Imaging of hepatic hypervascular tumors & clinical implications
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DISCUSSION & SUMMARY

CHAPTER 11

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PART I: CHAPTER 1 of this thesis provides an appraisal of the colourful history of medical imaging and an introduction to the hypervascular hepatic tumors discussed in this thesis: hepatocellular adenoma; focal nodular hyperplasia, hepatocellular carcinoma, and hepatic hemangioma. The general application of imaging modalities has long been established. However, fine-tuning of these techniques to specific diseases and abnormalities is still an ongoing process.

PART II discusses imaging and clinical management of hepatocellular adenoma (HCA) and focal nodular hyperplasia (FNH). Benign liver lesions do not always display typical characteristics for diagnosis and with that mindset; CHAPTER 2 discusses dynamic MRI imaging with Primovist® for HCA and FNH. Accurate diagnosis is essential, because FNH and HCA have opposing therapeutic consequences. The risk of complications, such as bleeding or even malignant transformation, are known to occur in HCAAs larger than 5 cm, unlike in FNH. This MRI technique proved highly accurate and makes invasive liver biopsy redundant. The study was designed to differentiate between HCA and FNH. Accurate diagnosis is difficult solely on the basis of the hepatobiliary phase of the MRI in patients with a liver tumor. If a patient presents with a positive history of malignancy or with a lesion with washout on the portal phase, the working diagnosis should be malignancy until proven otherwise. Therefore, if any suspicion of malignancy exists, a more aggressive diagnostic work-up is required with early invasive intervention whenever possible.

A second imaging modality that can differentiate between HCA and FNH is the “F-FCH PET/CT as described in CHAPTER 3. F-FCH PET/CT can be used as an additional tool when MR imaging with Primovist® remains inconclusive. Even with accuracy higher than MR imaging with Primovist® for differentiation of HCA and FNH, this modality will probably be impractical in many centers as a special cyclotron is necessary to synthesize F-FCH in close proximity to the hospital. Furthermore, as is discussed in CHAPTER 7, the “F-FCH PET/CT is useful in detection of hepatocellular carcinoma (HCC). Therefore, when HCC is not in the differential diagnosis the “F-FCH PET/CT can be used to differentiate HCA from FNH. When dynamic MR imaging can be accurately incorporated in the process of imaging, two very accurate imaging modalities can be combined with less impact for the patient [4]. In CHAPTER 8, the fine line between indicated surgical interventions against non-invasive care is discussed. Benign lesions will only need intervention when medically indicated by their associated risk factors and decreased quality of life expressed by the patient.

An important indication for intervention has been revealed in the past few years by enabling subclassification of HCA [5]. In the present day it is believed that beta-catenin mutated HCA are prone to malignant transformation [6]. Unfortunately, the subclassification is best assessed on resection specimen with immunohistochemical analyses while liver biopsy could very well miss the mutated part of HCA or result in sampling errors. Therefore, future studies will have to define non-invasive characteristics of HCA subtypes. MRI is shown most promising [7] for classification and if HCA subtypes can be accurately assessed, clinical implications should be assessed in large patient group to provide a treatment algorithm.

Malignant transformation of HCA occurs in an estimated 4,1% of patients with HCA larger than 5 cm [8] and is overshadowed by the risk of lesional bleeding. Bleeding is more frequent and demands emergency care with transarterial embolization in case of active bleeding or severe intra-abdominal Grade III bleeding as discussed in CHAPTER 5. The specific risk factors for lesional bleeding in HCA were identified in CHAPTER 6, being: patients with obesity, HCA size >35 mm, HCA protruding from the liver (exophytic growth), HCA located in the left liver lobe, and HCA with radiological presence of central or peripheral arteries. HCA located deeper in the liver might have a lower risk of severe bleeding as none of the intrahepatic lesions showed extrahepatic bleeding (n = 82) and only 11% showed Grade I or II bleeding. Based on these findings, preventive treatment can be better focused on the patients who are at risk. However, the best method of preventive treatment remains under debate. A preventive surgical intervention, even laparoscopically, in a patient with a benign liver tumor could be regarded as somewhat excessive. On the other hand, radio frequency ablation has been shown to be a safe alternative in small lesions and studies have shown that HCA under 3 cm can be completely and safely ablated [9, 10]. Another less invasive treatment could be transarterial embolization (TAE).

CHAPTER 5 already discusses the use of TAE in emergency care of bleeding HCA. Its potential in the preventive setting is clear when the arterial blood supply of the HCA lesion can be targeted and undermined. Revascularization may occur with time and unfortunately, no studies have yet assessed this method for its safety and effectiveness. Especially in lesions with a higher risk of malignant transformation (HCA with a beta-catenin mutation) the effects of TAE need to be investigated.

PART III discusses hepatocellular carcinomas (HCC) and unlike HCA and FNH this lesion has the potential to be life threatening. It is essential to detect HCC as early as possible to be able to remove and obtain curation. Multiple HCC lesions over 5 cm intrahepatically or extrahepatic spread of the disease means that curative treatment will no longer be possible [11]. Therefore, accurate staging of the disease is crucial for appropriate treatment implementations. In that respect, CHAPTER 7 shows the additional value of “F-FCH PET/CT imaging in staging and detection of extrahepatic disease with direct treatment implication in a third of the patients of the study. Even though this imaging modality has been proven highly accurate and of additional value to diagnostic and treatment plans; logistics and associated costs make its general use controversial. “F-FCH has to be specially synthesized and has a half-life time of 10 minutes. Therefore, the cyclotron cannot be located far from the medical center where the patients undergo the imaging. However, if it is a high-volume medical center regarding HCC patients or involved in a HCC screening program, the “F-FCH PET/CT will be of clear additional value. The additional value of the “F-FCH PET/CT for HCC lies in accurate whole body assessment in regards to the extent of disease, which has direct implications for staging and treatment decisions. Further studies need to determine its place in diagnostic work-up and show which patients will profit most from the “F-FCH PET/CT.

Another possibility to assess local extent of the disease is by staging laparoscopy (SL). A laparoscopy can be performed in the work-up prior to hepatic resection to assess local extent of disease and the overall condition of the liver (cirrhosis and fibrosis) by biopsy of non-tumorous tissue with consecutive histopathological evaluation. CHAPTER 8 shows that staging laparoscopy is outdated as
imaging modalities are of such quality that ‘an initial peek’ with more invasive laparoscopy holds no additional value. In this retrospective evaluation of patients undergoing staging laparoscopy prior to hepatic resection the yield was only 7%. Therefore, only in cases in which local or distant metastases are suspected SL can still be considered. In light of Chapter 7, the 18F-FCH PET/CT might however be a more elegant non-invasive tool to assess extent of disease. An overview and discussion of the patients with HCC seen at the Academic Medical Center of Amsterdam, a non-liver-transplant center is presented in Chapter 9. Overall survival in patients treated with curative intent and with palliative or symptomatic treatment is similar to data from literature. Transarterial chemoembolization is highlighted as this treatment is the most commonly used local treatment in the palliative setting for HCC and in some patients complete response to treatment occurs with subsequent high survival. Further study into TACE and optimal (re-)treatment will have to be conducted in a center with a high patient load to determine the best possible outcome for the individual patient with HCC requiring palliative TACE.

The differential diagnosis of hypervascular liver tumors is multifold. PART IV discusses 4 different case studies of hepatic tumors. Many hepatic tumors can have an atypical presentation and these cases are fine examples. The 1st CASE presents a young female patient (18 years old) suspected of having HCC. An 18F-FCH PET/CT was performed to assess extent of disease as described in Chapter 7, and 18F-FCH PET imaging showed four hepatic tumors without extrahepatic disease. However, histopathology after resection of the lesion showed hepatoblastoma. With this patient we showed that the 18F-FCH PET/CT can detect a hepatic hepatoblastoma. The 2nd CASE study discusses the co-existence of HCA and hepatic granulomas. We proposed that the hepatic granulomas in these cases are a response to persistent inflammation caused by (inflammatory) HCA, a local reaction to a neoplasm, chronic use of oral contraceptives, or a combination of these factors. The 3rd CASE discussed diagnosis is the most common benign hepatic tumor: hemangiomas. Invasive treatment is only indicated when abdominal complaints impair quality of life. These symptoms usually only occur in giant hemangioma larger than 5cm. Intervention is also required when, although rare, a complication of disseminated intravascular coagulation (Kasabach-Merrit syndrome) occurs. Surgical enucleation has proven effective in relief of symptoms. The 4th CASE study shows images of a patient with FNH with severe abdominal complaints in whom resection was decided. At laparotomy a liver with multiple greyish lesions was found similar to metastatic disease. This was not expected as FNH is a benign lesion and no other signs of malignant disease were present. Frozen sections showed bile duct hamartomas, and resection of the FNH was continued as planned.

References

IMAGING OF HEPATIC HYPERVASCULAR TUMORS & CLINICAL IMPLICATIONS

SUMMARY

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PART I of this thesis is the introduction of the hypervascular hepatic tumors discussed in this thesis.

PART II discusses imaging of benign hypervascular hepatic tumors and clinical implications. Consecutive patients with suspected hepatocellular adenoma (HCA) or focal nodular hyperplasia (FNH) were enrolled in a prospective study designed to test whether improvements in diagnosis and management can be made. CHAPTER 2 evaluates the additional value of the hepatobiliary phase of Gd-EOB-DTPA (Primovist®) magnetic resonance (MR) imaging compared to standard MR imaging. The accuracy of standard MR imaging for HCA was 50% (12/24) and for FNH 68% (19/28). After reviewing the hepatobiliary phase the accuracy for HCA improved to 96% (23/24) and accuracy for FNH to 96% (27/28). Lesional features with predictive value for diagnosis in HCA included bleeding, fat, and glycogen. The presence of a central scar was highly predictive for FNH. This study shows high accuracy of the Gd-EOB-DTPA enhanced MRI when standard contrast enhanced series are combined with the hepatobiliary phase for differentiation of HCA and FNH in lesions larger than 2 cm. In the same patient cohort the additional value of positron emission tomography (PET) computed tomography (CT) with 18F-fluoromethylcholine (18F-FCH) as a novel diagnostic approach in the differentiation of HCA and FNH is discussed.

CHAPTER 3. Evaluation of PET imaging was done with a ratio: the maximum standard uptake value (SUV) of the lesion, divided by the mean SUV of the surrounding liver. The mean SUV ratio for FNH was 1.67±0.31 (mean ±SD, n=28), resulting in a positive likelihood ratio of 32.3 for PET-positive FNH. The mean SUV ratio for HCA was 0.82±0.17 (n=32), with a likelihood ratio of ≈100 for PET-negative HCA. Receiver operating characteristic curve analysis revealed an optimal SUV ratio cut-off value of 1.13, which reached 100% sensitivity and 97% specificity in differentiating FNH from HCA. This prospective study shows that PET/CT with 18F-FCH can accurately differentiate FNH from HCA and may become a valuable diagnostic tool when conventional imaging techniques fail to do so.

CHAPTER 4 discusses the controversy of management of hepatocellular adenoma (HCA) and focal nodular hyperplasia (FNH), especially with respect to patient selection for surgery. This was the final study of the full cohort of 110 patients in which 51 patients with HCA and 59 with FNH were included. If patients with HCA and FNH require surgery, limited resection or enucleation of the lesion can be carried out with low morbidity and without mortality, using either an open or laparoscopic approach. Patients with preoperative symptoms show a high rate of postoperative symptom relief. The debate about invasive (preventive) treatment of HCA is further discussed in CHAPTER 5 & 6. Even though HCA is a benign hepatic lesion it does carry the risk of spontaneous bleeding. Bleeding was scored and graded on CT and/or MR imaging: intralesional (Grade I), intrahepatic (Grade II), or extrahepatic (Grade III). Treatment of bleeding consisted of observation in hemodynamically stable patients and selective transarterial embolization (TAE) in patients whom required blood transfusion. We propose a grading system of bleeding HCA in which Grade I and II with bleeding-areas larger than 6cm, and preferably all Grade III bleedings are treated with TAE. Additional care, being follow-up or preventive treatment, is advised in patients with exophytic adenomas.

CHAPTER 5. In CHAPTER 6 we aimed to assess risk factors for bleeding in patients with HCA. Standard of reference for diagnosis was histopathology, or dynamic CT and/or MR imaging. Bleeding was scored and evaluated on CT and/or MR imaging. As mentioned in CHAPTER 5 bleeding was seen in 29 (64%) patients and in 42 (22%) lesions. Patients with a body mass index (BMI) >25 showed...
an increased risk for severe bleeding Grade II and III. In lesions >35mm, exophytic lesions, lesions in segments 2-3, and lesions with peripheral or central arteries the risk of bleeding is increased.

PART III of the thesis discusses hepatocellular carcinoma (HCC), a hypervascular, malignant hepatic tumor. In the past two decades an increasing incidence of HCC was noticed in Western Europe, including in The Netherlands. At the Academic Medical Center a special dedicated team (GIOTA; gastrointestinal oncology center Amsterdam) has taken responsibility for the management of the patients presenting with liver lesions suspected for malignant disease, including HCC. Whereas diagnosis of HCC primarily involves imaging, the aim of Chapter 7 was to assess the advantage of 18F-FCH PET/CT for detection of HCC and evaluation of the extent of disease. Similar to Chapter 3 the SUVratio was used to evaluate PET images. Intrahepatic lesions on 18F-FCH PET/CT imaging were positive with an SUVratio 1.95 ± 0.66 and an accuracy of 88%. Eighteen extrahepatic lesions showed 18F-FCH uptake on PET/CT while uptake was absent in 3 affirmed non-HCC lesions by additional investigation, resulting in an accuracy of 100%. In 17 of 19 patients additional lesions were found on PET/CT imaging, with implications for treatment in 15 patients. The 18F-FCH PET/CT has implications for staging, management, and treatment evaluation, due to accurate assessment of extrahepatic disease. While imaging modalities have become more and more of importance as shown above Chapter 8 evaluated if staging laparoscopy (SL) for patients with HCC is still useful. Patients with HCC who underwent SL between January 1999 and December 2011 at the AMC were included. The 56 patients in this study underwent SL for assessment of the extent of disease and the quality of liver parenchyma. The additional value or yield of SL was 7% with an accuracy of 27%. A biopsy of the non-tumoral liver was performed in 45 patients who underwent SL, leading to changes in management in 4 patients (17%) with cirrhosis. With the current accurate imaging methods and the implementation of additional percutaneous biopsy of non-tumorous parenchyma as a standard procedure in the pre-operative workup of patients with HCC, the benefit of SL is lost. Chapter 9 evaluates the patients with HCC at the Academic Medical Center, a non-liver-transplant center. Patients’ treatment, follow-up and survival were assessed in 224 patients with definitive diagnosis of HCC. Treatment with curative intent resulted in a median 2-year survival of 80%. Palliative treatment showed a median 2-year survival of 26%. Factors associated with overall survival after multivariate analysis were: aspartate transaminase (AST), albumine, ascites, size of the largest lesion, and macrovascular involvement. The results of our series shows similar survival as current literature. Factors associated with survival are AST, low albumine, presence of ascites, macrovascular involvement, and size of the largest HCC lesion.

PART IV Chapter 10 discusses 4 different images of hepatic tumors. The 1st CASE shows the hepatoblastoma, a rare carcinoma mostly seen in children. We report the case of an 18-year-old girl who presented with abdominal pain, nausea, bloating, and fatigue. MRI showed three hepatic lesions with high signal intensity on arterial phase T1-weighted images and slight washout on the late phase, being suggestive of hepatocellular carcinoma. Laboratory examinations revealed plasma alpha-fetoprotein of 11245 ng/L. Baseline 18F-FCH PET/CT was performed followed by a post-treatment 18F-FCH PET/CT after neo-adjuvant chemotherapy to assess the extent of disease and treatment response. Standard CT imaging was used as standard of reference as this is standard of care. 18F-FCH PET/CT proved to be a promising additional imaging tool for hepatoblastomas and useful for staging and assessment of treatment response of this patient. The 2nd CASE study, presents five cases in whom two rare lesions were simultaneously found within the liver, i.e. HCA and hepatic granulomas. The coexistence of both entities in these patients confused diagnosis. HCA and especially the inflammatory subtype may cause formation of granulomas in (peri-)tumorous tissue as a local response to persistent inflammation and/or the presence of a tumor. Both HCA and hepatic granulomas have also been associated with oral contraceptive use and was thought to be (partially) causative in these patients. We suggested that HCAs associated with hepatic granulomas derive from a local response to (inflammatory) HCA or neoplastic, chronic use of oral contraceptives, or a combination of these factors. The 3rd CASE study addressed the most common benign hepatic lesions, the liver hemangioma. Fortunately liver hemangiomas are readily detected by abdominal ultrasonography, contrast enhanced CT or MR imaging on which giant liver hemangiomas are defined by a diameter larger than 5 cm. In asymptomatic patients with a giant liver hemangioma observation is justified. However, surgical resection is indicated in patients with (mechanical) abdominal complaints, or when diagnosis remains inconclusive. In these cases, enucleation is the preferred surgical method, according to existing literature and our own experience. Finally a rare coexistence of two benign hepatic lesions was presented in the 4th CASE: FNH and hepatic bile duct hamartomas. MR imaging with the hepatobiliary contrast Gd-EOB-DTPA, Primovist®, was performed showing a 6cm lesion in segment 2-3 of the liver typical of focal nodular hyperplasia. Because of severe complaints attributed to the lesion, the patient was scheduled for resection. During the laparotomy multiple small white lesions were found throughout the liver with enlarged loco-regional lymph nodes. Macroscopically, the findings could be consistent with widespread metastases and the surgeon felt compelled to determine the nature of these lesions before continuing the resection. The final diagnosis revealed multiple bile duct hamartomas and an FNH lesion as was expected.
The Gd-EOB-DTPA enhanced MRI shows high accuracy when standard contrast enhanced series are combined with the hepatobiliary phase for differentiation of HCA and FNH in lesions larger than 2 cm.

PET/CT imaging with ¹⁸F-FCH can accurately differentiate HCA from FNH and may become a valuable diagnostic tool when conventional imaging techniques fail to do so.

If patients with HCA and FNH require surgery, limited resection or enucleation of the lesion can be carried out with low morbidity and without mortality, using either an open or laparoscopic approach. Patients with preoperative symptoms show a high rate of postoperative symptom relief.

Bleeding HCA can be graded on which treatment can be based: Grade I and II with bleeding-areas larger than 6cm, and all Grade III bleedings are preferably treated with TAE. Additional care, being follow-up or preventive treatment, is advised in patients with exophytic adenomas.

Bleeding was seen in 64% patients and in 22% lesions. Patients with a body mass index >25 showed an increased risk for severe bleeding Grade II and III. Lesions >35mm, exophytic lesions, lesions in segments 2-3, and lesions with associated peripheral or central arteries have a higher risk for bleeding.

The ¹⁸F-FCH PET/CT has additional value for patients with HCC. The ¹⁸F-FCH PET/CT has implications for staging, management, and treatment evaluation due to accurate assessment of extrahepatic disease.

With the current accurate imaging methods and the implementation of additional percutaneous biopsy of non-tumorous parenchyma as a standard procedure in the pre-operative workup of patients with HCC, the benefit of staging laparoscopy is lost.

Overview of the cohort of hepatocellular carcinoma patients was similar to data of Western centers. Factors associated with survival of patients with HCC are AST, low albumine, presence of ascites, macrovascular involvement, and size of the largest HCC lesion.

1 ¹⁸F-FCH PET/CT proved to be a promising additional imaging tool for hepatoblastomas and useful for staging and assessment of treatment response of this patient.

2 We suggested that HCAs associated with hepatic granulomas derive from a local response to (inflammatory) HCA or neoplasm, chronic use of oral contraceptives, or a combination of these factors.

3 In asymptomatic patients with a giant liver hemangioma observation is justified. However, surgical resection is indicated in patients with (mechanical) abdominal complaints, or when diagnosis remains inconclusive. In these cases, enucleation is the preferred surgical method, according to existing literature and our own experience.

4 Looks can be deceiving: macroscopically, the findings could be consistent with widespread metastases, frozen section analysis revealed multiple bile duct hamartomas and a lesion as was expected.
Imaging of Hepatic Hypervascular Tumors & Clinical Implications

Samenvatting

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DEEL I van dit proefschrift leidt de levertumoren in die in dit proefschrift worden besproken. Het leveradenoom, focale nodulaire dysplasie (FNH) en lever hemangiomen zijn goedafdoende tumoren die vaak bij toeval in de lever worden gevonden. Van FNH worden geen complications gezien en van hemangiomen zijn complications heel zeldzaam, daarom worden deze tumoren alleen behandeld als de klachten opweken tegen de risico’s van een eventuele invaginende behandeling. Het leveradenoom kent wel complications zoals bloeding en in zeldzame gevallen kan het kanker worden. Voor patiënten met leveradenomen zijn deze risico’s de reden waarom een operatie geadviseerd wordt. Als laatste wordt het hepatocellulaire carcioom (HCC), leverkanker besproken. Deze vorm van kank- er wordt steeds vaker in Nederland gezien en als een patiënt zich presenteert met verdenking op lev- erkanker dan wordt een multidisciplinair team van specialisten ingezet om de diagnose en uitbreiding van de ziekte te evalueren en de behandeling zo snel mogelijk te kunnen starten.

DEEL II bespreekt de beeldvorming van goedafdoende hypervasculaire levertumoren en de klinische implicaties hiervan. Alle patiënten die verdacht werden van een leveradenoom of focale nodulaire dys- plasie (FNH) werden gevraagd deel te nemen aan beeldvormende onderzoeken met het doel diagnose en behandeling van deze patiënten groep te verbeteren. In HOOFDSTUK 2 wordt het ‘leverspecifieke contrastvrije resonantie imagerie’ (MRI) ingevoerd, de waarde van de standaard MRI scan en de SUV ratio's. In HOOFDSTUK 3 wordt in het zelfde patiëntencohort de positron emission tomography (PET/CT) met de ‘F-fluoromethylethanolamine (18F-FCH) tracer besproken als nieuwe diagnostische methode voor leveradenomen en FNH. PET wordt beoordeeld door middel van een ratio: de maximale ‘standard uptake value’ (SUV) van het leveradenoom en/of FNH werd gedeeld door de gemiddelde SUV van het omliggende (lever)weefsel. De gemiddelde SUV ratio van FNH was 1.67±0.31 (likelihood ratio van 32.3 voor PET-positieve FNH). De SUV ratio van leveradenomen was 0.82±0.17 (likelihood ratio van 100 voor PET-negatieve LA). De afkap waarde van de SUV ratio bij of hoger dan 1.13 voor leveradenomen en FNH bleek 1.13 lager dan 1.13 bij patie-anten met leveradenomen en hoger bij FNH. Deze studie laat zien dat de SUV PET/CT ratio voor het onderscheiden van leveradenomen en FNH. Dit kan gemakkelijk worden gedaan in patiënten met leveradenomen en FNH. Leveradenomen van 35mm of groter vertonen meer bloedingen dan lesies die kleiner zijn, exofytische lesies vertonen vaker bloeding dan intrapleurale of subcapsulair in de lever liggen. Lesies in de linker laterale leversegmenten (segment 2-3) vieren vaker bloedingen dan lesies in de rechter lever. Tenslotte is het risico op bloeding groter als er perifere of centrale arteriën in de leveraanwezigheid bestaat uit observatie van hemodynamisch stabiele patiënten en selectieve trans- sponderelle embolisatie (TAE) in patiënten met een actieve bloeding of patiënten die bloedtrans- fusie moeten ondergaan. In HOOFDSTUK 5 wordt de graderingsysteem gepresenteerd met betrekking tot de voorgestelde behandeling waarin alleen graad I & II bloedingen met een bloedingsgebied van 6cm of groter en bij voorkeur alle graad III bloedingen, door middel van TAE behandeld worden. Gezien het vergrote risico op bloeding, wordt extra zorg (controle of preventieve behandeling) geadviseerd in patiënten met leveradenomen die aan de lever pool (exofytisch). Het doel van HOOFDSTUK 6 was risicofactoren voor bloeding in kaart te brengen in patiënten met leveradenomen. Bloeding werd geëvalueerd op CT en/of MRI zoals hierboven beschreven. In 64% van de patiënten met de diagnose leveradenomen werd een bloeding gezien in (minstens 1) leveradenoom. Indien alle leveradenomen in alle patiënten werden beoordeeld, werd in 22% van alle lever- adenomen een bloeding gezien. Patiënten met een ‘body mass index’ (BMI) van meer dan 35 hebben een verhoogd risico op ernstige bloedingen (graad II & III). Leveradenomen van 5mm of groter vertonen meerdere bloedingen dan lesies die kleiner zijn, exofytische lesies vertonen vaker bloeding dan intrapleurale of subcapsulair in de lever liggen. Lesies in de linker laterale leversegmenten (segment 2-3) vieren vaker bloedingen dan lesies in de rechter lever. Tenslotte is het risico op bloeding groter als er perifere of centrale arteriën in de leveraanwezigheid voorkomen. In DEEL III van dit proefschrift bespreekt leverkanker (hepatocellular carcioom; HCC). In de afgelopen decennia wordt een toenemende ziekte van het aantal patiënten met HCC in West Europa, inclusief Nederland. In het Academisch Medisch Cen- trum zijn een speciale polikliniek en multidisciplinair team (GIOCA: gastro-intestinaal oncoloogisch centrum Amsterdam) opgezet die verantwoordelijk zijn voor diagnostiek en behandeling van patiënten met tumoren van het spija- verteringskanaal die verdacht zijn voor een kwaadaardige tu- mor zoals HCC. De diagnose HCC wordt meestal met beeldvorming gesteld en het doel van HOOFDSTUK 7 was in kaart te brengen of de ‘F-FCH PET/CT’ van toegevoegde waarde is voor detectie van HCC.
en voor evaluatie van de uitgebreidheid van de ziekte. Net als in DEEL IV heten de PET beelden te evalueeren alle patiënt. Na behandeling met curatieve intentie worden in dezelfde patiënt; LAs en lever granulomen. Het samengaan van beide afwijkingen in deze studie geeft 5 voorbeelden van patiënten waarin 2 verschillende afwijkingen simultaan gevonden werden in dezelfde patiënt. De 18STE CASUS (studie) geeft 5 voorbeelden van patiënten waarin 2 verschillende afwijkingen simultaan gevonden werden in dezelfde patiënt; LAs en lever granulomen. Het samengaan van beide afwijkingen in deze patiënten gaf verwarring omtrent de diagnose. LA en met name het inflammatoire subtype kan vorm (studie) geeft 5 voorbeelden van patiënten waarin 2 verschillende afwijkingen simultaan gevonden werden in dezelfde patiënt; LAs en lever granulomen. Het samengaan van beide afwijkingen in deze patiënten gaf verwarring omtrent de diagnose. LA en met name het inflammatoire subtype kan vorm (studie) geeft 5 voorbeelden van patiënten waarin 2 verschillende afwijkingen simultaan gevonden werden in dezelfde patiënt; LAs en lever granulomen. Het samengaan van beide afwijkingen in deze patiënten gaf verwarring omtrent de diagnose. LA en met name het inflammatoire subtype kan vorm
De Gd-EOB-DTPA MRI laat een hoge nauwkeurigheid zien wanneer standaard dynamische series gecombineerd worden met de hepatobiliare fase voor de differentiatie van HCA en FNH in afwijkingen groter dan 2 cm.

PET/CT met 18F-FCH kan een HCA accuraat onderscheiden van FNH en kan een waardevolle aanvullende techniek zijn als De Gd-EOB-DTPA MRI geen uitsluitsel geeft.

Wanneer in patiënten met HCA of FNH een chirurgische behandeling geïndiceerd is, kan een beperkte resectie of enucleatie uitgevoerd worden met lage morbiditeit en zonder mortaliteit. Hierbij kan gebruik worden gemaakt van een open of laparoscopische benadering. Patiënten met pre-operatieve klachten lieten een hoog percentage aan symptoomverlichting zien na chirurgische interventie.

Een gradersysteem voor bloedingen in HCA wordt voorgesteld waarin Graad I & II bloedingen met een bloedingsgebied groter dan 6 cm en alle Graad III bloedingen behandeld worden met transarteriële embolisatie. Extra zorg door middel van controle of preventief ingrijpen wordt geadviseerd in patiënten met exofytische lesies.

Bloedingen in HCA worden gezien in 64% van patiënten en in 22% van alle HCA lesies. Patiënten met een ‘body mass index’ (BMI) van 25 of meer hebben een verhoogde kans op een ernstige Graad II &III bloeding. HCA groter dan 35 mm, exofytische HCA, HCA in segment 2-3 van de lever en HCA met centrale of perifere voedende arteriën, hebben een hoger risico voor bloeding.

De 18F-FCH PET/CT heeft toegevoegde waarde in patiënten met HCC met implicaties voor stagering, behandeling en evaluatie van behandeling, door de accurate detectie van extrahepatische ziekte.

Met de huidige accurate beeldvorming en de implementatie van percutane biopsie van het niet-aangedane leverparenchym in de pre-operatieve work-up van patiënten met HCC, is het voordeel van een diagnostische laparosco piekweg gevallen.

Een overzicht van een cohort patiënten met HCC behandeld in het AMC kwam overeen met data van Westerse centra. Factoren die geassocieerd zijn met overleving van patiënten met HCC zijn ASAT, albumine, ascites, macrovasculaire betrokkenheid en de grootte van de tumor.

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