

SEGMENTAL ANATOMY OF THE LIVER; A PICTORIAL LITERATURE REVIEW

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Segmental Liver Anatomy

1. External and internal anatomy
2. Surgical approaches to the liver
3. Standardized segmental model
4. New concepts in segmental anatomy
5. Summary

Internal Liver Anatomy

- Individual vasculo–biliary segments
 - Each supplied by separate glissonian sheath
 - Portal vein
 - Hepatic artery
 - Biliary ducts
 - Lymph vessels
 - Separated by avascular planes or scissuras
- Interdigitation of vasculo–biliary sheaths and hepatic venous system

Surgical Approaches to the Liver

- **Hilar dissection**
 - Identify individual arterial, portal and biliary structures
- **Glissonian approach**
 - Requires detailed insight in portal branching pattern and corresponding segmental anatomy
- **Parenchyma dissection**
 - Along scissural planes, otherwise:
 - Profuse Bleeding
 - Necrosis non-perfused remaining parts
 - Bile leaks

Left hemi-liver

- **Left scissura**
 - between 2 and 3; variable in angulation in various studies
 - LHV located within left scissura
 - Seldom separate anatomic resection 2 or 3
- **Umbilical fissure contains vessels**
 - Umbilical part LPT
 - Art and portal branches to 2, 3 and 4
- **No consistent scissura between 4a and 4b**

Standardized Segmental Model

- Adequate for documentation lesions
- Adequate for planning most surgery
 - Hemi-hepatectomy, extended right, wedge resections
- Does not account for variability found in anatomic studies

Comments on Standardized Model

- Main scissura
- Right hemi-liver
 - Right scissura
 - Transverse scissura

Main scissura

- Line of Cantlie
 - Gallbladder fossa
 - IVC
- Division left and right hemi-liver
- Quite constant
 - 5% segmental branches from RPT to Segment 4

Main scissura

- In absence of right portal trunk (15–25%; trifurcation, early posterior trunk)
 - Main scissura left of Cantlie's line, and left of MHV
- Consequently:
 - MHV unreliable indicator main scissura
 - Pre-op underestimation hemi-right, overestimation hemi-left
 - Scissura to be assessed after selective clamping

Right hemi-liver; classic model

- Two sectors, supplied by RA and RP trunks
- Right scissura separating 5/8 from 6/7
 - In vertical plane of RHV
- Transverse scissura separating 5/6 from 7/8
 - In horizontal plane through right portal trunk

Right Scissura

Wu 2007: 90 CTAP

- 81% Part of segment 7 supplied by anterior trunk
- 62% Part of segment 5 supplied by posterior trunk

Right Scissura

- Always present
 - but variable in location
 - cranially more oblique than caudally
 - RHV poor indicator right scissura

Transverse scissura

- Area supplied by Right Anterior Trunk often not divided in superior (8) and inferior (5) segment, but in ventral and dorsal segment.
- Area supplied by Right Posterior Trunk often arch-like, giving of various branches.
- No consistent transverse scissura

Segmental Lesion localization

- 60 abd CT; 126 liver lesions
 - Bismuth/Couinaud quadrants
 - True portal segmentation
- 20/126 (16%) other segmental location
 - 14/20 right hemi-liver

Take home points 1

- Observe hilar anatomy and portal branching pattern
 - Hilar dissection
 - Glissonian approach
 - Deviation of main scissura when RPT absent
- Right hemi-liver
 - Right scissura usually oblique to RHV
 - Often three vertical sectors and two scissurae
 - Usually no transverse scissura

Take home points 2

- Anatomic resections within right hemiliver require individualized analysis of:
 - right portal branching pattern
 - right scissural locations
 - right segmental anatomy
 - segmental lesion localization