

MR imaging characterization and staging of malignant central bile duct stenosis: added value of the hepatocyte specific contrast agent gadoxetate disodium

Kristina Imeen Ringe¹, Hueseyin Bektas², Bastian Ringe², Patrick Opher¹, Angela Reichelt¹, Joachim Lotz³, Frank Wacker¹, and Bernhard Meyer¹

¹Department of Diagnostic and Interventional Radiology, Hannover Medical School, Hannover, Niedersachsen, Germany, ²Department of General-, Visceral- and Transplantation Surgery, Hannover Medical School, Hannover, ³Department of Diagnostic Radiology, University Hospital Göttingen, Göttingen

Introduction:

Gadoxetate disodium is a hepatocyte specific contrast agent with distinct pharmacokinetic and pharmacodynamic properties, including hepatocellular uptake and subsequent biliary excretion, which is about 50% in patients with normal liver and kidney function. It is expected, that these features improve tumor detection and characterization compared with other imaging modalities [1]. In patients with clinical suspicion of malignant central bile duct stenosis (CBDS), caused e.g. by hilar cholangiocarcinoma, assessment of exact tumor extension is crucial to define tumor resectability. Often, different modalities are implemented complementary in the preoperative diagnostic workup [2,3]. The purpose of this study was to assess the added value of gadoxetate disodium for characterization and staging CBDS.

Materials and Methods:

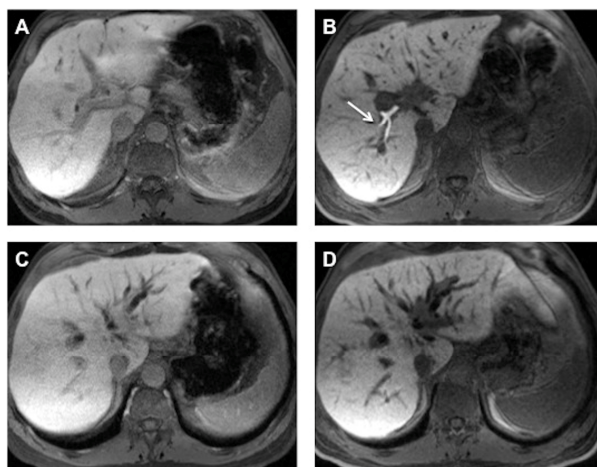
This prospective HIPAA-compliant study was IRB approved. 14 patients (8 male, 6 female; 36-80y) with clinical suspicion of CBDS underwent preoperative MRI including the administration of gadoxetate disodium. Images were assessed for etiology of CBDS. A modified Bismuth classification was applied for tumor extension. To estimate the value of hepatocyte phase images (5, 20 and 120 minutes p.i.), only T2w images (T2), only post contrast images (CM), or both image datasets were assessed in three reading sessions by 3 readers (two weeks interval). Agreement of each reading session with the intraoperative findings in terms of CBDS etiology and tumor extension (weighted kappa statistic) was calculated. In order to assess the value of different time points during the hepatocyte phase, one reader in addition retrospectively evaluated all post contrast images in knowledge of the histopathological outcome. The dataset in which the tumor was best delineated with regard to the intraoperative tumor extension was selected

Results:

CBDS was caused by hilar cholangiocarcinoma (n=9), gallbladder carcinoma (n=4) and pancreatic carcinoma (n=1). Characterization of CBDS etiology was correct by use of T2w images in 57%, 64% and 50%; by use of CM images in 64%, 57% and 50%; by combination of both in 71%, 64% and 64%. Agreement comparing reading sessions and intraoperative findings regarding tumor extension was fair up to moderate ($\kappa=0.21$ (T2); 0.34 (CM); 0.54 (both)) as a result of common understaging (T2: in 48%; CM: in 36%; both: in 24%). Interobserver agreement for tumor extension was fair (κ range = $0.31-0.33$). 10 lesions (71%) were in accordance with the intraoperative findings best visualized in the hepatocyte phase scan acquired 120 minutes after contrast injection (figure). No tumor was best visualized on hepatocyte phase images acquired 5 minutes after contrast initiation.

Discussion:

By means of combined evaluation of T2w sequences and post contrast images after injection of gadoxetate disodium, a more reliable characterization of CBDS was possible. Even though CBDS tended to be understaged before as well as after contrast injection, the application of gadoxetate disodium improves assessment of tumor extension, which is necessary to define tumor resectability. In this context images acquired in the late hepatocyte phase are most useful for exact tumor delineation. Further, the use of gadoxetate disodium in patients with central bile duct stenosis may help to better differentiate hilar cholangiocarcinoma from other tumor entities.



58-year-old male patient with histologically proven Klatskin tumor type 4. Hepatocyte phase scans acquired 20 minutes (A, C) and 120 minutes (B, D) after contrast injection. The hypointense tumor matrix is delineated best in the images acquired 120 minutes after contrast initiation. In addition, biliary excretion of the hepatocyte specific contrast agent can be appreciated (open arrow).

References:

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