

## Morphine enhanced 3D T1 Gadoxetate MRCP for pre-transplant living related liver donor evaluation

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**PURPOSE:** To assess low dose morphine sulfate for distension and improved visualization of intrahepatic bile ducts on T1 magnetic resonance cholangiography (MRC), in preoperative imaging of potential liver donors.

**MATERIALS AND METHODS:** Sixty consecutive potential living related liver donors (mean age, 40 years; age range, 21 to 59 years), referred for pre-transplant MRI evaluation were evaluated without (n=30) or with (n=30) intravenous morphine (0.04mg/kg). These patients were injected pre-MRI while establishing intravenous access allowing ~1 hour for biliary distension prior to final T1 MRCP. Intra hepatic biliary branch order visualization, CBD diameter, and overall image quality were compared. For those who underwent liver donation surgery, T1 MRC findings were correlated with intra operative findings. This retrospective study was approved by the institutional review board, and the requirement for informed consent was waived.

**RESULTS:** High agreement was seen between the two reviewers for intra hepatic biliary branch order visualization, CBD diameter and overall image quality scores for patients who received morphine. However, there was only poor agreement in patients who did not receive morphine. At 45 and 60 minutes post morphine, mean intra hepatic bile duct branch order visualization, CBD diameter and over all image quality scores were greater, compared to without morphine ( $p < 0.05$ ). Over all the rate of biliary complications for 3D T1 MRC was 0 of 8 with morphine, compared to 4 of 11 without morphine ( $p = 0.03$ ).

**CONCLUSION:** Intravenous low dose morphine distends and improves visualization of intra and extra hepatic bile ducts on T1 gadoxetate MRC.



Figure 1a, 1b, and 1c: 3D T1 MRC images at 15, 30 and 45 minutes post gadoxetate injection and 30, 45 and 60 minutes post morphine, demonstrate gradual filling of intra and extra hepatic bile ducts and gallbladder with improved segmental branch visualization. Note: Spillage of gadoxetate into duodenum 60 minutes post morphine (45 minutes post gadoxetate) indicating fading of morphine induced sphincter of oddi spasm.

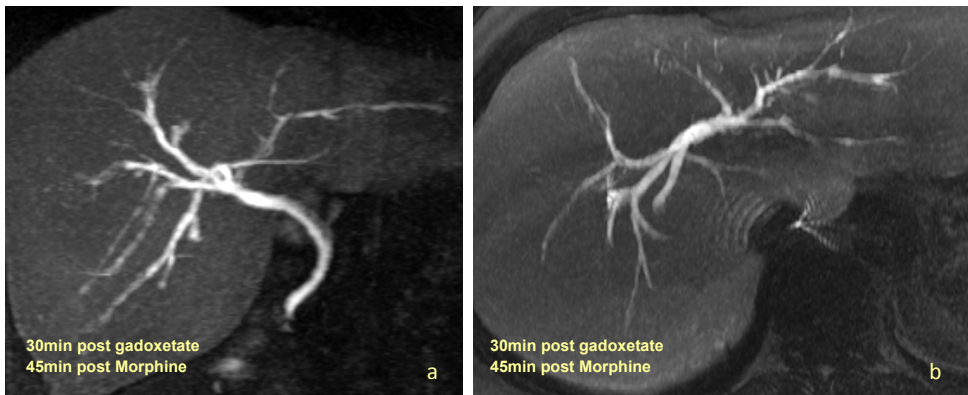


Figure 2a and 2b: Coronal and axial T1 3D MRC images at 30 minutes post gadoxetate/45 minutes post morphine demonstrates fourth order biliary branching. Greater morphine enhanced biliary distension is seen post cholecystectomy presumably because all excreted bile accumulated within the biliary tree instead of within gallbladder.

References: 1. Kropil P et al. AJR 2010 Feb;194(2):W171-5. 2. Breiman RS et al. Radiology 2008 Jun;247(3):733-7. 3. Silva AC et al. Radiographics 2004 May-Jun;24(3):677-87.