Supplemental Information

Loss of Bcl-6-Expressing T Follicular Helper

Cells and Germinal Centers in COVID-19

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Table S1 (Related to Figs. 1-4). Autopsied COVID-19 Patients studied by immunofluorescence and multispectral imaging

Duration of hospital stay	1-8 days	16-36 days
	n=5	n=6
Clinical Course		
Hospital stay duration (days) (mean ± s.d.)	3.6 (± 3.2)	25.8 (± 7.9)
Demographics		
Age (years) (mean ± s.d.)	66.2 (± 11.2)	63.8 (± 9.3)
Gender (% male)	60%	80%
BMI (kg/m^2) (mean ± s.d.)	33.0 (± 4.1)	30.2 (± 2.0)
Maximum Laboratory Values		
CRP (mg/L) (mean ± s.d.)	199.2 (± 102.3)	74.5 (± 44.8)
LDH (U/L) (mean ± s.d.)	590.0 (± 149.9)	423.0 (± 128.2)
Ferritin (ug/L) (mean ± s.d.)	703 (± 618.0)	410.8 (± 166.1)
D-dimer (ng/mL) (range)	1374 to >4000	725 to >4000

Body mass index (BMI), C-reactive protein (CRP), lactate dehydrogenase (LDH), standard deviation (s.d.)

Table S2 (Related to Figs. 1, 3 and 4). Non-COVID-19 Autopsied Controls

Age	Gender	Presumed Cause of Death
77	F	Multi-organ system failure, pancreatitis
78	M	Non-metastatic bladder malignancy
64	M	Multi-organ system failure, thromboembolic infarcts
78	M	Respiratory failure, treatment resistant MAC
69	M	Cerebellar hemorrhage
66	F	Fibrinous pericarditis, subpleural fibrosis

Table S3 (Related to Figs. 2-4). Control Spleen Samples from Massachusetts General Hospital

Age	Gender
61	M
20	M
54	F
74	F
59	M
68	F
58	M

Table S4 (Related to Figs. 5-7). Summary of information on COVID-19 patients (n=68) in whom circulating B cells were analyzed by flow cytometry.

	Convalescence	Moderate	Severe (CRP int) CRP < 200 mg/L	Severe (CRP hi) CRP > 200 mg/L
	mean ($\pm$ SD)	mean ($\pm$ SD)	mean ($\pm$ SD)	mean ($\pm$ SD)
	n=39	n=4	n=10	n=15
Demographics				
Age (years)	44.8 ($\pm$ 15.1)	35.5 ($\pm$ 15.4)	59.3 ($\pm$ 11.0)**	58.0 ($\pm$ 13.9)**
Deceased (%)	0.0	0.0	10.0	13.3
Gender (% male)	28.2	50.0	60.0	66.7*
BMI (kg/m^2)	24.5 ($\pm$ 4.6)	31.1 ($\pm$ 8.7)	35.7 ($\pm$ 8.1)**	33.5 ($\pm$ 8.7)**
Clinical Course				
Hospitalized due to COVID-19 (%)	0.0	0.0	100.0	100.0
Admitted to ICU due to COVID-19 (%)	0.0	0.0	70.0	86.7
Mechanically ventilated due to COVID-19 (%)	0.0	0.0	70.0	86.7
ECMO received due to COVID-19 (%)	0.0	0.0	0.0	6.7
Total Hospitalization (days)	na	na	26.5 ($\pm$ 17.9)	55.5 ($\pm$ 35.3)[+]
Symptom Duration at Draw (days)	na	17.0 ($\pm$ 9.7)	15.2 ($\pm$ 12.3)	32.8 ($\pm$ 14.4)[++]
Convalescence Period at Draw (days)	39.9 ($\pm$ 15.0)	na	na	na
Maximum Laboratory Values				
CRP (mg/L)	na	na	103.3 ($\pm$ 40.2)	314.6 ($\pm$ 72.5)[++++]
ESR (mm/h)	na	na	70.6 ($\pm$ 44.1)	102.0 ($\pm$ 36.7)
LDH (U/L)	na	na	526.5 ($\pm$ 240.5)	707.2 ($\pm$ 399.7)
Ferritin (ug/L)	na	na	2843.7 ($\pm$ 5616.7)	3535.9 ($\pm$ 3955.3)
D-dimer (ng/mL)	na	na	4399.0 ($\pm$ 3157.5)	7669.3 ($\pm$ 2691.4)[+]
Day of Draw Laboratory Values				
ALC (K/uL)	1.50 ($\pm$ 0.40)	na	1.40 ($\pm$ 0.62)	1.55 ($\pm$ 0.65)
CRP (mg/L)	na	na	39.8 ($\pm$ 47.8)	74.4 ($\pm$ 72.3)

Convalescence was defined as a clinically asymptomatic state on the date of blood draw, either from a baseline asymptomatic state or recuperated from moderate clinical symptoms of COVID-19. Moderate disease was defined as active clinical symptoms of COVID-19 on the date of blood draw that did not necessitate a hospital admission. Severe disease was defined as active clinical symptoms of COVID-19 on the date of blood draw that did necessitate a hospital admission. Severe disease was further subdivided by maximum CRP level during hospital admission as CRP < 200 mg/L 'CRP intermediate (int)' and CRP > 200 mg/L 'CRP high (hi).' Absolute lymphocyte count (ALC), Body mass index (BMI), C-reactive protein (CRP), extracorporeal membrane oxygenation (ECMO), erythrocyte sedimentation rate (ESR), lactate dehydrogenase (LDH), not available (na), standard deviation (SD), *significance by Student's t-test to 'convalescence' group, [+]significance by Student's t-test to 'severe (CRP int)' group.