Pre-operative T stage evaluation of esophageal carcinoma: a comparison study between self-gating radial VIBE and breath-hold VIBE

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Target audience: Clinicians who are interested in esophageal carcinoma

Purpose: The T staging of esophageal carcinoma is quite important for treatment decision. Contrast-enhanced T1W MR imaging is valuable for this staging, however, higher spatial resolution normally requires longer breath-hold capability, which is quite challenging for patients, often resulting in poor image quality. The recently developed self-gating radial VIBE prototype is capable of reducing motion artifacts while keeping higher spatial resolution. This study aims to evaluate the clinical value of self-gating radial VIBE in T staging of esophageal carcinoma as compared to conventional breath-hold VIBE.

Methods: Fifty patients with pre-operative pathologically-confirmed esophageal carcinoma lesions were examined on a Siemens MAGNETOM Skyra 3T scanner. The MRI protocol included a prototype self-gating radial VIBE [1,2] and a conventional breath-hold VIBE sequence with Cartesian data sampling with identical spatial resolution (1.1mm x 1.1mm x 3mm). Both VIBE protocols were acquired 1 minute after the contrast injection. The patients gave written consent and the study was approved by local ethics committee. The T stage criteria for MRI images referred to the 7th edition of UICC-AJCC TNM Classification for Esophageal Cancer [3]. The T stage based on self-gating radial VIBE and breath-hold VIBE was compared to post-operative pathologic T stage.

Results: The T stage agreement between both VIBE techniques and post-operative pathologic T stage was: 52% (26/50) for breath-hold VIBE, 72% (36/50) for self-gating radial VIBE for radiologist A, and 50% (25/50), 74% (37/50) for radiologist B, respectively. For the esophageal carcinoma in situ as shown in Fig. 1(1-4), self-gating radial VIBE achieved 71% (10/14) and 78% (11/14) agreement for radiologist A and B, respectively; For invasion of muscularis propria as shown in Fig. 1(5-8), self-gating radial VIBE achieved 83% (25/30) for both radiologists A and B; while in the evaluation of invasion of adventitia as shown in Fig. 1(9-12), self-gating radial VIBE could only accurately describe the T stage in 17% (1/6) for both radiologists.

Discussion: Self-gating radial VIBE is able to reduce the motion artifact while preserving high spatial resolution. In all scanned patients, no motion artifacts are visible for self-gating radial VIBE, while breath-hold VIBE gives a higher rate of motion blurring, especially in the esophageal region and region close to heart. As an additional benefit from the non-cartesian acquisition scheme, the contrast between submucosa and muscularis propria are more obvious in radial VIBE, thus allowing for more accurate description of invasion or staging.

Conclusion: Contrast-enhanced self-gating radial VIBE is clinically useful for esophageal carcinoma T staging and super to the conventional breath-hold technique.

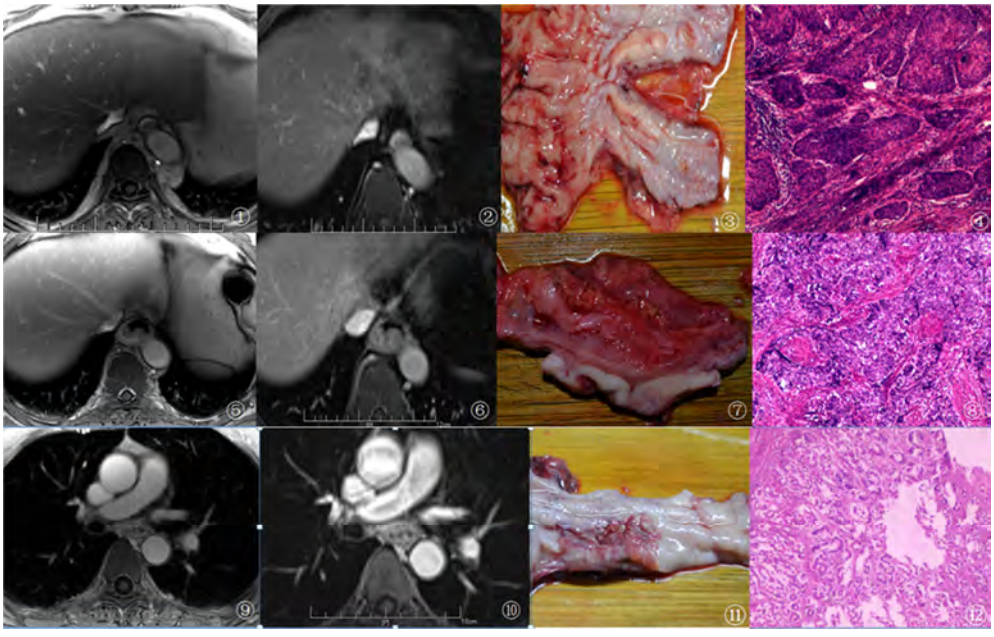

Figure 1: Self-gating radial VIBE (1,5,9), breathhold VIBE (2,6,10), post-operative slice (3,7,11) and post-operative pathology (4,8,12) of esophageal carcinoma in situ (row 1), invasion of muscularis propria (row 2) and invasion of adventitia (row 3).

Reference:

[1]. Grimm R., *et al*, ISMRM 2012, p. 598;
[2]. Chandarana, H, *et al*, Invest Radiol. 2011 Oct;46(10):648-53;
[3]. Stephen B. Edge, et al, Ann Surg Oncol (2010) 17:1471–1474.