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Case Report

# Living Liver Donor with Gallbladder Agenesis

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**Abstract**

Gallbladder agenesis (GA) is a rare congenital condition with a reported incidence of 10–65 per 100,000 (1), though its true prevalence is likely underestimated due to frequent asymptomatic presentation. Symptomatic individuals may experience manifestations related to associated biliary tract disorders. We report a case of a living liver donor with GA, with particular emphasis on intraoperative considerations and surgical awareness required during donor hepatectomy.

**Keywords:** Gallbladder agenesis, living liver donor, living donor liver transplantation

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Gallbladder agenesis (GA) is a rare congenital condition with a reported incidence of %0.01-0.02,[1] though its true prevalence is likely underestimated due to frequent asymptomatic presentation. Symptomatic individuals may experience manifestations related to associated biliary tract disorders.[2] We report a case of a living liver donor with GA, with particular emphasis on intraoperative considerations and surgical awareness required during donor hepatectomy.

## Case Report

The recipient of the living liver donor described in this report, a 38-year-old male patient presented with chronic liver disease. His Model for End-Stage Liver Disease (MELD) score was 15. He weighed 75 kg, with a body mass index (BMI) of 24.2 kg/m$^2$ and a body surface area (BSA) of 1.91 m$^2$. Dynamic computed tomography (CT) demonstrated a severely cirrhotic liver with moderate ascites. Following evaluation by a multidisciplinary liver transplantation committee, the patient was deemed an appropriate candidate for liver transplantation.

The donor was the patient's 25-year-old male nephew, he volunteered as a living liver donor candidate. His body weight was 73 kg, BMI 23.8 kg/m$^2$, and BSA 1.89 m$^2$. All laboratory investigations were within normal limits, and cardiopulmonary evaluation revealed no contraindications to living donation. On dynamic CT imaging, the gallbladder was not visualized, whereas both intrahepatic and extrahepatic bile ducts were present (Fig. 1). Volumetric analysis revealed a right lobe graft (segments V–VIII) volume of 750 cc, with a future liver remnant of 35%. Two segment VIII hepatic veins and two segment V hepatic veins were identified draining the right lobe. Hepatic arterial and portal venous anatomies were normal. Given the radiological findings consistent with GA, the donor evaluation and living donor liver transplantation were planned with specific consideration of this anatomical anomaly (Fig. 2).

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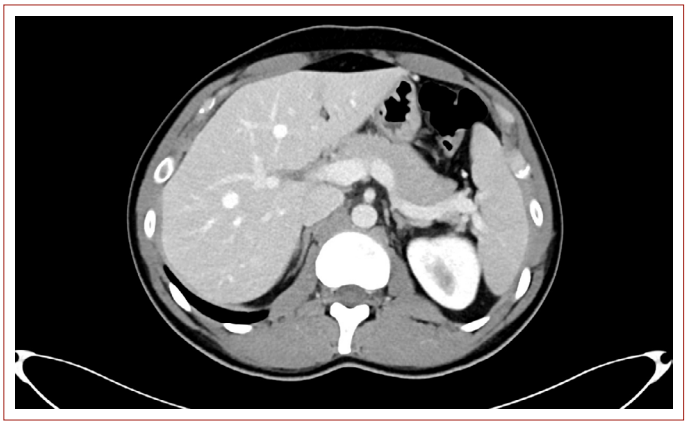

**Figure 1.** CT image of the donor with no gallbladder.

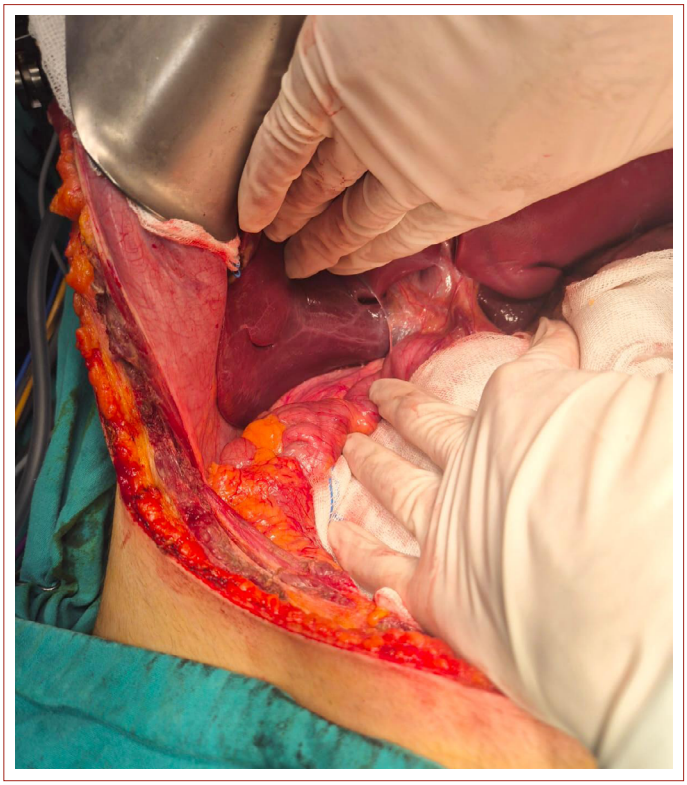

**Figure 2.** Operative appearance of the liver with gallbladder agenesis.

During donor surgery, GA was confirmed intraoperatively. Despite thorough exploration of all potential ectopic locations (intrahepatic, positioned on the left side, beneath the posteroinferior surface of the liver, between the omentum leaves, within the falciform ligament, retrohepatic, retroperitoneal, or in the retroduodenal and retropancreatic areas) no ectopic gallbladder was identified intraoperatively.[3] The hepatic parenchyma appeared macroscopically normal. Intraoperative histopathological examination (frozen section) of the liver parenchyma was consistent with <10% hepatic steatosis. Because standard intraoperative cholangiography (IOC) via the cystic duct was not feasible, cholangiography was performed by injecting contrast through an insulin needle introduced into the distal common bile duct. The cholangiography demonstrated three distinct bile ducts draining the right hepatic lobe, while the intrahepatic biliary anatomy of the entire liver was otherwise normal (Fig. 3). A right lobe donor hepatectomy was performed using Cavitron Ultrasonic Surgical Aspirator The three bile duct stumps of the right lobe graft were individually closed using 6-0 Prolene sutures. In addition, the puncture site used for IOC was closed with 7-0 Prolene sutures. A routine post-hepatectomy IOC was performed and normal (Fig. 4).

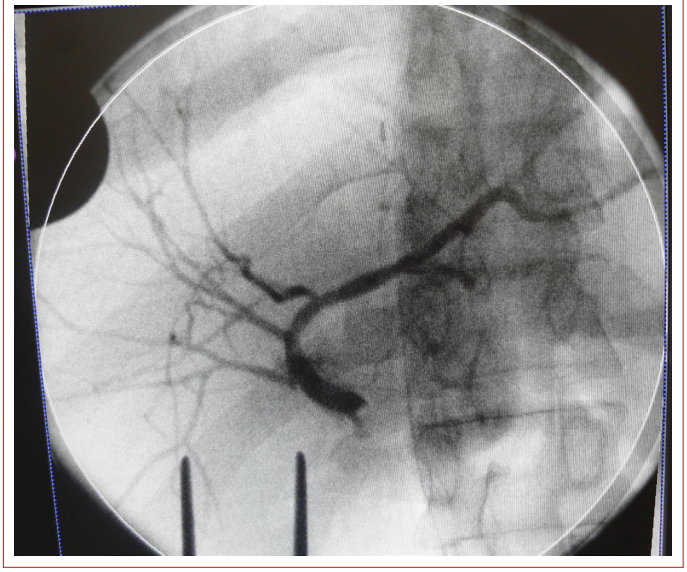

**Figure 3.** Intraoperative cholangiography in the beginning of the operation.

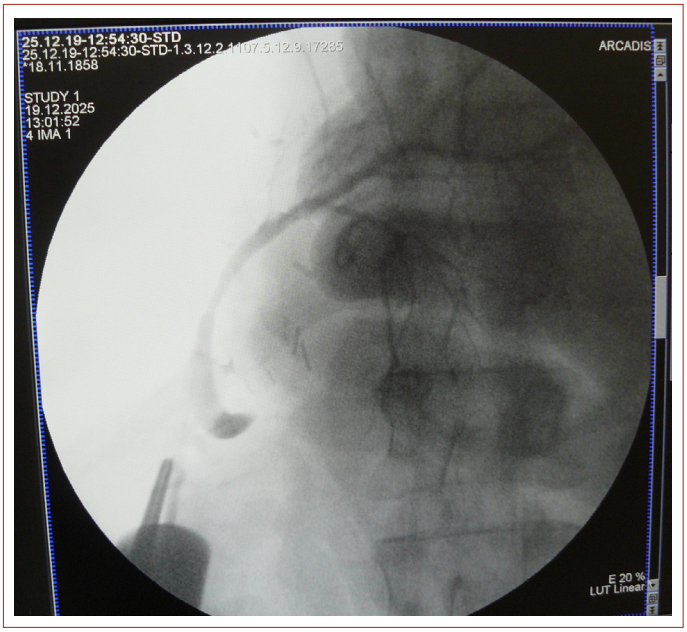


**Figure 4.** Completion cholangiography after the hepatectomy.

A right lobe living donor liver transplantation was performed. Two segment VIII hepatic veins, 1 segment V hepatic vein, and 1 right hepatic inferior vein were reconstructed. Other anastomoses were normal. Three bile ducts were anastomosed in duct-to-duct fashion, separately. One biliary anastomosis had a feeding catheter.

On postoperative day 2, the patient developed clinical signs of peritonitis, including severe abdominal pain, accompanied by elevated inflammatory markers and increased serum bilirubin levels. An emergency relaparotomy was therefore performed. Intraoperatively, a localized bile collection was identified, predominantly within the operative field. Minimal bile leakage was observed from the previously closed bile duct stumps as well as from the puncture site on the common bile duct used for IOC. All repair sites were carefully re-evaluated, and additional reinforcing sutures were placed. A choledochotomy was performed on the distal common bile duct, and a 6-Fr feeding catheter was advanced into the intrahepatic bile ducts. Cholangiography performed through the catheter demonstrated normal intrahepatic biliary anatomy, with no evidence of obstruction or leakage (Fig. 5). Leak testing using a lipid solution was negative.

The patient's subsequent postoperative course was uneventful.

## Discussion

GA is defined by the complete absence of the gallbladder in the presence of normally developed intrahepatic and extrahepatic bile ducts, a key feature that distinguishes it from biliary atresia. In some patients, dilatation of the proximal common bile duct with a normal-caliber distal segment may be observed. This finding is thought to result from biliary stasis within the common hepatic duct, which often becomes dilated and may function as a compensatory bile reservoir in the absence of the gallbladder.[4]

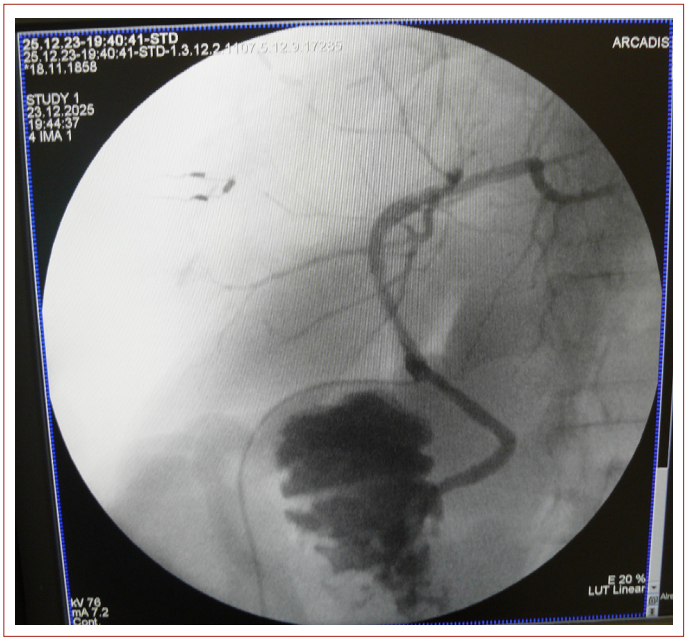


**Figure 5.** Intraoperative colangiography via feeding catheter in relaparotomy.

It is important to emphasize that IOC remains the gold standard diagnostic modality for confirming GA, particularly in cases where preoperative imaging is inconclusive. If GA is encountered intraoperatively, a systematic and meticulous exploration should be undertaken to exclude the presence of an ectopic gallbladder. This exploration should include careful inspection of the falciform ligament, the region between the leaves of the lesser omentum, the posterior surface of the duodenum, the retropancreatic region, and the retroperitoneum. In addition, IOC should be performed to definitively exclude the presence of an intrahepatic or ectopically located gallbladder and to accurately delineate the biliary anatomy.[5,6]

In this case, GA was suspected on preoperative CT imaging, and taking into account the extensive experience of our institute in living donor liver transplantation, the donor operation was considered feasible. Intraoperatively, GA was confirmed, and IOC demonstrated normal intrahepatic biliary anatomy, with no evidence of an ectopic gallbladder.

A routine completion cholangiography was performed in the same manner via the distal common bile duct that had been previously punctured with an insulin needle. However, three bile duct stumps and the additional puncture site of the bile duct were closed following hepatectomy and the risk of bile leakage from these sites was considered high, as biliary dyskinesia has been reported in the literature in association with GA.[6] This underlying functional abnormality may contribute to increased intraductal pressure and impaired bile flow dynamics, thereby predisposing to bile leakage from biliary suture lines and puncture sites. Based on the postoperative course observed in this case, we believe that whenever IOC is performed via the distal common bile duct in donors with GA, a biliary catheter should be placed into the biliary tree to allow completion cholangiography. Because biliary dyskinesia secondary to sphincter of Oddi dysfunction has been described in these cases. Although postoperative ERCP and sphincterotomy can be performed to address this issue, placement of an intraoperative biliary catheter provides a more immediate solution. Such temporary biliary drainage may reduce intraductal pressure in the postoperative period and thereby decrease the risk of bile leakage.[5,6]

## Conclusion

Living liver donation in the setting of GA may be considered in highly experienced centers, provided that all other donor evaluation parameters are normal.[7] We believe that preoperative magnetic resonance imaging, particularly MR cholangiography, is essential to exclude an ectopic gallbladder and to delineate intrahepatic biliary anatomy in detail before proceeding with donor hepatectomy in these rare cases. Although preoperative MR imaging was not performed in our patient, a diagnosis of gallbladder agenesis had already been established on CT. Therefore, additional MR imaging was not obtained. IOC is important for visualizing the intrahepatic biliary anatomy and detecting an ectopic gallbladder and should be performed at both the beginning and the end of donor hepatectomy, and a biliary catheter should be placed into the biliary tree to reduce intraductal pressure and to facilitate postoperative cholangiographic imaging.

### Disclosures

**Informed Consent:** Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

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**Conflict of Interest:** None declared.

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