

## Emergency treatment of thrombus in right coronary artery and aortic root in a newborn with acute myocardial infarction

*Akut miyokard enfarktüsülü bir yenidoğanda sağ koroner arter ve aort kökündeki trombusun acil tedavisi*

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### ABSTRACT

Perinatal myocardial infarction caused by aortic root and coronary artery thrombosis in neonatal period is extremely rare and has a gloomy prognosis that may cause devastating complications. A 3-h newborn baby who had acute myocardial infarction findings on postnatal electrocardiography had a thrombus in the aortic root with hyperechogenic right coronary artery region, and impaired right ventricular functions on echocardiography. The patient was urgently operated and thrombus was successfully removed from the aortic root and the right coronary artery. In conclusion, for large thrombi posing a risk for embolization in the aortic root, an urgent surgical thrombectomy procedure should be performed.

**Keywords:** Aortic root, newborn, right coronary artery, thrombus, treatment.

Aortic root thrombosis (ART) in the neonatal period is an extremely rare condition that may cause catastrophic complications with an unknown etiopathogenesis.<sup>[1]</sup> Perinatal myocardial infarction (MI) caused by coronary artery thrombosis is very rare and has a gloomy prognosis.<sup>[2]</sup> There is no common consensus regarding its prevalence and optimal treatment. Right coronary artery (RCA) thrombosis may result in significant morbidity due to myocardial ischemia or infarction, reduced ventricular functions, arrhythmic events, and papillary muscle infarction leading to tricuspid and mitral valve insufficiency.

### ÖZ

Yenidoğan döneminde aort kök ve koroner arter trombozunun neden olduğu perinatal miyokard enfarktüsü oldukça nadirdir ve yıkıcı komplikasyonlara yol açabilen kasvetli bir prognoza sahiptir. Doğum sonrası elektrokardiyografide akut miyokard enfarktüs bulguları olan üç saatlik yenidoğanda ekokardiyografide aort kökünde trombus, sağ koroner arter bölgesinde hiperekojenite ve sağ ventrikül fonksiyonlarında bozulma tespit edildi. Hasta acil ameliyata alındı ve trombus aort kökü ve sağ koroner arterden başarılı bir şekilde çıkarıldı. Sonuç olarak, aort kökünde emboli riski teşkil eden büyük trombuslarda acil cerrahi trombektomi işlemi yapılmalıdır.

**Anahtar sözcükler:** Aort kökü, yenidoğan, sağ koroner arter, trombus, tedavi.

Thus, urgent and effective treatment strategies are needed.

In this article, we present a 3-h newborn who had acute myocardial infarction (AMI) findings on postnatal electrocardiography (ECG), had thrombus in the aortic root, and impaired right ventricular functions on echocardiography and was urgently operated.

### CASE REPORT

A 3-h baby who was born by cesarean delivery with a weight of 3.4 kg and 7/9 Appearance, Pulse, Grimace, Activity, and Respiration (APGAR) score

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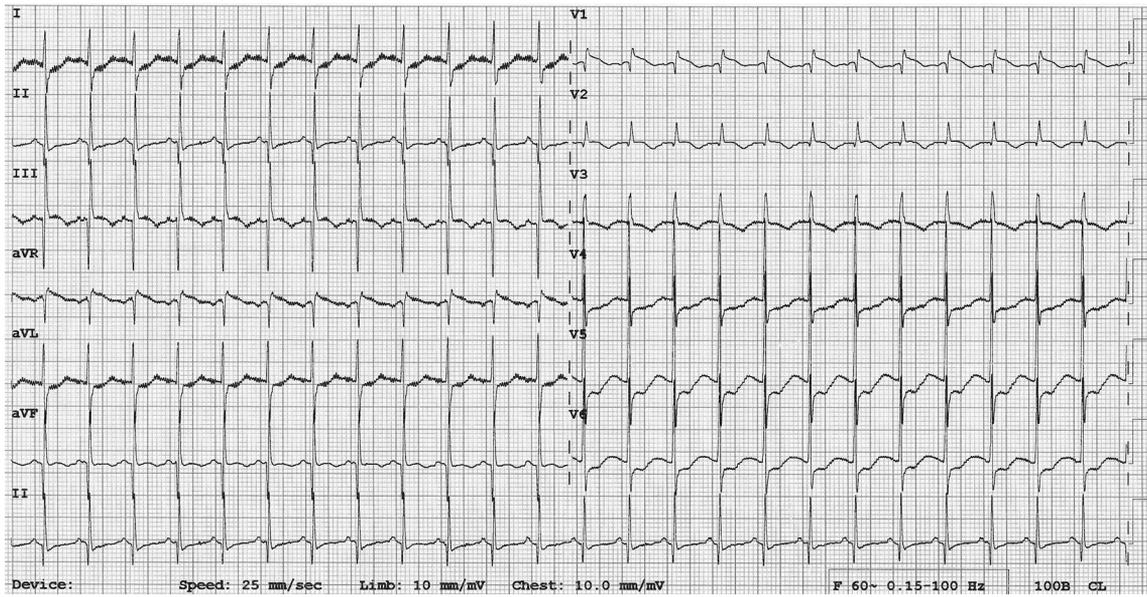
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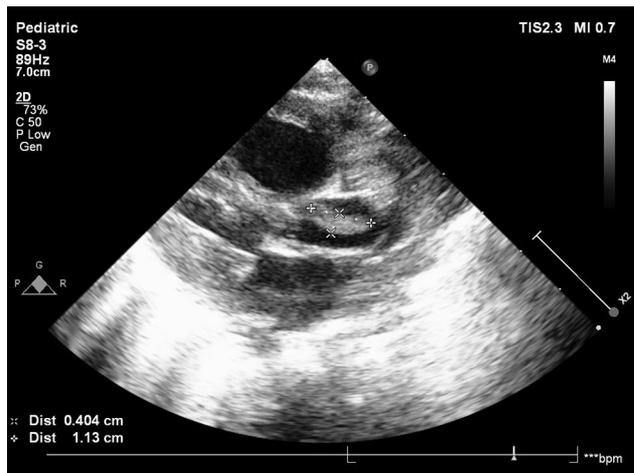
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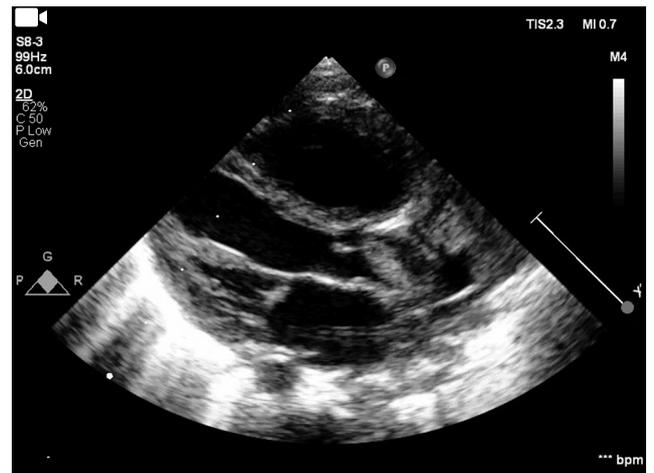
**Figure 1.** Reciprocal ST-T changes in precordial derivations and myocardial infarction findings in inferior leads of electrocardiography.

in the 37<sup>th</sup> gestational week due to the presence of meconium in the 31-year-old mother with a very high heart rate was admitted. During pregnancy, no follow-up was performed. On the initial ECG, normal sinus rhythm, a heart rate of 149/min, pathological deep Q waves in leads II, III and aVF, precordial derivations, and ST-segment depression in V4-V6 were observed (Figure 1). The echocardiography showed an 11×4-mm quite mobile mass with a thin stalk in the aortic root (long axis position, Video 1, Figure 2), ductus arteriosus, and patent foramen ovale,

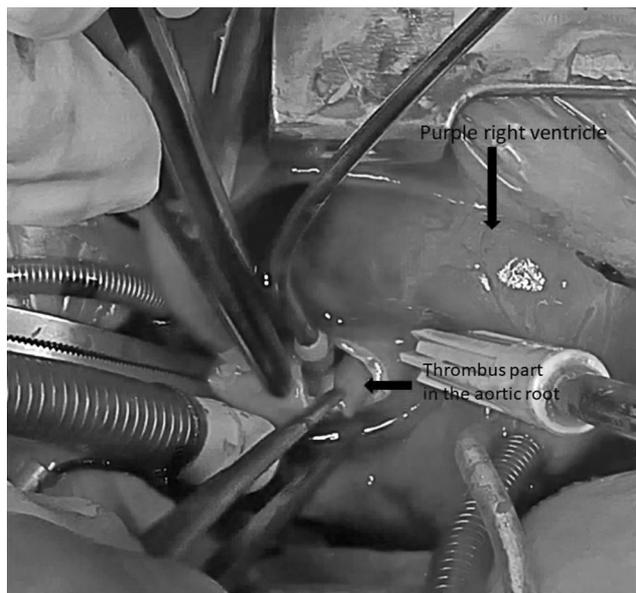
mild mitral regurgitation (MR) and tricuspid (TR), and normal left ventricular ejection fraction (EF) (64% by the M mode) (Figure 3). However, the RCA region was hyperechogenic and there was global hypokinesia in the right ventricle (EF: 36% by the M mode). The patient was taken into operation urgently with the suspicion of a thrombus. During the operation, extracorporeal circulation (ECC) was initiated with aortic-bicaval cannulation. The Custodiol® cardioplegia was performed and total cardiopulmonary bypass was initiated. The aorta



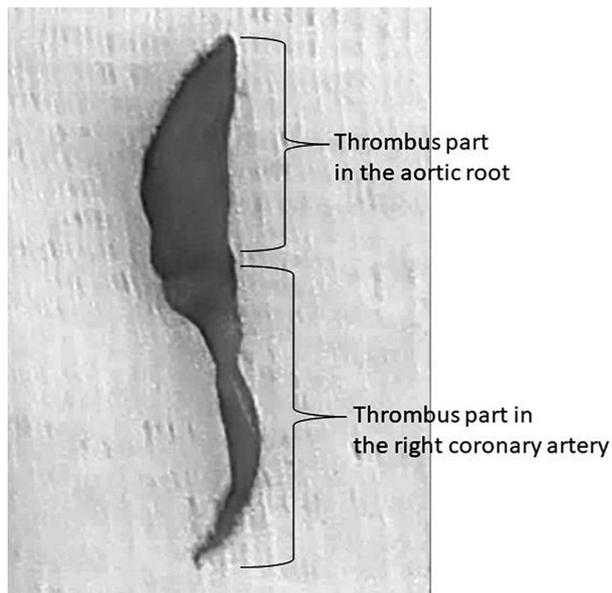
**Figure 2.** A very mobile mass of 11×4 mm in aortic root seen on echocardiography.



**Video 1.** A highly mobile mass of 11×4 mm in aortic root seen on echocardiography.



**Figure 3.** Right ventricle appearing purple due to ischemia during operation.



**Figure 4.** Thrombus extracted from the aortic root and right coronary artery during the operation.

was opened transversely. The right ventricle was in a deeply ischemic appearance and the stalk of the thrombus originated from the RCA (Figure 3). The thrombus in both the aortic root and RCA was removed (Figure 4). The ductus arteriosus, aortotomy, and atriotomy were closed. The operation was terminated. The troponin I value was 5,000 ng/L (newborn 95<sup>th</sup> percentile: 139.36 ng/L) during the follow-up and acetylsalicylic acid (5 mg/kg/day, single dose) and enoxaparin sodium (2 mg/kg/day, single dose), propranolol (3 mg/kg/day, divided into three doses) were administered at the treatment dose. The histopathological examination result was compatible with a thrombus. The thrombosis panel showed antithrombin III deficiency, and heterozygous mutation in methylenetetrahydrofolate reductase (MTHFR) (C677T), MTHFR (A1298C), plasminogen activator inhibitor (PAI) (4G/5G), and Factor XIII (V34L) genes. Protein S antigen, antithrombin 3 antigen, protein C antigen, protein C, and protein S activity were normal. Troponin I value and ECG results were also normal, when the patient was one month old. Right ventricular function was found to be normal (EF: 69% by the Simpson method) and the patient with a diagnosis of PAI and FXIII deficiency is still only receiving enoxaparin sodium and propranolol treatment and under the follow-up by the pediatric cardiology and hematology clinics. A written informed consent was obtained from the parents of the patient.

## DISCUSSION

Arterial thromboembolic events account for about 30 to 50% of neonatal thromboembolic complications and nearly 4 to 30% of these arterial events are associated with aortic thrombosis. In a small part of aortic thrombosis cases, a thrombosis in aorta and aortic arch exists. Aortic thrombosis may be caused by many factors including the presence of an idiopathic, central venous catheter, dehydration, polycythemia, cytomegalovirus infection, lupus anticoagulant, intrauterine cocaine exposure, hereditary thrombophilia, and excessive use of epsilon aminocaproic acid during cardiac bypass. As in our case, the majority of neonates with ascending aortic thrombosis are considered a neonatal emergency due to the upcoming risk of losing life, organ or limb. Nearly half of survivors suffer from hypertension, dysfunction of the affected organ, mild-to-severe growth retardation, limb length differences, loss of limb or toe/fiber loss due to amputation, neuropathic pain, and intermittent claudication. Due to such concerns about unfavorable consequences, patients are treated with catheter angiography, systemic tissue plasminogen activator (t-PA), or surgical embolectomy procedure. Surgical thrombectomy was deemed appropriate for our case. About 10 to 54% of infants have hemorrhagic complications, particularly due to thrombolysis treatment, while 30% of neonates die regardless of therapeutic intervention.<sup>[1]</sup>

Neonatal MI is a rare condition in neonates without congenital heart and coronary malformations. Most neonatal MIs are associated with thromboembolism and high mortality.<sup>[3,4]</sup> A MI may result from intrauterine infection, coronary artery vasoconstriction secondary to oxytocin administration, perinatal asphyxia with anemia, thromboembolism caused by umbilical vein catheterization, septal hypertrophy, perinatal enterovirus infection, myocarditis, paradoxical embolism from renal vein or ductus venous thrombosis, protein C/S or antithrombin III deficiency, and left ventricular obstructive disease.<sup>[5,6]</sup>

The majority of the patients reported in the literature had ECG findings compatible with ischemia, elevated cardiac enzyme levels, impaired ventricular function, and MR/TR.<sup>[7,8]</sup> Our case had MR/TR, decreased right ventricular function, and ischemia findings in inferior derivations of ECG. In patients without anomalous origin of RCA originating from the pulmonary artery or congenital tricuspid valve pathology, the risk of RCA thrombosis should be always considered, if there are TR, right ventricular dysfunction, and hyperechogenicity in the RCA region.

For coronary artery thrombosis, various treatment strategies such as conservative treatment, local and systemic thrombolysis, surgical thrombectomy and circulatory support are recommended.<sup>[2]</sup> A case with RCA thrombus and critical aortic stenosis which was treated medically was reported in the literature.<sup>[9]</sup> All of the other reported cases were associated with a left coronary artery thrombus. Except for two of these eight cases, others were treated with t-PA. One case who received surgical thrombectomy and two cases who were treated with t-PA died.<sup>[2,3]</sup> The most important reason to perform thrombectomy in our case is the fact that the thrombus in the aortic root has a high risk for embolization. To the best of our knowledge, this is the first case reported to perform thrombectomy for a thrombus in the aortic root and RCA.

In conclusion, for large thrombi posing a risk for embolization in the aortic root, an urgent surgical thrombectomy procedure should be performed as soon as possible. In a neonate with tricuspid regurgitation and right ventricular dysfunction and hyperechogenicity in the right coronary artery region,

as well as electrocardiographic findings showing myocardial infarction, but no other identifiable reasons, coronary artery thrombosis should be always suspected.

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