

Symposium SFP / Société Anatomique : Foie et voies biliaires

Anatomie chirurgicale du foie et des voies biliaires
Classification des hépatectomies

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Les grandes fonctions du foie

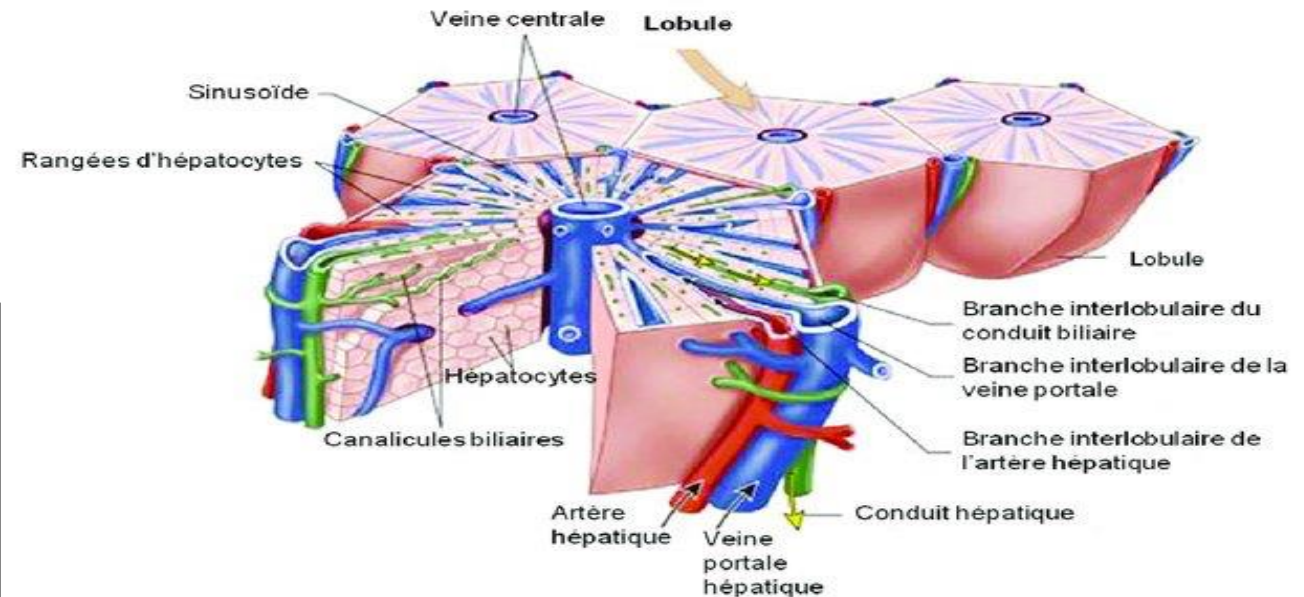
- Métabolisme des glucides et lipides
- Synthèse des protéines sanguines
- Détoxification
- Production de la bile

Lobule hépatique

1 artère + 1 veine porte

1 canal biliaire

1 veine hépatique



Généralités-rappels

- Organe le plus lourd de l'organisme: 1 à 2Kg
- Capsule de Glisson = enveloppe du foie
- Situation
 - Intra-abdominale, intra-péritonéale
 - Sous le grill costal
- Rapports
 - Diaphragme
 - Estomac, duodénum, colon transverse
 - Rein droit, glande surrénale droite
 - Veine cave inférieure
- Attaches pariétales
 - Ligament falciforme / ligament rond
 - Ligaments triangulaires droit et gauche



Anatomie du foie



```
graph TD; A[Anatomie du foie] --> B[Anatomie de surface]; A --> C[Anatomie fonctionnelle]; B --> D["Vision superficielle<br/>• Des lobes<br/>• Des ligaments<br/>• Des empruntes<br/>• Vésicule biliaire<br/>• Une cavité/hile"]; C --> E["Structure « interne »<br/>Unités fonctionnelles<br/>autonomes"];
```

Anatomie de surface

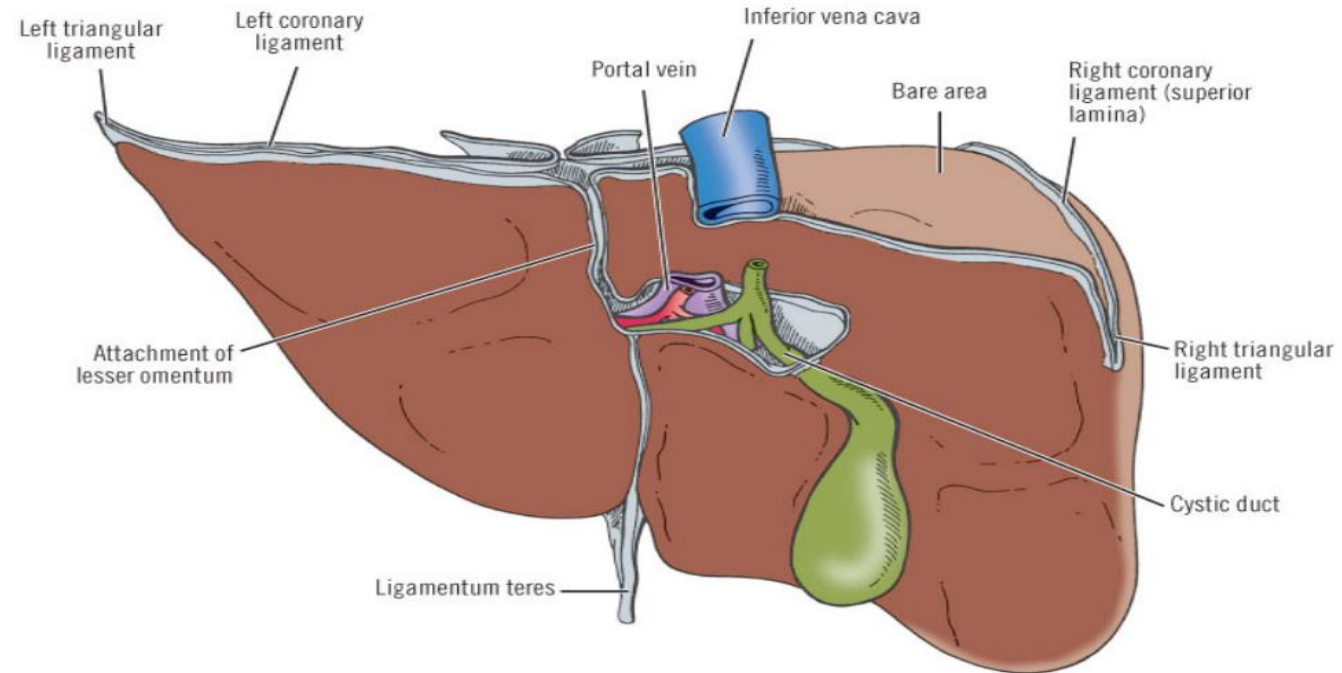
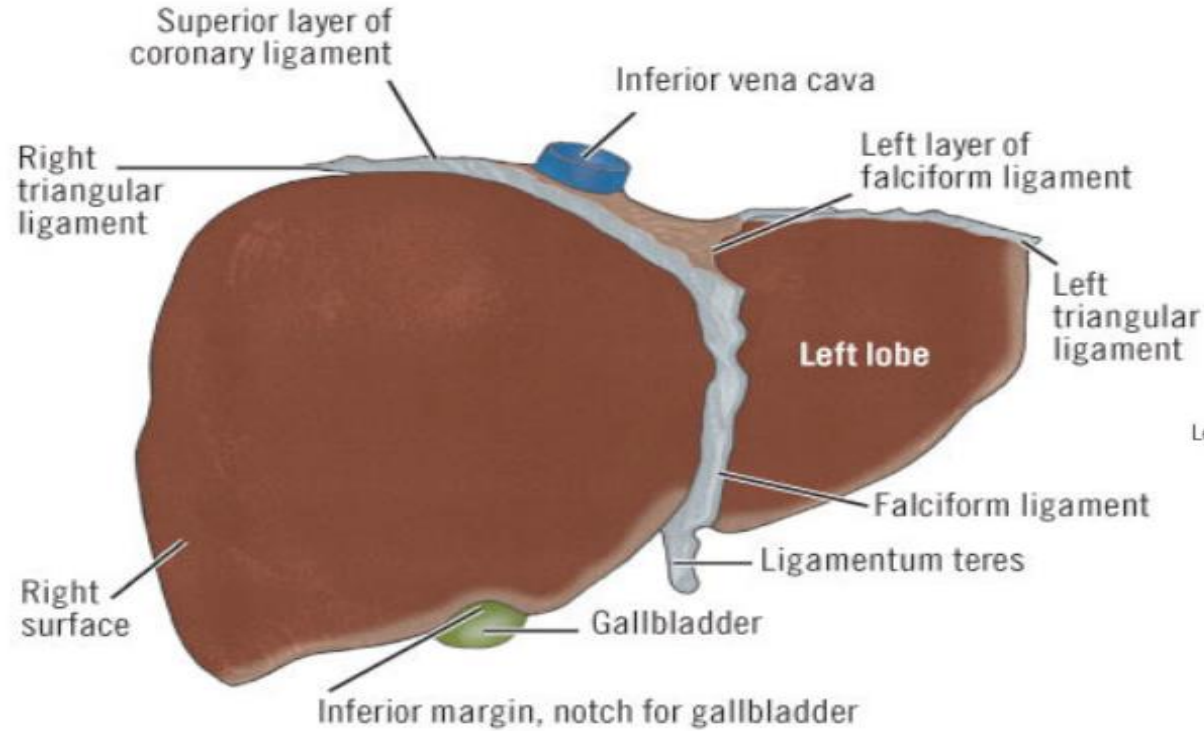
Vision superficielle

- Des lobes
- Des ligaments
- Des empruntes
- Vésicule biliaire
- Une cavité/hile

Anatomie fonctionnelle

Structure « interne »
Unités fonctionnelles
autonomes

Anatomie de surface



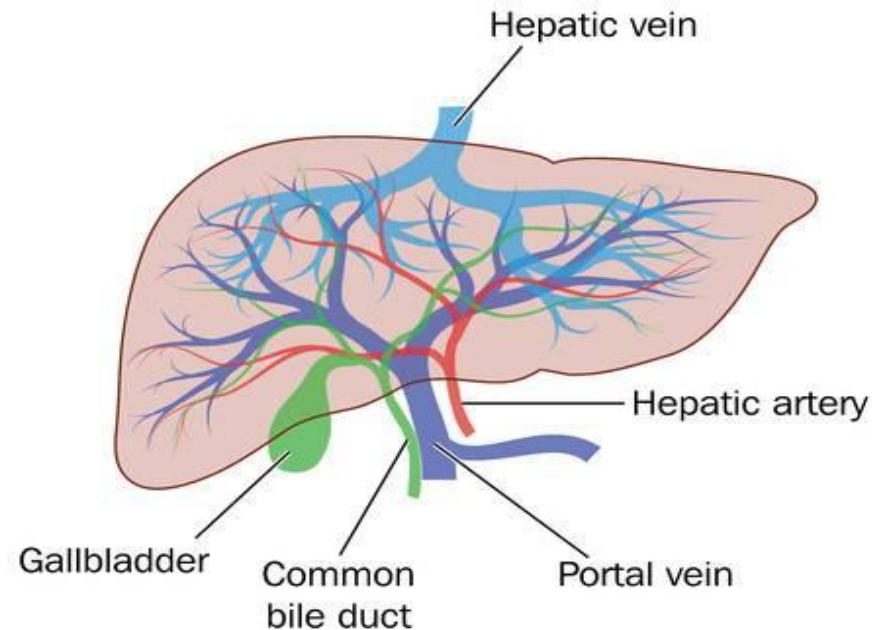
Vascularisation hépatique

« Inflow »
Apport vasculaire

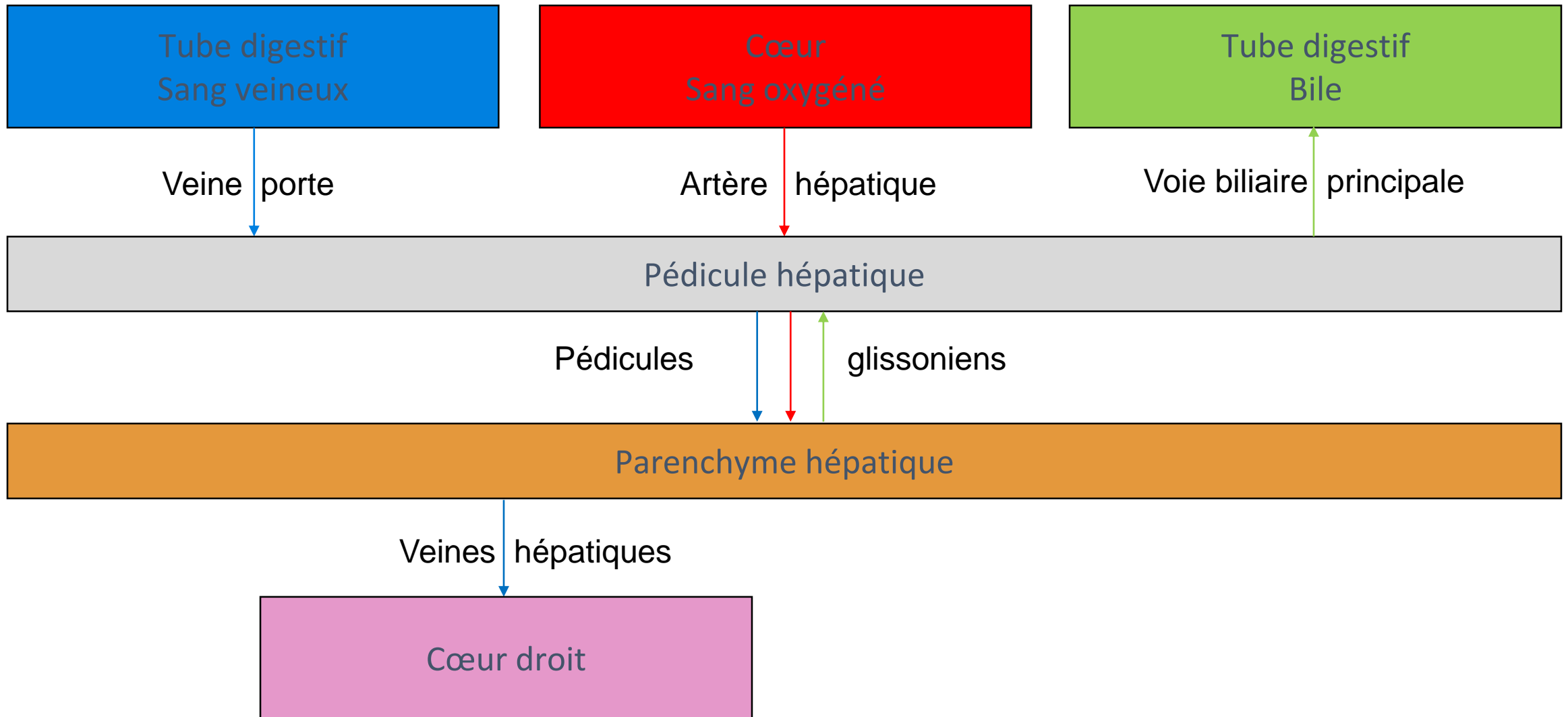
- Veine porte
- Artère hépatique

« Outflow »
Drainage

Veines hépatiques



Physiologie simplifiée

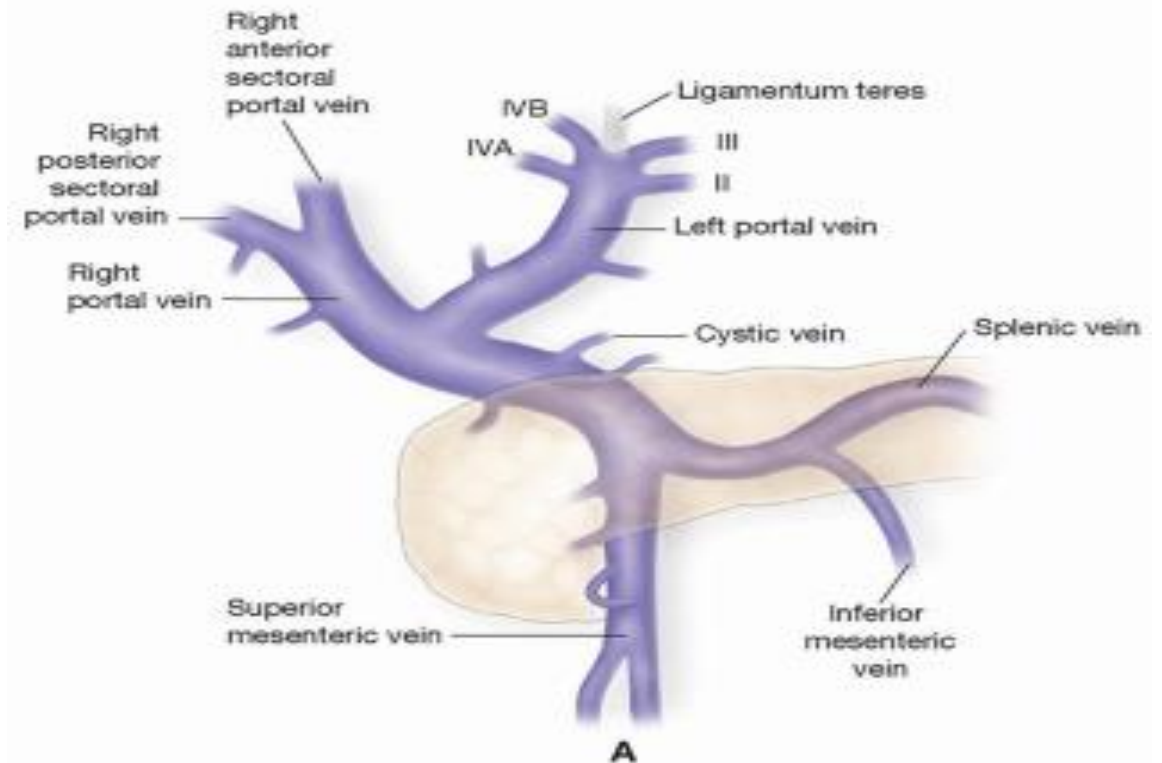


Veine porte

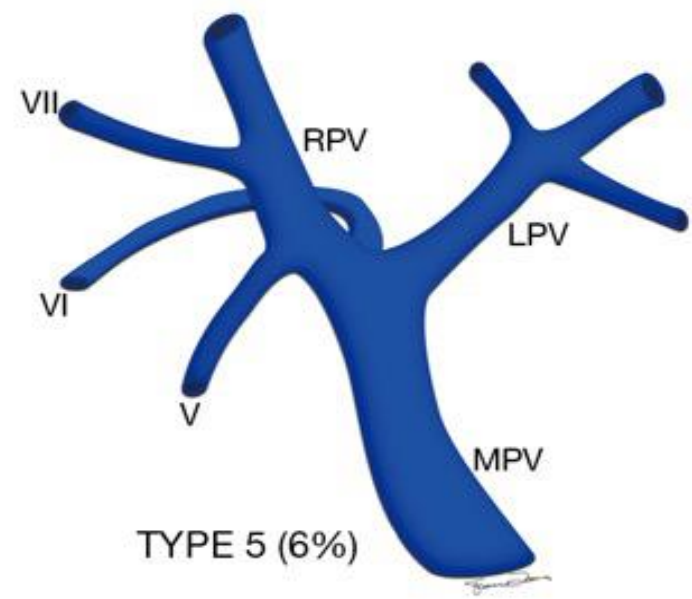
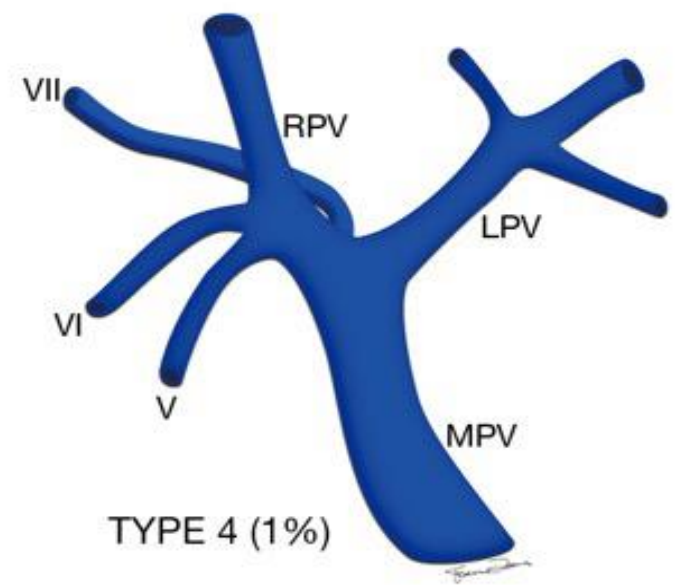
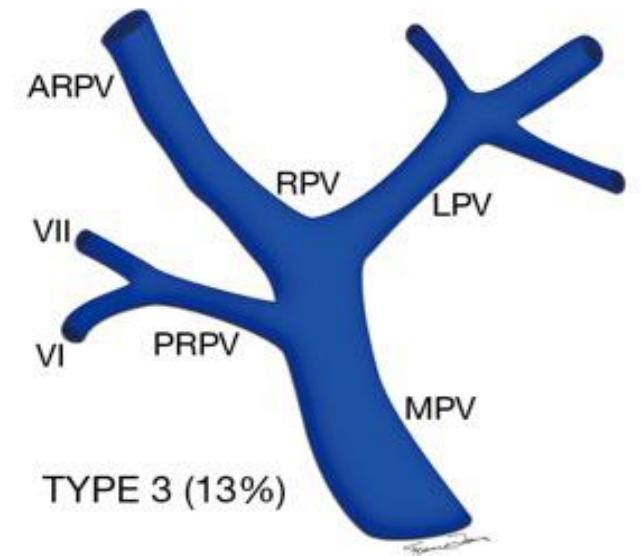
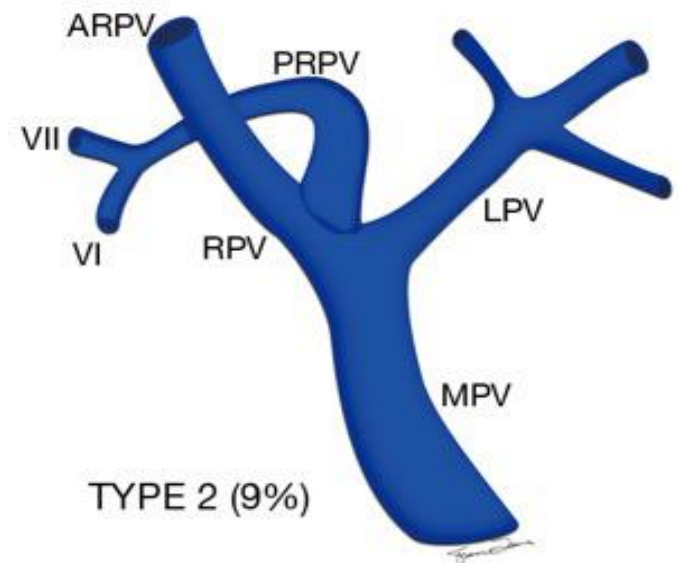
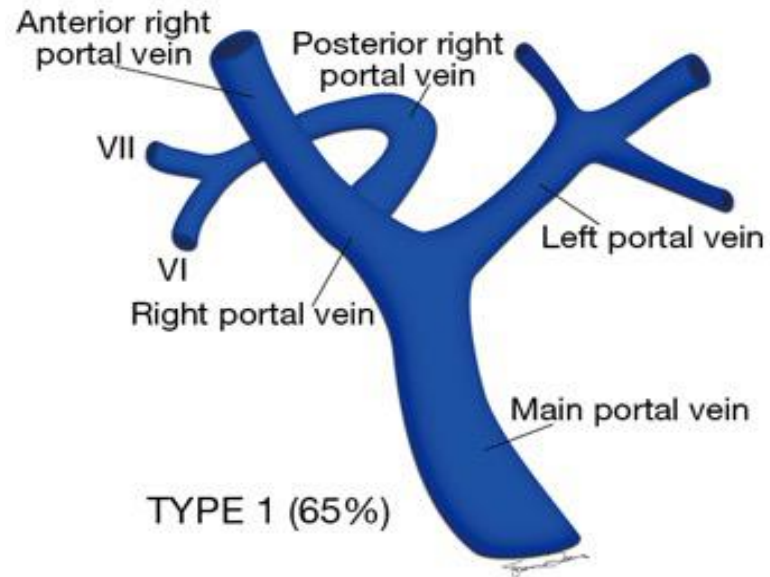
Sang veineux d'origine splanchnique

60-70% de l'apport vasculaire du foie

- Vascularisation hépatocytaire
- Sang riche en nutriments
- Détoxification



Principales variantes anatómicas

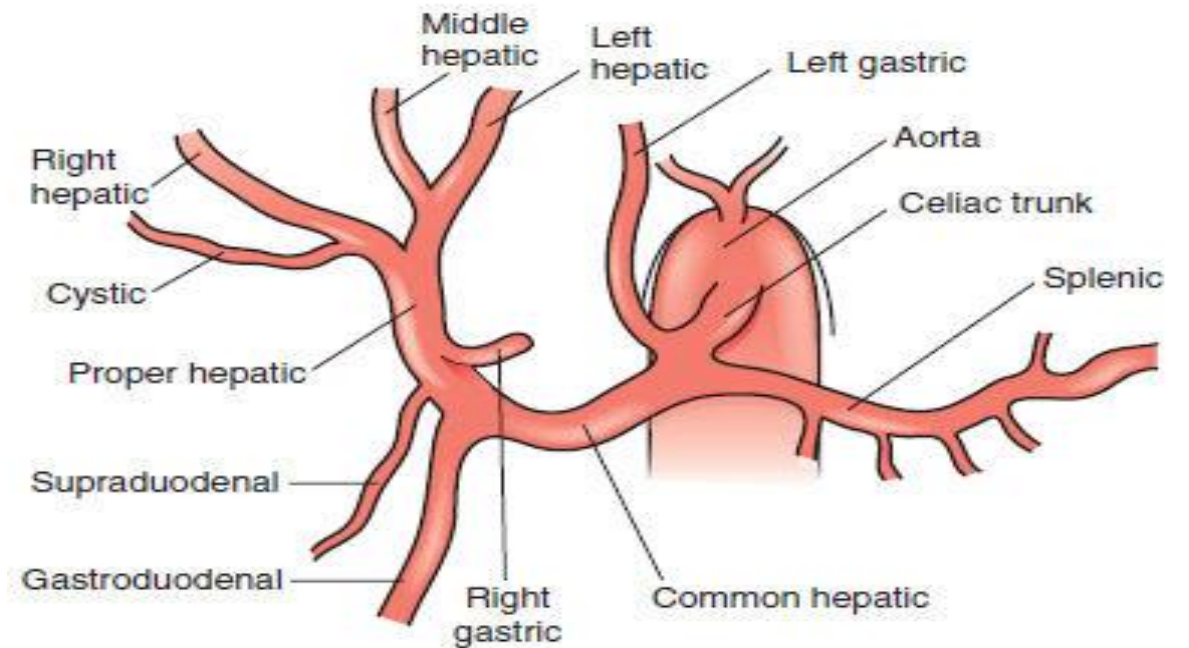


Artère hépatique

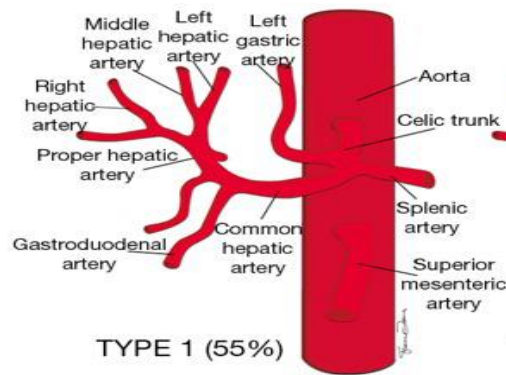
Sang artériel (oxygéné)

30-40% de l'apport vasculaire du foie

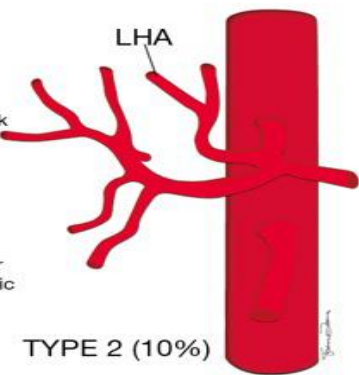
- Vascularisation biliaire
- +/- vascularisation hépatocytaire



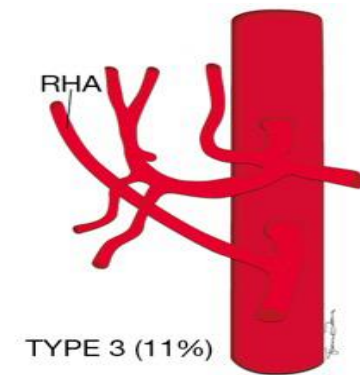
Principales variantes anatomiques



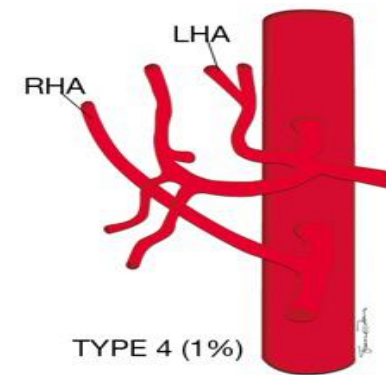
TYPE 1 (55%)



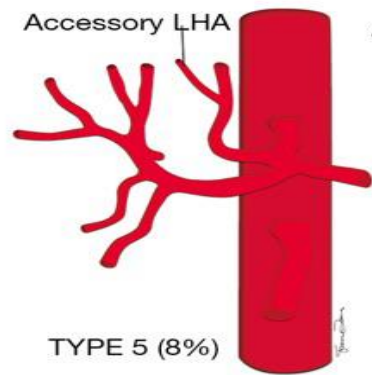
TYPE 2 (10%)



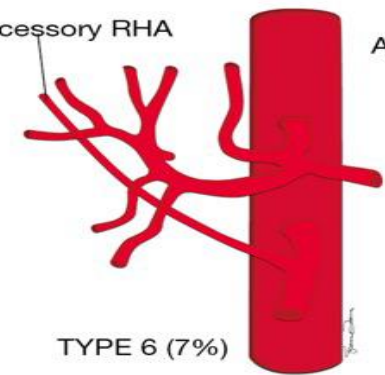
TYPE 3 (11%)



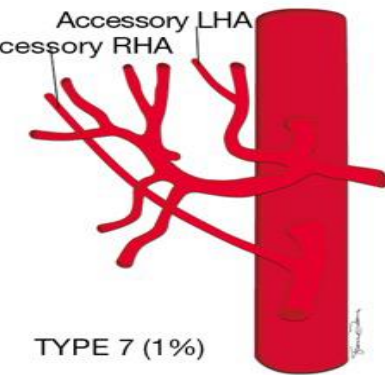
TYPE 4 (1%)



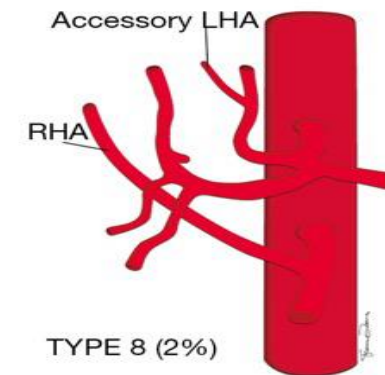
TYPE 5 (8%)



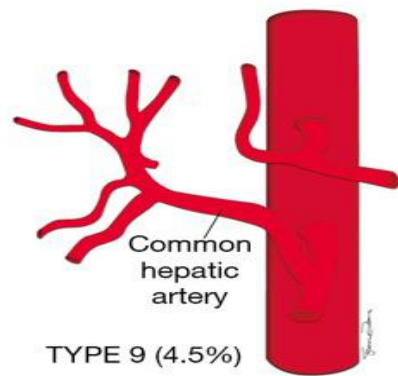
TYPE 6 (7%)



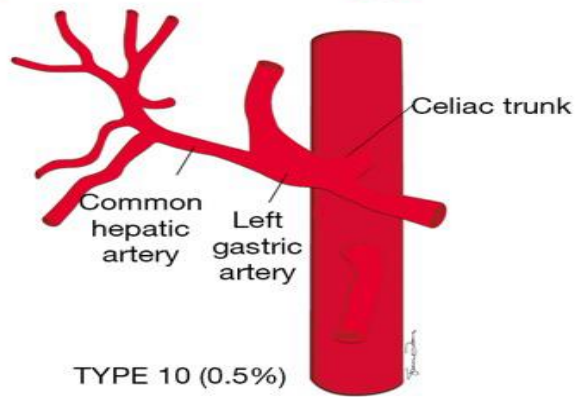
TYPE 7 (1%)



TYPE 8 (2%)



TYPE 9 (4.5%)



TYPE 10 (0.5%)

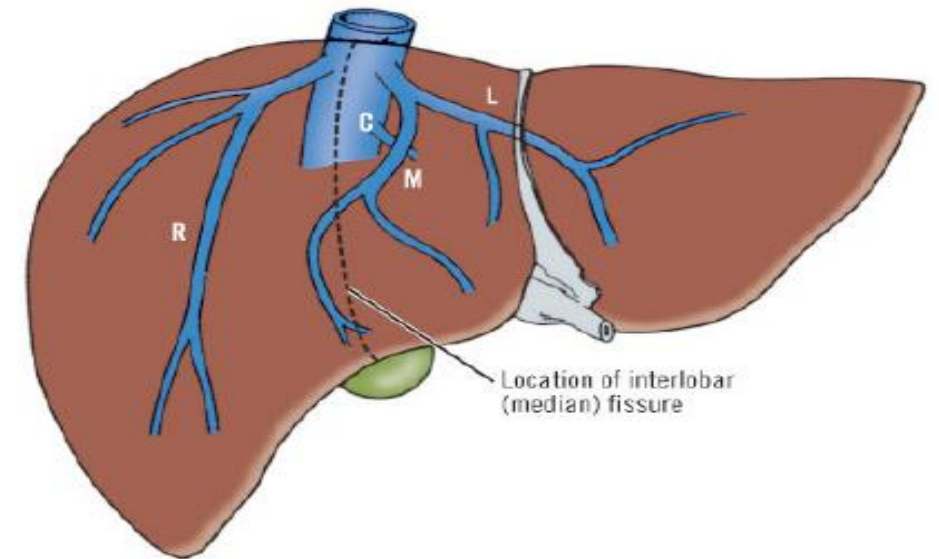
Veines hépatiques

Sang veineux

3 veines principales

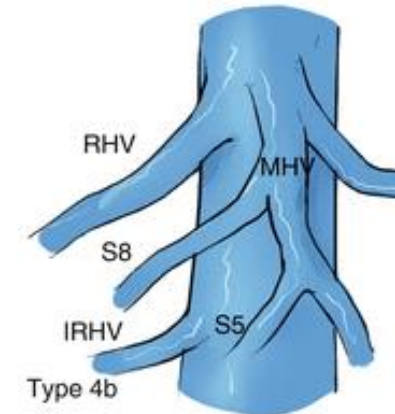
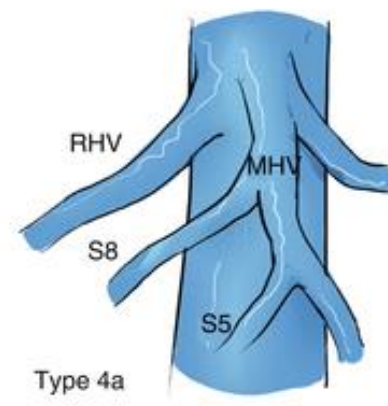
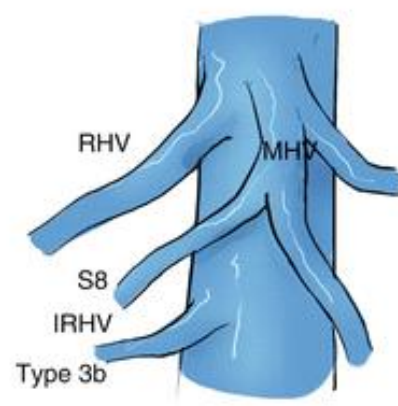
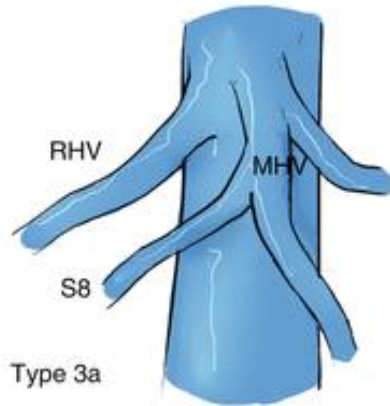
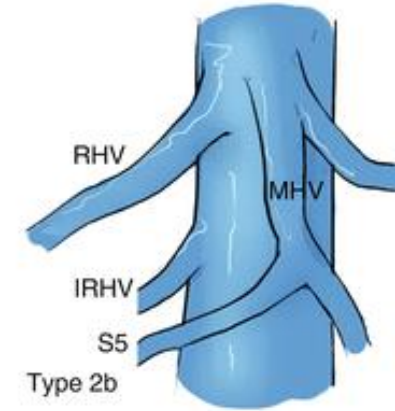
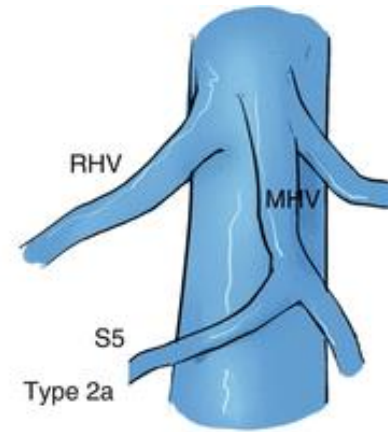
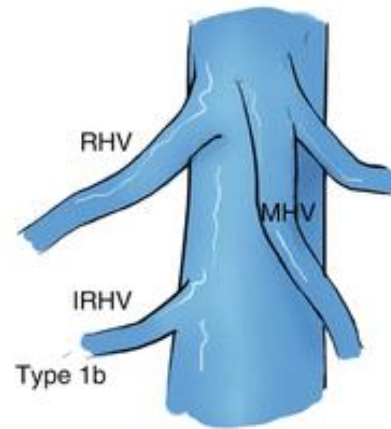
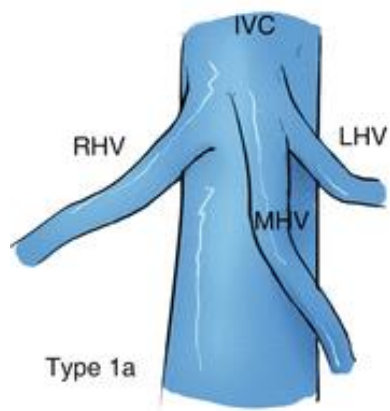
- VHD
- VHM/VHG

Veines accessoires
Veines spiegeliennes

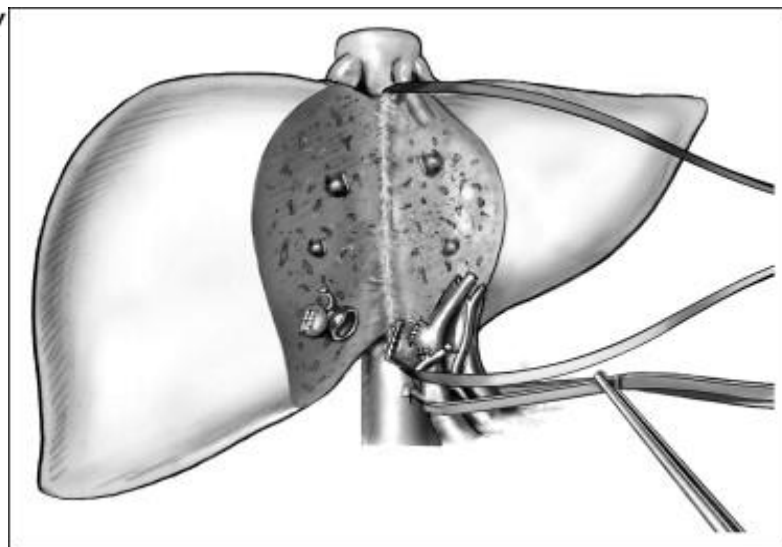
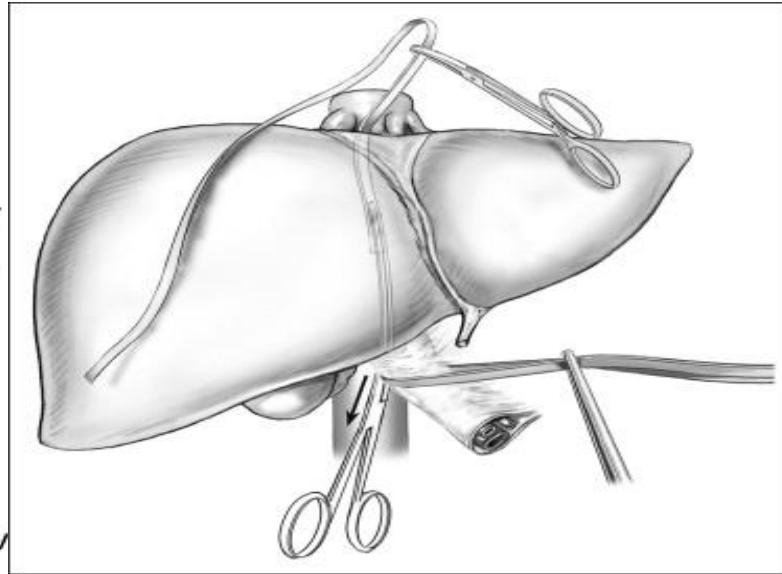
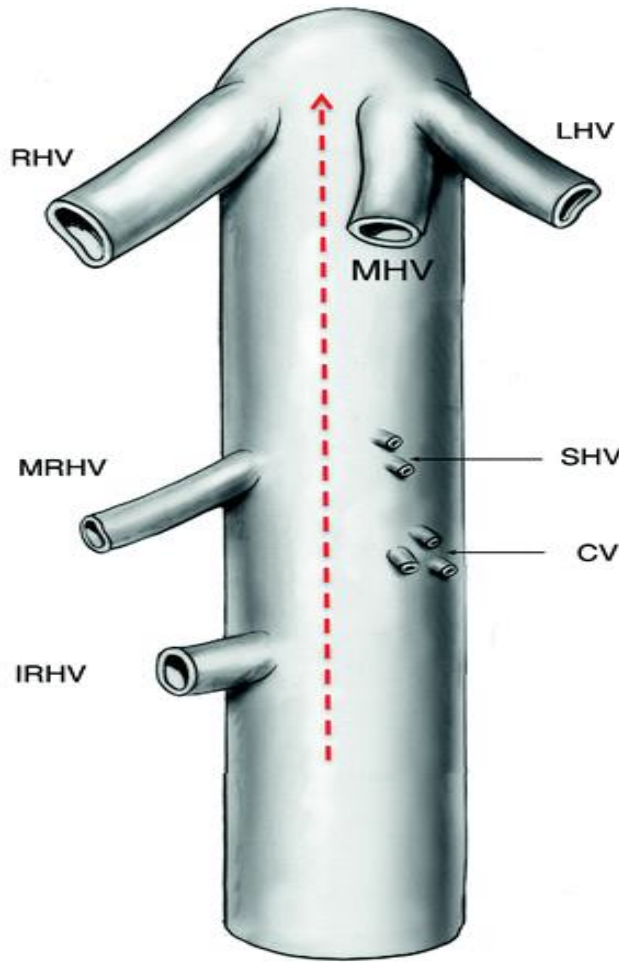


Se drainent dans la veine cave inferieure

Principales variantes anatomiques



L'espace avasculaire de Couinaud



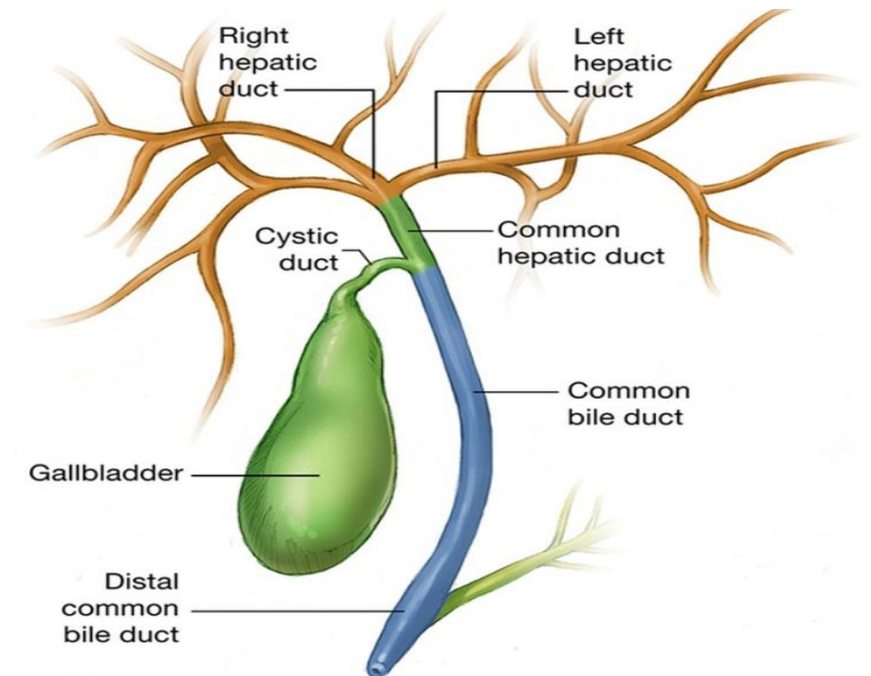
VCI rétrohépatique
Entre la VHDte et la VHM
Pas de veines spiegelienues

Manœuvre de Hanging

Voies biliaires intra-hépatiques

Bile sécrétée par le foie

Canaux intra-hépatiques (D/G)
Voie biliaire principale
Vésicule biliaire = réservoir
Canal commun bilio-pancréatique



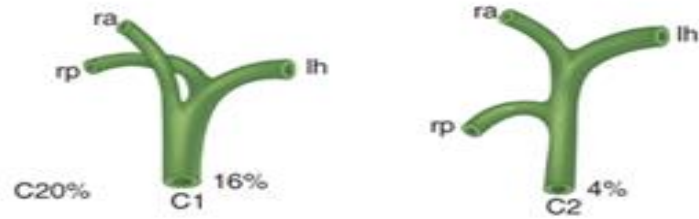
Se mélange au bol alimentaire au niveau du deuxième duodenum

Principales variantes anatómicas

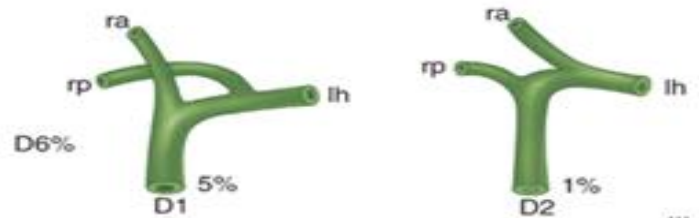
A: Normal bifurcation 57%
B: Trifurcation of 3 ducts 12%



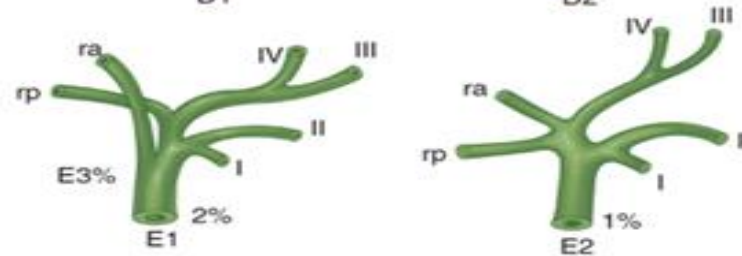
C: R anterior (C1, 16%) or R posterior (C2, 4%) duct draining into CHD



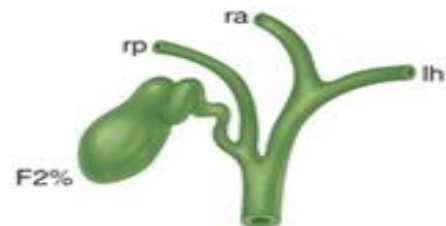
D: R posterior (D1, 5%) or R anterior duct (D2, 1%) draining into the left hepatic duct



E: Absence of hepatic duct confluence 3%



F: Drainage of R posterior duct into cystic duct 2%



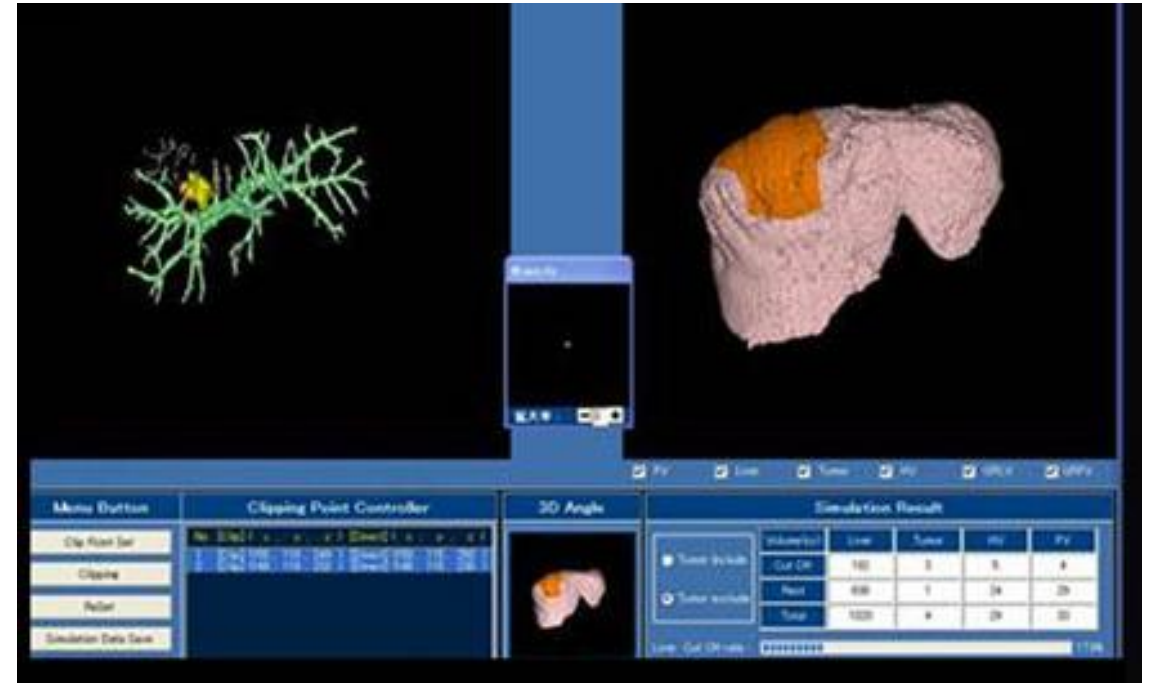
Implications chirurgicales des variations anatomiques

Planification chirurgicale

- Indication chirurgicale
- Nature de l'intervention
 - Difficultés à prévoir

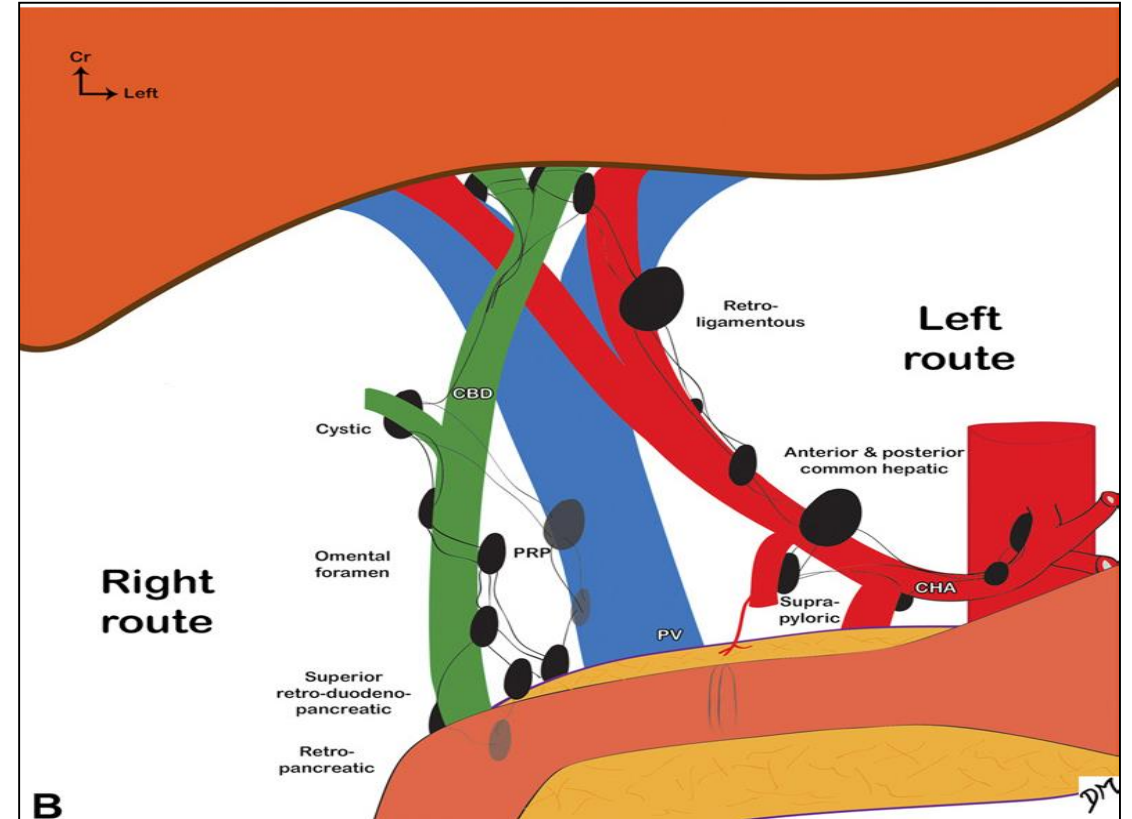
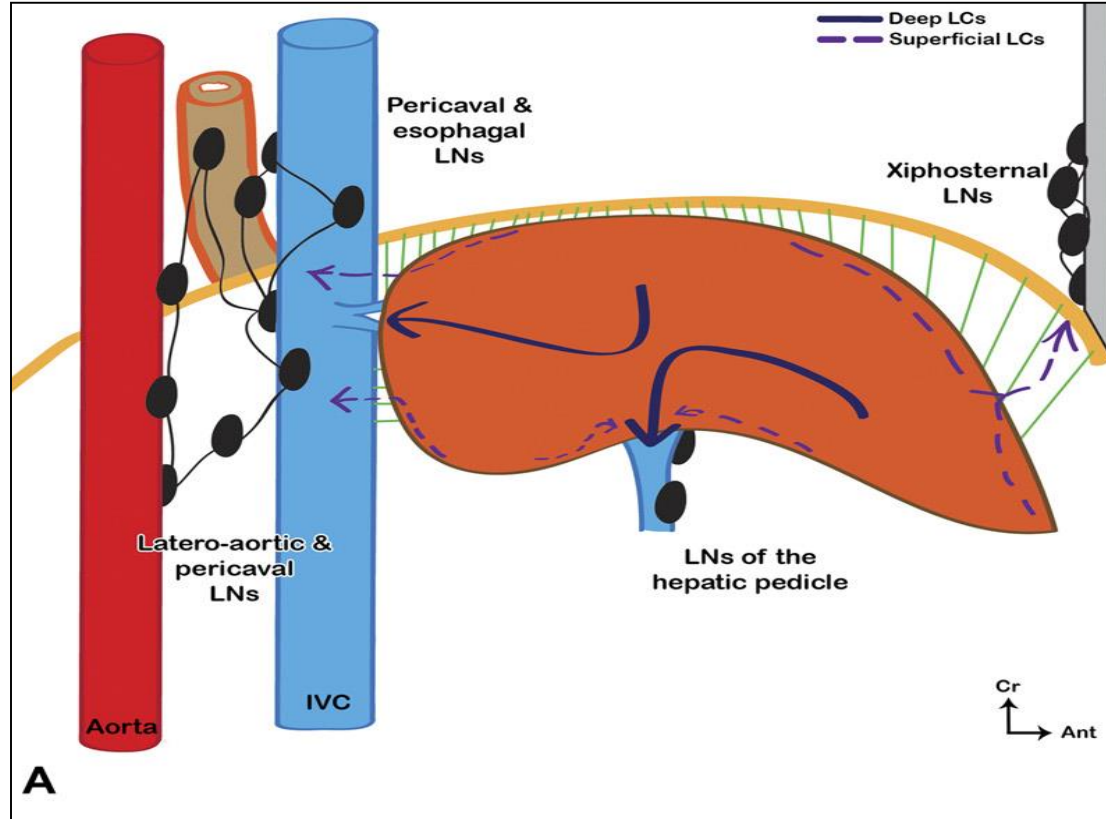


L'anormalité est devenue la normalité!!!



La planification chirurgicale préopératoire basée sur la reconstruction 3D permet de diminuer la morbidité chirurgicale!!

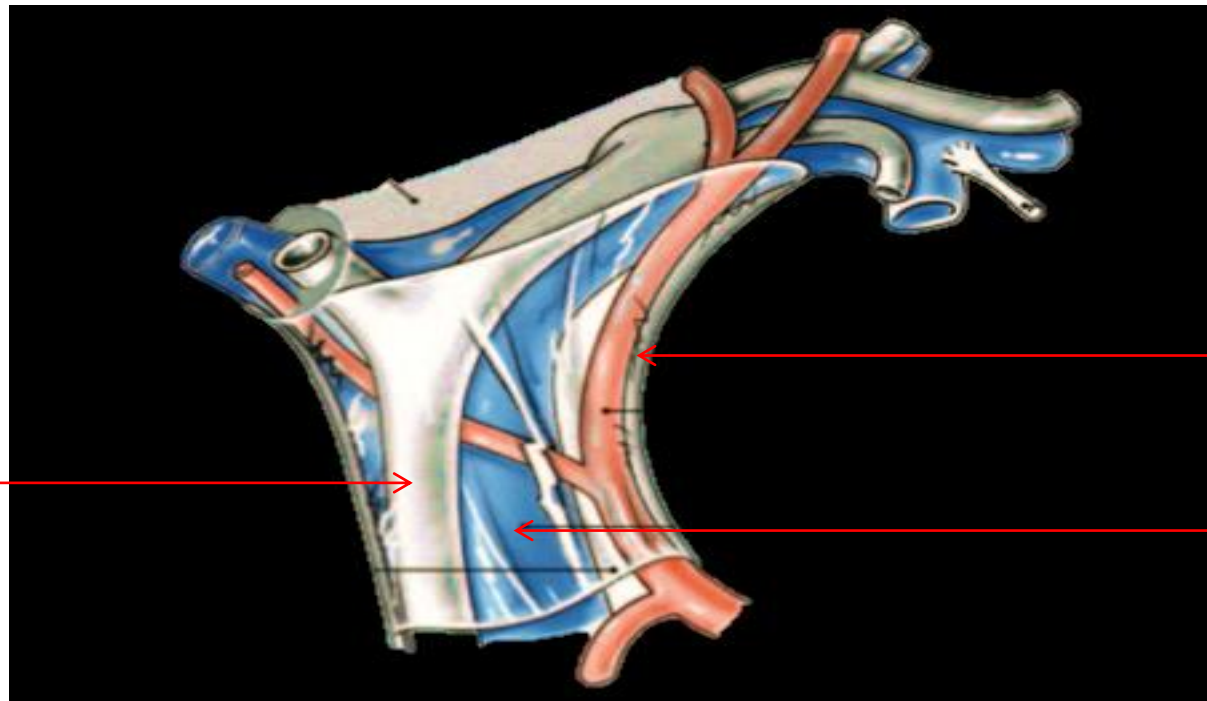
Drainage lymphatique



Pédicule hépatique

- Ensemble de structures extra-hépatiques constitué par veine porte + artère hépatique + VBP + tissu cellulo-ganglionnaire + innervation
 - Entouré par du péritoine

Voie biliaire principale



Artère hépatique

Tronc porte

Anatomie fonctionnelle

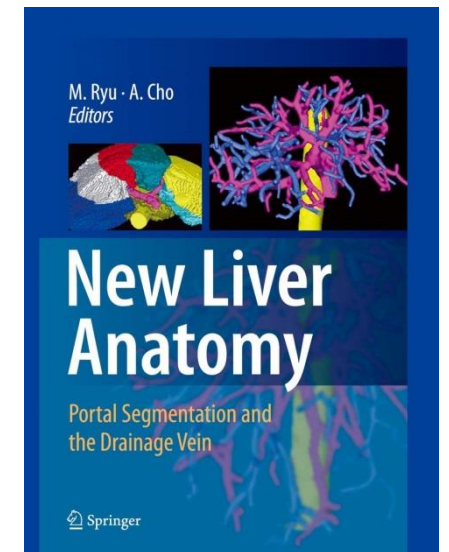
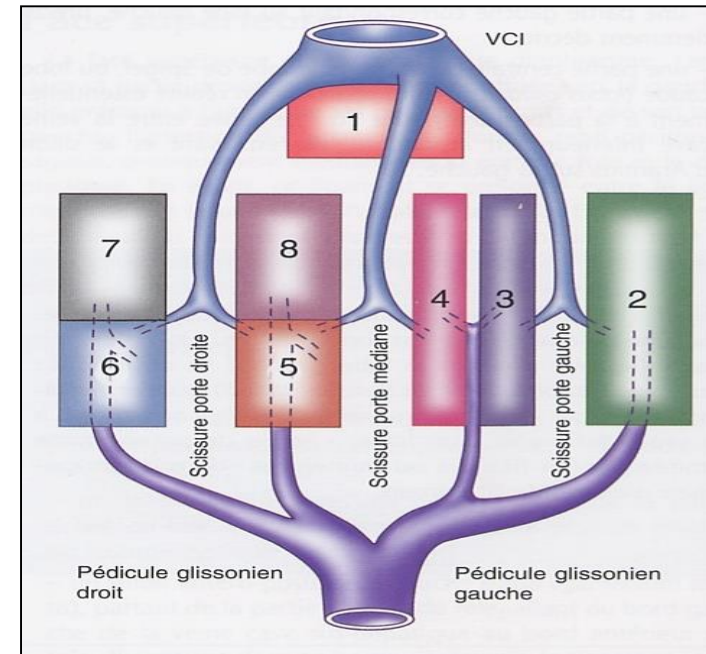
Segmentation hépatique



Couinaud+++

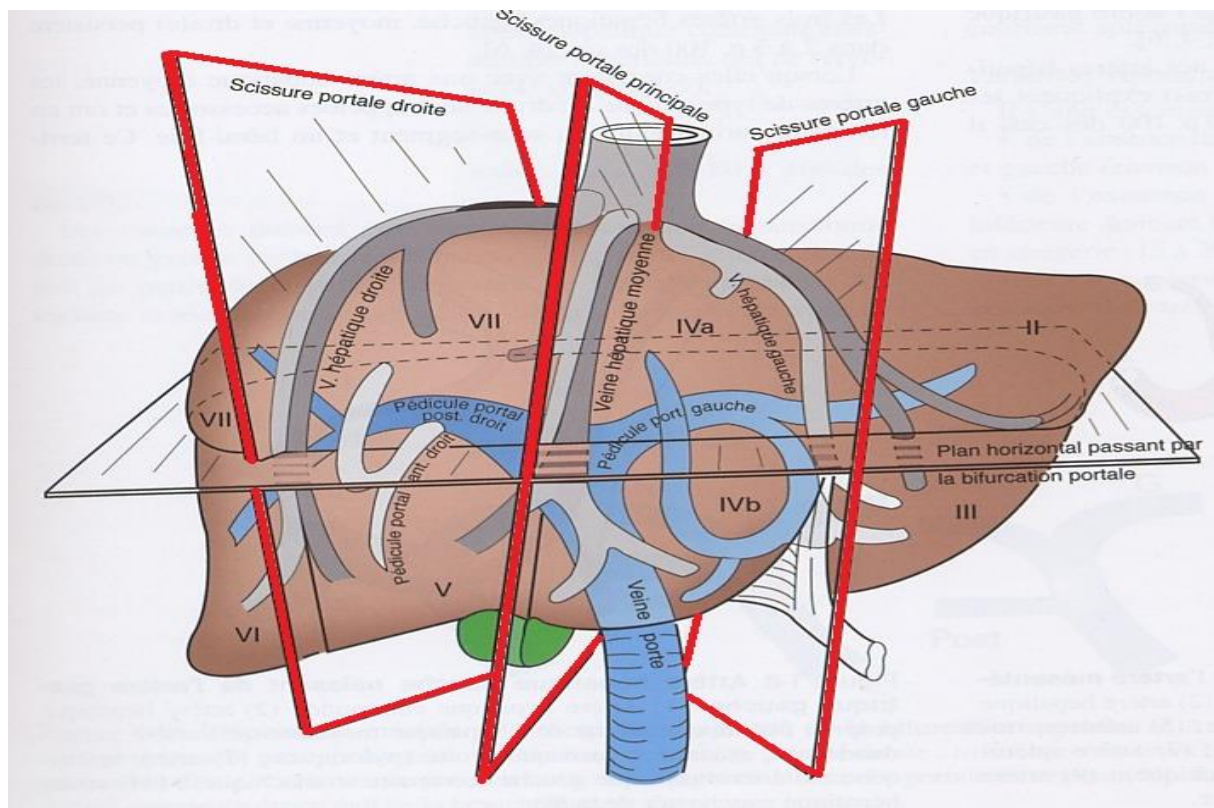
Ryu

Majno

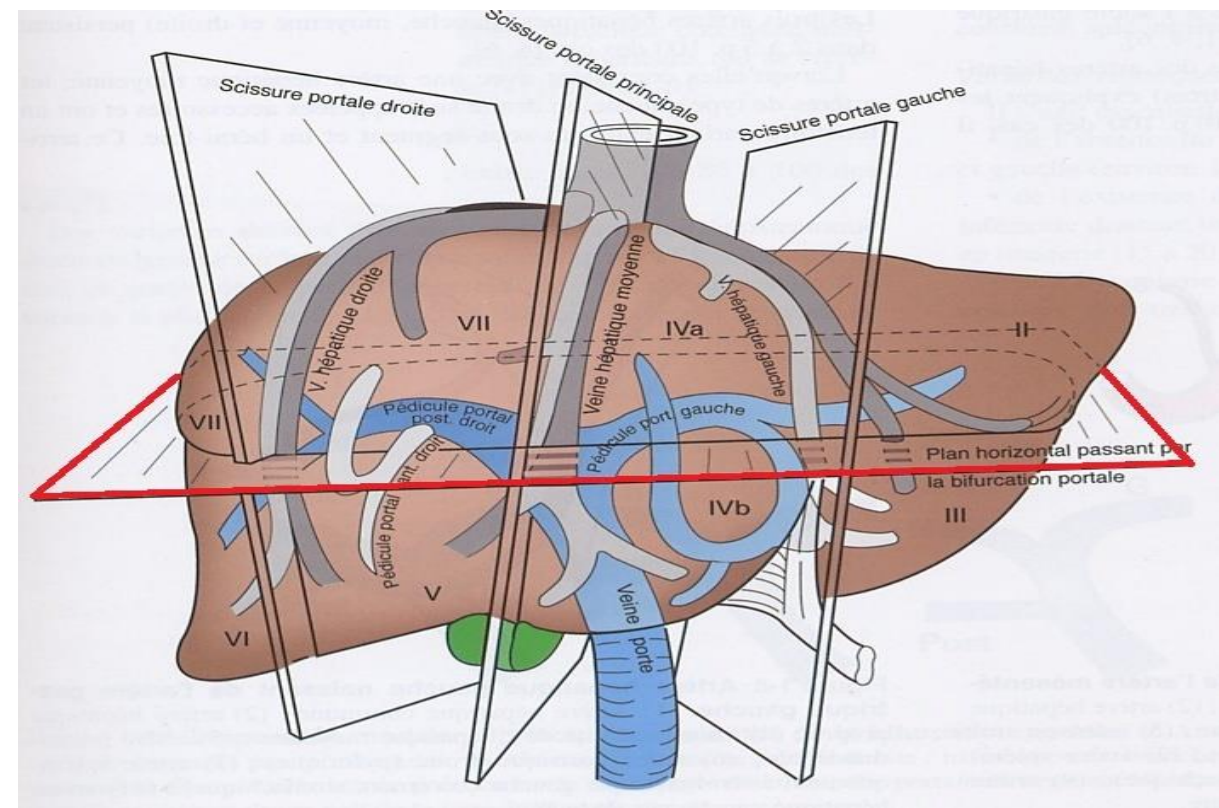


Les veines portes cheminent au centre des segments alors que les veines sus-hépatiques séparent les segments

Verticalement les secteurs sont séparés par le plan des VSH qui cheminent au sein des scissures portes



Horizontalement, les segments sont séparés par un plan passant par l'axe de la bifurcation portale principale



Le segment 1...

Segment 1 (lobe caudé) + IX

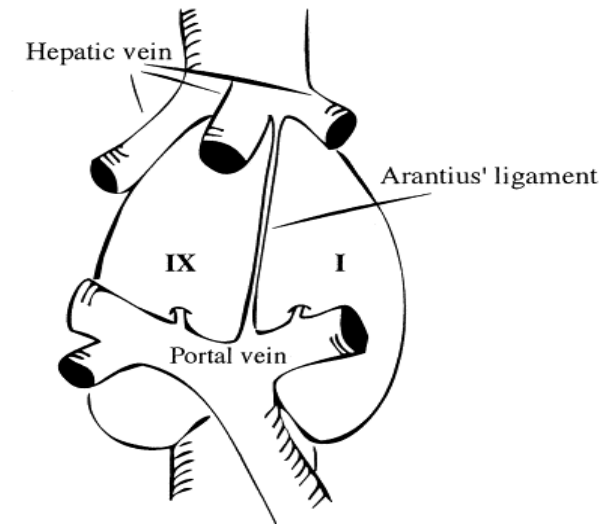
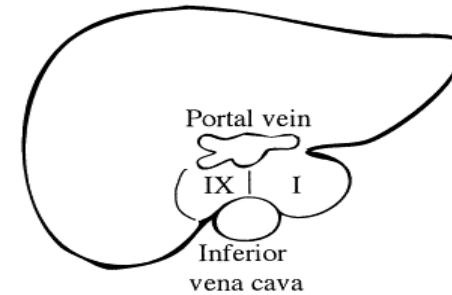
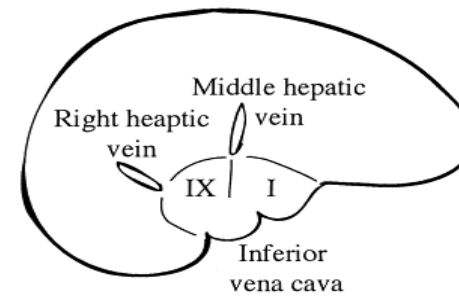


Petit foie dans le foie

Vascularisation portale bilatérale

Drainage veineux direct VCI

Drainage biliaire dans la convergence



Classification des hépatectomies

- **Etendue de la résection**

- Résection mineure: Maximum 2 segments contigus
- Résection majeure: Plus de deux segments contigus

- **Nature de la résection**

- Anatomique: Exérèse parenchymateuse correspondant à un territoire porte systématisé
 - Majeure ou mineure
 - Uni ou pluri-segmentaire
- Non-anatomique: Exérèse parenchymateuse ne correspondant pas à un territoire porte systématisé

- **Difficulté de la résection**

Quelques dénominations

- **Lobe:**
 - Droit (80% du volume): SIV-SV-VI-VII-VIII
 - Gauche (20% du volume): SII-SIII
- **Hémi-foie:**
 - Droit (60% du volume): SV-VI-VII-VIII
 - Gauche: (40% du volume): SII-SIII-SIV
- **Secteurs:**
 - Postérieur droit (30% du volume): SVI-SVII
 - Antero-latéral droit (30% du volume): SV-SVIII
 - Antéro-médial (20% du volume): SIV
- **Foie:**
 - Central (45-50% du volume): SIV-V-VIII
 - Antérieur (70% du volume): SII-III-IV-V-VIII

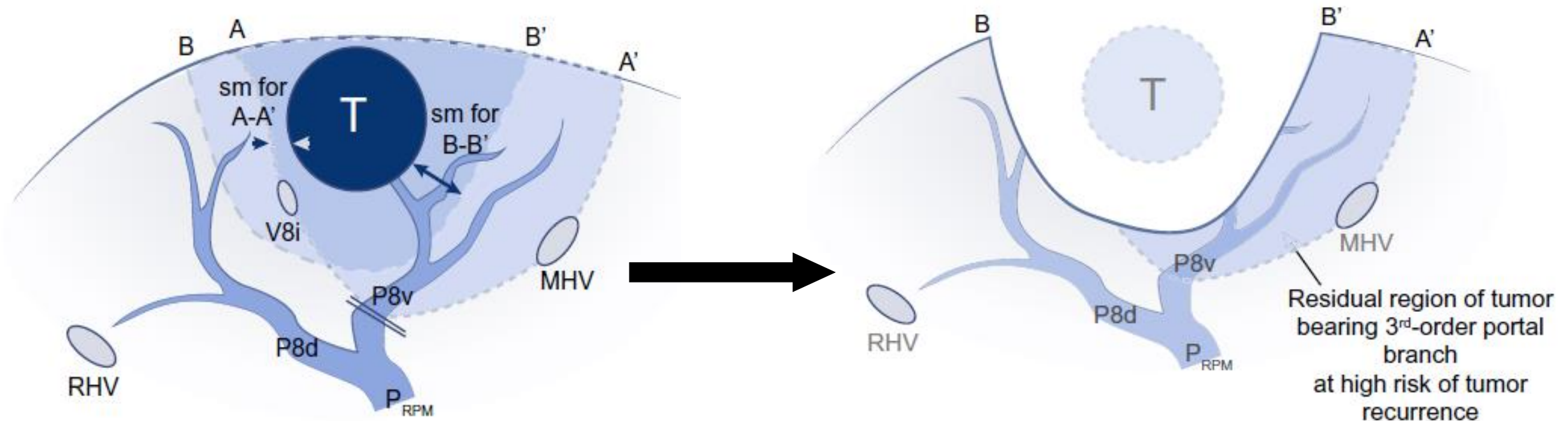
Repères anatomiques
de surface

Peu de repères
anatomiques
de surface

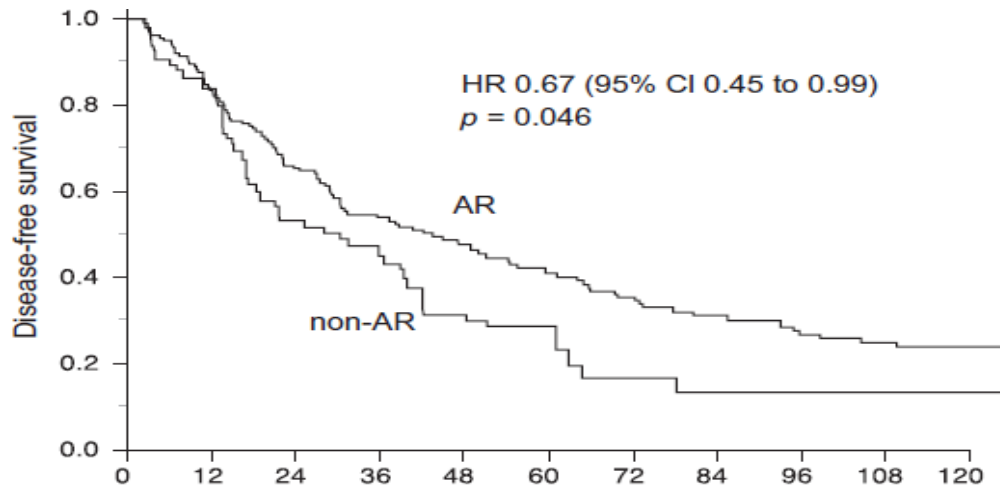
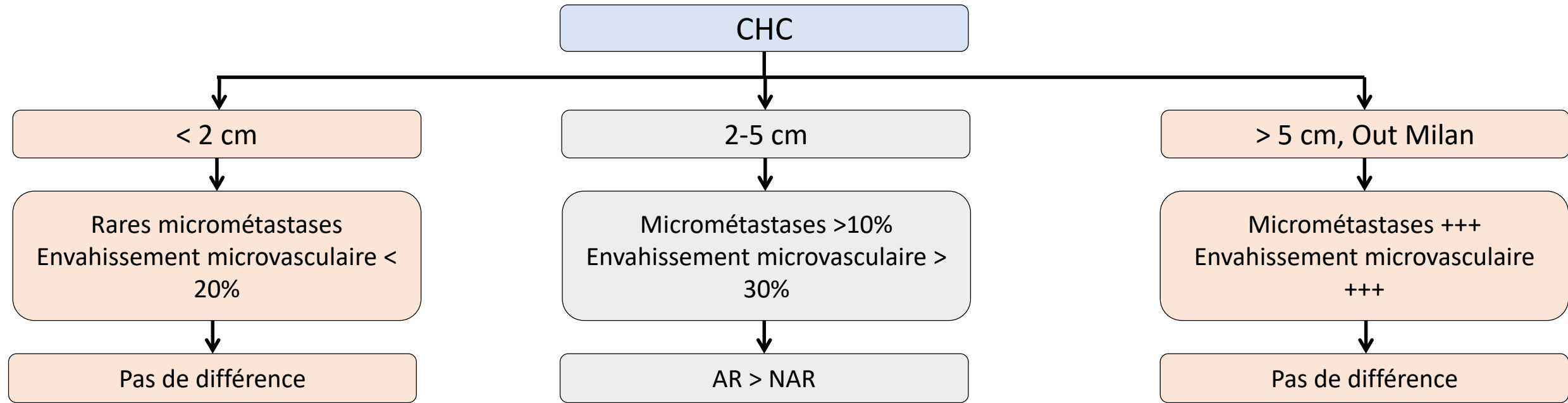
Résection anatomique et non anatomique

Rationnel de la résection anatomique

- Résection de la tumeur et de son territoire vasculaire portal
- Micrométastases intrahépatiques + embols vasculaires!!!

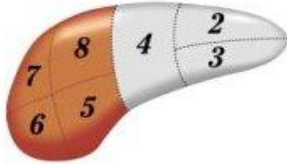
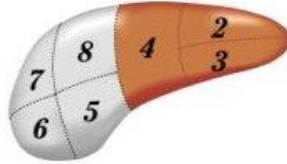




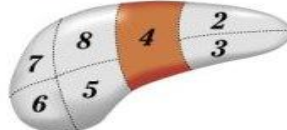

Résection anatomique vs. non anatomique pour le CHC





	HR (95% CI)*	p value
Anatomic resection (vs. non-AR)	0.50 (0.28 to 0.90)	0.020
Age >65 (vs. ≤65)	1.00 (0.57 to 1.77)	0.995
Tumor size >2 cm (vs. ≤2 cm)	1.46 (0.79 to 2.68)	0.226
Fibrosis grade F3-4 (vs. F0-2)	1.96 (0.99 to 3.89)	0.053
ICG-R15 >15% (vs. ≤15%)	1.72 (0.96 to 3.08)	0.068
Microvascular invasion yes (vs. no)	1.81 (0.92 to 3.53)	0.084
Poor tumor differentiation (vs. well or moderate)	0.89 (0.39 to 2.03)	0.783

Nomenclature des hépatectomies

1 <i>First-order division</i>			
Anatomical Term	Couinaud segments referred to	Term for surgical resection	Diagram (pertinent area is shaded)
Right Hemiliver OR Right Liver	Sg 5-8 (+/-Sg1)	Right Hepatectomy OR Right Hemihepatectomy (stipulate +/-segment 1)	
Left Hemiliver OR Left Liver	Sg 2-4 (+/-Sg1)	Left Hepatectomy OR Left Hemihepatectomy (stipulate +/-segment 1)	

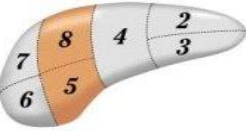



2 <i>Second-order division</i> (second-order division based on bile ducts and hepatic artery)			
Anatomical Term	Couinaud segments referred to	Term for surgical resection	Diagram (pertinent area is shaded)
Right Anterior Section	Sg 5,8	Add (-ectomy)to any of the anatomical terms as in Right anterior sectionectomy	
Right Posterior Section	Sg 6,7	Right posterior sectionectomy	
Left Medial Section	Sg 4	Left medial sectionectomy OR Resection segment 4 (also see Third order) OR Segmentectomy 4 (also see Third order)	
Left Lateral Section	Sg 2,3	Left lateral sectionectomy OR Bisegmentectomy 2,3 (also see Third order)	

3 <i>Third-order division</i>			
Anatomical Term	Couinaud segments referred to	Term for surgical resection	Diagram (pertinent area is shaded)
Segments 1-9	Any one of Sg 1 to 9	Segmentectomy (e.g. segmentectomy 6)	
2 contiguous segments	Any two of Sg 1 to Sg 9 in continuity	Bisegmentectomy (e.g. bisegmentectomy 5,6)	

For clarity Sg. 1 and 9 are not shown. It is also acceptable to refer to ANY resection by its third-order segments, eg. right hemihepatectomy can also be called resection sg 5-8.

Border or watersheds: The borders or watersheds of the segments are planes referred to as intersegmental planes.

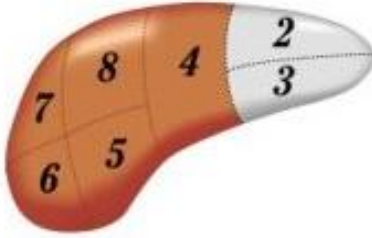

Nomenclature des hépatectomies

4 Addendum. <i>Alternative second-order division</i> (second-order division based on portal vein)			
Anatomical Term	Couinaud segments referred to	Term for surgical resection	Diagram (pertinent area is shaded)
Right Anterior Sector OR Right paramedian Sector	Sg 5,8	Add (-ectomy) to any of the anatomical terms as in Right anterior sectorectomy OR Right paramedian sectorectomy	
Right Posterior Sector OR Right Lateral Sector	Sg 6,7	Right posterior sectorectomy OR Right lateral sectorectomy	
Left Medial Sector OR Left Paramedian Sector	Sg 3,4	Left medial sectorectomy OR Left paramedian sectorectomy OR Bisegmentectomy 3,4	
Left Lateral Sector OR Left Posterior Sector	Sg 2	Left lateral sectorectomy OR Left posterior sectorectomy OR Segmentectomy 2	

Right anterior sector and Right anterior section are synonyms. Right posterior sector and Right posterior section are synonyms. Left medial sector and Left medial section are NOT synonyms and are NOT exchangeable terms. They do not describe the same anatomic areas. Left lateral sector and Left lateral section are also NOT synonyms and are NOT exchangeable terms.

Border or watershed: The border or watersheds of second-order division based on PV are called right and left intesectional planes. These have no surface markings.

Other "sectional" liver resections

Sg 4-8 (+/-Sg1)	Right Trisectionectomy (preferred term) or Extended Right Hepatectomy or Extended Right Hemihepatectomy (stipulate +/-segment 1)	
Sg 2,3,4,5,8 (+/-Sg1)	Left Trisectionectomy (preferred term) or Extended Left Hepatectomy or Extended Left Hemihepatectomy (stipulate +/-segment 1)	

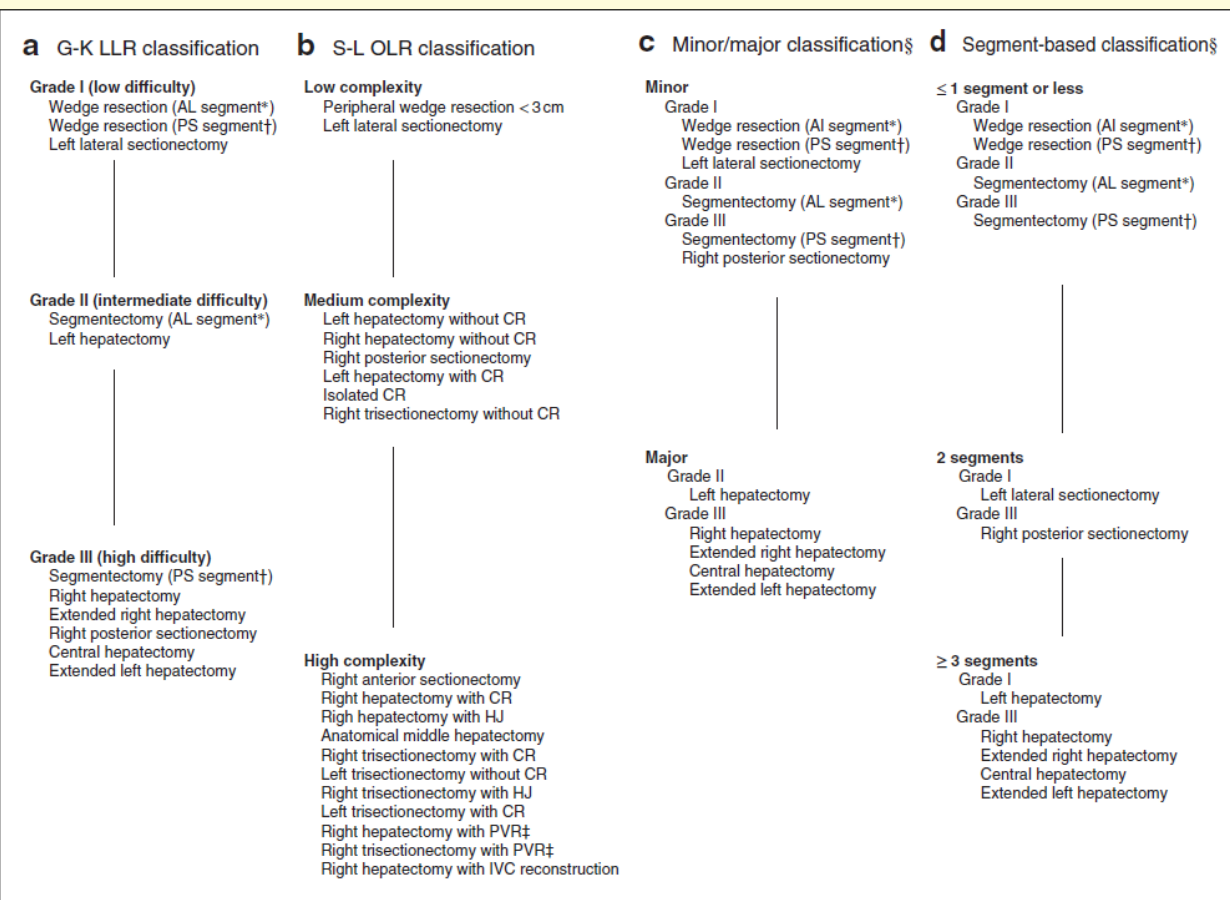
Border or watershed: The borders or watersheds of the sections are planes referred to as the *right and left intersectional planes*. The left intersectional plane passes through the umbilical fissure and the attachment of the falciform ligament. There is no surface marking of the right intersectional plane.

Difficulté des hépatectomies

Etendue et localisation de la résection



Fig. 1 Classifications of liver resection procedures



Autres facteurs



- Techniques
 - Curage ganglionnaire
 - Résection vasculaire/biliaire
 - ATCD d'hépatectomie
- Tumeur
 - Taille, marges à atteindre
- Foie sous jacent
 - Fibrose sévère, NASH, cholangite
- Patient
 - Obésité

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Classification des hépatectomies

François Cauchy

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