

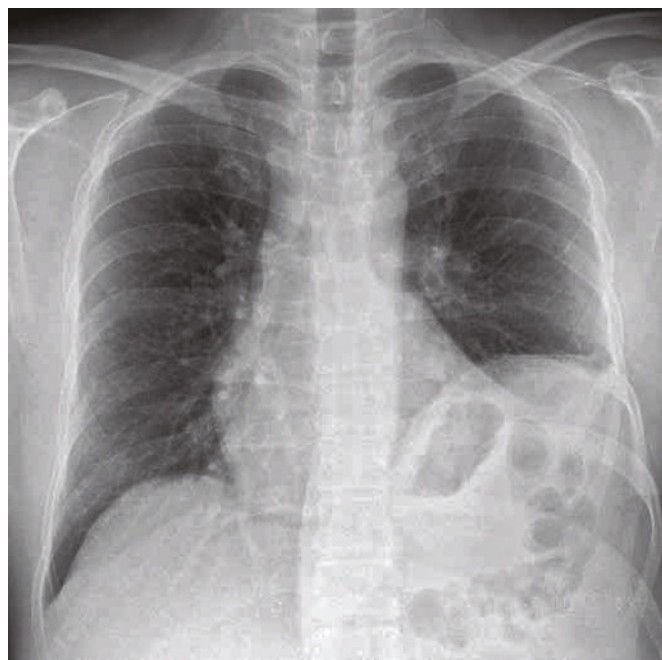
coronary arteries were identified. The lung parenchyma was without focal and infiltrative changes and without pleural effusion. In late October, ECG Holter monitor showed frequent monomorphic premature ventricular contractions (overall burden 10%) with right bundle branch block morphology. Sinus tachycardia and numerous ventricular extrasystoles were present at the time of subjective difficulties reported by the patient. No supraventricular extrasystole or atrial fibrillation was identified. As part of the primary prevention of sudden cardiac death, a single-chamber cardioverter defibrillator (ICD Visia) was implanted in the patient in November 2019 at the Division of Arrhythmias and Cardiac Pacing of the National Institute for Cardiovascular Diseases in Bratislava. After increasing the dose of beta-blocker, the incidence of ventricular extrasystole were reduced. Mild cardiomegaly, increased bronchovascular pattern, and elevated left diaphragm persisted on the follow-up chest X-ray (Figure 1). The follow-up spirometry test documented a moderate restriction disorder with a moderate reduction in diffusion capacity. In October 2019, the NT-proBNP level was 255 ng/l and the LVEF was 30%. The echocardiographic image is shown in Figure 2. During another follow-up, in December 2020, the level of NT-proBNP was 204 ng/l and LVEF was 25%. At another follow-up, in May 2021, the level of NT-proBNP was 180 ng/l and LVEF was 30%. Subjectively, the patient feels good, has no chest pain, tolerates normal physical exertion without difficulty. The patient is treated by a cardiologist with the recommendation of regular blood pressure checks and adequate physical activity and the recommended treatment: beta-blocker, ACE inhibitor, eplerenone, vitamin D and furosemide. The patient is a potential candidate for a heart transplant, which currently is not indicated for good functioning. Possible barriers in the future include the carrying of the gene for CADASIL syndrome.

## Discussion

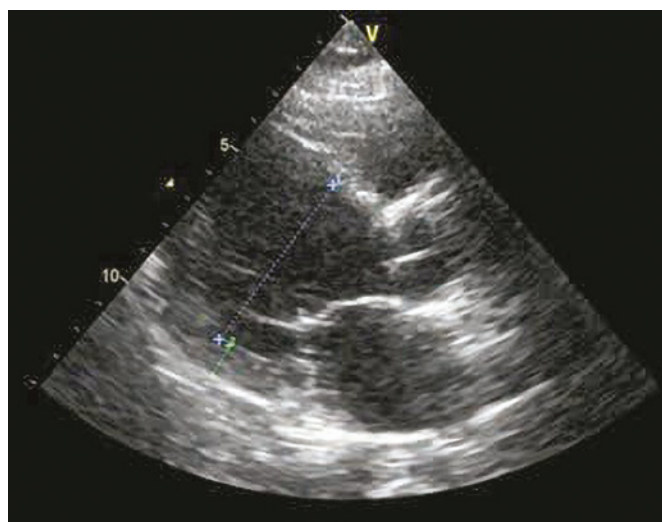
The present case report describes a patient, who at the age of four years was treated for T-cell non-Hodgkin lymphoma with chemotherapy containing doxorubicin at a cumulative dose of 230 mg/m<sup>2</sup>. Even though this anthracycline dose is not high (the maximum cumulative dose in children is 400 mg/m<sup>2</sup>), it cannot be considered safe, especially given the patient's young age and stressful situations (such as respiratory infection) during the years following successful cancer treatment. Already in 2010, the patient was diagnosed with mild diffuse hypokinesia with LVEF of 50-55%, and in 2016 the LVEF was 54%. In the early 1990s, first data that long-term survivors of childhood cancer

may develop irreversible, often progressive heart damage (cardiomyopathy, LV dysfunction, heart failure) and arrhythmias were published. The data of the first 15 patients with serious late clinical cardiotoxicity after therapy of childhood cancer were analysed by Steinherz et al. in 1995. Cardiac failure and arrhythmias were manifested in these series of patients from 6 to 19 years after the completion of anthracycline treatment. One out of 15 patients died, others underwent successful heart transplantation (8). In 2015, Cardinale et al. prospectively evaluated the incidence, timing of occurrence, clinical correlates, and response to heart failure therapy of cardiotoxicity in 2625 of anthracycline-treated adult patients. Cardiotoxicity occurred in 226 (9%) of them. One hundred eighty-three (81%) patients, were in New York Heart Association class I to II, and 43 (19%) were in class III to IV. In 9 patients, cardiotoxicity was manifested as an acute decompensated heart failure. Six of them subsequently died. In the remaining 217 patients developing cardiotoxicity, no hospitalization was needed. Heart failure therapy was initiated in all

**Fig. 1.** Chest X-ray of October 2019



**Fig. 2.** Echocardiography image of October 2019



**Tab. 2.** Recommended frequency of echocardiographic examinations (according Children's Oncology Group, 2018)

Dose of ANTR	Dose of RT	Frequency of Echokg
None	< 15 Gy or none	No screening
	≥ 15 < 35 Gy	Every 5 years
	≥ 35 Gy	Every 2 years
< 250 mg/m <sup>2</sup>	< 15 Gy or none	Every 5 years
	≥ 15 Gy	Every 2 years
≥ 250 mg/m <sup>2</sup>	undecided	Every 2 years

Abbreviations: ANTR, anthracycline; RT, radiotherapy; Echokg, Echocardiography