Supplemental Table 1. Comprehensive overview of published COVID-19 kidney biopsy findings.

Author	N	Mean Age (years)	Sex	Race	Creatinine mg/dL	Proteinuria	Hematuria	Presentation	Diagnosis	Conclusions and Patient Outcomes	Reference
Sharma et al	10	65 (range: 45-77)	5 M / 5 F	5 Black, 3 Hispanic, 2 White	N/A	9/10	6/10	AKI	5/10 ATN 1/10 ATI with myoglobin casts, 2/10 Thrombotic microangiopathy 1/10 Crescentic glomerulonephritis 1/10 Collapsing glomerulopathy	5/10 Death 2/10 Dialysis dependent 3/10 Improvement of kidney function	7
Jhaveri et al	1	69	F	White	Dialysis	Yes	Yes	AKI	Thrombotic microangiopathy	Death	25
Kissling et al	1	63	M	Black	4.07	Yes	N/A	AKI, oliguria Sub-nephrotic proteinuria	Acute tubular necrosis	Persistent renal dysfunction	37
Kudose et al	17	49.9	12 M / 5 F	12 Black, 3 White, 1 Hispanic, 1 Asian	Elevated in 16/17 Average: 7.31 Range: (0.8 - 11.6)	4/17	6/6	AKI: 15 patients CKD: 5 patients	5/17 Collapsing glomerulopathy 1/17 Minimal change disease 2/17 Membranous nephropathy 1/17 Lupus nephritis 1/17 Anti-GBM disease 5/17 Acute tubular injury 1/17 T cell-mediated rejection 1/17 Cortical infarction	1/17 Death 9/17 Dialysis 5/17 Recovery of renal function 2/17 Unknown	8
Larsen et al	1	44	F	Black	11.4	Yes	Yes	AKI superimposed on known CKD.	Collapsing glomerulopathy	Dialysis	32
Magoon et al	2	42 (28; 56)	1 M / 1 F	2 Black	Elevated in both patients (6.5; 7.72)	Yes	N/A	AKI, proteinuria 1/2 concurrent CKD	2/2 Collapsing glomerulopathy	2/2 Dialysis	33
Moeinzadeh et al	1	25	M	Iranian	Elevated (5.5)	Yes (2.9 g/24 h)	N/A	AKI	Crescentic glomerulonephritis	Persistent renal dysfunction	51
Noble et al	2	49.5 (54; 45)	2/2 M	2Black	Elevated (13.58; 14.03)	Yes	1 / 2	AKI on CKD	2/2 Collapsing glomerulopathy (1 native, 1 allograft)	Dialysis dependent	34
Peleg et al	1	46	M	Black	Elevated (16.6)	Yes (Nephrotic range)	No	AKI	Collapsing glomerulopathy	Dialysis dependent	35

Akilesh et al	17*	53.6 (range: 34-77)	8 M, 9 F	8 Black, 5 Hispanic, 4 White	Elevated in 16/17 Average: 6.08 Range: (0.7 to 11.9)	11/17	4/17	15/17 AKI 11/17 Proteinuria	7/17 Collapsing glomerulopathy 1/17 FSGS – non-collapsing 2/17 TMA 1/17 Minimal change disease 1/17 Diabetic nephropathy 1/17 Post-infectious GN 2/17 ATN alone 2/17 Antibody-mediated rejection	8/17 Dialysis dependent 9/17 Improvement in renal function	9
Rossi et al	1	49	M	N/A	N/A	N/A	N/A	AKI	ATI	Improvement in renal function	10
Sharma et al	2	58 (67: 49)	1 M/ 1 F	2 Black	Elevated (8.27; 10.0)	2/2	1/2	AKI, proteinuria	2/2 Collapsing glomerulopathy	2/2 Dialysis dependent	30
Uppal et al	2	55 (64; 46)	2 M	1 Black; 1 South Asian	Elevated (7.9; 4.0)	1/2	1/2	2/2 AKI	2/2 Crescentic glomerulonephritis	2/2 Improvement in renal function	52
Wu et al	6	54.8	4 M/ 2 F	6/6 Black	Elevated 6.5 Range: (2.9 to 11.4)	6/6	4/6	6/6 AKI; Nephrotic-range proteinuria; 3/6 with CKD	6/6 Collapsing glomerulopathy	2/6 Death 3/6 Dialysis-dependent 1/6 Recovery of renal function	31
Hale et al (abstract)	1	56	M	Black	Elevated (5)	Yes (15 g/day)	N/A	AKI with oliguria	Collapsing glomerulopathy	Dialysis dependent	S1
Song et al (abstract)	1	74	F	N/A	Elevated (10.2)	Yes (4 g/day)	Yes	AKI	Pauci-immune crescentic glomerulonephritis, ANCA-associated	Dialysis dependent	S2
Tran et al (abstract)	10	Range 25-63	N/A	N/A	Elevated (Range: 1.2 to 13.5)	N/A	N/A	AKI	10/10 ATI, reported 'viral particles' by EM	4/10 Dialysis dependent	S3
Flores-Chang et al (abstract)	1	69	F	White	N/A	Yes	Yes	AKI + microangiopathic hemolytic anemia	TMA with cortical necrosis.	Death	S4
Kadosh et al	1	56	M	Black	7.78	7.4 g / day	N/A	AKI + nephrotic range proteinuria	Collapsing glomerulopathy	Improvement of renal function with supportive care, no dialysis	38
Couturier et al	2	53	M	Black	2.19 ; 5.32	1870 mg/mmol; 2.65 g/day	No	AKI + proteinuria	2/2 Collapsing glomerulopathy	Improvement of renal function, persistence of sub-nephrotic proteinuria	39
Huang et al	1	65	F	Chinese	1.09	288.8 mg/g	Yes	Nephritic syndrome	IgA nephropathy	Reduced hematuria + proteinuria	48
Nlandu et al	1	48	M	Black	15.9	18 g/day	N/A	AKI + nephrotic syndrome	Collapsing glomerulopathy	Dialysis, persistent proteinuria	40
Shetty et al	6**	56 (Range 49-64)	3 M / 3 F	Black	Elevated (Range:	Yes (range 0.6-12.06)	5/6	AKI + proteinuria	3/6 Collapsing glomerulopathy 3/6 Podocytopathy (1 FSGS)	2/6 Dialysis 3/6 Recovery of renal function 2/6 Decreased proteinuria	29

					2.35 – 13.52)						
Fontana et al	2	60.5 (50; 71)	2 M	White	Elevated	Yes (1/2; 1.2 g/day)	1/2	AKI	2/2 Oxalate nephropathy	2/2 Dialysis; No return of renal function at discharge	44
Izzedine et al	2	62.5 (38; 49)	2 F	Antilles; African	Elevated (8.63 – 11.68)	Yes (2.16-2.34 mg/mmol)	1/2	AKI + proteinuria	2/2 Collapsing glomerulopathy	1/2 Dialysis	41
Sandhu et al	1	22	M	White	Normal	Yes, 2 g/day	Yes	Proteinuria	IgA nephropathy	Normal renal function, no active urinary sediment	2
Suso et al	1	78	M	White	Elevated, 1.96	Yes, 10 g/day	Yes	AKI + nephritic / nephrotic syndrome	IgA nephropathy	Improvement in renal function, persistent proteinuria and hematuria	49
Brix et al	1	44	M	White	Elevated	Unknown	Yes	AKI	Anti-GBM disease	Unknown, received plasmapheresis and cyclophosphamide	46
Papadimitriou et al	2	52; 64	2 M	Unknown	7.5; 1.4	Yes (1.85; 7.4)	Unknown	AKI + proteinuria	2/2 ATI 1/2 Secondary FSGS	1/2 Dialysis, discontinued after 11 weeks	19
Ferlicot et al	47	63	38 M, 9 F	Unknown	1.79	Mean 2.52	22/47 patients	46/47 AKI 9/47 nephrotic syndrome	20/47 ATI 11/47 Collapsing FSGS 5/47 FSGS-NOS 1/47 FSGS-Tip 1/47 TMA 1/47 Arteritis 1/47 AA amyloidosis 2/47 Membranous (PLA2R +) 1/47 Crescentic GN 1/47 IgA Nephropathy 1/47 Light chain cast nephropathy 1/47 Calcineurin inhibitor nephrotoxicity 1/47 Grade III IF/TA (allograft)	30/47 required dialysis 16/30 who required dialysis remained dialysis dependent 9/47 died	20
Szajek et al	1	62	M	White	5.87	Minimal on UA	Yes	AKI + microscopic hematuria	Granulomatous tubulointerstitial nephritis	Required CVVH, had progressive improvement of kidney function without requirement for KRT	28
Gupta et al	2	71; 54	2 M	1 Indian; 1 African American	4.49; 4.69	16 g; 16 g	No	2/2 AKI + nephrotic syndrome	1/2 MCD, ATI 1/2 Collapsing FSGS	1/2 Dialysis 1/2 Lost to follow-up	21
Koc et al	1	80	F	Unknown	6.0	5.8	Yes	AKI + nephrotic range proteinuria	Anti-GBM disease; acute interstitial nephritis	Death	47
Li et al	1	30	M	White	0.58	0.576 g/mmol	Yes	Nephritic syndrome	IgA vasculitis	Preserved kidney function on corticosteroids	50
Nasr et al	13	52	12 M, 1 F	9 African American; 2 Hispanic; 2 White	Elevated	Yes, all 13 patients	Yes, 10/13	13/13 AKI; 6/13 CKD; 11/13 nephrotic range proteinuria	8/13 Collapsing FSGS 1/13 Membranous (PLA2R neg, THSD7A neg) 3/13 Diabetic glomerulosclerosis 1/13 IgA nephropathy	10/13 required dialysis, 6/13 remained on dialysis 2/13 who did not require dialysis had improvement in kidney function	42
Sethi et al	1	25	F	White	2.4	13	Yes	AKI + nephrotic syndrome	Membranoproliferative glomerulonephritis, immune complex type	No return of kidney function, nephrotic range proteinuria	45

Lazareth et al	1	29	M	Sub-saharan African	6.04	490 mg/mmol	Unknown	AKI + nephrotic syndrome in a transplant	Collapsing glomerulopathy ATN 1 APOL1 risk allele in donor	Partial recovery of kidney function	43
Westhoff et al	1	69	M	Unknown	2.2	Unknown	Unknown	AKI in a kidney allograft (kidney-pancreas recipient with ESKD due to diabetes mellitus)	Interstitial inflammation and tubular injury associated with SARS-CoV-2 positivity by ISH and RT-PCR	Recovery of kidney function (Cr 1.2 mg/dL); No recovery of pancreas function with requirement for insulin	22

Abbreviations: M, male; F, female; N/A, not applicable, AKI, acute kidney injury; ATI, acute tubular injury; CKD, chronic kidney disease; GBM, glomerular basement membrane; FSGS, focal segmental glomerulosclerosis; GN, glomerulonephritis; ATN, acute tubular necrosis; EM, electron microscopy; TMA, thrombotic microangiopathy; ANCA, anti-neutrophil cytoplasmic antibodies. *Of 17 biopsies, 14 were native and three were allografts. ** Of 6 biopsies, 5 were native and one was an allograft.

Supplemental Table 2. Review of autopsy findings within kidneys of SARS-CoV-2 infected decedents

Author	N=	Mean age	Sex	Race	Creatinine (mg/dL)	Proteinuria >1 g/day	Hematuria Present/Absent	Presentation	Diagnosis	Cause of Death and Conclusions	Ref
Bradley et al	14	73.5	6 M, 8 F	N/A	Elevated 6/14	N/A	N/A	8/14 CKD	11/14 ATI 14/14 Arterionephrosclerosis 2/14 Diabetic nephropathy 1/14 Amyloidosis	14/14 ARDS or pneumonia 6/14 Kidney disease	11
Farkash et al	1	53	M	N/A	Elevated	N/A	N/A	AKI	ATI with isometric vacuolization	Hypoxic respiratory failure, oliguric acute renal failure	12
Gaillard et al	1	79	M	Black	Elevated (2.5)	Yes	N/A	AKI on CKD3	Collapsing glomerulopathy	ARDS, acute renal failure	36
Su et al	26	69	19 M, 7 F	26/26 Chinese	Elevated 18/26 Average: 1.32 Range: 0.4 to 5.2	7/26	4/26	AKI	26/26 ATI 2/26 Acute pyelonephritis 3/26 ATI contained pigmented casts 3/26 Fibrin thrombi without overt TMA	Multisystem organ failure 2/2 COVID-19	13
Munoz Casablanca et al (abstract)	17	64	12 M, 5 F	3/17 Black, 14/17 not specified	Range: 0.96 to 2.98	1/17	1/17	12/17 AKI	9/17 ATI 1/17 had TMA and ATI. Diabetic nephropathy Arterionephrosclerosis	No data provided	S5
Salvatore et al (abstract); Elsoukkary et al (manuscript) (n=34, details for 30 patients)	30	68.5	6 M, 24 F	38% White, 29% Hispanic, 15% Black, 9% Indian, 9% Asian	Elevated Mean 1.7 Range: 0.7 to 9.6	0/30	N/A	18/30 AKI 2/30 ESKD	ATI ('n' not provided) 2/30 Obesity related glomerulopathy 1/30 Atheroemboli 1/30 Bilateral infarction 2/30 Papillary necrosis 2/30 TMA 14/30 Diabetic nephropathy	No data provided	S6; 16
Golmai et al	12	70.25	10 M, 2 F	6/12 Hispanic, 3/12 Black, 3/12 White	Elevated Average: 5.27 Range: 2.35-11	12/12	Yes, number not specified	12/12 AKI	9/12 ATI/ATN 1/12 AIN 1/12 Oxalate nephropathy 4/12 Medullary urate crystals 2/12 Diabetic nephropathy	No data provided	14
Diao et al	6	69 (51-86)	4 M, 2 F	6/6 Chinese	Not specified	Not specified	Not specified	Not specified	6/6 ATN (6/6 reported autolysis) 2/6 Severe interstitial inflammation	No data provided	17
Xia et al	10	69 (57-86)	8 M, 2 F	10/10 Chinese	Elevated 10/10; mean 1.21,	Not specified	Not specified	10/10 AKI	8/10 ATI 1/10 Venous thrombosis 7/10 Arteriosclerosis	ARDS, septic shock, coagulopathy, acute renal failure	18

					range = 0.64-2.29				1/10 Glomerulomegaly		
Santoriello et al	42	71.5	29 M, 13 F	24/42 Hispanic, 18/42 unknown	Elevated 31/33 (with Cr available)	23/29 (with proteinuria available)	N/A	31/33 AKI	19/31 ATI 6/42 Fibrin thrombi 1/42 Collapsing FSGS 42/42 Arteriosclerosis	ARDS or pneumonia (n=30), decompensated heart failure (n=3), intracranial hemorrhage (n=2), MI (n=1)	15
Simms et al	1	67	M	Unknown	0.57	Unknown	Unknown	ESKD, transplant at 10 days Cr 0.57	No histopathologic abnormalities (in allograft at autopsy)	SARS-CoV-2 positive donor and in recipient who has SARS-CoV-2 negative prior, suggests transmissibility by kidney transplant	25
Alshomrani et al (abstract)	9	67	8 M, 1 F	Unknown	Unknown	Unknown	Unknown	AKI	7/9 ATI 3/9 Microthrombi 3/9 Arteriosclerosis 2/9 Glomerulopathy 2/9 Myocyte necrosis	Pneumonia or diffuse alveolar damage/ARDS	S7
Rapkiewicz et al	7	57	3 M, 4 F	3 White 3 Hispanic 1 Black	Unknown	Unknown	Unknown	AKI	ATN with pigmented casts Platelet-rich microthrombi Arteriosclerosis Viral-like particles in proximal tubules and by EM	Multi-organ system dysfunction	24

Abbreviations: M, male; F, female; N/A, not applicable, AKI, acute kidney injury; ATI, acute tubular injury; CKD, chronic kidney disease; glomerular basement membrane; FSGS, focal segmental glomerulosclerosis; ATN, acute tubular necrosis; TMA, thrombotic microangiopathy; ARDS, acute respiratory distress syndrome; COVID-19, Coronavirus disease-19; MI, myocardial infarction.

Supplemental Table 3. Comparison of COVID-19 biopsy diagnosis to COVID-19 disease severity. Scale: Mild = asymptomatic COVID-19 infection or symptomatic COVID-19 infection without increased oxygen requirements in outpatients; Moderate = COVID-19 infection required inpatient hospitalization without mechanical ventilation and/or dialysis; Severe = COVID-19 infection required intensive care unit admission and/or mechanical ventilation or dialysis.

3A) Native kidney biopsies

Diagnosis	Mild	Moderate	Severe	Unknown
Collapsing Glomerulopathy	4	21	27	10
Acute Tubular Injury	2	11	16	3
Diabetic Nephropathy	8	16	3	2
Podocytopathies	4	6	5	3
Pauci-Immune Crescentic GN	2	4	3	2
Membranous Nephropathy	5	0	2	4
Myoglobin Cast Nephropathy	0	1	6	1
Infection-Associated GN	1	4	3	0
Arterionephrosclerosis	1	4	3	0
FSGS, Secondary	2	3	0	3
IgA Nephropathy	4	2	0	1
Lupus Nephritis	2	1	3	0
Thrombotic Microangiopathy	0	2	3	0
Amyloidosis	0	2	1	1
Acute Interstitial Nephritis	1	2	1	0
PGMID	1	3	0	0
Cryoglobulinemic GN	1	1	0	1
Acute Pyelonephritis	0	1	1	0
Light Chain Cast Nephropathy	0	0	1	1
MGMID	0	1	0	0
Cortical Infarct	0	0	1	0
Anti-GBM Disease	0	0	0	1
Fibrillary Glomerulopathy	0	0	1	0
Light Chain Deposition Disease	1	0	0	0
Hemoglobin Cast Nephropathy	0	0	0	1
Thin Glomerular Basement Membrane Disease	0	0	0	1
Sickle Cell Nephropathy	0	1	0	0

3B) Allograft biopsies.

Diagnosis	Mild	Moderate	Severe	Unknown
Antibody-Mediated Rejection	4	6	1	6
T-Cell Mediated Rejection	2	1	2	1
Mixed Rejection	0	4	0	0
Acute Tubular Injury	1	6	2	3
Negative for Rejection	1	0	1	0
IgA Nephropathy	1	0	0	0
Collapsing Glomerulopathy	0	2	0	0

Supplemental Table 4. Histopathologic features of podocyte diseases within native and transplant kidney biopsies from COVID-19 patients.

Diagnosis	n	% GGS	Segmental Sclerosis	IF/TA	Arteriosclerosis	Arteriolar Hyalinosis	Foot Process Effacement
Native biopsies							
Collapsing Glomerulopathy	62	37.6% ± 25.0%	62/62	None: 1/62 Mild: 17/62 Moderate: 24/62 Severe: 19/62 No data: 1/62	None: 11/62 Mild: 12/62 Moderate: 12/62 Severe: 26/62 No data: 1/62	None: 23/62 Mild: 12/62 Moderate: 14/62 Severe: 13/62	None: 0/62 Mild: 2/62 Moderate: 5/62 Severe: 43/62 No data: 12/62
Primary Podocytopathies (MCD n=11, Primary FSGS n=7)	18	15.6% ± 26.2%	7/18	None: 6/18 Mild: 7/18 Moderate: 3/18 Severe: 1/18 No data: 1/18	None: 7/18 Mild: 4/18 Moderate: 1/18 Severe: 6/18	None: 8/18 Mild: 5/18 Moderate: 2/18 Severe: 3/18	None: 0/18 Mild: 0/18 Moderate: 0/18 Severe: 18/18
Secondary FSGS	8	46.7% ± 19.8%	8/8	None: 0/8 Mild: 0/8 Moderate: 4/8 Severe: 4/8	None: 1/8 Mild: 1/8 Moderate: 2/8 Severe: 4/8	None: 2/8 Mild: 1/8 Moderate:1/8 Severe: 4/8	None: 0/8 Mild: 3/8 Moderate: 0/8 Severe: 4/8 No data: 1/8
Transplant biopsies							
Collapsing Glomerulopathy	2	6.5% ± 9.1%	2/2	None: 0/2 Mild: 2/2 Moderate: 0/2 Severe: 0/2	None: 1/2 Mild: 1/2 Moderate: 0/2 Severe: 0/2	None: 2/2 Mild: 0/2 Moderate: 0/2 Severe: 0/2	None: 2/2 Mild: 0/2 Moderate: 0/2 Severe: 2/2

Abbreviations: FSGS, focal segmental glomerulosclerosis; GGS; global glomerulosclerosis; IF/TA, interstitial fibrosis and tubular atrophy. GGS expressed as mean ± standard deviation. For parameters represented as fractions, the frequency of positivity for each parameter is shown. GGS expressed as mean ± standard deviation. Electron microscopy performed on 50/62 Collapsing Glomerulopathy cases and 7/8 secondary FSGS cases (tissue unavailable in remainder of cases).

Supplemental Table 5. A) Light microscopic features of glomerular diseases, excluding podocytopathies, in native kidney biopsies from COVID-19 patients; B) Immunofluorescence and ultrastructure of these glomerular diseases.

A) Light microscopic features of glomerular disease cases.

Diagnosis	N=	% GGS	Seg Scl	IF/TA	Art Scl	Mes Exp/ Mes HC	Endo HC	Fib Nec / Cres	Hyaline Thrombi	ATI	Edema	Micro-changes
Membranous glomerulopathy	11	22.7% ± 23.6%	9/11	None: 2/11 Mild: 4/11 Moderate: 2/11 Severe: 3/11	None: 3/11 Mild: 1/11 Moderate: 4/11 Severe: 3/11	9/11; 5/11	1/5	1/11	0/11	7/11	4/11	1/11
Crescentic GN	11	9.9% ± 11.7%	3/11	None: 3/11 Mild: 5/11 Moderate: 1/11 Severe: 2/11	None: 3/11 Mild: 0/11 Moderate: 3/11 Severe: 4/11 None: 1/11	2/11; 0/11	0/11	11/11	0/11	10/11	7/11	0/11
Infection-associated GN	8	12.5% ± 12.4%	1/8	None: 4/8 Mild: 2/8 Moderate: 1/8 Severe: 1/8	None: 2/8 Mild: 1/8 Moderate: 2/8 Severe: 2/8 No data: 1/8	7/8; 7/8	8/8	2/8	0/8	7/8	4/8	0/8
Cryo-GN	3	3.9% ± 4.2%	0/3	None: 1/3 Mild: 2/3 Moderate: 0/3 Severe: 0/3	None: 1/3 Mild: 0/3 Moderate: 1/3 Severe: 1/3	2/3, 2/3	3/3	0/3	3/3	3/3	2/3	1/3
IgA nephropathy	7	20.6 ± 28.0	4/7	None: 4/7 Mild: 1/7 Moderate: 0/7 Severe: 2/7	None: 4/7 Mild: 0/7 Moderate: 0/7 Severe: 2/7 No data: 1/7	6/7; 4/7	3/7	2/7	0/7	4/7	3/7	0/7
Lupus nephritis*	6	26.3% ± 30.5%	4/6	None: 2/6 Mild: 1/6 Moderate: 1/6 Severe: 1/6 No data: 1/6	None: 1/6 Mild: 2/6 Moderate: 2/6 Severe: 0/6 No data: 1/6	4/6; 3/6	1/6	1/6	1/6	2/6	2/6	1/6

Sickle cell nephropathy	1	13.5%	1/1	Moderate	Mild	0/1; 0/1	0/1	0/1	0/1	1/1	1/1	1/1
PGMID	4	16.4% ± 15.6%	2/4	None: 0/4 Mild: 2/4 Moderate: 2/4 Severe: 0/4	None: 1/4 Mild: 1/4 Moderate: 1/4 Severe: 1/4	4/4; 3/4	2/4	1/4	2/4	4/4	4/4	1/4
MGMID	1	54.5%	1/1	Moderate	Moderate	1/1; 1/1	1/1	1/1	0/1	1/1	1/1	1/1
Anti-GBM disease	1	12.4%	0/1	None	None	0/1; 0/1	1/1	1/1	0/1	1/1	1/1	0/1

* Two cases in the lupus nephritis group were limited samples, two with no arteries for evaluation and one with insufficient cortex for evaluation of tubulointerstitial scarring

Abbreviations: GN, glomerulonephritis; GGS, global glomerulosclerosis; Seg Scl, segmental sclerosis; IF/TA, interstitial fibrosis/tubular atrophy; Art Scl, arteriosclerosis; Mes Exp/Mes HC, mesangial expansion and hypercellularity; Endo HC, endocapillary hypercellularity; Fib Nec/Cres, fibrinoid necrosis or crescent formation; ATI, acute tubular injury; Interst Inflam, interstitial inflammation; Micro-changes, microangiopathic changes. GGS expressed as mean ± standard deviation. For parameters represented as fractions, the frequency of positivity for each parameter is shown.

5B) Immunofluorescence and ultrastructural features of glomerular disease cases.

Diagnoses	Number Cases	IgA	IgG	IgM	C3	C1q	Mesangial Deposits*	Subepithelial deposits*	Subendothelial deposits*
Membranous	11	1/11	11/11	5/11	10/11	2/10**	3/9*	9/9*	0/9
Crescentic glomerulonephritis	11	3/10***	3/10***	3/10***	4/10***	0/10***	2/6*	0/6*	0/6*
Infection-Associated glomerulonephritis	8	3/8	4/8	0/8	6/8	2/8	5/7*	3/7*	4/7*
Cryoglobulinemic glomerulonephritis	3	2/3	3/3	3/3	3/3	0/3	2/3	1/3	3/3
IgA nephropathy	7	7/7	4/7	6/7	6/7	0/7	5/6*	0/6*	1/6*
Lupus nephritis	6	6/6	6/6	6/6	6/6	4/6	3/3*	3/3*	2/3*
Sickle cell nephropathy	1	0/1	0/1	0/1	0/1	0/1	1/1	0/1	0/1
PGMID	4	0/4	3/4	0/4	3/4	2/4	4/4	3/4	3/4
MGMID	1	0/1	1/1	1/1	0/1	0/1	1/1	0/1	0/1
Anti-GBM disease	1	0/1	1/1	0/1	1/1	0/1	0/1	1/1	0/1

*Not all cases had electron microscopy available for evaluation.

**One case in the membranous group lacked C1q staining.

***One case in the crescentic glomerulonephritis group lacked immunofluorescence microscopy.

Supplemental Table 6. Histopathologic features of tubulointerstitial diseases in COVID-19 native and transplant kidney biopsies.

Diagnosis	N=	GGS	IF/TA	Arteriosclerosis	Arteriolar hyalinosis	ATI	Edema	Interstitial Inflammation	Tubulitis
Acute Tubular Injury	32	21.5% ± 22.0%	None: 7/32 Mild: 12/32 Moderate: 6/32 Severe: 7/32	None: 11/32 Mild: 2/32 Moderate: 5/32 Severe: 14/32	None: 10/32 Mild: 8/32 Moderate: 6/32 Severe: 8/32	32/32	21/32	8/32	1/32
Acute Interstitial Nephritis	4	11.3% ± 10.3%	None: 2/4 Mild: 0/4 Moderate: 2/4 Severe: 0/4	None: 1/4 Mild: 1/4 Moderate: 1/4 Severe: 1/4	None: 1/4 Mild: 2/4 Moderate: 1/4 Severe: 0/4	4/4	4/4	4/4	4/4
Myoglobin Cast Nephropathy	8	14.9% ± 13.9%	None: 2/8 Mild: 5/8 Moderate: 1/8 Severe: 0/8	None: 2/8 Mild: 1/8 Moderate: 0/8 Severe: 4/8 No data: 1/8	None: 5/8 Mild: 2/8 Moderate: 1/8 Severe: 0/8	8/8	2/8	3/8	1/8
Hemoglobin cast nephropathy	1	0	None	Mild	None	1/1	1/1	0/1	0/1
Cortical infarct	1	6.7%	None	None	None	1/1	1/1	1/1	0/1
Acute Pyelonephritis	2	21.3% ± 1.8%	None: 0/2 Mild: 2/2 Moderate: 0/2 Severe: 0/2	None: 0/2 Mild: 1/2 Moderate: 0/2 Severe: 1/2	None: 1/2 Mild: 1/2 Moderate: 0/2 Severe: 0/2	2/2	2/2	2/2	1/2
Light chain deposition disease	1	30.3%	Moderate	Severe	Severe	1/1	1/1	1/1	1/1
Light chain cast nephropathy	2	6.5% ± 9.2%	None: 0/2 Mild: 1/2 Moderate: 0/2 Severe: 1/2	None: 0/2 Mild: 1/2 Moderate: 0/2 Severe: 1/2	None: 1/2 Mild: 0/2 Moderate: 1/2 Severe: 0/2	2/2	2/2	1/2	1/2
Transplant									

Acute Tubular Injury	12	14.8% ± 19.6%	None: 3/12 Mild: 3/12 Moderate: 5/12 Severe: 1/12	None: 3/12 Mild: 7/12 Moderate: 0/12 Severe: 1/12 No data: 1/12	None: 5/12 Mild: 4/12 Moderate: 0/12 Severe: 2/12 No data: 1/2	12/12	12/12	2/12	1/12

Abbreviations: GGS, global glomerulosclerosis; IF/TA, interstitial fibrosis/tubular atrophy; ATI, acute tubular injury. GGS expressed as mean ± standard deviation. For parameters represented as fractions, the frequency of positivity for each parameter is shown.

Supplemental Table 7. Histopathologic features of vascular diseases in COVID-19 native and transplant kidney biopsies.

Diagnosis	N =	GGS	Segmental Sclerosis	IF/TA	Arteriosclerosis	Arteriolar hyalinosis	Glomerular Micro-angiopathic changes	Vascular Micro-angiopathic changes	ATI
Arterionephrosclerosis	8	63.6% ± 21.7%	3/8	None: 0/8 Mild: 0/8 Moderate: 0/8 Severe: 7/8 No data: 1/8	None: 0/8 Mild: 1/8 Moderate: 0/8 Severe: 6/8 No data: 1/8	None: 1/8 Mild: 2/8 Moderate: 0/8 Severe: 5/8	0/8	2/8	3/8
Thrombotic microangiopathy	5	13.3% ± 16.3%	2/5	None: 2/5 Mild: 1/5 Moderate: 1/5 Severe: 1/5	None: 2/5 Mild: 1/5 Moderate: 0/5 Severe: 1/5 No data: 1/5	None: 2/5 Mild: 1/5 Moderate: 1/5 Severe: 1/5	2/5	5/5	5/5

Abbreviations: GGS, Global Glomerulosclerosis; IF/TA, Interstitial Fibrosis/Tubular Atrophy; ATI, Acute Tubular Injury. GGS expressed as mean ± standard deviation. For parameters represented as fractions, the frequency of positivity for each parameter is shown.

Supplemental Table 8: Histopathologic features of chronic diseases in COVID-19 native and transplant kidney biopsies.

Diagnosis	N =	GGS	Segmental Sclerosis	IF/TA	Arteriosclerosis	Arteriolar Hyalinosis	Mesangial expansion	ATI
Diabetic Nephropathy	29	53.4% ±18.8%	26/29	None: 1/29 Mild: 2/29 Moderate: 4/29 Severe: 22/29	None: 0/29 Mild: 5/29 Moderate: 5/29 Severe: 19/29	None: 1/29 Mild: 2/29 Moderate: 4/29 Severe: 22/29	29/29	15/29
Amyloidosis	4	29.3% ± 5.5%	0/4	None: 0/4 Mild: 1/4 Moderate: 3/4 Severe: 0/4	None: 0/2* Mild: 1/3* Moderate: 0/3* Severe: 2/3*	None: 2/3* Mild: 0/3* Moderate: 0/3* Severe: 1/3*	4/4	3/4
Fibrillary glomerulopathy	1	86.4%	0/1	Severe	Severe	Severe	1/1	0/1
Thin Glomerular Basement Membrane Disease	1	6.7%	0/1	None	Mild	None	0/1	0/1

Abbreviations: GGS, Global glomerulosclerosis; IF/TA, Interstitial fibrosis/tubular atrophy; ATI, Acute tubular injury. GGS expressed as mean ± standard deviation. For parameters represented as fractions, the frequency of positivity for each parameter is shown.

*One limited sample without vessels available for evaluation in the amyloidosis group.

Supplemental Table 9. Histopathologic features of kidney diseases within transplant biopsies from COVID-19 patients.

Diagnosis	N=	GGS	Seg Scl	if	ta	cv	ah	g	ptc	cg	i	t	v	C4d (≥2)	ATI
AMR	17	19.1% ± 25.0%	8/17	0: 4/17 1: 7/17 2: 4/17 3: 1/17	0: 2/17 1: 7/17 2: 4/17 3: 1/17	0: 3/17 1: 6/17 2: 6/17 3: 2/17	0: 7/17 1: 3/17 2: 0/17 3: 7/17	0: 2/17 1: 5/17 2: 3/17 3: 6/17	0: 0/17 1: 5/17 2: 11/17 3: 1/17	0: 6/17 1: 4/17 2: 1/17 3: 5/17	0: 9/17 1: 8/17 2: 0/17 3: 0/17	0: 7/17 1: 8/17 2: 2/17 3: 0/17	0: 14/17 1: 3/17 2: 0/17 3: 0/17	4/17	15/17
TCMR	6	9.9% ± 13.5%	1/6	0: 2/6 1: 1/6 2: 2/6 3: 1/6	0: 0/6 1: 2/6 2: 2/6 3: 2/6	0: 3/6 1: 0/6 2: 3/6 3: 0/6	0: 3/6 1: 1/6 2: 1/6 3: 1/6	0: 5/6 1: 1/6 2: 0/6 3: 0/6	0: 0/6 1: 0/6 2: 4/6 3: 1/6	0: 6/6 1: 0/6 2: 0/6 3: 0/6	0: 0/6 1: 2/6 2: 1/6 3: 3/6	0: 0/6 1: 0/6 2: 3/6 3: 3/6	0: 5/6 1: 0/6 2: 1/6 3: 0/6	0/6	5/6
AMR and TCMR*	4	15.3% ± 19.4%	0/4	0: 0/4 1: 1/4 2: 3/4 3: 0/4	0: 0/4 1: 1/4 2: 3/4 3: 0/4	0: 0/4 1: 1/4 2: 1/4 3: 1/4	0: 2/4 1: 1/4 2: 1/4 3: 0/4	0: 1/4 1: 2/4 2: 0/4 3: 1/4	0: 0/4 1: 0/4 2: 3/4 3: 1/4	0: 4/4 1: 0/4 2: 0/4 3: 0/4	0: 0/4 1: 0/4 2: 3/4 3: 1/4	0: 0/4 1: 1/4 2: 2/4 3: 1/4	0: 1/4 1: 1/4 2: 1/4 3: 0/4	2/4	4/4
Negative for Rejection	2	0%	0/2	0: 1/2 1: 0/2 2: 1/2 3: 0/2	0: 1/2 1: 0/2 2: 1/2 3: 0/2	0: 0/2 1: 1/2 2: 0/2 3: 0/2	0: 2/2 1: 0/2 2: 0/2 3: 0/2	0: 2/2 1: 0/2 2: 0/2 3: 0/2	0: 2/2 1: 0/2 2: 0/2 3: 0/2	0: 2/2 1: 0/2 2: 0/2 3: 0/2	0: 2/2 1: 0/2 2: 0/2 3: 0/2	0: 2/2 1: 0/2 2: 0/2 3: 0/2	0: 2/2 1: 0/2 2: 0/2 3: 0/2	0/2	1/2
IgA nephropathy	1	29.6%	1	1	1	2	2	0	0	0	0	0	0	0	0

*One case in the AMR + TCMR group had no arteries available for evaluation.

Abbreviations: AMR, antibody-mediated rejection; TCMR, T-cell mediated rejection; GGS, global glomerulosclerosis; Seg scl, segmental sclerosis; if, interstitial fibrosis; ta, tubular atrophy; cv, chronic vascular (arteriosclerosis); ah, arteriolar hyalinosis; g, glomerulitis; cg, chronic glomerular (capillary loop double contours); i, interstitial inflammation; t, tubulitis; v, vasculitis/endothelialitis; ATI, acute tubular injury. All parameters are graded according to the Banff classification for allograft rejection. GGS expressed as mean ± standard deviation. For parameters represented as fractions, the frequency of positivity for each parameter is shown.

Supplemental Table 10. APOL1 genotypes on individual native biopsy cases to include main diagnosis and presence/absence of focal segmental glomerulosclerosis. Abbreviations: FSGS, focal segmental glomerulosclerosis; PGMID, proliferative glomerulonephritis with monoclonal IgG deposits; ANCA, anti-neutrophil cytoplasmic antibodies

Biopsy diagnosis	FSGS?	Risk Alleles	Genotype
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	0	G0/G0
Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	0	G0/G0
Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	2	G2/G2
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy + PGMID	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G2/G2
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G1

Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G2/G2
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	0	G0/G0
Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	0	G0/G0
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G1
Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	2	G1/G2
Collapsing glomerulopathy	Yes	2	G1/G2
Acute tubular injury	No	0	G0/G0
Acute tubular injury	No	2	G1/G2
Acute tubular injury	Yes	2	G1/G2
Acute tubular injury	Yes	2	G1/G2
Acute tubular injury	Yes	2	G1/G2
Acute tubular injury	Yes	0	G0/G0
Acute tubular injury	No	0	G0/G0
Acute tubular injury	No	2	G1/G1
Acute tubular injury	Yes	2	G1/G2
Protracted tubular injury	Yes	2	G1/G1
Diabetic nephropathy	Yes	0	G0/G0
Diabetic nephropathy	Yes	2	G1/G1
Diabetic nephropathy	Yes	0	G0/G0

Diabetic nephropathy	Yes	1	G0/G2
Diabetic nephropathy	Yes	2	G2/G2
Diabetic nephropathy	Yes	0	G0/G0
Diabetic nephropathy	Yes	1	G1/G0
Diabetic nephropathy	Yes	0	G0/G0
Diabetic nephropathy	No	0	G0/G0
Diabetic nephropathy	Yes	1	G1/G0
Diabetic nephropathy	Yes	1	G0/G2
Diabetic nephropathy	Yes	2	G1/G2
Diabetic nephropathy	Yes	2	G1/G1
Minimal change disease	No	2	G2/G2
Minimal change disease	No	2	G1/G1
Minimal change disease	No	2	G1/G1
Minimal change disease	No	2	G1/G1
Minimal change disease	No	2	G1/G2
FSGS, favor primary	Yes	2	G1/G1
FSGS, tip variant	Yes	0	G0/G0
Membranous glomerulopathy	Yes	1	G0/G2
Membranous glomerulopathy	No	0	G0/G0
Membranous glomerulopathy	Yes	0	G0/G0
Membranous glomerulopathy	Yes	0	G0/G0
Membranous glomerulopathy	Yes	1	G0/G2
FSGS, favor secondary	Yes	2	G1/G2
FSGS, favor secondary	Yes	0	G0/G0
FSGS, favor secondary	Yes	2	G1/G1
FSGS, favor secondary	Yes	0	G0/G0
ANCA-associated glomerulonephritis	No	0	G0/G0
ANCA-associated glomerulonephritis	Yes	0	G0/G0
Arterionephrosclerosis	Yes	1	G1/G0
Arterionephrosclerosis	No	0	G0/G0
Arterionephrosclerosis	No	2	G1/G1
Myoglobin Cast Nephropathy	No	1	G0/G2
Myoglobin Cast Nephropathy	No	1	G1/G0

Myoglobin Cast Nephropathy	Yes	0	G0/G0
Thrombotic Microangiopathy	Yes	0	G0/G0
Lupus Nephritis	Yes	2	G2/G2
Kappa Light Chain Cast Nephropathy	No	0	G0/G0
Kappa Light Chain Cast Nephropathy	No	1	G1/G0
AL Amyloidosis	No	0	G0/G0
Cortical Infarct	No	0	G0/G0
Acute Interstitial Nephritis	No	2	G1/G1
Hemoglobin Cast Nephropathy	Yes	0	G0/G0
Cryoglobulinemic Glomerulonephritis	No	0	G0/G0
Sickle Cell Nephropathy	Yes	1	G1/G0
C3 Glomerulonephritis	No	1	G1/G0
Light Chain Deposition Disease	Yes	0	G0/G0

Supplemental references - conference abstracts:

S1. Hale M, Barney EJ, Jean-Claude YD*, et al.* Collapsing FSGS in COVID-19. *ASN Meeting* 2020; **Abstract PO0806**.

S2. Song R, Thiruvarudsothy S, Hassler J*, et al.* ANCA-Associated Vasculitis Under a COVID-19 Mask. *ASN Meeting* 2020; **Abstract PO0813**.

S3. Tran THT, Wu M. Renal Biopsy Findings in Patients with COVID-19 Infection. *ASN Meeting* 2020; **Abstract PO0829**.

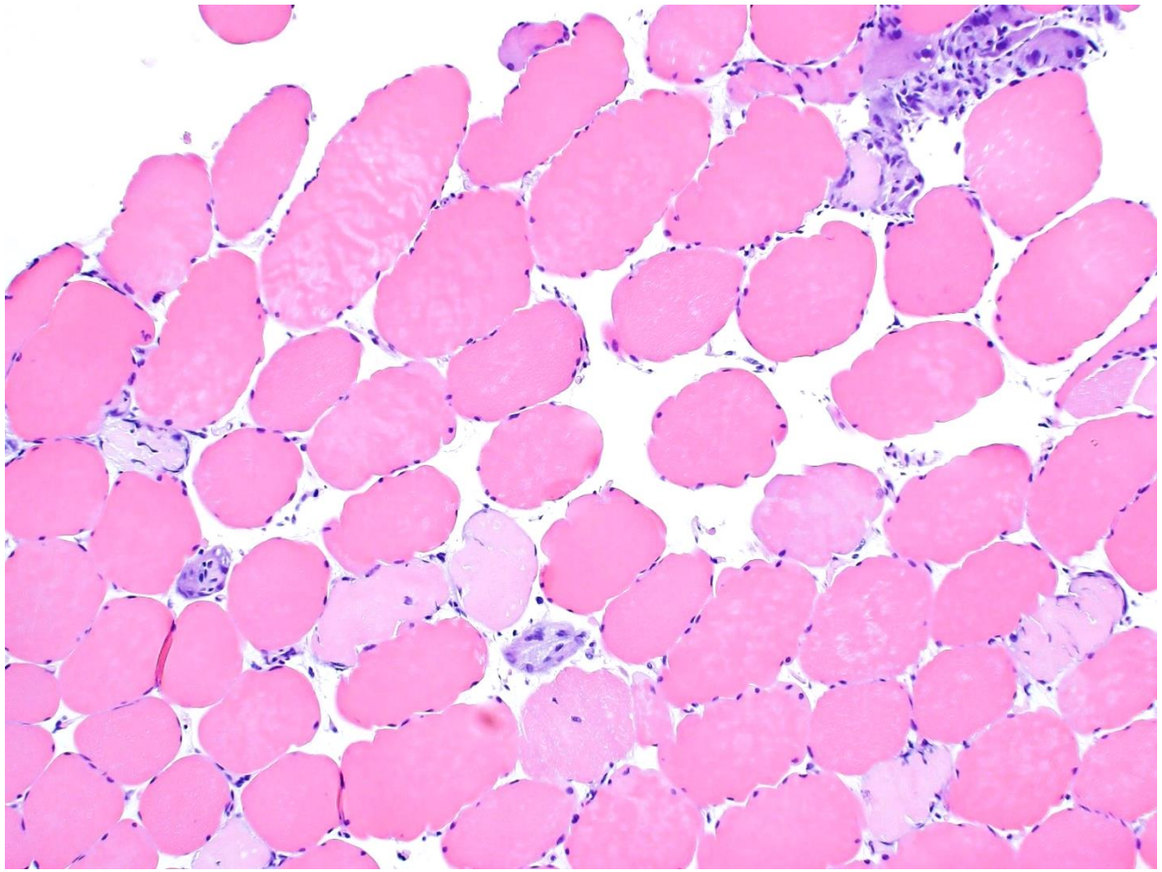
S4. Flores Chang BS, Parikh R, Wanchoo R*, et al.* Thrombotic Microangiopathy (TMA) in a Patient with COVID-19. *ASN Meeting* 2020; **Abstract PO0789**.

S5. Munoz Casablanca NN, Haroon Al Rasheed MR, Hindi J*, et al.* Renal Histopathological Post-Mortem Findings of 17 Patients with COVID-19 in New York City. *ASN Meeting* 2020; **Abstract PO0840**.

S6. Salvatore S, Borczuk AC, Seshan SV: Renal Pathology of 34 Consecutive COVID Autopsies: A Single-Institution Experience. In *American Society of Nephrology Kidney Week*, On-Demand, 2020

S7. Alshomrani A et al. *A sticky issue: thrombotic phenomena amidst autopsy findings in fatal cases of COVID-19*. United States and Canadian Academy of Pathology Annual Scientific Meeting, 2021.

Supplemental Figure 1.



Supplemental Figure 1: Scattered pale staining acutely necrotic muscle fibers with only minimal associated chronic lymphoid inflammation (necrotizing myopathy) in a 29-year-old African-American male with myalgias and clinical non-traumatic rhabdomyolysis characterized by marked CPK elevation (~180,000), occurring the week of COVID-19 diagnosis, which did not respond to hydration and supportive care, and required steroid treatment (hematoxylin and eosin; 100x).