid intake was increased. However, 10 days later, the infant's condition worsened, with persistent jaundice and complete stool discoloration despite ongoing intravenous hydration. Laboratory tests showed persistent cholestasis with hyperbilirubinemia (total bilirubin at 102 µmol/L and conjugated bilirubin at 101 µmol/L), elevated GGT at 1185 U/L and cytolysis (Aspartate aminotransferase at 125 U/L and Alanine aminotransferase at 93U/L). Further evaluations, including a sweat test (Chloride level at 3 mmol/L; normal range<60 mmol/L),

ophthalmological examination with slit lamp, and spinal X-ray, were normal. Given the history of hemolytic disease due to blood group incompatibility, a TORCH screen was not initially prioritized. Additionally, the absence of a relevant family history made a metabolic disorder less likely.

Given the progression, laparoscopic cholangiography with therapeutic bile duct lavage was performed. A laparoscope was introduced through an umbilical trocar, and the gallbladder was punctured using an infusion trocar, through which contrast was injected. Perioperative cholangiography revealed opacification of the gallbladder, intrahepatic bile ducts, and the common bile duct, effectively excluding biliary atresia. It also revealed complete obstruction of the distal common bile duct with no contrast flow to the duodenum. After confirming the presence of normal bile ducts, 20 ml of saline was injected through the same trocar, successfully clearing the biliary sludge and restoring bile flow (Figure 2). The liver biopsy revealed bile pigment deposits within the bile ducts.

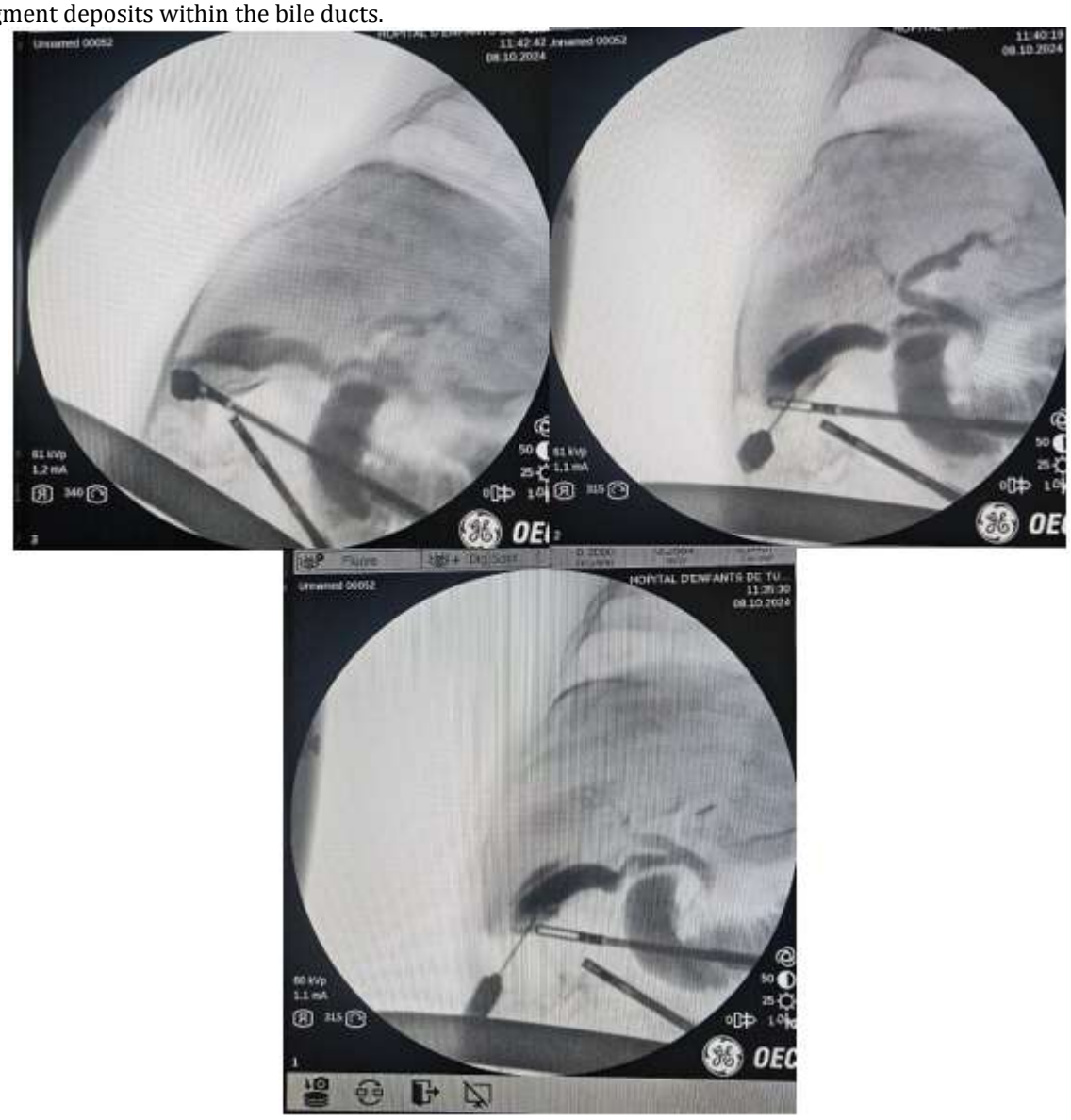

Figure 2: Intraoperative cholangiography showing (a+b) intrahepatic duct opacification and distal common bile duct obstruction without contrast flow to the duodenum, and (c) restoration of the bile flow after saline lavage

The immediate postoperative course was complicated by early cholangitis, which occurred 7 days after the intervention. This was effectively managed with antibiotic therapy (Cefotaxime, metronidazole, and gentamicin). Over time, the infant's condition improved significantly. Liver enzyme levels gradually normalized, and conjugated bilirubin levels returned to normal within six weeks (Figure 3). One month later, the infant had a normal weight and no recurrence of symptoms. Follow-up ultrasonography showed

complete resolution of the biliary ductal dilatation and absence of sludge. Liver tests were within normal range.

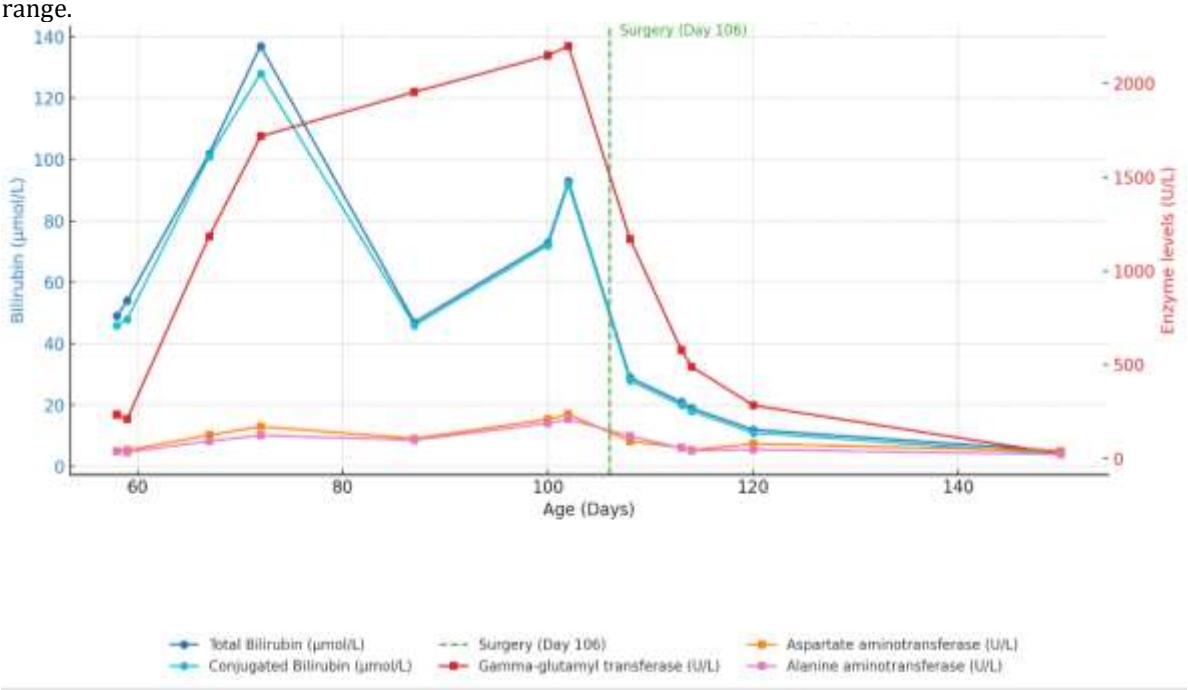

Figure 3. Evolution of liver enzymes and serum bilirubin levels after laparoscopic cholangiography with bile duct lavage

Discussion

Inspissated bile syndrome (IBS) accounts for 8% of extrahepatic biliary obstruction cases in term infants without anatomical abnormalities, congenital defects in bile composition, or hepatocellular disease.[1] This condition is frequently associated with underlying risk factors such as prolonged parenteral nutrition,[3] cystic fibrosis,[4] hemolytic diseases,[5] dehydration, sepsis and certain antibiotics like cefotaxime.[6]

In our case, severe hemolysis resulting from O/A blood group incompatibility resulted in bilirubin overload and cholestasis, leading to biliary tract obstruction. This aligns with previously reported cases where hemolytic disease was found to be a key precipitating factor for IBS.[5] Additionally, urine cytobacteriological examination revealed a positive culture for *Escherichia coli*, confirming a urinary tract infection, which, together with the administration of cefotaxime, may have contributed to the aggravation of IBS. But at that point, cholestasis was attributed to infection rather than IBS, and cefotaxime was chosen as per antimicrobial stewardship guidelines. Additionally, previous studies have reported that ceftriaxone is more frequently associated with biliary sludging.[7]

The first documented case of IBS causing biliary tract obstruction was reported by Ladd in 1935.[8] Diagnosis typically relies on a combination of clinical history and imaging findings, with abdominal ultrasound serving as a first-line modality. Ultrasound often reveals echogenic material in the common bile duct or gallbladder and can quantify the degree of extrahepatic and intrahepatic duct dilation.[1,6,9] In this patient, ultrasound findings of significant ductal dilation (5 mm) combined with echogenic material in the biliary tract supported the diagnosis. Importantly, biliary atresia was excluded based on these findings and the clinical presentation.

IBS-related cholestasis often resolves spontaneously or with medical treatment using ursodeoxycholic acid (UDCA).[2,3,5,6] In fact, UDCA is generally the first-choice medication for most cholestatic hepatopathies. However, its role in neonatal obstructive cholestasis remains controversial, as its potent choleretic effect may disrupt biliary integrity.[10] We opted for hyperhydration rather than UDCA in our patient.Severe IBS cases can progress to complete obstruction requiring surgical or interventional management. Studies suggest that significant bile duct dilation (>4 mm) correlates with a higher likelihood of requiring intervention,[11] as was observed in our patient.

Various therapeutic approaches for severe IBS cases have been described, including percutaneous cholecystostomy with saline lavage,[9,12] open surgical bile duct exploration with lavage,[13,14] or lavage using mucolytic agents like N-acetylcysteine during percutaneous cholangiography.[15] Less invasive options such as parenterally administered cholecystokinin[16] or cholecystectomy[1] have also been explored.

Conservative management was initially chosen for our patient, as most cases of IBS resolve spontaneously.[3] Moreover, early surgical intervention in neonates carries inherent risks. However, progressive worsening of cholestasis despite medical treatment ultimately necessitated surgical intervention. In our patient, laparoscopic cholangiography with therapeutic saline lavage proved effective in relieving the obstruction caused by biliary sludge. The diagnosis of biliary atresia must be considered in any infant presenting with cholestasis and completely discolored stools, as seen in our patient. In fact, Isa et al. reported that the majority (86.4%) of infants with biliary atresia exhibited clay-colored stools, highlighting its diagnostic significance.[17] While the immediate postoperative period was complicated by cholangitis, it was managed successfully with antibiotics. Ultimately, the patient experienced a favorable outcome, with normalization of liver function and resolution of symptoms within six weeks.

This case underscores the importance of recognizing IBS as a potential cause of cholestasis in infants, particularly in those with predisposing conditions like hemolytic disease. It also highlights the utility of laparoscopic cholangiography and therapeutic lavage as an effective and minimally invasive treatment option for severe IBS, offering a balance between diagnostic accuracy and therapeutic efficacy.

Conclusion

Our paper describes a case of IBS as a cause of cholestatic jaundice in infants, particularly in the context of hemolytic disease. This condition, although often benign, can rarely present as a severe case mimicking biliary atresia. Early recognition and follow-up of IBS are crucial for timely therapeutic intervention, to prevent complications and progression to liver damage. Laparoscopic cholangiography combined with therapeutic saline lavage proved to be a safe, effective, and minimally invasive approach for relieving biliary obstruction in this patient.

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