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ST segment depression after Norwood/systemic-pulmonary artery shunt



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Keywords: Diastolic runoff flow, Holter monitor, Single ventricle

A three-month-old girl with double inlet left ventricle (S;D;D), hypoplastic outlet ventricle, restrictive bulboventricular foramen, d-transposition of great arteries and interrupted aortic arch underwent Norwood stage 1 operation, systemic to pulmonary artery (PA) shunt and atrial septectomy, and developed ectopic atrial tachycardia that responded to digoxin therapy. She developed fussiness lasting two hours, not associated with cyanosis, and not relieved by feeding. Her pulse oximetry was 88% while breathing room air, and she had no differential blood pressure gradient. Apart from single second heart sound and a grade IV/VI ejection systolic murmur, the examination was normal. Her electrocardiogram and echocardiogram were unchanged. A Holter monitor revealed ST segment depression and T wave inversion upon increasing the heart rate beyond 140 beats/minute (Figs. 1 and 2). A cardiac catheterization showed patent systemic



Figure 1. Absence of ST segment depression with a heart rate <140 beats/minute in a patient with Norwood/systemic to pulmonary artery shunt with diastolic runoff flow.

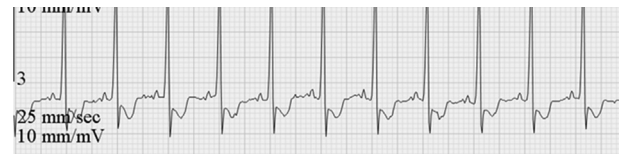


Figure 2. ST segment depression and T wave inversion with a heart rate >140 beats/minute in a patient with Norwood/systemic to pulmonary artery shunt with diastolic runoff flow.

to PA shunt, patent native aorta, and no evidence of coarctation of aorta. After undergoing the second stage operation, her diastolic runoff

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Figure 3. Absence of ST depression with a heart rate <140 beats/minute after stage II palliation with no diastolic runoff flow.



Figure 4. Absence of ST depression with a heart rate >140 beats/minute after stage II palliation with no diastolic runoff flow.

and symptoms of fussiness disappeared and a surveillance Holter monitor showed better-looking ST segments and T waves even at higher heart rates (Figs. 3 and 4). Three months later, the patient is doing well and is awaiting Fontan completion.

Despite many advances in the field of pediatric cardiology, the interstage mortality rate remains high [1]. The use of the systemic to PA shunt in the Norwood operation has been complicated by wide pulse pressure, diastolic runoff flow [2,3], uneven distribution of pulmonary blood flow [4],

and increased early mortality [5]. Providers need to keep a high index of suspicion for the adverse effects of the diastolic runoff that accompanies the presence of systemic to PA shunts.

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