The Foundation board is comprised of medical professionals with experience in myocarditis and lay persons who have been touched by the disease.

Joseph Rumore, President - Myocarditis survivor and heart transplant recipient. He is a former managing Director of a national insurance company.

Candace Moose, Secretary - Giant Cell Myocarditis survivor and heart transplant recipient. She is a retired nurse, a speaker and advocate for organ donation and is also the author of the book, The Grateful Heart: Diary of a Heart Transplant.

Louis Romano, Treasurer - Owner of Home Well Senior Care, a home health care agency.

DeLisa Fairweather, PhD, FAHA, Director - Associate Professor, Director of Translational Research, Department of Cardiovascular Medicine, Mayo Clinic Jacksonville, Florida.

Dr. Jack Price, MD, Director - Associate Professor of Pediatrics at Baylor College of Medicine and the Clinical Director of the Cardiovascular Intensive Care Unit at Texas Children’s Hospital.

Joel Aranson, Director - Founder and Chairman of National Sporting Good Corporation and father to a Myocarditis victim.

Randy Vanness, Director - Community leader and father to a Myocarditis victim.

Christopher Corso, Director – Reinsurance executive at XL Catlin and father to a Myocarditis survivor, who continues his battle today.

Francine Andrea, Director – Vice-President for Enrollment Management, Student Affairs and Chief Compliance Officer for Felician University.

Akira Matsumori, MD - Professor of Medicine, Department of Cardiovascular Medicine, Kyoto University Graduate School of Medicine, Kyoto, Japan.

Bettina Heidecke, MD - Associate Professor at the University of Zurich, Switzerland Myocarditis Researcher and previous Myocarditis Foundation Fellowship Grant Recipient.

Bruce M. McManus, PhD, MD, FRSC, FCAHS - Professor & Director, The James Hogg ICAPTURE Centre, University of British Columbia-St. Paul’s Hospital Scientific Director, The Heart Centre-Providence Health Care, Vancouver, British Columbia, Canada.

Dennis M. McNamara, MD - Associate Professor of Medicine; Director, Heart Failure Section; Director, Cardiomyopathy Clinic and Heart Failure Research Program, Cardiovascular Institute at University of Pittsburgh Medical Center Presbyterian, Pittsburgh, PA.

Steven D. Colan, MD - Professor of Pediatrics at Harvard Medical School and Associate Chief of Cardiology at Boston Children’s Hospital.

The Myocarditis Foundation (MF) seeks to increase awareness and hasten progress in understanding myocarditis by awarding grants to help guarantee that new and innovative research avenues are thoroughly funded and explored. Please donate now.

The MF is a private, non-profit organization that exists to educate physicians and the public about this rare disease and support the patients and their families who have been affected by the disease. Copies of our materials will be available without charge. All of the money donated to MF will go directly to programs and services.

For more information: info@myocarditisfoundation.org

Knowledge Nurtures Hope. . .

Your journey is just beginning

The Myocarditis Foundation is here to help.

www.myocarditisfoundation.org
DEFINITION: What is Myocarditis?

Myocarditis is a rare, potentially life-threatening inflammatory disorder of the myocardium. It is a common cause of heart failure in otherwise healthy children and accounts for up to one-third of the cases of pediatric dilated cardiomyopathy. The true incidence of myocarditis in children is unknown. Most children with myocarditis recover with minimal sequelae, but some may develop progressive heart failure leading to cardiac transplantation or death. Prompt diagnosis is imperative to allow for rapid and appropriate treatment of these children.

CLINICAL PRESENTATION

Signs and symptoms of myocarditis are highly variable in the pediatric population. Children may present with complaints of mild, non-specific flu-like symptoms or with evidence suggestive of cardiac involvement such as acute chest pain. A subset of patients recall a history of a viral prodrome followed by the sudden onset of symptoms consistent with cardio-pulmonary disease such as chest pain, tachycardia, dyspnea, fatigue, pallor, lethargy or cyanosis, suggesting hemodynamic compromise. A three-tiered classification of myocarditis is based upon the type and severity of presenting symptoms coupled with the clinical course and outcomes. Fulminant myocarditis appears to be preceded by a viral prodrome in children followed by acute onset of cardio-pulmonary signs and symptoms consistent with impending shock. Despite the serious nature of the initial illness, the prognosis for recovery and long-term survival is excellent if the patients survive the acute episode. Acute myocarditis has a milder, less distinct presentation but may often progress to dilated cardiomyopathy and heart failure. Chronic myocarditis, as the name suggests, is persistent and may be latent or progressive with possible recurrences requiring ongoing medical therapy.

ETIOLOGY

In the developed world, the most common causes of pediatric myocarditis are viral infections. Enteroviruses, more frequently coxsackievirus B, were historically implicated as a common cause of this disease in children, although many other infectious agents have since been identified. Other viruses such as influenza, adenovirus, and parvovirus B19 as well as bacteria, fungi, protozoa, rickettsiae and parasites may also cause myocardial inflammation. Immune-mediated diseases such as collagen vascular diseases, venoms, toxins, and some chemotherapeutic agents can also lead to myocarditis.

EPIDEMIOLOGY

Myocarditis may occur more frequently during seasonal influenza epidemics and during the summer and fall, a time of increased prevalence of coxsackievirus B in the general population. Neonatal myocarditis usually presents acutely and severely with a mortality rate reported around 75%. Infants are also quite susceptible to viral myocarditis but the incidence decreases during the toddler and early childhood years. Around the time of puberty and adolescence, the incidence increases again. In this older population, myocarditis is a significant contributor to sudden cardiac death, as verified on post-mortem examination. Gender differences have also been observed. Approximately two-thirds to three-quarters of coxsackievirus B cases occur in males.

DIAGNOSIS

The variable nature of the pediatric myocarditis patients’ presenting signs and symptoms makes it difficult to diagnose accurately. In fact, the disease is often missed at the initial physician encounter. The consequences of a missed diagnosis can be dire, highlighting the need for physicians to maintain a high degree of suspicion for myocarditis when assessing these patients. Common findings on exam are: Tachycardia partially compensates for inadequate tissue oxygenation secondary to diminished cardiac output. Decreased peripheral perfusion manifests as cool extremities, weak pulses, pallor, increased time to capillary refill, and/or decreased urine output. Vasoconstriction initially maintains an age-normal blood pressure but hypotension may occur as a late finding of cardiac failure in children. A variety of abnormal heart sounds may be detected, including diminished heart sounds, murmurs, gallops and rhythm disturbances. Wheezing, coughing, grunting, nasal flaring, intercostal retractions, rales, dyspnea, tachypnea, cyanosis and hypoxia are evidence of respiratory distress. Hepatomegaly and peripheral edema suggest cardiac failure in severe cases. Non-specific findings include fever, malaise, anorexia, fatigue and lethargy.

FURTHER DIAGNOSTIC EVALUATION

Common findings on diagnostic evaluation in pediatric myocarditis are:

- Chest radiography: Cardiomegaly and pulmonary vascular congestion are important findings on a chest radiograph in the myocarditis patients and can help to distinguish a diagnosis of myocarditis from more common respiratory ailments. However, these radiographic features may not be evident in cases presenting as fulminant myocarditis. In patients presenting with shock or impending shock of unknown cause without cardiomegaly or pulmonary vascular congestion on chest radiograph, a diagnosis of myocarditis cannot be excluded.

- Electrocardiography: The electrocardiogram (ECG) is usually abnormal in pediatric myocarditis patients. Findings on ECG may include sinus tachycardia, low voltage QRS complexes, ST-T wave abnormalities, prolonged QT intervals and/or atrioventricular block. A variety of tachy- and brady-arrhythmias including ventricular tachycardia and third degree atrioventricular block may be observed in pediatric myocarditis.

- Laboratory studies: Biomarkers of cardiac injury, including troponin, have variable diagnostic yield. Viral serologies and peripheral blood and tissue cultures are frequently negative not helpful in achieving an early diagnosis. B-type natriuretic peptide (BNP) is a non-specific hormonal marker of stress or volume loading of the ventricle. Concentrations of BNP are elevated in heart failure patients but cannot distinguish myocarditis from other etiologies of heart failure.

- The endomyocardial biopsy remains the gold standard for diagnosis of viral myocarditis despite the low sensitivity and high rate of false negative test results. Due to the focal nature of myocardial inflammation, biopsy samples may fail to include affected areas causing a missed diagnosis. Polymerase chain reaction (PCR) of the myocardial tissue for viral genome can increase the sensitivity of the endomyocardial biopsy. The invasive nature of obtaining a myocardial tissue sample poses a significant risk to the patient and should only be utilized when the clinical suspicion is high for a cardiac disorder that is amenable to treatment.

PROGNOSIS

Most children with myocarditis recover with supportive care, but a substantial percentage may develop progressive heart failure leading to cardiac transplantation or death. In some situations, death is sudden and unexpected and a diagnosis of myocarditis is not made until post-mortem examination is performed. Prompt diagnosis is imperative to allow for rapid and appropriate treatment of these children. There is no virus-specific therapy for myocarditis. Treatment is focused on correcting hemodynamic derangements, optimizing cardiac output, and reducing symptomatic relief. In children with shock or impending shock, temporary mechanical circulatory support (ECMO or ventricular assist devices) can maintain circulation in children with shock or impending shock, temporary mechanical circulatory support (ECMO or ventricular assist devices) can maintain circulation in children with shock or impending shock, temporary mechanical circulatory support (ECMO or ventricular assist devices) can maintain circulation in children with shock or impending shock, temporary mechanical circulatory support (ECMO or ventricular assist devices) can maintain circulation in children with shock or impending shock.