Assessment of early onset chronic progressive anthracycline cardiotoxicity by tissue Doppler imaging in children

Divisions of Pediatric Cardiology (1) and Pediatric Hematology and Oncology (2), Department of Pediatrics (3), Akdeniz University School of Medicine, Antalya, Turkey.

Introduction: Most of the clinical studies concerning anthracycline cardiotoxicity have investigated “late onset cardiotoxicity” and focused on particularly the left ventricular systolic functions. We aimed in this study to assess “early onset chronic progressive anthracycline cardiotoxicity” in the left and right ventricular segments using tissue Doppler imaging (TDI) with increasing cumulative anthracycline doses.

Methods: The patient group included the patients who had been received doxorubicin and/or daunorubicin within a time period of between one week and one year when they were examined (mean 2.6±2.9 months, range: 0.3-11.5 months). During TDI studies, apical 4-chamber views were obtained and diastolic and systolic parameters were measured at four different segments [lateral annulus of the mitral valve (MV-lat), middle part of left ventricular lateral wall (LVLW), lateral annulus of the tricuspid valve (TV-lat) and right ventricular lateral wall (RVLW)]. The echocardiographic data on all patients were classified into three groups according to their cumulative anthracycline doses: treatment group (TG-I (≤ 120 mg/m²; n=26), TG-II (120-240 mg/m²; n=39), TG-III (≥ 240 mg/m²; n=40). Standard echocardiographic and TDI parameters of the patients were compared with healthy controls.

Results: 72 patients (38 girls, 34 boys) and 31 controls (18 girls, 13 boys) were enrolled in this study. The mean age was 8.2±4.5 years in patient group and 9.6±4.2 years in the control group (p>0.05). The comparison of control and TG-1 groups revealed significant decreases in E’ velocities in TV-lat and RVLW segments (p<0.001 and p<0.05, respectively). While MPI was significantly increased in all four segments, a significant decrease in S’ velocity was seen only in MV-lat and LVLW segments (p<0.05 and p=0.001, respectively). Conventional echocardiographic parameters including EF did not change significantly in TG-I. These changes in TDI were more prominent in TG-II and TG-III. Moreover, increase in IRT in all segments except MV-lat segment and decrease in EF were statistically significant with a cumulative anthracycline dose of >120 mg/m².

Conclusions: Abnormalities in diastolic functions by TDI were observed in the RV earlier than LV with ≤120 mg/m² cumulative anthracycline doses, whereas systolic dysfunction findings were observed first in LV with increasing drug doses.