To investigate the effect of combined DLIR reconstruction algorithm with different concentrations of contrast agents on coronary CTA image quality

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Objective

Compared with conventional reconstruction algorithms, deep learning image reconstruction (DLIR) technology is expected to effectively improve image quality while maintaining spatial resolution. The purpose of this study was to investigate the effect of a combined DLIR with different concentrations of contrast agents on the quality of CCTA images.

Methods

Thirty patients who underwent coronary CT angiography (CCTA) in our hospital from September 2021 to January 2022 were collected and divided into two groups with 15 cases in each group according to the concentration of contrast agent used. Contrast agent concentration in group 320mg/mL, contrast agent concentration in group B 370mg/mL (conventional), group A medium-grade (DLIR-M), high-grade (DLIR-H) deep learning algorithm for reconstruction, group B using clinical routine 40% weight Adaptive Statistical Iterative Reconstruction (ASIR-V). The image noise of the aortic root and proximal main coronary artery of each group of images was recorded, and the Signal-to-Noise Ratio (SNR) and Contrast-to-Noise Ratio (CNR) were calculated. Subjective image quality was rated on a 5-point scale by two diagnostic radiologists with more than 5 years of experience.

Results

1) Compared with ASIR-V40%, both DLIR-M and DLIR-H performed better noise reduction effect (P value <0.05). The SNR and CNR of DLIR-M and DLIR-H groups were significantly improved by 69.91% %, 67.91% and 120.25%, 119.85%, compared to ASIR-40%, respectively.

Table 1 Image SNR and CNR of the two reconstruction algorithms（X±s）

		Group B	Group A		*P*
		ASiR-V 40% group	DLIR-Mgroup	DLIR-Hgroup	
AO	SNR	7.82±1.59	14.67±3.21	22.12±4.55	＜0.01
	CNR	7.11±1.58	13.33±3.13	20.09±4.48	＜0.01
LMA	SNR	8.06±1.64	12.94±3.12	16.32±4.28	＜0.01
	CNR	7.30±1.63	11.70±2.94	14.73±3.90	＜0.01
LAD	SNR	7.33±1.62	11.73±3.11	15.76±11.42	＜0.01
	CNR	6.57±1.60	10.49±2.92	14.17±11.29	＜0.01
RCA	SNR	7.74±1.68	12.43±3.23	15.44±4.54	＜0.01
	CNR	6.99±1.67	11.19±3.04	13.85±4.19	＜0.01
LCX	SNR	7.60±1.60	12.97±7.72	15.27±3.98	＜0.01
	CNR	6.84±1.60	11.74±7.64	13.69±3.64	＜0.01

2) The scoring results of two observers, physician A and physician B, showed that the noise reduction level increased with the increase of the deep learning image reconstruction technology (DLIR) (P value < 0.05), and both observers believed that the diagnosis effect was the best The one is DLIR-H, and its subjective image quality is significantly improved by 40% compared with ASIR-V, which is 28.52% higher.

Table 2 Comparison of subjective image quality scores between the two groups of images（X±s）

	Group B	Group A		*P*
	ASiR-V 40% group	DLIR-Mgroup	DLIR-Hgroup	
Doctor A	3.85±0.50	4.73±0.63	4.91±0.30	＜0.01
Doctor B	3.83±0.48	4.72±0.41	4.96±0.33	＜0.01
Kappa value	0.846±0.052	0.867±0.071	0.866±0.120	-

Conclusion

Compare to the CCTA scanning scheme of 370mg/mL contrast agent combined with ASIR-V40% algorithm, the results show that the SNR and CNR of using 320mg/mL contrast agent combined with DLIR-H algorithm group was higher than those of the high contrast agent concentration group, indicating that DLIR had better image correction ability, which has higher clinical application value.

Clinical Correlation

How to reduce the radiation dose is the focus of domestic attention. The combination of deep learning reconstruction algorithm (DLIR) under the condition of low contrast agent concentration can replace the conventional contrast agent concentration combined with ASIR-V40% scanning method, which not only improves the image quality, but also greatly reduces the The dosage of iodine contrast agent can effectively reduce the adverse reaction of contrast agent and reduce the risk of contrast agent extravasation.

Thank You!

reconstructed images of DLIR-
ly. The image ality DL -L is
DLIR-H is fine d th tru e is
male patient, 6 ear d, r nstructed
image for ASIR-V40%, the image as a certain graininess.