



## Peer-Reviewed Case Report

# Old School Still Has Merit: ECG as a Marker of Cardiac Recovery at Weaning from Mechanical Circulatory Support

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## Abstract

In a case of acute cardiac allograft failure requiring temporary mechanical circulatory support (MCS), serial electrocardiograms (ECG) denoted the degree of myocardial inflammation and damage caused by severe rejection and subsequent recovery. This case highlights the relevance of the ECG during temporary MCS and suggests that resolution of acute electrocardiographic abnormalities might be a marker of myocardial recovery to help guide appropriate timing for weaning from MCS in the setting of acute graft failure.

## Keywords

Acute cardiac graft failure; Electrocardiogram; Temporary mechanical circulatory support; Weaning

## Abbreviations

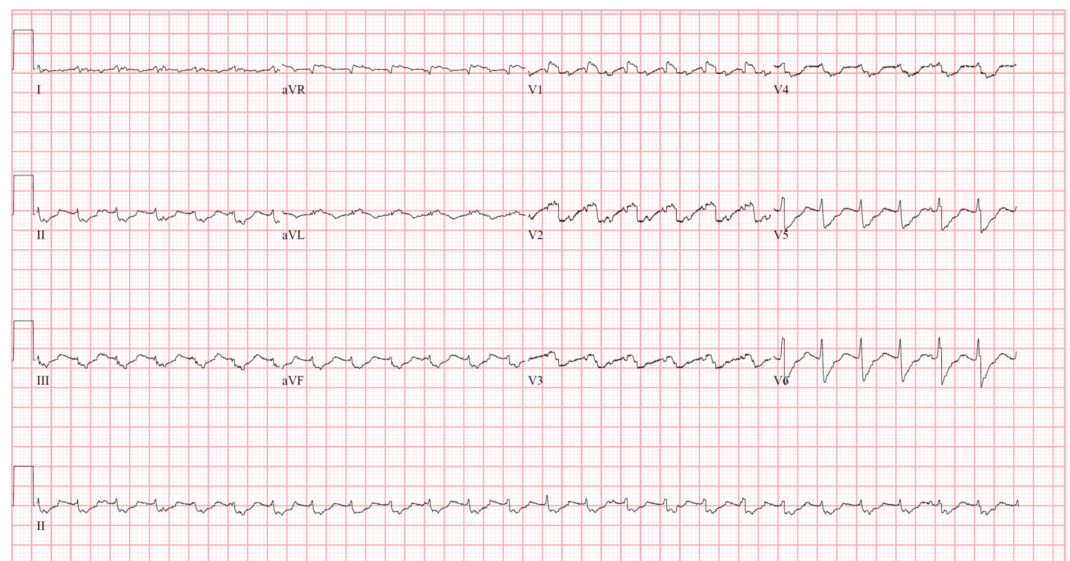
ECG: electrocardiogram; MCS: mechanical circulatory support

In the early days of cardiac transplantation, electrocardiogram (ECG) changes were used to identify allograft rejection, an 'old school' approach. This was particularly relevant in a recent case of acute cardiac graft failure requiring temporary mechanical circulatory support (MCS), in which the ECG dramatically



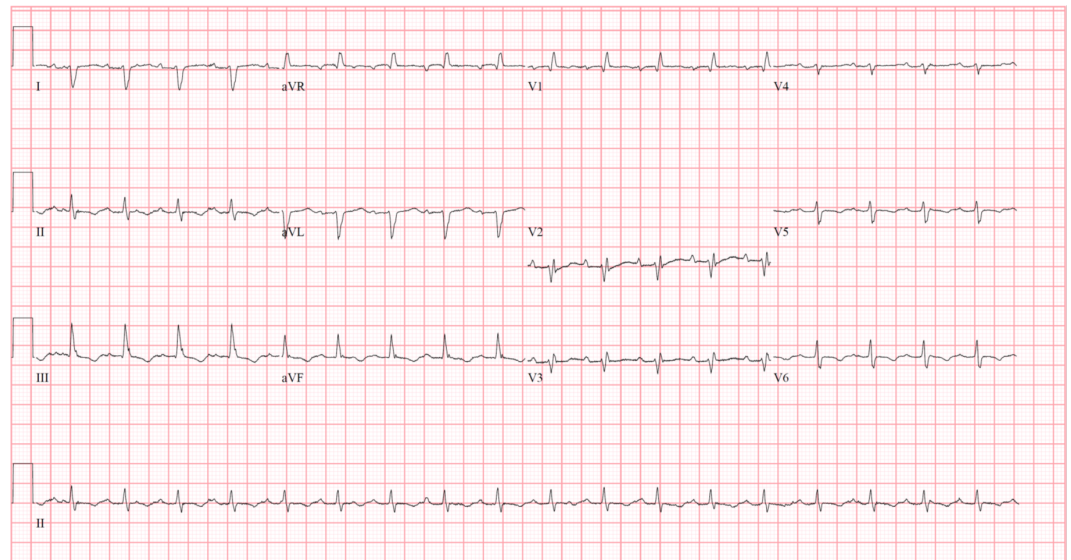
reflected the degree of myocardial inflammation and damage, and subsequent recovery – supporting the decision for weaning from MCS.

A 59-year-old male, status one year post uncomplicated heart transplant, was admitted with acute graft failure and rapid deterioration to cardiogenic shock. Echocardiogram showed severe biventricular failure with increased wall thickness. Despite immediate institution of aggressive treatment for presumed overwhelming graft rejection, progression to imminent multisystem organ failure occurred and the patient required mechanical circulatory support with veno-arterial extracorporeal membrane oxygenator and an Impella 3.5L for left ventricular venting. At the time of MCS implantation, his ECG impressively denoted the extent of myocardial compromise (**Figure 1**).



**Fig 1. Electrocardiogram during episode of acute cardiac graft failure that progressed to cardiogenic shock. Tracing demonstrated sinus tachycardia, diffuse low QRS voltages and ST-T wave abnormalities (25mm/s, 10mm/mV, 100Hz).**

Mechanical circulatory support was maintained for one week until echocardiographic signs of recovery were present. In addition to evidence of adequate pulsatile waveform, improved biventricular function on low supportive flow and resolving imminent end-organ dysfunction, his ECG had transformed, with narrowing of the QRS complexes and increasing voltages back to his baseline (**Figure 2**). The patient's MCS was successfully explanted. He was discharged home and is doing well approximately 6 months after the rejection episode. Echocardiography after weaning demonstrated low normal cardiac function.



**Fig 2. Electrocardiogram at the occasion of weaning from mechanical circulatory support. Tracing showed improvement in voltages and ST-T wave abnormalities, corroborating with clinical, echocardiographic and hemodynamic evidence of myocardial recovery (25mm/s, 10mm/mV, 100Hz).**

Weaning strategies for temporary MCS have been increasingly reported in the literature, though evidence-based recommendations are still limited. Most centers have their own institutional protocols that include distinct ways to assess the presence of cardiac recovery, stability in hemodynamic profile and improvement of end-organ dysfunction. The best predictors of cardiac recovery and subsequent weaning success are yet to be explored. Herein, we highlight that resolution of dynamic ECG modifications might be an important marker of myocardial recovery to help guide appropriate timing for weaning from MCS. This could be particularly relevant in the setting of acute graft failure. It is well recognized that rejection causes delays in ventricular repolarization and, therefore, significant dynamic changes might be observed in the ECG in the setting of severe rejection, particularly when it is associated with graft dysfunction.