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Title of Project:
Assessment of prognostic factors in the recovery of cardiac function via strain imaging echocardiography in patients with MIS-C

Study Purpose and Rationale

During the global pandemic, many centers from Europe and United States have reported and described children with recent COVID-19 infection who had a severe inflammatory syndrome that presented as a KD-like or toxic shock-like illness, known as MIS-C. Cardiac manifestations of this disease have been described in the literature including coronary artery anomalies, myocarditis with depressed ventricular systolic function, and valvar regurgitation. Few studies have specifically analyzed cardiac mechanics and deformation parameters (via strain imaging echocardiography) in this population of pediatric patients with this disease entity.

The purpose of this analysis is to describe and evaluate strain parameters in pediatric patients diagnosed with MIS-C and to analyze these parameters over time to evaluate for associated prognostic factors (such as initial inflammatory and cardiac biomarkers).

Study Design

This is a retrospective, single-center, cohort study looking at patients clinically diagnosed with MIS-C according to CDC guidelines at CHONY starting in March 2020 who had echocardiograms at presentation, and approximately 2 weeks, 3 months, and 6 months after.

Conventional echocardiographic data and strain data (see below) will be collected from each echocardiogram. Additional data from presentation including age, gender, and lab values (troponin, pro-BNP, CRP, ESR) will be obtained.

Conventional echocardiographic parameters
- Presence and degree of valvular regurgitation
- LV EF (%) Simpson's based on age
- LV SF (M mode)
- Presence of pericardial or pleural effusions
- MV E/A ratio
- Coronary dilation (based on coronary measurements and z-scores), ectasia, aneurysm

Strain parameters
- Global longitudinal strain (GLS) - %
- Global longitudinal strain rate (GLSR)- 1/sec
- Longitudinal early diastolic strain rate (EDSR- L)- 1/sec
- Global circumferential strain (GCS)- %
- Global circumferential strain rate (GCSR)- 1/sec
- Circumferential early diastolic strain rate (EDSR- C)- 1/sec
- Right ventricular free wall longitudinal strain (RVFWLS)- %

Statistical Procedures

To assess the correlation between initial lab data, age, and gender and normalization of echocardiographic parameters, a linear regression will likely be used. Based on the current number of subjects (75), we will be powered to detect an $r > 0.32$ or < -0.32. If the data for time to recovery/normalization of function is not normally distributed, a logistic regression may be used.

Alternatively, based on sample size, we may dichotomize between those who recover quickly (by the 2-week mark) vs. those who recover later (at the 3 or 6 month mark) and compare average lab values at presentation using a 2 sample t-test.

Study Procedures

Laboratory and demographic data will be collected by myself and confirmed by another contributor (Nicole Stanford). Echocardiographic and strain data will be collected from echocardiograms performed at presentation, 2 weeks, 3 months, and 6 months after presentation. The data will be corroborated by at least 2 imaging cardiologists.

Study Subjects

Pediatric patients at CHONY who meet criteria for MIS-C per CDC guidelines who had echocardiograms at presentation and roughly 2 weeks, 3 months, and 6 months afterwards.

Confidentiality

Chart review will be done only on secure, password protected computers. All patient identifiers will be removed from the electronic data set prior to analysis, and each patient will be assigned a unique study ID number. A separate file correlating this study number with patient identifiers will be kept in a secure, password protected database. Only the study personnel will have access to the file, which will be kept on encrypted endpoint devices.

Potential Benefits

There will be no direct benefit to the subjects, however greater understanding of prognostic factors from initial presentation correlated with return of cardiac function may inform follow up care for patients affected by MIS-C.

Potential Risks

None identified

References

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