



## Survival advantage of treated patients diagnosed with cardiac TTR amyloidosis by dual isotope perfusion metabolism CZT SPECT: Four year experience at the University of Rochester

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### Background

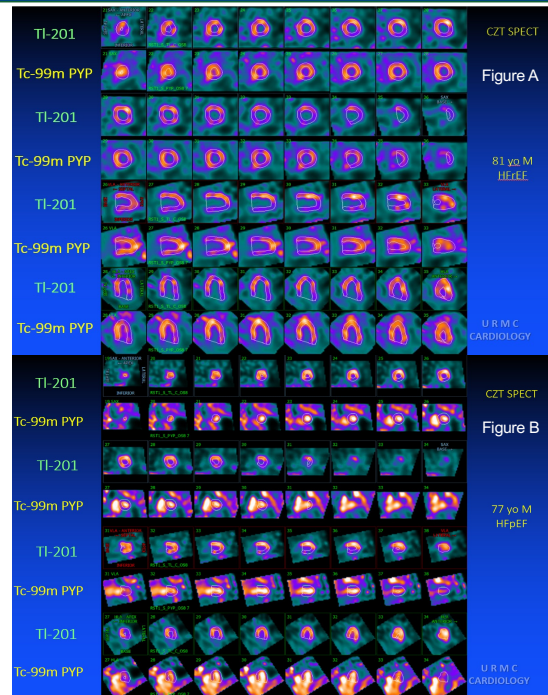
ATTR cardiac amyloidosis causes infiltrative cardiomyopathy (ATTR-CM) and heart failure with high morbidity and mortality. Availability of effective treatments for ATTR-CM mandates efficient diagnosis and referral for therapy. Tc-99m pyrophosphate (PYP) imaging by planar and SPECT techniques is highly accurate and routinely avoids endomyocardial biopsy for diagnosis. Dual isotope perfusion metabolism amyloidosis imaging (DIPMAI) with CZT SPECT offers substantial advantages over standard planar or SPECT PYP imaging including:

1. Higher spatial resolution of myocardial or blood pool location of PYP by use of a gold standard LV myocardium reference region of interest with very low dose ( $\leq 1$  mCi) thallium-201 resting MPI
2. Reduced dose Tc-99m PYP (10 mCi vs. 20 mCi)
3. Streamlined, time efficient simultaneous dual isotope single imaging protocol (90 min vs. 3 hours) to define cardiac PYP distribution.

**Study Aim:** To establish diagnostic value of CZT SPECT using asynchronous or simultaneous imaging (SDI) DIPMAI by evaluating differences in mortality in both tafamidis treated and untreated patients diagnosed with ATTR-CM using this approach.

### Methods

We performed an IRB approved secondary analysis of a quality assurance REDCap database, including 313 patients who underwent DIPMAI with CZT SPECT May 2018 - February 2022. All studies were obtained using the high efficiency D-SPECT camera (Caesaria, IS). We recorded PYP Perugini scores (0 to 3+ scale) on reconstructed planar and SPECT displays, number of patients referred for treatment, patients who started treatment, time from positive scan to treatment, and survival times in treated and untreated patients.



Figures of CZT SPECT SDI (Simultaneous dual isotope imaging) clearly define Tc-99m PYP myocardial uptake vs. LV blood pool. **Figure A:** Tc-99m PYP myocardial uptake (within TI-201 ROI) in ATTR-CM patient. **Figure B:** LV blood pool PYP without myocardial uptake in HFrEF without ATTR-CM.

### Results

Of 313 patients, 53 (17%) with follow-up in our system were diagnosed with ATTR-CM using DIPMAI. Most patients (N=41, 75%) with positive scans were treated with tafamidis. Starting therapy was associated with enhanced survival: 5 of 41 treated patients (12%) died, and 5 of 12 non-treated patients (42%) died ( $p=0.0357$ ). Of the 10 patients who died, treatment was associated with 12 months longer mean survival ( $17.8 \pm 4.3$  for treated patients vs.  $5.7 \pm 6.8$  months for untreated patients,  $p=0.0078$  by unpaired t-test). Of the 12 untreated patients, 5 patients died, and 4 patients cited significant cost barriers to tafamidis. Average time from diagnosis to treatment was  $62 \pm 44$  days.

### Conclusions

Combined perfusion metabolism dual isotope CZT SPECT precision imaging (DIPMAI) at 90 minutes post injection provides accurate diagnosis of TTR cardiac amyloidosis and effectively triages patients for treatment. Treatment of ATTR-CM defined by CZT SPECT DIPMAI was associated with improved survival in our 4 year clinical experience. Treatment failures include some patients unable to afford therapy. Increased availability of specialty pharmacists may enhance treatment and survival rates of patients diagnosed with TTR cardiac amyloidosis. Study of comparison of efficiency, accuracy, referral of patients to treatment and clinical outcomes using DIPMAI with CZT SPECT vs traditional planar and SPECT appears warranted.

### Reference

Tamarappoo B, Otaki Y, Manabe O, Hyun M, Cantu S, Arnson Y, Gransar H, Hayes SW, Friedman JD, Thomson L, Slomka P, Dey D, Vescio R, Patel J, Berman DS. Simultaneous Tc-99m PYP/Tl-201 dual-isotope SPECT myocardial imaging in patients with suspected cardiac amyloidosis. *J Nucl Cardiol.* 2020 Feb;27(1):28-37. doi: 10.1007/s12350-019-01753-5. Epub 2019 Jun 6. PMID: 31172386.