Detection of Myeloid Signature in COVID-19 Patients Using Flow Cytometry in Response to SARS-CoV-2 Infection

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Introduction: Myeloid cells, such as dendritic cells and monocytes, play a key role in SARS-CoV-2 Infection as early indicators by secreting the cytokines against viral infection. In this study, a standardized dry antibody panel, a cocktail of liquid antibodies was used to identify myeloid cells in COVID-19 patients. The recruitment of myeloid dendritic cells such as CD11c+CD16+ and CD11c+CD1c+, as well as a subset of monocytes such as CD14+CD16- classical monocytes, CD14++CD16+ intermediate monocytes and CD16+CD14- non-classical monocytes, CD169+HLA-DR+ and CD64+ HLA-DR+ monocytes was evaluated.
Methods: Whole blood samples with EDTA anticoagulant from healthy control (n=45) and from patients with RT-PCR-confirmed SARS-CoV-2 infection (n=33 for 3 consecutive days) were taken for antibody staining. Whole blood samples were stained with the above panels, followed by RBC lysis, PBS wash and resuspension of cells in Fixation Buffer. Cells were acquired using a CytoFLEX flow cytometer. Expression of the markers of myeloid dendritic cells and subset of monocytes and CD169+HLA-DR+ and CD64+ HLA-DR+ monocytes were reported as the percentage of positive cells for respective receptors.
Results: There was significant upregulation of CD169+HLA-DR+ (*p value <0.0001*) and CD64+HLA-DR+ (*p value <0.0001)* monocytes in COVID-19 patients in comparison with the healthy control samples. CD11c+CD16+ myeloid cells were significantly increased in patients (*p value <0.0001*) as compared to healthy controls. No changes were observed for subset of monocytes in comparison to healthy controls. There was no expression of CD64 on granulocytes in patient samples.
Conclusions: The increased CD169+HLA-DR+ and CD64+HLA-DR+ monocytes indicates that monocytes were activated during SARS-CoV-2 infection and resulted in induction of a severe form of COVID-19. The increased CD11c+CD16+ myeloid dendritic cells indicate early response of dendritic cells against SARS-CoV-2. These observations help in understanding myeloid immune response during early stage of COVID-19 infection and identifying targets for developing treatment strategies.