

Serum immunoglobulin G level as an important marker of protein-losing enteropathy in patients with a Fontan circulation

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Objectives: Hypogammaglobulinemia (HG) and lymphopenia (LP) have been observed in Fontan patients. However, data on these complications are scarce. The aims of the present study were to identify risk factors associated with HG and LP in a Fontan cohort.

Methods: Institutional databases were searched to identify Fontan patients in whom serum levels of immunoglobulin G (IgG) and absolute lymphocyte count (ALC) were measured. Lymphopenia was defined as < 1500 cells/uL. Bacterial infectious history of the last 2-years was obtained. PLE remission was defined as a normalisation of serum albumin and fecal alfa-1 antitrypsin (A1AT) levels without having clinical signs and symptoms of PLE. PLE patients not fulfilling these criteria were in active disease.

Results: Fifty-five Fontan patients (37% female, age: 10.7 ± 4.5 years; PLE: $n = 14$, 25.4%) were included in this study. HG was found in 11/55 patients (20.0%). All of these patients had a diagnosis of PLE and had active disease. Three PLE patients were in remission and had (low) normal IgG levels. In addition, LP was present in 21/55 patients (38.2%). LP was observed in all PLE patients with active disease and HG. LP was not found in PLE patients who were in remission. Six patients (PLE $n = 5$) suffered from a bacterial infection (pneumonia $n = 5$; sepsis $n = 1$). Moderate correlations were found between IgG, albumin levels ($R = 0.647$, $P < 0.0001$), and ALC ($R = 0.527$, $P < 0.0001$). Moderate inverse correlations were observed between IgG levels, A1AT ($R -0.442$, $P 0.013$) and markers of systemic inflammation ($R -0.600$, $P < 0.0001$). A multiple regression analysis was run to predict serum IgG. Serum albumin, ALC, and WBC significantly predicted IgG levels ($F = 21.9$, $P < 0.0001$, R square = 0.569). Fecal A1AT, NTproBNP level and time since Fontan could not predict IgG concentration.

Conclusions: Immune alterations such as HG and LP are common in PLE and non-PLE Fontan patients, respectively. Serum IgG levels can be predicted from albumin levels, ALC and WBC and seem negatively related to active disease in PLE patients.