

Appendix 1 The detailed surgical procedure for LR

The patient was administered intravenous and inhaled anesthesia and positioned supine with legs apart, head elevated, and feet lowered (Figure S1). Laparoscopy was performed using the “five-hole method”, and the trocars were positioned as shown in image (Figure S2). Pneumoperitoneum was established with a pressure of 12 mmHg. Laparoscopic radical surgery and open radical surgery followed the same surgical guidelines and procedures. During the operation, routine laparoscopy and ultrasound examination were performed to determine the location and size of the tumor in the hepatic portal, the depth and extent of bile duct infiltration, and the presence of peritoneal or liver metastasis. If peritoneal or reserved liver segment metastasis was observed, termination of the surgery was considered. The feasibility and scope of radical resection under laparoscopy were initially evaluated. The surgery routinely involved regional lymph node dissection, which included clearance of all lymph nodes in the hepatoduodenal ligament (groups 12h, 12b, 12e, 12p, 12a), lymph nodes around the common hepatic artery (groups 8a, 8p), and lymph nodes posterior to the head of the pancreas (group 13a). The common bile duct was transected horizontally above the head of the pancreas (Figure S3), and the tissue of the lower cut margin was sent for frozen section pathological examination. The hepatic artery, portal vein and their branches were completely preserved and dissected (Figures S4,S5) to achieve skeletonization of the hepatoduodenal ligament vessels and free dissection of the portal hepatis. If portal vein or hepatic artery invasion was found during surgery, vascular resection and reconstruction surgery were performed jointly during the operation (Figures S6,S7). After transection of the preserved branch of the hepatic duct, the tissue of the upper cut margin was sent for frozen section pathological examination. In cases of Bismuth type I disease, dumbbell-form liver resection was routinely performed. In cases of type II disease, mesohepatectomy combined with resection of the whole caudate lobe was performed. In cases of type III disease, left or right hemihepatectomy combined with caudate lobe resection was usually performed (Figures S8,S9), while in cases of type IV disease, extended left or right liver resection combined with whole caudate lobectomy was performed. Finally, ductoplasty of bile ducts and biliary-enteric anastomosis were performed. Ductoplasty of intrahepatic bile ducts was first performed to facilitate anastomosis (Figure S10). Intrahepatic cholangiojejunostomy was performed using end-to-side anastomosis between the segmental ducts and a Roux-en-Y jejunal loop without any stent (Figure S11).

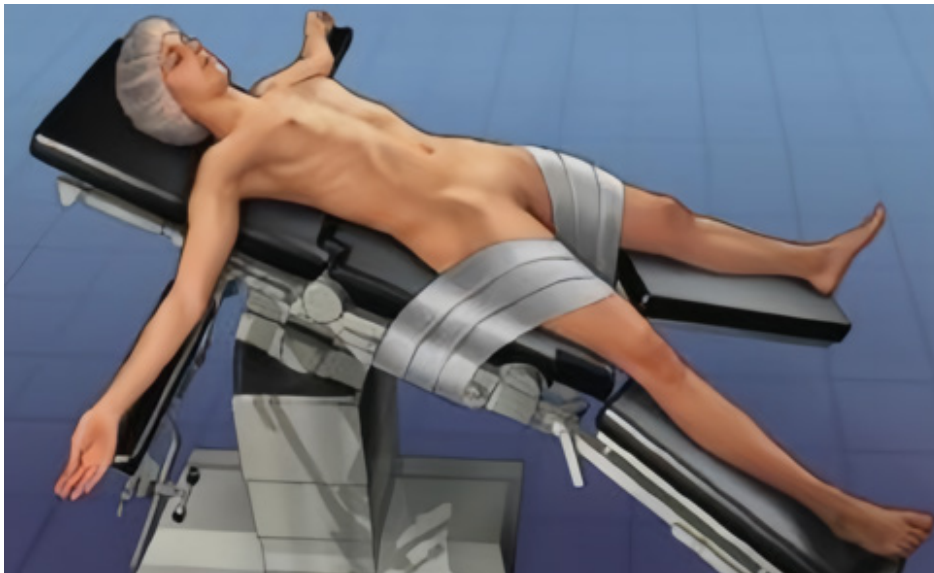


Figure S1 Surgical positioning for the procedure.

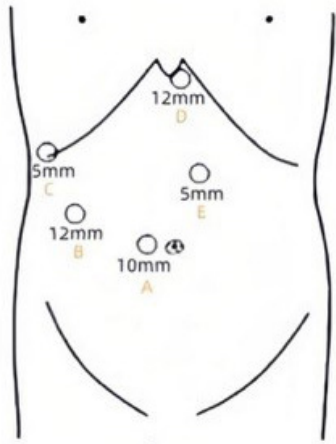


Figure S2 The standard five-port laparoscopic technique.

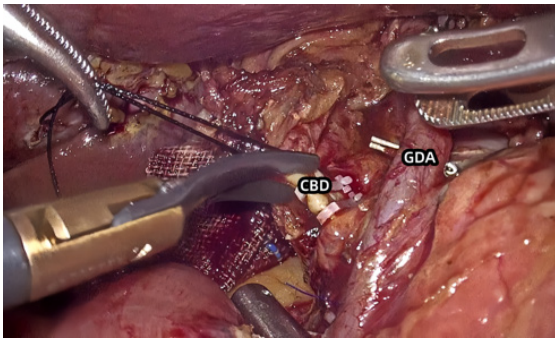


Figure S3 Excision of the lower common bile duct.

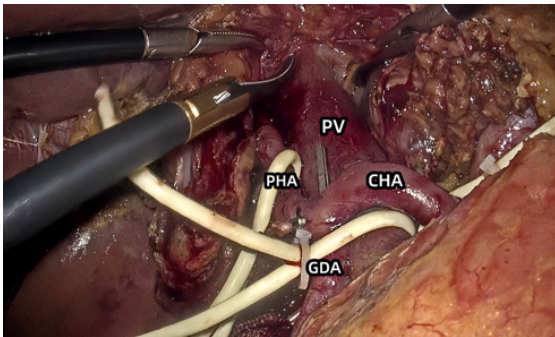


Figure S4 Selective dissection of the hepatoduodenal ligament.

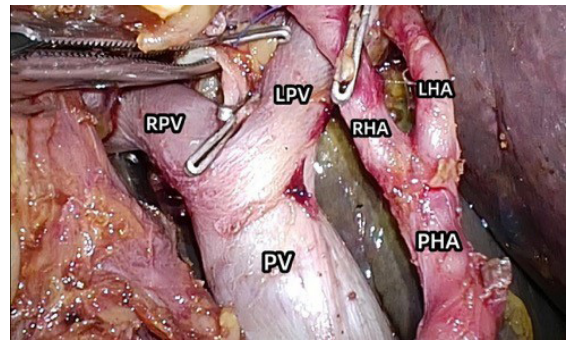


Figure S5 Extended dissection of the hepatoduodenal ligament.

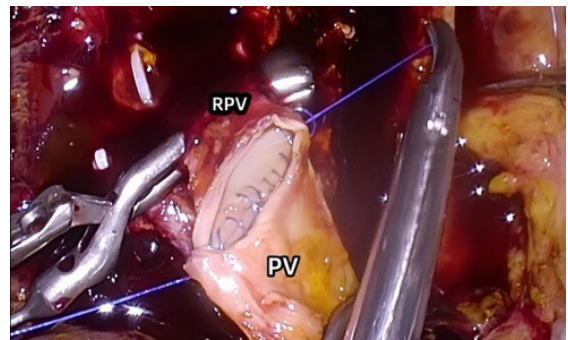


Figure S6 Resection and anastomosis of the hepatic portal vein.



Figure S7 Advanced techniques in hepatic portal vein resection and reconstruction.

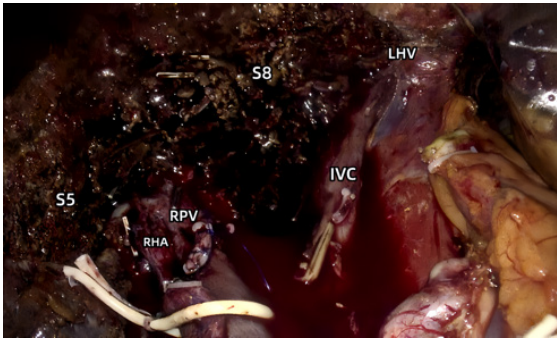


Figure S8 Left hemihepatectomy: surgical technique.

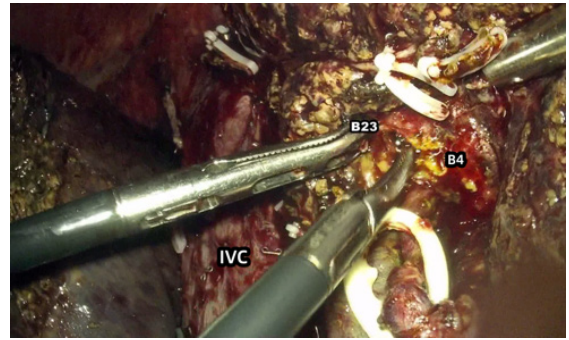


Figure S10 Biliary tract reconstruction: hepatic duct plasty.

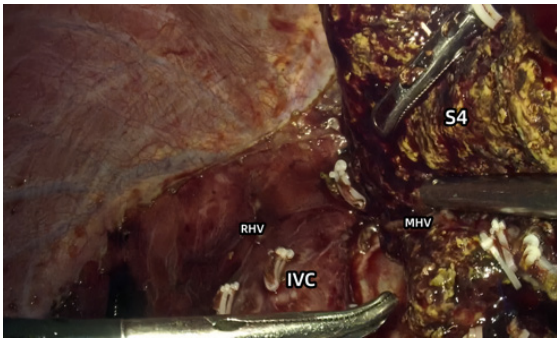


Figure S9 Right hemihepatectomy: surgical approach.

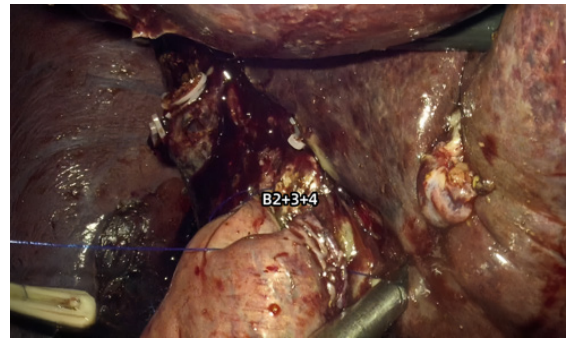
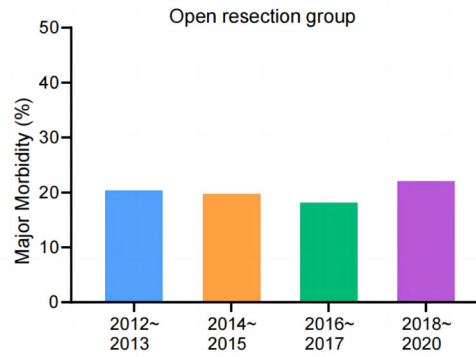
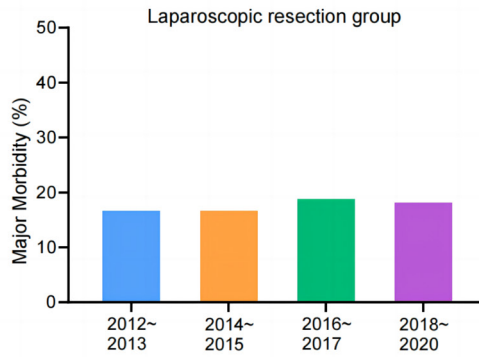


Figure S11 Hepatico-jejunostomy: establishing biliary continuity.



	2012.01~2013.12	2014.01~2015.12	2016.01~2017.12	2018.01~2020.01
Laparoscopic resection group	16.7% (1/6)	16.7% (2/12)	18.8% (3/16)	18.2% (2/11)
Open resection group	20.4% (11/54)	19.7% (13/66)	18.2% (10/55)	22.1% (15/68)

Figure S12 Trends in major morbidity over the years.