Procedures	An operator	1st assistant
Preparation	Identify the variant anatomy of the hepatic veins (HV), portal vein (PV), hepatic artery (HA), and biliary tract using preoperative imaging studies.	
Position	Position the patient in a supine position with legs apart. Ensure proper padding to prevent pressure injuries and secure the patient to the operating table. Adjust the table to a	
Ports placement	Make a trans- or peri-umbilical incision and insert a 12mm trocar for the camera. Insert 2 trocars for the operator: 1. 5mm or 12mm trocar in the righ side of the epigastrium 2. 5mm or 12 mm trocar in the right midlclavicular line below the rib cage.	Insert two trocars for the first assistant: 1. A 5 mm trocar in the subxiphoid area. 2. A 5mm or 12 mm trocar in the right upper quadrant.
Preparing	Identify the liver, and divide the round ligament and the falciform ligament.	Hold the round ligament down while dissecting the falciform ligament.
Liver mobilization	Mobilize the right liver lobe by carefully dissecting the right coronary and triangular ligaments to free the liver from the diaphragm. Use the energy device or electrocautery alternately with your right and left hands.	Hold the round ligament or gallbladder with the right instrument, transect to the left, and support the liver's lower surface with the left instrument. You can hold the gauze with forceps and use it as a cushion, or you can perform traction with a snake retractor or flexible retractor.
Preparing for the Hanging Maneuver	Create a tunnel between the liver and IVC by ligating short hepatic veins or insignificant RIHV using an energy device or the conventional tie and cut method. Blunt dissection using the flexible tip of the instrument might be needed when making a tunnel between RHV and MHV. Place a rubber tube or silastic band in the tunnel for the Hanging maneuver	Right instrument: hold the round ligament and push cranially. Left instrument: lift up the caudate lobe and displace the hepatoduodenal ligament to the side.
Hilar Exposure & Partial Cholecystectomy	Isolate the cystic duct and cystic artery. Hold the gallbladder's infundibulum and apply traction laterally to show the view of safety. Isolate the cystic duct and the cystic artery, then ligate the cystic duct, leaving the long remnant cystic duct for traction. Isolate the cystic artery and resect it.	Grab the gallbladder fundus and retract it cranially to expose Calot's triangle. Expose the hilum by lifting the liver or retracting the round ligament in a cranial direction.
Hilar Dissection (Individual Approach)	Isolate the Right PV and Right HA with blunt dissection, encircling each vessel with blue and red vessel loops. The caudate branch of PV should be separated and ligated	Lift the liver cranially by grasping the round ligament or by lifting it cranially with the gauzecushioned tip of the instrument.
ICG injection & resection line demacartion	After temporarily clamping the HA & PV, administer ICG (0.02mg/kg) intravenously. Perform the complete cholecystectomy, then mark the resection line along the boundary of the fluorescence area on the surface and the Gallbladder fossa.	Suction to keep the field clear and provide counter-traction as needed.
Preparing for Parenchymal Dissection	No traction is needed, or make traction sutures on both sides of the resection line at the liver edge. Rubber traction might be applied. Rubber bands can be used for traction in the direction of the two active ports for the operator.	Place the rubber band inside. Retract the rubber band outside through a small puncture near both laterally located trocars after securing it with traction sutures
Parenchymal Dissection	Perform a superficial dissection down to 1-2 cm using an energy device. For deep parenchymal dissection, use CUSA or an energy device with a suction instrument in the other hand.	Suction debris and blood, maintaining a clear surgical field. Expose the resection plane by retracting the left liver to the left.
Finding MHV	During the parenchymal dissection, find a branch of the hepatic vein, and follow it cranially to meet the MHV main trunk. Then follow the right side of the MHV during parenchymal dissection. Isolate the V5 branch and ligate it with a plastic clamp for declamping at the bench surgery. Isolate the V8 branch and resect it after clamping with a plastic clip.	Retract the left liver to the left to expose the resection plane. Suction debris and blood to maintain a clear surgical field.
Bile duct division under ICG Fluorescence	Trace up the Common BD and perform soft tissue dissection around the Right BD under the ICG fluorescence images. Identify the RBD, isolate it, clip the remnant side of the BD, and divide the Right BD. Resect the remnant Hilar plate with tight ligation on both sides.	Exposure the hilar area.
Transection of Paracaval Portion of the Caudate Lobe under the Hanging Maneuver	Transect the caudate lobe. Place a rubber tube between the remnant liver parenchyma and the Hilar plate. Perform parenchymal dissection under the Hanging maneuver or by lifting the parenchyma with a laparoscopic instrument.	Retract the remnant cystic duct to expose the hilum. When transecting the caudate lobe, retract the vessel loop for HA and PV upwards to expose the resection plane.
RHV isolation	Separate the right liver from the IVC by ligating short hepatic veins. Isolate the RHV and/or encircle the RHV with a string.	
Placing the Vinyl Bag	Place the right liver into a vinyl bag.	Grab the gallbladder and place it into a vinyl bag.
Skin Incision and Fascia Division	Make a 10-12cm length Pfannenstiel incision. Open the fascia transversely without splitting the muscle. Create a space between the muscle and fascia. Divide the midline and preserve the peritoneal layer.	
Vessle division	Clear the soft tissue around the Right HA and ligate it with a plastic clip and a metal clip, then resect it. Grasp the portal vein with forceps just to the right of the bifurcation level of PV. Place the staple and perform stapling. Lift up the encircling sling or string around the Right HV, place the staple, then resect it after stapling. Resect the IVC ligament with a staple or by ligating vessels.	Assist in the extraction of the graft, ensuring to maintain a sterile field and prevent contamination.
IVC ligament resection	Resect the IVC ligament with a staple or ligating vessels.	
Graft Retrieval	Open the peritoneum at the Pfannenstiel incision site	Make a large orifice to extract the liver graft.
Finalizing the procedure	Irrigate, achieve hemostasis, and anchor the liver to the abdominal wall or remnant falciform ligament. Place the drainage tube in the subphrenic area and the tip of the tube in the foramen of Winslow.	Assist in checking for hemostasis and bile leaks, providing suction and exposure as needed. Assist in suturing and closing the incisions, ensuring a clear and dry surgical field.
Skin closure	Apply knot-bearing sutures for the living donors	