Respiratory Gated Body Diffusion Weighted Imaging Avoiding Prolongation of Scan Time: Tracking Only Navigator Echo (TRON) Technique.

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Purpose: DWIBS (Diffusion weighted Whole body Imaging with Background Suppression) technique showed that it was possible to obtain practical image even under free breathing. However, respiratory gating is still important to minimize blurring especially in the upper abdomen. But it suffers from long acquisition time and moreover unexpectable prolongation in case with irregular respiration. Our hypothesis is that tracking only navigator echo (TRON) technique makes sure respiratory gating within theoretical scanning time.

Materials and methods: Five volunteers were examined with 1.5T scanner. Different three types of scan consists of free breathing scan (FB), respiratory triggering scan with conventional technique (RT), and respiratory gating scan with TRON technique underwent for all subjects. Imaging parameters of DWI is as follows: TR of 5000 ms in FB, 1200 ms (i.e, respiratory interval) in RT, and 5481 ms in TRON, TE of 60ms, Number of excitations of 4, actual acquisition matrix of 160 (phase) x 256 (frequency), Number of slices of 42, b factor of 50 sec/mm^2. Navigator echo was applied for every three slices with delay time of 20msec in lower slices and 400msec of upper slices. Long delay time was used for avoiding overlapping saturation effect originated from excited slice prior to navigator. Evaluation was done in 1) actual scanning time and 2) image quality. The latter were assessed by two radiologists and results were reached in consensus. Criteria of image quality were classified in five point scales from 1 to 5 based on blurring of vascular structure.

Results: Actual scanning time of FB, RT and TRON is 1min30sec, 4min13sec, and 1min34sec, respectively (Fig.1). Relative scanning time based on one of FB is 2.81 in RT and 1.04 in TRON. Image quality assessed was 3.2 in FB, 4.5 in RT, and 4.0 in TRON. Gating error was noted in all types of images. But no significant difference was seen between RT and TRON (Fig.2).

Conclusion: Tracking only navigator echo (TRON) technique can be done within almost same scanning time to free breathing. Although image quality of that is slightly inferior to conventional respiratory gating, it may be usable widely because of much shorter scanning time.

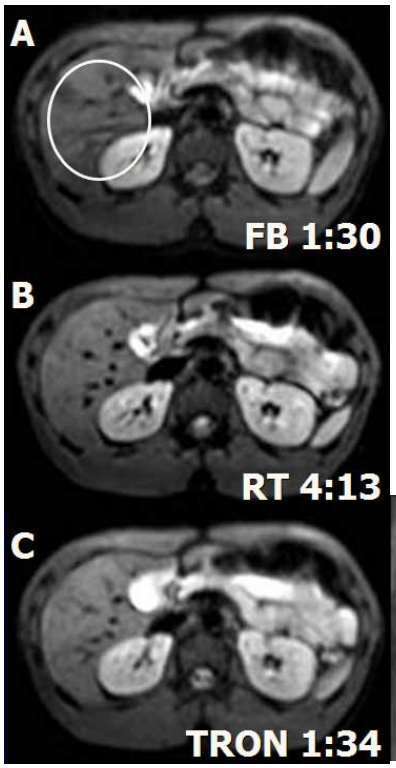

Fig.1 (Left): A (Free breath) showed blurring of vascular structure in right lobe of the liver (circle). B (Respiratory triggering) showed best results, but it takes 4min13sec, which corresponds 281% of FB. C (TRON) showed significant improvement in image quality with very small prolongation of scan time.

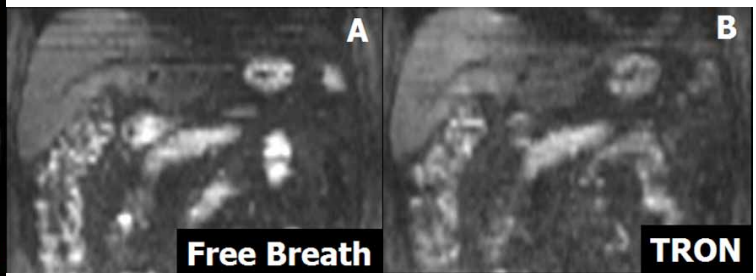

Fig.2 (Bottom): Both A (Free breath) and B (TRON) showed gating error. However, there is no significant difference with each other.