The predictive value of right ventricular strain in Epirubicin induced cardiotoxicity in patients with breast cancer

Introduction

Being known for the notorious effect of cardiotoxicity, Doxorubicin has been replaced by Epirubicin gradually. However, despite the improved concepts of cardiotoxicity prevention, like the dose of chemotherapy and sequential monitoring cardiac function, a reliable and sensitive detector of occult myocardial dysfunction remains lacking. Speckle tracking echocardiography (STE) is an emerging imaging modality in detecting early occult myocardial dysfunction.

Objectives

In this study, we aim to identify the very early myocardial injury upon the receipt of chemotherapy in breast cancer patients using STE.

Methods

Echocardiography, including STE, was performed at baseline, 6 hours and three months during the period of Epirubicin therapy. The clinical cardiovascular events and severity of dyspnea were recorded. Doppler echocardiography was used to evaluate right heart function. Patients with early cardiac valve disease, systemic hypertension, severe mitral regurgitation or significant structure heart disease or significant arrhythmia were excluded due to structure heart disease and poor image quality. Compared with the age and gender matched controls (n=41).

Results

1. Compared with the age and gender matched controls (n=41), right ventricular longitudinal strain at 6 hours was significantly impaired in patients with dyspnea (-16.94±6.81%; -16.86±7.27%; p=0.01; 0.001, respectively).

2. Also, the accumulating dose of Epirubicin positively correlated to the development of dyspnea (R2=0.38, p=0.04) and the decline of right ventricular strain (R2=0.53, p=0.02).

This was noted prior to left ventricular systolic or diastolic dysfunction.

Discussion

During Epirubicin therapy, both of RV LS and LV LS significantly impaired at three months (T3) (-16.94±6.81%; p=0.01; 0.001, respectively), but the changes of LV LS was even more striking, starting at the phase three (T3=71.43±35.32; p=0.01).

Conclusion

Right ventricular longitudinal strain sensitively predicts the development of dyspnea in breast cancer patients receiving Epirubicin therapy. Larger scale studies are required to validate its role in right ventricular cardiotoxicity and long term survivals.

Acknowledgements

0.015% high sensitive Troponin T; BNP= B-type natriuretic peptite; DT=Deceleration time; MPI=myocardial performance index; LS=longitudinal strain; RS=radial strain; CS=circumferential strain; LSR=longitudinal strain rate; RSR= radial strain rate; CSR= circumferential strain rate. The predictive value of right ventricular strain in Epirubicin induced cardiotoxicity in patients with breast cancer

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1. This study recruited patients with newly diagnosed breast cancer preparing to receive Epirubicin therapy. 2. Patients who underwent early stages of therapy before history of heart failure, significant structure heart disease or significant co-morbidities were excluded. 3. Dyspnea index was quantified by questionnaire "Please circle the number that best describes how short of breath you have felt over the past 2 weeks when climbing stairs. Front (0) to (10) (most severe).

Clinical characteristics were significantly changing during the period of Epirubicin therapy. BNP and MPI were similar during the similar therapy period.

Both LV and RV left heart associated parameters, including diastolic characteristics (E', E'/A, PTI, MPI, IVRT, ITI) and systolic performance (LVMI, LVESD, LVEDD) and speckle tracking (LV, RV) were significantly changed.

Abstract

With the improvement of cancer therapies, the life span extended but the quality has been threatened by the treatment induced toxicity. Cardiotoxicity leads to not only edema, exercise intolerance but fatal arrhythmia and heart failure. However, most cardiac complications failed to be observed until specific symptoms developed. Speckle tracking echocardiography (STE) is a sensitive imaging modality in detecting early occult myocardial dysfunction.

The main clinical characteristic was significantly changing during the period of Epirubicin therapy. The clinical cardiovascular events and severity of dyspnea were recorded. Doppler echocardiography was used to evaluate right heart function. Patients with early cardiac valve disease, systemic hypertension, severe mitral regurgitation or significant structure heart disease or significant arrhythmia were excluded due to structure heart disease and poor image quality.

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