



The Lingering Impact of COVID-19: Arrhythmias and Autonomic Dysfunction

The Indian Perspective

Raja Selvaraj 19 May 2024





COVID 19





Daily new confirmed COVID-19 cases per million people

Our World in Data

7-day rolling average. Due to limited testing, the number of confirmed cases is lower than the true number of infections.





COVID 19













#HRS2024

Paul Garner: For 7 weeks I have been through a roller coaster of ill health, extreme emotions, and utter exhaustion

May 5, 2020

Paul Garner, professor of infectious diseases at Liverpool School of Tropical Medicine, discusses his experience of having covid-19



In mid March I developed covid-19. For almost seven weeks I have been through a roller coaster of ill health, extreme emotions, and utter exhaustion. Although not hospitalised, it has been frightening and long. The illness ebbs and flows, but never goes away. Health professionals, employers, partners, and people with the disease need to know that this illness can last for weeks, and the long tail is not some "post-viral fatigue syndrome"—it is the disease. People who have a more protracted illness need help to understand and cope with the constantly shifting, bizarre symptoms, and their unpredictable course.

https://blogs.bmj.com/bmj/2020/05/05/paul-garner-people-who-have-a-more-protracted-illness-need-help-tounderstand-and-cope-with-the-constantly-shifting-bizarre-symptoms/ eart Rhythm Society





Long COVID - Signs, symptoms, and conditions that continue or develop after acute COVID-19 infection.

PASC (Post acute sequelae of COVID) - Constellation of new, returning, or persistent health problems experienced by individuals 4 or more weeks after SARS-CoV-2 infection. (4 weeks used by CDC, others use 12 weeks)





Long COVID









PASC-CVD - Broad group of cardiovascular conditions that manifest ≥4 weeks after SARS-CoV-2 infection. Includes, but is not limited to, myocarditis and other forms of myocardial involvement, pericarditis, new or worsening myocardial ischemia due to obstructive coronary artery disease, microvascular dysfunction, nonischemic cardiomyopathy with involvement of the left and/or right ventricles, thromboembolism, cardiovascular sequelae of pulmonary disease, and arrhythmia

PASC-CVS - Heterogeneous disorder that includes widely ranging cardiovascular symptoms, without objective evidence of cardiovascular disease using standard diagnostic tests.



PASC-CVS is due to autonomic dysfunction



<u>Mayo Clin Proc.</u> 2012 Dec; 87(12): 1196–1201. doi: <u>10.1016/j.mayocp.2012.10.013</u> PMCID: PMC3541923 NIHMSID: <u>NIHMS422427</u> PMID: 23218087

COMPASS 31: A Refined and Abbreviated Composite Autonomic Symptom Score David M. Sletten,^a Guillermo A. Suarez,^{†,a} Phillip A. Low,^a Jay Mandrekar,^b and Wolfgang Singer^{a,*}

66 % of 2314 patients with PASC-CVS had Compass-31 score > 20

Larsen NW et al. Characterization of autonomic symptom burden in long COVID: A global survey of 2,314 adults. Front Neurol. 2022 Oct 19;13:1012668. doi: 10.3389/fneur.2022.1012668



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Mechanisms





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BMJ 2021; 374 doi: https://doi.org/10.1136/bmj.n1648



Deconditioning spiral











Orthostasis can be a challenge







Autonomic nervous system and orthostasis











Orthostatic intolerance syndromes

- Orthostatic hypotension
- Postural orthostatic tachycardia syndrome
- Vasovagal syncope









 How many patients have dysautonomia causing PASC in India ?







Our World in Data

Confirmed COVID-19

45 Million

Cumulative confirmed COVID-19 cases

Due to limited testing, the number of confirmed cases is lower than the true number of infections.



https://ourworldindata.org/coronavirus/country/india#what-is-the-cumulative-number-of-confirmed-cases



Disabling symptoms at 2 months in 44%

19 Million



Carfì A et al. Gemelli Against COVID-19 Post-Acute Care Study Group. Persistent Symptoms in Patients After Acute COVID-19. JAMA. 2020 Aug 11;324(6):603. 605. doi: 10.1001/jama.2020.12603.



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PASC-CVS in about 50%

Dysautonomia in 66%

6.3 Million

9.5 Million

Larsen NW et al. Characterization of autonomic symptom burden in long COVID: A global survey of 2,314 adults. Front Neurol. 2022 Oct 19;13:1012668. doi: 10.3389/fneur.2022.1012668







Improve in 1-3 years - 50%

3.2 Million

1. Dani M, Dirksen A, Taraborrelli P, et al. Autonomic dysfunction in 'long COVID': rationale, physiology and management strategies. Clin Med (Lond)2021;21:e63-7. doi:10.7861/clinmed.2020-0896 pmid:33243837



Where are these patients ?



- Improved / adapted with time
- Did not seek medical attention
- Did not come to the right person
- But who is the right person ?
- PASC-CVS and dysautonomia not considered



Evaluation in PASC



What was the clinical presentation of the acute infection (eg, symptom type/duration/severity, hospitalization, organ injury)? Physical exam What are the patient's primary symptoms (eg, chest pain, dyspnea, palpitations, tachycardia, lightheadedness)? Orthostatic vitals and active stand test: Which symptoms are most bothersome and/or have a significant impact on quality of life? Measurement of HR and BP after being Does the patient report exercise intolerance, tachycardia, orthostasis, or symptoms suggestive of autonomic supine for 5 minutes, immediately upon dysfunction (eg, GI dysmotility, urinary retention/incontinence, sexual dysfunction)? standing, and at 2, 5, and 10 minutes Are other symptoms present (eg, sleep disturbance, cognitive impairment/brain fog, post-exertional malaise)? thereafter What is the patient's baseline health status? Standard cardiac and pulmonary exam Are there known cardiovascular comorbidities (eg, hypertension, hypercholesterolemia, diabetes mellitus)? • Is there a family history of premature CAD, CM, or SCD? Basic evaluation (consideration of the following based on the clinical presentation) Laboratory testing (eg, CBC, BMP, cTn, CRP)* Chest X-ray or chest CT • ECG Echocardiogram Ambulatory rhythm monitor PFTs · Abnormal cardiac test results? **PASC-CVD** evaluation Yes · Known cardiovascular disease with new or worsening symptoms or signs? Cardiology Testing based on the clinical condition suspected Documented cardiac complications during SARS-CoV-2 infection? consultation (eg, myocarditis, myocardial ischemia, nonischemic Persistent and/or concerning cardiopulmonary symptoms? CM, arrhythmia) No PASC-CVS evaluation (consideration of the following based on the predominant symptom, patient characteristics, and pretest probability) Tachycardia and exercise intolerance Chest pain Dyspnea Orthostatic vitals and autonomic testing (autonomic dysfunction evaluation) Stress test (CAD evaluation) Echocardiogram (VHD, CM Symptom pattern and CPET (deconditioning evaluation) evaluation) Echocardiogram (CM evaluation) Stress test (CAD evaluation) Active stand test (POTS evaluation) CMR (myocarditis evaluation) CPET (differentiate cardiac vs. CCTA (CAD evaluation) pulmonary etiologies) Palpitations Invasive coronary angiography (CAD, Stress PET/CT (MVD evaluation) Ambulatory rhythm monitor, if not already done (arrhythmia evaluation) coronary vasospasm, MVD evaluation)

2022 ACC Expert Consensus Decision Pathway on Cardiovascular Sequelae of COVID-19 in Adults: Myocarditis and Other Myocardial Heart Post-Acute Sequelae of SARS-CoV-2 Infection, and Return to Play: JACC Volume 79, Issue 17, 3 May 2022, Pages 1717-1749 RS2024

HUTT – Orthostatic hypotension









HUTT – POTS









Active stand test



Sheldon RS, Grubb BP, 2nd, Olshansky B, et al. 2015 Heart Rhythm Society expert consensus statement on the diagnosis and treatment of postural tachycardia syndrome, inappropriate sinus tachycardia, and vasovagal syncope. Heart Rhythm 2015; 12:e41–63.



Heart rate variability





Shah B, Kunal S, Bansal A, Jain J, Poundrik S, Shetty MK, et al. Heart rate variability as a marker of cardiovascular dysautonomia in post-COVID-19 syndrome using artificial intelligence. Indian Pacing Electrophysiol J. (2022) 22:70–6. doi: 10.1016/j.ipej.2022.01.004

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Management



- Education
- Exercise
- Fluid and salt repletion
- Avoid exacerbating / triggering factors
- Isometric exercise to abort episodes
- Compression garments
- Cardiac rehabilitation program





Pharmacologic treatment



- Propranolol Beta blocker
- Ivabradine
- Midodrine alpha agonist, peripheral vasocontrictor
- Fludrocortisone volume depletion
- Clonidine central adrenergic inhibitor



Uncommon / experimental



- HRV biofeedback training
- IVIG
- Auricular stimulation
- Stellate ganglion block

- 1) Corrado, J. et al. HEART rate variability biofeedback for long COVID symptoms (HEARTLOC): protocol for a feasibility study. BMJ Open. 12, e066044 (2022).
- 2) Novak, P. Post COVID-19 syndrome associated with orthostatic cerebral hypoperfusion syndrome, small fiber neuropathy and benefit of immunotherapy: a case report. eNeurologicalSci 21, 100276 (2020)
- 3) Uehara, L. et al. Transcutaneous auricular vagus nerve stimulation effects on inflammatory markers and clinical evolution of patients with COVID-19: a pilot randomized clinical trial. Exp. Rev. Med. Devices 19, 915–920 (2022)
- 4) Liu, L. D. & Duricka, D. L. Stellate ganglion block reduces symptoms of Long COVID: a case series. J. Neuroimmunol. 362, 577784 (2022)





Challenges for India



- Scope of the problem
 - Population level studies
 - Cohort studies
- Clinics with multidisciplinary team based approach
- Explore novel therapies

