

Comparison of Scoutless EZ-STEP and Conventional Contrast Enhanced Magnetic Resonance Angiography in Thoracic Aorta at 3T

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Introduction Contrast enhanced magnetic resonance angiography (CE-MRA) of thoracic aorta has been recognized as a routinely used imaging modality in recent years. It could be well depicts all acute aortic diseases, including dissection, aneurysm, injury hematoma and other occlusions, congenital lesions, and anatomic anomalies. However, with conventional CE-MRA, the process of acquiring the scout images and localization of the 3D volumes at each case may take up to 70% of total examination time [1-3]. Here is one recently development technology, termed as EZ-STEP, will acquire 3D volume data thick enough to cover entire thickness of the thoracic aorta, thus acquisition of scout images would not be required, and lots of time will be saved. It had been proved that EZ-STEP used to image peripheral artery demonstrated comparable or better image quality than conventional CE-MRA at 1.5T MR scanner [4]. Considering imaging of acute thoracic diseases, less examination time and good image quality are two important aspects. There is no current knowledge how EZ-STEP will be applicable in thoracic aorta at 3T MR scanner. The aim of this study is to determine if the EZ-STEP has enough image quality and shorter totally examination time in thoracic aorta imaging.

Method In this prospective study, 60 consecutive patients were divided into two groups randomly and underwent thoracic aorta CE-MRA with scoutless EZ-step and conventional respectively. Written informed consent was obtained from all patients. All examinations were performed at clinical 3.0T scanner (GE Signa Exite HD). For EZ-STEP group, the standard selective RF excitation (typically about 1~2 msec in duration) was replaced by a very short, spatially nonselective RF pulse with a duration of 0.1ms. Whole volume excitation was achieved by applying the RF pulse without a slice-selection gradient. Except for field of view, all scan parameters and contrast agents were similar between two groups. The total scan time from the beginning to the end of angiography was recorded. The images quality was estimated by two radiologists independent and regarding the score grading system. Signal noise ration (SNR) and contrast noise ration (CNR) of ROI both ascending and descending aorta were determined and compared individually.

Results All 60 cases have undergone either EZ-STEP or conventional CE-MRA examination. The image quality, SNR, and CNR were calculated and compared (Table 1, Figure 1). The average scan time for EZ-STEP group was 8 minutes, corresponding to 15 minutes for conventional CE-MRA

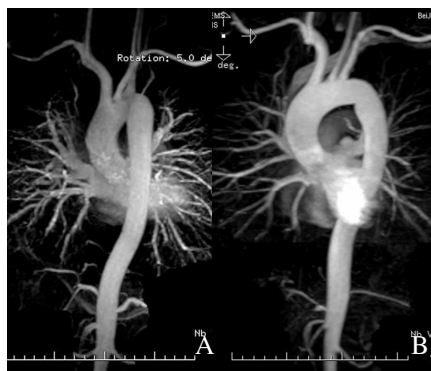


Figure 1. MIP images of conventional(A) and EZ-STEP(B) contrast enhanced MRA in two normal cases

group in thoracic aorta imaging. The image quality score of EZ-STEP was little lower than conventional group, although there were no statistical difference ($P=0.058$). The SNR of conventional group was higher than EZ-STEP ($P<0.01$), however, there are no statistical difference between these two groups in CNR ($P=0.112$). All the diagnosis result was coefficient and the image quality scores did not show significant significance between two observers (kappa: 0.71).

| | Conventional (n=30) | EZstep (n=30) | P Value |
|---------------------------------|---------------------|---------------|---------|
| Average Scan time | 15min | 5min | <0.01 |
| Average Image quality Score | 3.89±0.27 | 3.57±0.21 | 0.058 |
| SNR _{ascending aorta} | 181.2±31.8 | 137.8±22.4 | <0.01 |
| SNR _{descending aorta} | 121.3±22.3 | 98.7±14.6 | <0.01 |
| CNR | 1.76±0.54 | 1.49±0.59 | 0.112 |

Table 1 Imaging quality comparison of EZ-STEP and conventional CE-MRA

Conclusion For thoracic aorta CE-MRA, the scoutless EZ-STEP technique definitely reduces scan time obviously and provides comparable image quality at 3.0T scanner. To the best of our knowledge, this is the first EZ-STEP study of thoracic aorta imaging at 3.0T scanner. The method validation should facilitate fasten the total examination time in patients with acute thoracic aortic diseases.

References: 1. Vogt FM, *et al*, Radiol Clin North Am. **41**: 29-41, 2003. 2. Nael K. Radiology. **242**: 600-609, 2007. 3. Nael K, *et al*, Magn Reson Imaging Clin N Am, **13**: 359-380, 2005. 4. Li W, *et al*, JMIR, **23**: 235-241, 2006.