Imagerie et Différenciation du Carcinome hépatocellulaire

Agnès Rode
Imagerie Médicale et Interventionnelle
Hôpital Croix Rousse
LYON
Evaluation de l’évolution du CHC:

- Avant décision traitement par RF/chirurgie
- Avant transplantation

Récidive tumorale après chirurgie:
Plus de 50% à 5 ans

Récidive précoce:
- microinvasion vasculaire
- mauvaise différenciation cellulaire
- nodules satellites

Chansik Radiology 2015
Evolution de la vascularisation veineuse et artérielle

Since hepatocarcinogenesis consists of continuous changes, it is often difficult, even for the pathologist, to distinguish early HCC from dysplastic nodule (19). After many years of confusion of terminology, a consensus on "early HCC" has been recently established by the International Consensus Group for Hepatocellular Neoplasia (19). According to the final report from this consensus group, the pathological hallmark feature that distinguishes high-grade dysplastic nodule from early HCC is an infiltrative growth of the tumor cells within Glisson's sheath, specifically stromal invasion (Fig. 3).

The statement also requires special staining to confirm early HCC, which includes positive staining for glypican 3, heat shock protein (HSP) 70, or glutamine synthetase (4,5,20) to support the pathomorphological diagnosis of HCC.

EXTRACELLULAR MR CONTRAST AGENTS: CONVENTIONAL APPROACH FOR THE DIAGNOSIS OF HYPOVASCULAR HCC

Extracellular MR contrast agent-enhanced dynamic MRI had a great success for the diagnosis of typical or hypervascular HCC with extremely high specificity, in which early enhancement and subsequent washout are the...
Evolution du drainage veineux

- **High DN**
  - Intranodular and perinodular hepatic veins
  - Hepatic artery
  - Portal vein
  - Hepatic vein
  - Sinusoid

- **Early HCC**
  - Hepatic vein
  - Hepatic sinusoids
  - Not definite

- **Well HCC**
  - Portal venules in capsule and septum
  - Thin corona (ring)
  - Corona

**Main drainage vessels**

**Peritumoral enhancement**

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1 KANAZAWA UNIVERSITY
2 FUKUIKEN SAISEIKAI HOSPITAL
3 TAKAOKA CITY HOSPITAL

**Matsui,**
Abd Imaging 2011
In special hemodynamics the liver and venules in hypervascular liver HCCs, a blood inflow comes from the hepatic veins into the pseudo-capsule and septum. Then, the tumor begins to drain into the main blood vessels and sinusoids. In Early HCC, intranodular and perinodular hepatic veins are not definite. In Well HCC, thin corona (ring) is identified. In Moderately HCC, coronal vessels are drained by the portal and hepatic veins.

**Background:**
Late HCCs, the blood flow from the hepatic veins into the sinusoids is well visualized on CT. This is because the thin, strong capsule and septum are not definite. In Early HCC, the blood flow of the hepatic veins is well visualized compared to Well HCC, where the thin corona is identified.

**Conclusion:**
The dynamic change of drainage vessels during hepatocarcinogenesis is critical for understanding the tumor's growth and development. The findings of this study provide valuable insights into the early stages of HCC, allowing for more precise intervention.

**Relevant Figures:**
- **Figure 1:** Diagram of hypervascular HCC showing the flow of blood into and out of the tumor. The portal venule and sinusoids are highlighted.
- **Figure 2:** Serial images showing the contrast enhancement of the tumor during CTHA. The time frames (Pre, 5s, 14s, 23s, 40s) are indicated to illustrate the dynamic changes.

**Key Points:**
- Hypervascular HCCs have a rich blood supply from the portal and hepatic veins.
- The blood flow changes dramatically during hepatocarcinogenesis, with the thin corona being a critical indicator.
- Understanding these changes is crucial for effective intervention and treatment strategies.
Wash in                       wash out

CHC avancé moyennement différencié
Nodule non ou faiblement hypervasculaire :
Biopsie = CHC grade 1
Enhancement Patterns of Hepatocellular Carcinoma at Contrast-enhanced US: Comparison with Histologic Differentiation¹

JANG Radiology 2007
• Augmentation de la vascularisation artérielle
• Augmentation de l’épaisseur des travées cellulaires
• Diminution du nombre de sinusoides
CHC bien différencié:

- Absence de washout
- Hyper T1
LE CHC HYPER T1: réhaussement ?
LE CHC HYPER T1: réhaussement ?

artériel  ➞ T1 à blanc

soustraction

Echo de contraste +++
CHC grade 1
CHC bien différencié:

- Absence de washout
- Hyper T1
- Absence d’hyperintensité T2
CHC HYPER T2

Corrélation entre hyperintensité T2 et

- augmentation de la néoangiogénèse
- augmentation du volume du stroma
- Remaniements péliotiques

SHINMURA Radiology 2005
WINTER Radiology 1994
T2
RCR b800
( Relative Contrast Ratio)

\[ \text{RCR b800} = \frac{S_{\text{lesion}}}{S_{\text{liver}}} \]

Le Moigne BJR 2013
Grade 3 à nodules satellites

Pas de wash out

Grade 1
CHC bien différencié:

- Absence de washout
- Hyper T1
- Absence d’hyperintensité T2
- Capsule
• Capsule: tumeur moins invasive, moins d’envahissement vasculaire, augmentation de la survie pour Tumeurs > 5 cm

• Meilleure efficacité de la chimioembolisation
CHC bien différencié:

- Absence de washout
- Hyper T1
- Absence d’hyperintensité T2
- Capsule
- stéatose
HCC et stéatose:

Élément diagnostique ou pronostique ?
20% des CHC

CHC stéatosiques: grade 1 ou 2 d’Edmonson dans 93% cas

CHC avec composante graisseuse importante présentent moins de microinvasion vasculaire que CHC non stéatosiques ou faiblement stéatosiques
Association avec NASH, stéatose hépatique et facteurs dysmétaboliques

Steatotic hepatocellular carcinoma: a variant associated with metabolic factors and late tumour relapse

Survie globale

Reprise évolution tardive
Single Hepatocellular Carcinoma: Preoperative MR Imaging to Predict Early Recurrence after Curative Resection

Chansik An, MD
Dong Wook Kim, PhD
Young-Nyun Park, MD
Yong Eun Chung, MD
Hyungjin Rhee, MD
Myeong-Jin Kim, MD

Purpose:
To identify magnetic resonance (MR) imaging features that enable prediction of early recurrence (within 2 years) after curative resection of hepatocellular carcinoma (HCC) and to derive a preoperative prediction model.

Materials and Methods:
This retrospective study was approved by the institutional review board. The requirement to obtain written informed consent was waived. A total of 268 patients who underwent hepatic resection for a single HCC from January 2008 to August 2011 were divided into two cohorts: a training cohort, which was used to derive a prediction model (n = 187), and a validation cohort (n = 81). All MR images from the training cohort were reviewed by two radiologists. A prediction model was constructed by using MR imaging features that were independently associated with early recurrence with use of multiple logistic regression analysis. The performance of the prediction model in the validation cohort was evaluated with respect to discrimination (ie, whether the relative ranking of individual predictions of subsequent early recurrence is in the correct order).

Results:
In the training cohort, four MR imaging features were independently associated with early recurrence: rim enhancement (odds ratio [OR] = 3.83; 95% confidence interval [CI]: 1.39, 10.52), peritumoral parenchymal enhancement in the arterial phase (OR = 2.64; 95% CI: 1.27, 5.46), satellite nodule (OR = 4.07; 95% CI: 1.09, 15.21), and tumor size (OR = 1.66; 95% CI: 1.31, 2.09). A prediction model derived from these variables showed an area under the receiver operating characteristic curve (AUC) of 0.788 in the prediction of the risk of early recurrence in the training cohort. When applied to the validation cohort, this model showed good discrimination (AUC, 0.783).

Conclusion:
The prediction model derived from rim enhancement, peritumoral parenchymal enhancement, satellite nodule, and tumor size can be used preoperatively to estimate the risk of early recurrence after resection of a single HCC.

Tumor grade 3 Edmonson, with satellite nodules and microvascular invasion

Taille
Nodules satellites
Réhaussement parenchymateux péritumoral

Risque de récurrence après chirurgie

Tumeur grade 3 Edmonson, avec nodules satellites et microinvasion vasculaire
Récidive moins de 6 mois après exérèse chirurgicale
CHC et microinvasion tumorale
CHC grade 3 Edmonson avec embols tumoraux et thrombus tumoral portal
Can Current Preoperative Imaging Be Used to Detect Microvascular Invasion of Hepatocellular Carcinoma?\textsuperscript{1}

Purpose:
To determine the accuracy of imaging features, such as tumor dimension, multinodularity, nonsmooth tumor margins, peritumoral enhancement, and TTPVI, in the prediction of microvascular invasion (MVI) in hepatocellular carcinoma (HCC).

Results:
The total number of HCC nodules was 140. Large tumor size, nonsmooth tumor margins, TTPVI, and peritumoral enhancement were significantly related to the presence of MVI: maximum diameter, number of lesions, tumor expression that the authors called two-trait predictor of MVI: maximum diameter, number of lesions, tumor

Conclusion:
“Worrisome” imaging features, such as tumor dimension, multinodularity, nonsmooth tumor margins, peritumoral enhancement, and TTPVI) was associated with tumor microvascular invasion (MVI) in HCC.

No significant interobserver differences (Pearson coefficient of 0.56 and 0.71, respectively, for tumors larger than 5 cm, and 0.91 for observer 2 for tumors smaller than 2 cm to turned a positive predictive value of 0.95 for observer

References:
1.
This single-center retrospective study was approved by the institutional review board, and the requirement for informed consent was waived. One hundred twenty-five patients (median age, 63 years; interquartile range, 53–71 years) with known HCC who subsequently underwent explorative liver resection were included. Two observers independently re

Materials and Methods:
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Can Current Preoperative Imaging Be Used to Detect Microvascular Invasion of Hepatocellular Carcinoma?¹

Taille de la tumeur
Bords flous
Réhaussement péritumoral

Risque plus élevé
de microinvasion tumorale
Can Current Preoperative Imaging Be Used to Detect Microvascular Invasion of Hepatocellular Carcinoma?¹

Purpose:

To determine the accuracy of imaging features, such as tumor dimension, multinodularity, nonsmooth tumor margins, and peritumoral enhancement, in the prediction of microvascular invasion (MVI) in hepatocellular carcinoma (HCC).

Materials and Methods:

One hundred twenty-five patients (median age, 63 years; interquartile range, 53–71 years) with a diagnosis of HCC and indications for hepatic resection were included. Two observers independently reviewed radiologic images to evaluate the following features: maximum diameter, number of lesions, tumor size, multinodularity, nonsmooth tumor margins, peritumoral enhancement, and TTPVI. Interobserver agreement was checked, and diagnostic accuracy of current predictive algorithms was investigated.

Results:

The total number of HCC nodules was 140. Large tumor size, multinodularity, nonsmooth tumor margins, peritumoral enhancement, and TTPVI were significantly related to the presence of MVI. The presence of all three worrisome features resulted in a positive predictive value of 0.95 for observer 1 and 0.96 for observer 2 independent of tumor size, with a risk of microinvasion tumorale of 0.85. Whereas the presence of all three worrisome features resulted in a positive predictive value of 0.95 for observer 1 and 0.96 for observer 2 independent of tumor size, with a risk of microinvasion tumorale of 0.85.

¹Please note that the superscript number indicates a footnote or reference within the text, which is not visible in this image.
Primovist (Gd-EOB-DTPA)

Kitao Radiology 2010

Lee AJR 2011
Primovist (Gd-EOB-DTPA)

Captation hépatocytaire des CHC décroit parallèlement à l'augmentation du grade tumoral

CHANSIC Eur Radiol 2012

CHC hyperintenses à la phase hépatobiliaire existent ! (4 à 10%)

Histologie :
Peu d'évolution infiltrante
Moins de microinvasion vasculaire
+ de sinusoides

Kim Eur J Radiol 2012

Kim JMRI 2012
Quand on n’a pas de Primovist...

Multihance

Pas de wash out

Phase excréto-biliaire
Phase hépatobiliaire: hypointensité péritumorale révélatrice d’une microinvasion tumorale.
Sens. 38,3%  Sp 93,2%  VP+ 88,5%  VP- 52,6%

Primovist (Gd-EOB-DTPA)

Kim JMRI 2012
Take home message

Il faut regarder attentivement les contours d’un CHC