

## Dynamic Sincalide (Cholecystokinin)-enhanced magnetic resonance imaging of the gallbladder and biliary tree: Initial results in healthy volunteers

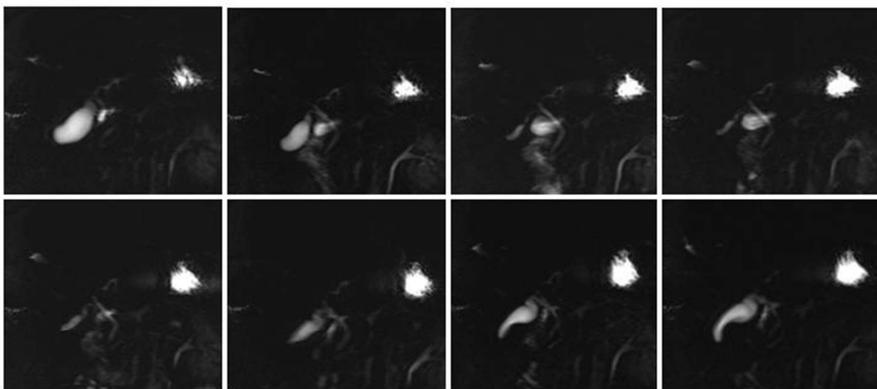
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**Purpose:** Ten to 15% of patients with clinical symptoms suggestive of biliary lithiasis have no gallstones and normal findings in morphologic imaging studies including MR Cholangiopancreatography (MRCP), an effective imaging tool to morphologically assess gallbladder (GB) and biliary ductal disease. Those patients may suffer from functional disorders such as chronic acalculous cholecystitis, gallbladder dyskinesia and sphincter of Oddi dysfunction and may benefit from a cholescintigraphy scan (HIDA) to assess GB dysfunction<sup>1</sup>. A synthetically-prepared C-terminal octapeptide of cholecystokinin (CCK) is used to induce GB contraction. While 84-100% of these patients with nonspecific symptoms will benefit from Sincalide-enhanced cholescintigraphy, this imaging technique is limited by relatively poor spatial resolution and limited capacity to show anatomic detail. In addition, it requires radiation exposure and an examination time of up to 90 min. In contrast, MRCP provides excellent anatomic detail; however, the experience with functional dynamic imaging of the GB is limited. Secretin-enhanced MRCP has proven to improve the assessment of chronic pancreatitis<sup>2</sup> and sphincter of Oddi dysfunction<sup>3</sup>. Secretin, however, has no effect on the GB, a function reserved to CCK. Purpose of this study was to utilize MR imaging to show the effects of Sincalide on the GB and biliary tree, and to establish an MR imaging protocol with appropriate dose and timing for dynamic Sincalide-enhanced MRCP of the GB and biliary system.

**Method:** Fourteen healthy volunteers (7F, 7M; mean age 42± 13 yrs) underwent Sincalide-enhanced MRCP on a 3T MRI system. After 5 hrs of fasting, 2D and 3D T2W imaging was performed before, during, and after injection of Sincalide. T2W images (RARE; TR 3090; TE 1100; SL 35mm) were obtained at every minute during 50min. Morphologic imaging was performed with 2D T2W single shot imaging and high resolution 3D TSE (TR3723ms; TE673ms; SL1mm) at time points before, 30min after injection and at the end of the protocol. A dosage of 0.02 mcg/kg BW of Kinevac ® (Sincalide, Bracco Diagnostics Inc. Princeton, NJ) was administered intravenously using either manual injection over 3min (group1) or infusion over 30min (group 2). The changes in GB volume and common bile duct (CBD) diameter were analyzed by two observers on 2D and 3D images using manual segmentation and distance measurements. Comparative statistical analysis was applied.

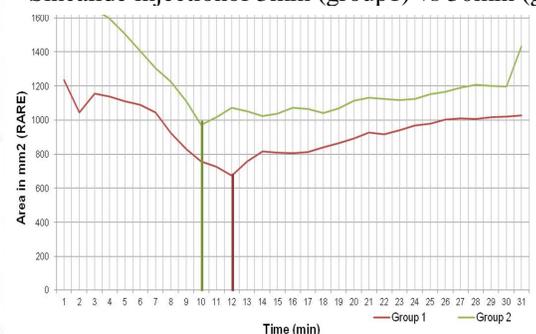
**Results:** No adverse events were observed during the entire study. Maximum contraction of GB occurred at 10.8±2.0 minutes post-injection in group 1 and at 11.5±2.2 minutes post injection in group 2. The time of maximum contraction revealed no significant difference (p= 0.68) between two groups. Dynamic pattern of GB contraction is more consistent in group 2; gradual “refill” of GB was observed in all individuals during a scanning period of 60min. Mean CBD diameter in group1 before and after maximum GB contraction was 3.35±0.84mm and 3.28±0.87mm, respectively. Mean CBD diameter in group 2 before and after maximum contraction of GB was 3.32±0.60mm and 3.15±0.70mm. Non-parametric t-test showed no significant difference (p>0.05) between the two groups.

**Conclusion:** Sincalide-enhanced MRCP is capable of providing functional dynamic information of GB contraction combined with excellent anatomic detail which is currently not available with any other imaging modality including nuclear medicine studies. The procedure is safe. Provided further evaluation in patients with GB pathology, Sincalide-enhanced MRCP may open the possibility for future combined morphologic and dynamic assessment of diseases of the GB in one examination.



**Figure1:** Gradual and continuous contraction of the gallbladder (upper row; minutes 1-11); gradual “refill” of the gallbladder (lower row; minutes 11-29)

**Figure2:** Dynamics of gallbladder contraction after Sincalide injection of 3min (group1) vs 30min (group2)



1. Krishnamurthy GT, et al. What value is normal for GB ejection fraction, and how is it established? *Radiology*, (2003) 226:593-594.
2. Sandrasegaran K, Lin C, et al. State-of-the-art pancreatic MRI. *AJR Am J Roentgenol*, (2010) 195:42-53.
3. Pereira SP, et al. Prospective comparison of Secretin-stimulated MRCP with manometry in the diagnosis of sphincter of Oddi dysfunction types II and III. *Gut*, (2007) 56: 809-813.