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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Introduction: TTR cardiac amyloidosis (TCA) causes infiltrative cardiomyopathy and heart failure with high morbidity and mortality. Availability of effective treatments for TCA 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 to diagnose TCA. Dual isotope perfusion metabolism amyloidosis imaging (DIPMAI) with CZT SPECT offers substantial advantages over standard planar or SPECT PYP imaging including: 1. Optimizing 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); and 3. streamlined, time efficient simultaneous dual isotope single imaging protocol (90 min vs. 3 hours) to resolve PYP distribution. Despite advantages of DIPMAI with CZT SPECT, clinical effectiveness for diagnosis and referral for treatment and outcomes with this approach are not well defined.

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

Results: Of 313 patients, 53 (17%) with follow-up in our system were diagnosed with TCA using DIPMAI. Most patients (N=41, 75%) with positive scans were treated. 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 ± 4.3 for treated patients vs. 5.7 ± 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 ± 44 days.

Conclusion: Combined perfusion metabolism dual isotope CZT SPECT precision imaging at 90 – 120 minutes post injection provides accurate diagnosis of TTR cardiac amyloidosis and effectively triages patients for treatment which was associated with improved survival in our 4 year clinical experience. Treatment failures include 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.