EFFECT ON IMAGE QUALITY OF CAROTID THREE-DIMENSIONAL MR-ANGIOGRAPHY: 1.0 M GADOBUTROL VERSUS 0.5 M GADOTERATE MEGLUMINE AT 3 TESLA SCANNER

RAYMOND LEE1, Gladys Lo Goh, Kai Ming Paul Au Young, Chi Wai Liu, Ka Man Chan, and Mei Lee Betty Hung1
1Department of Diagnostic and Interventional Radiology, Hong Kong Sanatorium & Hospital, Hong Kong, Hong Kong, China, People’s Republic of

INTRODUCTION
One approach to improve the diagnostic quality of contrast enhanced MRA is the introduction of contrast agent with increased T1 relaxivity, which leads to higher vessel signal intensity. Previous studies1,2,3 showed contradictory results whether 1.0 M gadobutrol could improve image quality over 0.5 M gadolinium-based contrast, possibly because different anatomic regions were examined and study design. Evaluation on the significance of 1.0 M versus 0.5 M gadolinium-based contrast in carotid contrast-enhanced 3D MR angiography is lacking and not confirmed. The purpose of this study was to compare a macrocyclic non-ionic 1.0 M contrast agent (Gadobutrol) with a macrocyclic ionic 0.5 M contrast agent (Gadoterate Meglumine) on the effect of image quality in carotid contrast-enhanced 3D MR angiography.

SUBJECTS AND METHOD
In an intraindividual comparative study, 10 patients (five women, five men; mean age, 71, range, 37–94 years) with symptomatic of cerebral ischemia underwent 3 Tesla MRI contrast-enhanced 3D MR angiographic examinations performed with parallel imaging technique. At random and in separate sessions, each patient was examined after IV injection of 0.1 mmol/kg body weight 1.0 M macrocyclic non-ionic Gadobutrol and 0.5 M macrocyclic ionic Gadoterate Meglumine at 2cc/sec by a power injector through a cubital or hand vein.

Quantitative analysis included signal-to-noise (SNR) and contrast-to-noise (CNR) values were calculated based on signal intensity (SI) measurements in 3 segments of each carotid artery: Proximal common carotid artery, common carotid artery just proximal to carotid bifurcation and cervical segment of internal carotid artery. SI determinations were performed in ROIs of identical size placed immediately adjacent to the delineated artery in the stationary tissues and were measured on coronal source images. Absolute SI measurements were related to noise, defined as the standard deviation of SI measurements collected in an ROI outside the neck tissue. Based on these data, SNR and CNR values were calculated in the following manner: SNR= SIVessel/noise; CNR = SIVessel – SIAbsolute/nSIAbsolute.

For qualitative analysis, the overall image quality of each vessel segment was rated from 2 experienced radiologists also with the CNR of using Gadobutrol (97.52 ± 28.65) was also significantly (P< 0.05) higher than that of using Gadoterate Meglumine (76.9 ± 31.7).

RESULTS & DISCUSSION
Results of quantitative analysis showed that there were significantly higher SNR and CNR after administration of 1.0 M Gadobutrol compared to 0.5 M Gadoterate Meglumine. The SNR of using 1.0 M Gadobutrol (106.7 ± 27.5) was significantly (P< 0.05) higher than that of using 0.5 M Gadoterate Meglumine (88.7 ± 32.1) while the CNR of using Gadobutrol (97.52 ± 28.65) was also significantly (P< 0.05) higher than that of using Gadoterate Meglumine (76.9 ± 31.7).

Our results concord with the previous studies1,2,3 that there is significant advantage of using 1.0 M Gadobutrol versus 0.5 M Gadoterate Meglumine in contrast-enhanced 3D MR angiography. Positive results may be explained by less bolus dispersion of contrast in carotid vessel as suggested by Fink et al1, when compare to other study with insignificant results which examined more distal anatomical part such as lower limbs. However, our study does has limitation such as relatively small sample size.

CONCLUSION
At the dosage of 0.1 mmol/kg of 1.0 M Gadobutrol versus 0.5 M Gadoterate Meglumine, administration of 1.0 M Gadobutrol resulted in better quality of carotid contrast-enhanced 3D MR angiography.

REFERENCES