

M. Davenport

Liver Anatomy

The segmental nature of the liver is not immediately obvious from the surface; indeed what looks like a large right lobe and smaller left lobe, defined by the falciform ligament, is somewhat misleading. Knowledge of the various divisions is the basis for liver resection. The key division is between right and left and the principle plane (of Cantlie) extends from gallbladder bed to a point slightly to the left of the hepatic vein confluence.

Table 1 lists the key facts for the segments thereafter.

Each half of the liver is supplied by right and left branches of the portal vein and hepatic artery (>90% from celiac axis). Aside from the caudate (which is drained by small veins directly into intrahepatic cava); venous drainage occurs via three veins (left, right and middle).

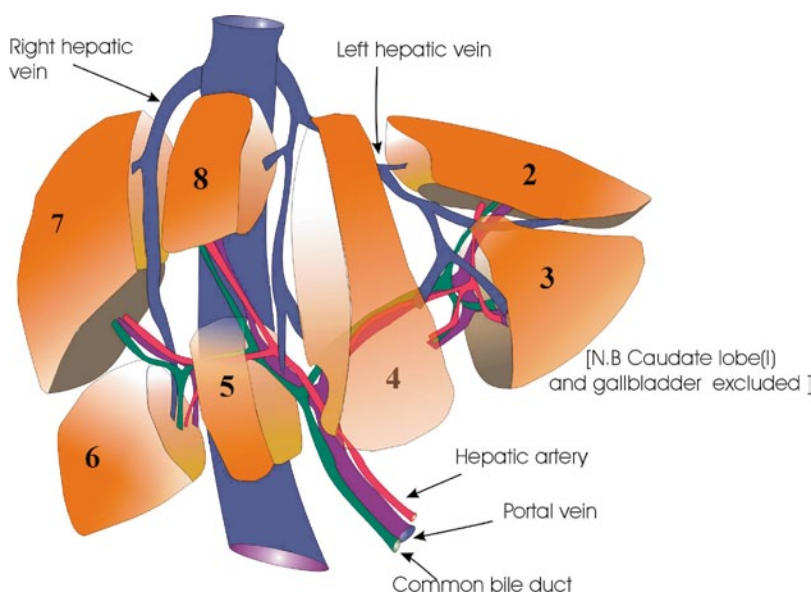


Fig. 1

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Table 1 Segmental anatomy of the liver

Segment		Resection			
	I	Caudate lobe	Rarely excised in isolation, but part may be taken typically with right hemihepatectomy.		
LEFT	II, III	Left lateral segment	Left hemihepatectomy	Left lateral segmentectomy	Extended left hepatectomy
	IV	Quadrate lobe		Extended right hepatectomy	
RIGHT	V, VI	Anterior section	Right hemihepatectomy		
	VII, VIII	Posterior section			–

Right Hemihepatectomy

- Incision
 - Muscle cutting transverse abdominal, “Mercedes-Benz” (in adolescents)
 - Wound/rib cage retraction – using the Thompson® retractor, for instance
- Liver mobilisation
 - Division of falciform, right and left triangular and coronary ligaments
 - Exposes the cava lying at the back
 - Exposure and separation of cava from liver
 - divide small veins from caudate
- Cholecystectomy
 - Diathermy haemostasis to bed
- Pringle Manoeuvre
 - Tape or sling around entire structures in free edge of lesser omentum. Allows inflow control to entire liver and can replace individual vascular ligation step
 - If so combine with *ischaemic preconditioning*. A short-period (5–10 min) technique of occlusion; reperfuse (15 min) before definitive parenchymal transection, under total inflow control
- Exposure of right vascular pedicle at liver hilum
 - Ligation/over-sew/transfix right hepatic artery and portal vein.
 - Avoid deliberate ligation of bile duct at this stage. Bile duct anatomy is very variable and damage to remaining left duct possible
- Exposure/control of right hepatic vein (can also be left to end of transection phase)
 - Parenchymal transection
 - With right inflow ligation, there will be a line of demarcation on surface.
 - Use diathermy to draw limits of resection
 - always bear in mind 3D anatomy and the presence of cava at back.
 - There are many devices designed either to identify network of small vessels within liver substance and allow diathermy haemostasis before division (e.g. Cavitation Ultrasonic Surgical Aspirator [CUSA®]) or to seal the network directly (e.g. LigaSure®).
 - Similarly use of the Argon beam plasma coagulator facilitates surface haemostasis. Last part to be detached should be right hepatic vein pedicle.
 - The right bile duct should have been separately ligated during transection but once dry check assiduously for small bile leaks. Seal with tissue glue (e.g. TISSEEL®, a human fibrin glue).
 - Ensure remnant liver is secured to abdominal wall to avoid kinking.
 - Drain.
 - Postoperatively, check coagulation tests especially the international normalized ratio (INR). This may necessitate fresh frozen plasma support if the INR value is >1.5), platelet count and haemoglobin. Elevation of liver enzymes is invariable for 2–3 days, but bilirubin levels should be within normal limits (Table 2).

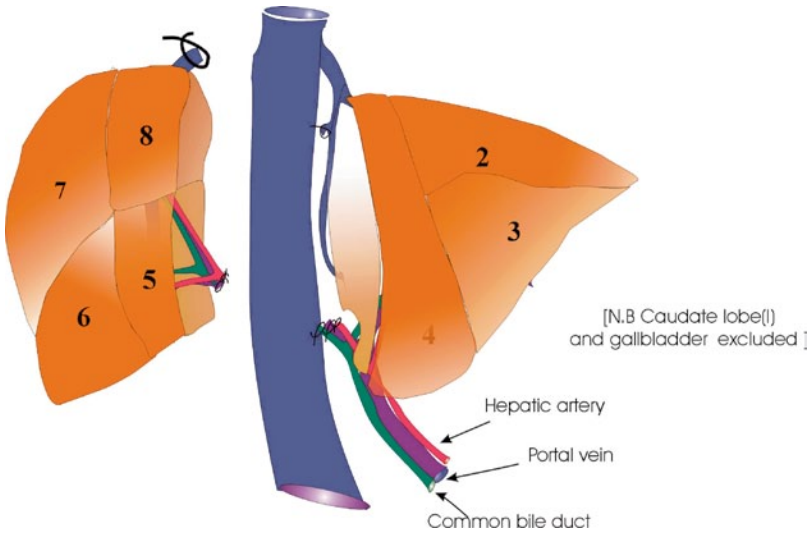


Fig. 2

Table 2 Complications after liver resection

Time scale	Problem	Laboratory
0–48 hrs	Small remnant	↑ Lactate ↑ Coagulopathy ↑ Acidosis
	Bleeding	↓ Haemoglobin ↓ PCV
2–14 days	Sepsis	↑ Bilirubin ↑ CRP ↑ WBC
5–14 days	Bile duct injury	↑ Bilirubin ↑ GGT
5–14 days	Bile leak	↑ Bilirubin → GGT