The use of high sensitivity troponin T as a biomarker of anthracycline cardiotoxicity

C. Bannister¹, B. Tam To¹, T. Patel¹, R. Yap¹, A. Cannata¹, D. Bromage¹, T. Mcdonagh¹
¹King’s College Hospital, London, United Kingdom of Great Britain & Northern Ireland

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Introduction: Anthracyclines are a highly effective class of chemotherapy used to treat a wide variety of malignancies. Their use is complicated by the development of cancer therapy-related cardiac dysfunction (CT-RCD), defined broadly as the development of left ventricular systolic dysfunction following cancer treatment. Troponin, a well-established marker of myocardial necrosis and early myocardial injury following anthracycline chemotherapy, may predict the subsequent development of CT-RCD. It is not known, however, at what timepoint troponin should be measured, or if there is a clinically relevant threshold that best predicts the development of CT-RCD.

Purpose:
1. To investigate if high sensitivity troponin T (hsTnT) accurately predicts the development of anthracycline CT-RCD
2. To establish the best timepoint at which hsTnT should be measured to predict CT-RCD
3. To establish the most clinically relevant hsTnT concentration to predict CT-RCD

Methods: In 2020 we introduced a clinical pathway for outpatients receiving anthracycline chemotherapy at our Institution. As part of this pathway, hsTnT concentrations are measured at baseline (pre-chemotherapy) and prior to each anthracycline cycle. In this study, we performed a prospective audit of outpatients receiving anthracycline chemotherapy for the treatment of breast or haematological malignancies. Troponin concentrations prior to each chemotherapy cycle were assessed and ROC curve analyses were performed to determine the most accurate timepoint and threshold to predict CT-RCD. CT-RCD was defined as a drop in the left ventricular ejection fraction (LVEF) of >10% from baseline to a value of <50%.

Results: 118 outpatients were treated with anthracycline chemotherapy between August 2020 and May 2022. 64 patients (54%) were treated for breast cancer and 54 (46%) for haematological malignancies. The mean age was 54±15yrs, with 71% females. At baseline, 27 (23%) of patients had a diagnosis of hypertension, 16 (14%) diabetes, 28 (24%) smoking history, 10 (8%) chronic kidney disease and 31 (26%) obesity. The median cumulative dose was 360mg/m² for Epirubicin and 300mg/m² for Doxorubicin. The baseline mean LVEF was 60.5±4%. 97/118 (82%) of patients had a follow up echocardiogram. 11/97 (11%) of patients developed CT-RCD. Mean hsTnT concentrations rose incrementally as the cumulative dose of anthracycline increased (Fig 1). Baseline hsTnT concentration was the most accurate predictor of subsequent CT-RCD (AUC 0.75), with a 75% sensitivity and 80% specificity for predicting CT-RCD if the baseline hsTnT concentration was ≥10.5ng/L. In addition, the baseline mean hsTnT concentration was significantly higher in patients with CT-RCD vs. those with no CT-RCD, P=0.0008 (Fig 2).

Conclusions: High sensitivity troponin T concentrations appear to be clinically useful in predicting subsequent CT-RCD, with the most accurate point of measurement being at baseline, prior to chemotherapy commencing.
Fig 2. Baseline mean high sensitivity troponin T concentrations in patients with CT-RCD vs. non CT-RCD

P = 0.0008