Longitudinal evaluation of cardiac and extracardiac amyloid load in patients with AL and ATTR amyloidosis, measured by 124I-AT-01 PET/CT imaging

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Background: The amyloid imaging agent, 124I-AT-01 (124I-p5+14), is being developed for the diagnosis and monitoring of amyloidosis, of any type, by PET/CT imaging (1,2). PET/CT is an intrinsically quantitative imaging modality, and this reagent could provide a facile, first-line method for the diagnosis of amyloidosis as well as permit quantitative longitudinal imaging for monitoring progression or regression of disease, notably in the heart, of all amyloid patients. Here we describe an interim analysis of a case series of AL and ATTR patients who have been imaged at least twice with 124I-AT-01 with a minimum of 12 months between imaging (NCT designation pending). Radiotracer uptake has been quantified for the heart, liver, spleen and kidneys and changes in uptake reported.

Purpose: The goal was to quantitatively assess changes in organ-specific radiotracer uptake in AL and ATTR patients with previous cardiac uptake using manual region-of-interest methods.

Methods: The study will enroll patients with AL (n=10) and ATTR (n=10) who were previously imaged more than 12 months prior and who had positive uptake of 124I-AT-01 in the heart. To date, six patients have been imaged twice and one has had three evaluations since 2019. Patients received 37 or 74 MBq 124I-AT-01 and PET/CT imaging was performed at ~5 h post injection. A fully manual 2D region of interest analysis was performed on three representative image views of the heart in the transaxial plane as well as the liver, spleen and kidneys. The blood pool was used as a reference tissue to determine standard uptake value ratios (SUVRmean). Changes in cardiac uptake of radiotracer were compared with contemporaneous NTproBNP measurements.

Results: The PET images were of high quality and readily interpretable and quantifiable (Figure 1A). In this early analysis of the data, both AL (n=2) and ATTR (n=4) have been evaluated. The mean time between first and second imaging was 30.3 ± 8.9 months. In the patients with ATTR amyloidosis, there was an average of a 7.9 ± 10% decrease in cardiac uptake of 124I-AT-01 after an average of 32.5 months from the first scan, in patients on silencers or stabilizers. In the AL patients, one had a 10% decrease and the other a 12% decrease in heart uptake. In some, these changes correlated with serum NTproBNP levels. A notable decrease in 124I-AT-01 binding in both AL patients was observed in the liver (45% and 59%) and spleen (75% and 73%) with one example shown in Figure 1B. No cases of increased radiotracer uptake were observed in the heart, consistent with these patients being stabilised with standard of care therapy.

Conclusion: Changes in cardiac amyloid load, based on differential uptake of radiotracer, can be seen by longitudinal imaging and quantified using 124I-AT-01 PET/CT imaging. This technique may play a valuable role not only in the early and accurate diagnosis of amyloidosis but also for monitoring changes in organ-specific amyloid load.