

A Case Study of Postural Orthostatic Tachycardia Syndrome (POTS) caused by Post-Acute Sequelae of Long COVID-19 during Pregnancy

Bharti Sharma

Consultant Scientist and Epidemiologist, Head of Research Department, Duallinks International. 24, I. P. Extension, New Delhi-110092, India.

***Corresponding Author:** Dr. Bharti Sharma, Consultant Scientist and Epidemiologist, Head of Research Department, Duallinks International. 24, I. P. Extension, New Delhi-110092, India. Email: duallinks_3@yahoo.com; ORCID: 0000-0001-8477-6225

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Abstract:

This is a clinical case report of an extremely unusual case of development of permanent Postural Orthostatic Tachycardia Syndrome (POTS) with orthostatic hypotension due to suffering from long COVID-19 during pregnancy. The case is unusual since the patient did not have indications of POTS during the first trimester of the pregnancy. At the start of the second trimester, she suffered from a severe case of SARS-CoV-2 infection and was hospitalized for the same. She had COVID-19 infection all through her pregnancy since she suffered from a long Covid-19 infection. Following her delivery and full recovery from the COVID-19 infection, she was diagnosed as having developed permanent POTS. At present, three years post her recovery from the long-term COVID-19 infection contracted during pregnancy, she continues to suffer from POTS despite being on medication.

Key words: autoimmune pots; postural orthostatic tachycardia syndrome (POTS); COVID-19-induced postural orthostatic tachycardia syndrome; POTS in pregnancy; tachycardia and COVID-19 in pregnancy

Introduction

Postural Orthostatic Tachycardia Syndrome (POTS) has been known to be a disorder of the autonomic nervous system and 81% of the patients are women of reproductive age, though it can occur in males also [1]. POTS is characterized by orthostatic intolerance and presentation with symptoms like feeling dizzy, fainting bouts, weakness, visual alterations, extreme fatigue, uneven palpitations, trouble breathing, syncope and in some rare cases, gastrointestinal issues that get pronounced by heat exposure or by normal physical activity [2-4]. The working mechanisms of POTS include neuropathy, hyper-adrenergic causes, hypo-volemic issues as well as autoimmune pathways being involved [1-3]. At present, there is evidence-based data which indicates that after suffering from long-term SARS-CoV-2 infection (severe acute respiratory syndrome corona virus 2 infection) or the long COVID-19 infection, there are incidents of POTS in survivors of long COVID-19 [4-6].

Even though POTS has been usually observed during pregnancy, of recent there have been documented studies of increased incidence of chronic POTS presenting as a related complication of the long COVID-19 sequelae in not only women but the specific population that has had long COVID-19 infection [5-10]. Patients that present with the chronic

sequelae of the long COVID-19 infection have reported to healthcare facilities while showing all the symptoms of POTS such as shortness of breath, heartbeat palpitations, chronic fatigue, cognitive issues like constant brain fog, disturbed sleep patterns, aggravated orthostatic intolerance, peripheral neuropathies, mild pain in the chest, digestive issues, frequent nausea, diarrhea, joint stiffness with accompanying pain, anxiety or panic attacks, a sore throat, as well as tinnitus [5-12].

At present, if a patient is found to be presenting with the POTS symptoms alongside the known features of long COVID-19, then the chronic POTS is considered to be chronic sequelae of the long COVID-19 infection [5-12]. I present here, a clinical case study which highlights the incidence of chronic POTS development post-pregnancy and recovery from long COVID-19 in a female patient.

Clinical Case Report

In April 2021, a pregnant female 33 years of age (she had no prior respiratory issues history or other complications in her pregnancy) who was in the second trimester of pregnancy was admitted with a severe COVID-19 infection. After confirmed diagnosis, she was treated

successfully for the COVID-19 infection and discharged after 15 days. In the remaining months of her pregnancy and post-pregnancy (she had a normal delivery of a healthy child at 38 weeks of gestation), she continued to visit the out-patient department with complaints of very frequent fainting episodes (as many as 9 to 11 times a week), severe fatigue, very low blood pressure, constant chest pain, severe fatigue, heart palpitations as well as brain fog. The patient reported experiencing spiking of her heart rate to 145 beats per minute following simple routine activities like walking in the market (as recorded by her smart watch). She had suffered from some incidents of syncope and upon examination was found to be displaying neuropathic pain in her upper extremities. She did not have paroxysmal nocturnal dyspnea and her vitals were found to be normal. A cardiac stress echocardiogram was carried out and had shown no anomalies with a normal ejection fraction of 64%. A number of previous diagnoses from clinics mostly stated that she had anxiety since her previous 2D echocardiograms were normal. She was also prescribed an albuterol 108 MCG/ACT inhaler together with a fluticasone propionate 50 MCG/ACT spray to help with her breathing issues but both were ineffective. After testing, the patient's lab values for PFT (pulmonary function tests) TSH (thyroid stimulating hormone), BNP (brain natriuretic peptide), computerized tomography of her chest, and ESR values (erythrocyte sedimentation rate) were found to be within usual limits. However, the patient's rheumatoid factor was quite high and it was indicative of autoimmune involvement in her symptoms.

In order to confirm the diagnosis of POTS, a head-up tilt table test was performed in which she was strapped to a table for a time frame of 10 minutes and the table was tilted at various angles while her blood pressure as well as heart rate readings were monitored. She was found to have low blood pressure and her heart rate increased by over 30 beats per minute in response to the test. Heart rhythm testing was done using a Holter test and the patient's heart rate was recorded as spiking up to 165 times within the range of 140-150 in the 24-hour test monitoring time frame.

In addition, in order to rule out other possible disorders like Lupus, TSH, vitamin B12 levels, Vitamin D levels, required hormone and enzyme level testing was done. A beta-human chorionic gonadotropin test was done to rule out possibility of an adrenal gland cancer tumor.

A QSART test (Quantitative Sudomotor Axon Reflex Testing) was performed on the patient in order to understand the kind of abnormality she was suffering from: either an abnormality of the nerve signal or problems related to releasing of the transmitter acetylcholine [6, 12-14]. Detailed screening and examination indicated damage to the nerves of the right hand and leg (a possible impact of the long COVID-19 she survived), which happened to be this patient's dominant side. The test results indicated neuropathic POTS. The patient's heightened cardiac responses to activities particularly when posture was changed and the overall neurological and other test results gave a working diagnosis of neuropathic POTS.

The patient was given beta blockers, steroids and advised use of compression clothing. She was also put on a structured exercise regime. However, in her third weekly follow-up consultation, she continued to have a heart rate of over 135 beats per minute following physical activity and especially when she stood up to move around. She also reported being very dizzy, having impaired memory as well as brain fog. She was prescribed 5mg (2x a day) of Ivabradine 5mg 2x daily. She reported slight improvement in the next weekly follow-up in her fatigue as well as tachycardia issues. However, this medication was discontinued as her heart rate became dangerously low in the next 2 weeks and the brain fog episodes increased. She was now prescribed Lisdexamfetamine 30 mg by the neurological specialist for her memory problems and brain fog. In addition, her management regime also included a Fludrocortisone 0.1 mg dose together with high sodium dietary items for just a week, so as to improve her blood pressure. The patient was also sent for a consultation with the specialist allergy department to check for the possibility of a potential issue of having comorbidity with an autoimmune subtype of

POTS. The reports of the allergy department suggested a diagnosis of long COVID-19 related dysautonomia with POTS as well as some degree of small fiber neuropathy.

After some degree of improvement for about 4 weeks, the patient started to experience extreme fatigue, brain fog and severe insomnia. She was unable to work as she found it difficult to read and understand information. Within six weeks, she was admitted to the hospital as she presented with severe black outs whenever she changed her position. She sustained a fractured left arm after banging into a wall during one black out episode and then falling face-down on the floor. The patient's orthostatic heart rate jumped to as high as 180 beats per minute if she attempted to stand up and move. The specialist neurologist did a DOTA PET-CT scan in order to check for any issues related to possible endocrine diseases like Parkinson's syndrome. However, there was no conclusive diagnosis of any endocrine disease. Her symptoms stabilized after 10 days and she was discharged. However, within two weeks her symptoms returned and the neurological specialist was unable to detect what alterations in the brain caused the severe autoimmune response and neuropathies post her long COVID-19 infection.

Discussion

This patient case report has detailed the case of a patient who contracted COVID-19 during pregnancy and continued to suffer from long COVID-19 symptoms for over 15 months post pregnancy. She was diagnosed with neuropathic POTS and now almost after two years of various treatments with different medications, the neurological specialist has been unable to have any conclusive insights on the unusual and chronic POTS related disorder which she now lives with. There is little knowledge on the exact brain changes and autoimmune changes caused by long COVID-19 related POTS in her brain. The patient now lives with this chronic condition and is able to only work for 2-4 hours at a stretch. She is still on Midodrine to help with the unstable blood pressure changes she experiences when she attempts to change her position. Her heart rate continues to be around 121 beats per minute and she has been advised not to attempt harsh physical exercises or activities.

In the past, autoimmune responses like POTS were observed as a rare complication in pregnant females or in people post viral infections such as chicken pox or herpes (in a few patients) [5-12]. However, now there is a growing body of validated and published research studies showing a large number of long COVID-19 patients (both male and female) who present with autoimmune as well as neuropathic POTS characterized with chest pain, hypotension, as well as breathing issues, extreme fatigue, brain fog and palpitations [5-18].

This unusual case study has highlighted the involvement of an impaired autoimmune response, possible nerve damage as well as the presence of autonomic dysfunction as a long-term impact of long COVID-19. At present, the neurological pathways involved in this long COVID-19 associated POTS and its pathogenesis are not clearly understood. There is need for future, large scale research studies of POTS in long COVID-19 patients so as to have better insights into the involved patho-physiology.

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Data availability statement: Data available in article.

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