Successful conservative treatment of myocardial infarction in a teenager with MTHFR mutation

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Pediatric myocardial infarction (MI) is a rare event, but requires both immediate attention and long-term therapy. Literature on management of acute MI in pediatrics is scant and outcomes are variable [1]. We report a case of a 15-year-old male with MI.

A 15-year-old male, a competitive swimmer, went to the ER with acute stabbing non-radiating central chest pain that started while he was swimming. He denied fever, palpitations, or syncope. Family history was negative for MI at a young age, thrombophilia, or bleeding disorders. His physical exam was normal. An EKG demonstrated c ST-T changes. Initial Troponin I was 6.46, creatine kinase-MB (CKMB) 27, and creatine kinase (CK) 586. An echocardiogram showed regional apex wall abnormality suspicious for myocarditis and left ventricle ejection fraction (LVEF) 61%. Subsequently, Troponin I peaked at 92.1, CKMB at 81.4, and CK 615 within the next 24 h. In the meantime, a Cardiac MRI showed a preserved left ventricle (LV) function, an abnormal enhancement with 25% trans-mural involvement of the sub-endocardial apical anterior, and antero-septal LV with associated wall motion abnormality. These findings were consistent with a sub-endocardial infarct. CT angiogram showed a filling defect resulting in 90% stenosis in the lumen of Left Anterior Descending (LAD) artery and at the origin of the second diagonal vessel (Fig. 1). Cardiac catheterization confirmed the findings. The thrombus being at the bifurcation of LAD, angioplasty/stenting could not be done.

Enoxaparin was started immediately on admission. Subsequently he was on discharged home on warfarin, metoprolol, enalapril, and aspirin. All the medications except aspirin were discontinued after 6 months. Thrombophilia workup revealed a homozygous MTHFR mutation for C677T gene.

Nine months after the event, he had a repeat CT angiogram which showed resolution of the filling defect in his LAD and, repeat MRI which showed no wall motion abnormalities (even in the region of scar) and preserved LV systolic function. He reached his target heart rate (197 bpm) with a good blood pressure response and no ST changes/ischemia or ventricular arrhythmias in the exercise test. On his one year follow-up he is back to his baseline swim practice.

Though MTHFR genetic mutation has been reported in adults as a cause for thrombosis [2], there are no reported cases of MI in children with homozygous mutation of MTHFR.

The management of MI in children and young adults is complex and seems to vary depending on the age of the patient, location of the thrombus and, individual diagnose [3–7]. For instance, cases of coronary thrombosis related to vasculitis, lipid abnormalities, cocaine-induced vasospasm, hyper-transfusion of coagulation factors, and hypercoagulability have all been managed successfully with varied treatment modalities. The limited number of case reports highlighting the success of angioplasty, thrombolysis, and anticoagulation is not sufficient to create a robust backbone of recommendations for the treatment of this disorder in this particular age group (Table 1). In our patient the combination of anticoagulation, ACE inhibitors, beta blockers and aspirin seems to have assisted in the resolution of the thrombus, and proper remodeling of cardiac muscle allowing for adequate function.

The role of hypercoagulability has been a controversial cause of coronary artery thrombosis [8,9], yet thrombophilia evaluation is indicated in young patients with thrombosis. Reports on MI secondary to genetic mutations such as homozygous endothelial nitric oxide synthase (eNOS) T-786-C mutation, heterozygote prothrombin gene mutation (G-20210-A), and protein S deficiency have been documented in children and young adults [10]. Thrombophilia can be a cause of MI in this population and, therefore, thrombotic work up needs to be considered.

The good outcome of our patient with conservative therapy doesn’t prove that all pediatric patients with MI should be treated conservatively. In fact, if the thrombus was not located at junction of LAD bifurcation, we would have possibly treated the patient with percutaneous angioplasty. Evidence behind treatment of pediatric MI is extrapolation.
Reports of myocardial infarction in children.

Table 1

| Year | Author | Age of patient | Number of patients | Treatment | Etiology |
|------|--------|----------------|--------------------|-----------|----------|
| 1978 | Ishikawa et al. | 5 years | 1 | None | SLE |
| 1985 | Penny et al. | 17 years | 1 | Warfarin | Factor XII deficiency |
| 1990 | Takegoshi et al. | 18 years | 1 | LDL aphaeresis | SLE with nephrotic syndrome |
| 1990 | Friedman et al. | 8 years old | 1 | Steroid and immunosuppressive | SLE |
| 1995 | Miller et al. | 8 year old female | 1 | Conservative | |
| 1996 | Fearon and Cooke | 17 years | 1 | CABG | |
| 2002 | Osula S et al. | 16 years | 1 | PCI and atenolol, aspirin, azathioprine, and prednisolone | Thrombus |
| 2005 | Meyringer et al. | 17 years | 1 | PCI and coronary artery stenting | Thrombus |
| 2005 | Kierzkowska et al. | 17 years | 1 | Nitroglycerin, aspirin, enoxaparin sc, metoprolol | Clopidogrel induced thrombosis |
| 2005 | Erbilen et al. | 16 years | 1 | Nitroglycerin | SLE |
| 2007 | Kiec-Wilk et al. | 16 years | 1 | Conservative | |
| 2007 | Lane JR | 12–20 years | 9 | Nitroglycerine, diltiazem | Vasospasm |
| 2008 | Mohlia et al. | Teenage male | 1 | Revascularization by hybrid coronary artery bypass graft surgery and percutaneous coronary intervention | SLE |
| 2009 | Morel Ayala et al. | 13 years | 1 | Steroid, immunosuppression and anticoagulation | SLE |
| 2010 | Biteker et al. | 9,10,11,13 years | 3 | Anti-histamines, prednisolone | Kawasaki Syndrome |
| 2012 | Klincheva M | 19 years | 1 | PCI and heparin, acetyl salicylic acid and clopidogrel | Thrombus |
| 2013 | Jasmine R | 13 years | 1 | Conservative treatment | Vasospasm |
| 2016 | Hill D | 16 years | 1 | PCI and aspirin, prasugrel, carvedilol, simvastatin, and epifibatide | Thrombus |

Conflict of interest

The authors have no conflicts of interest to disclose.

Contributors’ statement

Dr Lahiri conceptualized the case report, drafted the initial manuscript, and approved the final manuscript as submitted.

Drs Landeo, Cuglievan carried out the initial management of the patient and reviewed and revised the manuscript, and approved the final manuscript as submitted.

Dr. Pefkarou follows the patient, ordered the labs, revised the manuscript and approved the final manuscript as submitted.

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