**Table 3 - Case reports, case series and studies without control group demographics, presentation comorbidities, diagnostics, laboratory investigations and outcomes of COVID-19 patients with cardiovascular injury**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Study | Study type  Country | n  (Sex) | Age | Comorbidities | Definition of CI/  abnormality | CI Identification Method | Inflammatory and cardiac markers (reference units)^ (IQR or ±SD) | | Treatment / Intervention | Outcome |
| Blondiaux et al, 2020 20 | Case series  France | 4 | 6-12 years | None | MIS-C with Kawasaki disease–like symptoms  Acute myocarditis | TTE and MRI | CRP | 131, 340, 456, 310 | Aspirin  HFOT  IMV  IVIg  Steroids  Vasoactive agents  Volume expanders | Recovered |
| Troponin I | 0.125, 4.607, 0.545, 0.340 |
| BNP | 2305, 918, 3214, 3140 |
| Cai et al, 2020 21 | Case series  China | 3  (2M, 1F) | 10 months | Intussusception | MODS with myocardial injury | Not specified | CRP | 202 | Ribavirin  Blood purification IFN inhalation  IMV  IV  IVIg  Methylprednisone  O2 support | Died |
| PCT | >100 |
| Ferritin | 1179.11 |
| IL2 | 1.75 |
| IL6 | 3868.86 |
| TNF-alpha | 2.15 |
| INF-gamma | 16.98 |
| LDH | 3171 |
| CK-MB | 840 |
| Troponin | 0.007 |
| NT-proBNP | >9000 |
| D-dimer | 40.34 |
| 1.2 years | Hydronephrosis in left kidney, rotavirus infection | MODS with myocardial injury | Not specified | CRP | 69.1 | Blood purification IFN inhalation  IMV  IV ribavirin  IVIg Methylprednisone  O2 support | Recovered |
| PCT | 2.66 |
| Ferritin | 1796.8 |
| IL2 | 1.32 |
| IL6 | 177.86 |
| TNF-alpha | 3.52 |
| INF-gamma | 2.26 |
| LDH | 751 |
| CK-MB | 98 |
| Troponin | 0.272 |
| NT-proBNP | >9000 |
| 2 months | None | Myocardial function damage | Not specified | CRP | 5 | IFN inhalation | Recovered |
| IL2 | 1.43 |
| IL6 | 7.06 |
| TNF-alpha | 1.01 |
| INF-gamma | 8.35 |
| LDH | 562 |
| CK-MB | 90 |
| D-dimer | 1.18 |
| Coyle et al., 2020 22 | Case report  USA | 1  (M) | 57  Years | HT | Myocarditis, cardiomyopathy, cardiogenic shock | ECG, CMR | CRP | Arrival: 81 Day 3: 129 Day 5: 207 Day 6: 51 | Aldose reductase inhibitor  Anti-gout agents  Antibiotics  Endotracheal intubation  HCQ  IMV  Inotropic vasodilator  Oxygen support  Plasma exchange  Steroids  Tocilizumab | Recovered |
| IL-6 | Day 3: 18 |
| Ferritin | Arrival: 2,106 Day 5: 2,280  Day 6: 1,678 |
| LDH | Arrival: 347 Day 3: 487 Day 5: 559 Day 6: 367 |
| Troponin I | Day 3: 0.02–7.33 Day 5: 0.54 Day 6: 0.30 |
| NT-proBNP | Day 3: 859  Day 5: 1300 Day 6: 520 |
| Del Barba et al, 2020 23 | Case report  Italy | 1  (M) | 38  Days | None | Myocarditis | CMR | CRP | negative | NR | Recovered |
| PCT | 3.28 |
| LDH | mildly increased |
| Troponin T | 0.082 |
| CK-MB § | 9.8 |
| NT-proBNP | 208 |
| Giacomet et al, 2020 24 | Case report  Italy | 1  (F) | 2  Month | None | Acute myocarditis | TTE | CRP | Day 1: 8.9  Day 2: 35  Day 5:3.9 | Antibiotics  IVIg | Recovered |
| IL-6 | Day 1: 236  Day 5: 25 |
| PCT | Day 1:1300  Day 2: 2000  Day 5: <100 |
| Troponin T | Day 1: 0.103  Day 2: 0.15  Day 3: 0.039  Day 5: 0.048  Day 7: 0.042 |
| NT-proBNP | Day 1: 12507  Day 3: 2101, 3353  Day 5: 3353  Day 7: 279 |
| Gnecchi et al, 2020 25 | Case report  Italy | 1  (M) | 16 years | None | Myocarditis | ECG | CRP | Day 1: 32.5  Day 2: 62  Day 3: 33.3  Day 4: 16.7  Day 5: 9.5  Day 7: 4  Day 8: 2.9 | Antiviral  Aspirin HCQ NSAID | Recovered |
| PCT | Day 1: 0.27  Day 4: 0.07  Day 5: <0.02 |
| Troponin I | Day 1: 9.45 (am)/16.86 (pm)  Day 2: :14.81  Day 4: 3.212  Day 5: 0.339  Day 6: 0.151  Day 7: 0.061  Day 8: 0.039 |
| CK (mU/mL) | Day 1: 671  Day 2: 509  Day 5: 49  Day 8: 45 |
| Greene et al, 2020 26 | Case report  USA | 1  (F) | 11 years | None | MIS-C with Kawasaki disease–like symptoms | TTE | CRP | <300 | Antivirals  Convalescent plasma  Enoxaparin  IVIg  Milrinone  Norepinephrine Vitamin K  Steroids  Tocilizumab  Vitamin K | Recovered |
| IL-6 | 1449 |
| PCT | 16.28 |
| Ferritin | 1789 |
| LDH | 301 |
| Troponin | 0.112 |
| BNP | 8718 |
| Grimaud et al, 2020 27 | Retrospective cohort without control  France | 20  (10M, 10F) | 2.9-15 years | None | Acute myocarditis | TTE, ECG and elevated troponin | CRP | 251 (94-458) | Dobutamine  Epinephrine  HFOT  IL-1 receptor antagonist  IMV  Inotropes  Intubation  IVIg  Milrinone  NIV  Norepinephrine  Steroids  Tocilizumab | Recovered |
| PCT | 46 (1.6-448) |
| Troponin | 269 (31-4607) |
| BNP | 927 (49-5179) |
| Kariyanna et al, 2020 28 | Case report  USA | 1  (M) | 68 Years | COPD | Myocarditis, ST elevation myocardial infarction, arrhythmias | ECG | CRP | 2470 | Antiplatelet  Aspirin  TPA | Died – multi organ failure |
| Lung Cancer | PCT | 7.4 |
|  | Ferritin | 2634.1 |
| LDH | 856 |
| Troponin | 94.36  75 |
| Kazi et al, 2020 29 | Case report  USA | 1  (M) | 73  Years | Diabetes Mellitus | Suspected myopericarditis with ventricular dysfunction | ECG, TTE | CRP | 118.2 | Aantiarrhythmic drug  Antibiotics Anticoagulants  Antivirals HCQ  IMV  IVIg | Died – multi organ failure |
| Obstructive Sleep Apnea | Ferritin | 2695 |
| Atrial Fibrillation | LDH | 572 |
| Aortic Stenosis | Troponin T | 4.19 |
| HTN | NT-proBNP | 1298 |
| CK | 1129 |
| Latimer et al, 2020 30 | Case report  USA | 1  (M) | 16 Years | Chromosome 18q Deletion | Myocardial injury (suspected myopericarditis) | High Troponin T and TTE | Ferritin | 7051 | Epinephrine  Hydrocortisone  HCQ Milrinone  IV fluids | Recovered |
| Epilepsy | LDH | 2383 |
| Troponin T | 25.92 |
| CK (U/L) | 1129 |
| BNP | 9959 |
| Luetkens et al, 2020 31 | Case report  Germany | 1  (M) | 79  Years | Asthma | Myocarditis with pericardial effusion | CMR | CRP | 64.23 | Heart failure treatment | Recovered |
| Troponin I | 0.0635 |
| NT-proBNP | 1178 |
| Oberweis et al, 2020 32 | Case report  Luxembourg | 1  (M) | 8  Years | None | Thrombocytopenia and myocarditis | TTE, CMR | CRP | Initial: 73 Highest: 151 | Antibiotics Anticoagulant  Dobutamine  IVIg  Milirinone  Oxygen Support  Tocilizumab | Recovered |
| IL-6 | Initial: 377.8 Highest: 1023 |
| Ferritin | Highest: 2869 |
| Troponin T | 0.044 |
| BNP | 5112 |
| Rodriguez-Gonzalez et al., 2020 33 | Case report  Spain | 1  (M) | 6 Month | Short Bowel Syndrome | Severe RV failure, cardiogenic shock | ECG, TTE | CRP | 86 | Antibiotics  Anticoagulant  HCQ IMV  Milirinone  Norepinephrine  Tocilizumab | Recovered |
| IL-6 | 198 |
| PCT | 0.00346 |
| Ferritin | 7634 |
| Troponin I | 0.09 |
| NT-proBNP | 26000 |
| Rauf et al, 2020 34 | Case report  India | 1  (M) | 5 Years | None | Atypical Kawasaki Disease with myocarditis | TTE | CRP | 120 | Antibiotics  ACEi  Diuretics  Inotropic support IVIg  HFOT  Steroids | Recovered |
| Ferritin | 600 |
| Troponin | 0.029 |
| NT-proBNP | 8000 |
| Tavazzi et al., 2020 35 | Case report  Italy | 1  (M) | 69 Years | None | Severe, necrotizing myocarditis and cardiogenic shock | TTE and endomyocardial biopsy | CRP | 52.7 | Adrenaline  ECMO  Intra-aortic balloon pump  NIV  Noradrenaline | Died - septic shock |
| Troponin I | 4.332 |
| Taza et al., 2020 36 | Case report  USA | 1  (M) | 52 Years | Schizophrenia  Diabetes Mellitus | Takotsubo syndrome | ECG | CRP | 276 | Anti-coagulants  Endotracheal intubation  Steroids Tocilizumab | Recovered |
| HTN | IL-6 | 67 |
| Ferritin | 1427 |
| Troponin | <0.015 |
| Terzi et al, 2020 37 | Case report  Italy | 1  (M) | 73 Years | None | Intramural hemorrhage | CT | CRP | 205 | HIV protease Inhibitors  HCQ NIV  Paracetamol | Recovered |
| IL-6 | 121 |
| Troponin I | 0.2 |
| NT-proBNP | 4000 |
| Villanueva et al, 2020 38 | Case report  USA | 1  (M) | 68  Years | Obesity | Decompensated HFrEF and atrial dysrhythmias | Not specified | CRP | 64 | Antibiotics  Endotracheal intubation  HCQ Supplemental Oxygen Tocilizumab | Recovered |
| Stage 3 CKD | IL-6 | 7305 |
| Type 2 Diabetes Mellitus | Ferritin | 699 |
| HTN | LDH | 854 |
| Non Ischemic  Cardiomyopathy | D-dimer | >20 |
| HFrEF |
| Warchol et al, 2020 39 | Case report  Poland | 1  (M) | 74 Years | Type 2 Diabetes Mellitus | Decreased ejection fraction and left arterial enlargement | CMR | CRP | 1.2 - 94 | Antiarrhythmic drug Antibiotic Antiviral  Magnesium infusion  Temporary pacemaker | Recovered |
| Hypothyroidism | PCT | normal |
| Atrial Fibrillation | LDH | 369 |
| Arterial HTN | Troponin T | 0.072-0.102 |
| NT-proBNP | 2451 |
| D-dimer | 1.39 |
| Zeng et al, 2020 40 | Case report  China | 1  (M) | 63 Years | Allergic Cough  Smoking History | Fulminant myocarditis, MODS | ECHO and ECG | IL-6 | 272.4 | Antibiotics  Antivirals  CRRT ECMO  HFOT  Interferon alpha-1b  IVIg  Steroids | Died – sepsis and DIC due to secondary infection |
| Troponin I | 11.37 x 10^6 |
| NT-proBNP | 22.6 x 10^3 |

**ACEi**: Angiotensin Converting Enzyme inhibitor; **ARB**: Angiotensin Receptor Blocker; **ARDs**: Acute Respiratory Distress Syndrome; **BNP:** Brain Natriuretic Peptide; **CK-MB:** Creatinine Kinase; **CKD**: Chronic Kidney Disease; **CMR:** Cardiovascular Magnetic Resonance Imaging**; COPD**: Chronic Obstructive Pulmonary Disease; **CRP**: C-Reactive Protein; **CRRT**: Continuous Renal Replacement Therapy; **CT:** Computed Tomography; **CXR:** Chest X-Ray; **DIC:** Disseminated Intravascular Coagulation; **ECHO:** echocardiogram; **ECMO**: Extra Corporeal Membrane Oxygenation; **HCQ:** Hydroxychloroquine, **HFrEF**: Heart Failure With Reduced Ejection Fraction; **HFOT:** High Flow Oxygen Therapy; **HTN**: Hypertension; **IL:** Interleukin; **IMV**: Intermittent Mandatory Ventilation; **IVIg:** Intravenous Immunoglobulin; **LA:** Left Atrium; **LDH**: Lactate Dehydrogenase; **MIS-C:** Multisystem Inflammatory Syndrome In Children, **MODS:** Multisystem Organ Dysfunction Syndrome; **MRI:** Magnetic Resonance Imaging; **NIV**: Non-Invasive Ventilation; **NSAID:** Non-Steroidal Anti Inflammatory Drugs**; NT-ProBNP:** N-Terminal (NT)-Pro Hormone Brain Natriuretic Peptide**; PCT**: Procalcitonin; **RV:** Right Ventricle; **TPA;** Tissue Plasminogen Activator; **TTE:** Transthoracic Echocardiography; **US:** Ultrasound; **\***: significant. **Units ^:** CRP (mg/L), IL-6 (pg/mL), TNF-alpha (pg/mL), IL-2 (pg/mL), IFN-gamma (pg/mL), PCT (ng/mL), Ferritin (ng/mL), Troponin (ng/mL), BNP/NT-proBNP (pg/mL), CK/CK-MB (U/L), CK-MB § (ng/L), LDH (U/L).