X marks the spot:

Long-COVID's damage to the vagus nerve and the impact on dental patients

By dental hygienist **Deborah Lindell**[1]

Following a SARS-CoV2 (COVID-19) viral infection, for some, the related signs, symptoms, and conditions may present four or more weeks later. These people are referred to as long-haulers or have long-COVID (LC). The condition of those who never test positive for COVID-19 but develop post-infection symptoms have 'presumed COVID'.[1] When treating patients with LC, understanding potentially compromised systems[2] can help avoid medical emergencies and allow for best-practice care. Although most fully recover from COVID-19, new findings suggest as many as 30% experience adverse health symptoms for weeks, months, or years after first being infected.[3] The Centers for Disease Control and Prevention (CDC) found that among those experiencing a related post-COVID condition, 20% were between ages 18–64 and 25% were 65+,[4] more likely to be older and female[5] and unvaccinated.[6]

Any viral, bacterial, or parasitic infection can cause an autoimmune reaction and chronic illness. Researchers are studying more than 200 possible symptoms of LC, some of which damage organs and tissues. Specialists can only treat symptoms.[7]

Tenth cranial nerve (X) and human anatomy innervation

The vagus nerve (X) is the 10th of 12 paired cranial nerves that send electrical signals between the brain, face, neck, and torso and is known as the 'wandering nerve' because it interacts with so many different parts of the body. It extends from the brain (medulla oblongata) to the large intestine, connecting with and controlling signals between the brain, neck (carotid artery and jugular vein and pharynx and larynx), chest (thorax), heart, lungs, abdomen/digestive system, and muscles involved in swallowing and gag reflex. X innervates muscles to the throat and the voice box, nerves to the ear and spine, and nerves to the lungs and oesophagus.[8]

Systemic autoimmune, autonomic-related health problems can impact any part of the body; more seriously affected systems include the brain, heart, lungs, kidneys, eyes, and skin.[2] Many symptoms may result from

injury and damage to the vagus nerve.[9] The most common conditions after six months were fatigue, cognitive dysfunction, and post-exertion malaise (PEM), 86% reported relapsing with exercise, stress, mental or physical exertion, 87% reported fatigue, 45% (1,700 subjects) needed a reduced workweek, and 22% were still unable to work.[10] X is our front-line defence against infection or injury. It sends a trauma message to the brain, which activates the dynamic innate immune response (neutrophils, macrophages, monocytes) to regulate and calm the inflammation. Our healthy immune system has small proteins called cytokines, which are present to manage blood activity, and immune cells, which inform the immune system to activate. When too many are released, an immune system overload occurs, known as a too-aggressive cytokine storm.[10,11,12] Long-COVID seems to occur due to a dysregulated immune-inflammatory response to an infection or inflammatory condition, creating increased cytokines within the peripheral and central nervous system.[10,11]

The healthy immune system's response to viral, bacterial, and parasitic infections eradicates enemies as a PacMan would eat its invaders. Unfortunately, for those with LC, this natural process continues invading healthy cells and disrupts the systems responsible for homeostasis.[12] Dysautonomia occurs when the PacMan cannot distinguish between friendly cells and enemy invaders.

X effects on the nervous system

We've likely all experienced patients feeling light-headed when the dental chair goes forward or back too quickly.

When X becomes damaged by LC, metabolic homeostasis malfunctions, and vasovagal syncope can occur. Blood pressure can drop suddenly, causing light-headedness or syncope. The heart overreacts to certain situations like anxiety, overheating, hunger, stress, pain, and sleep deprivation. Additionally, pancreatic secretions and hepatic glucose function can dysregulate.

Gastroparesis (stomach paralysis) occurs when the X is damaged, which stops food from moving from the stomach to the intestines, causing abdominal pain, GERD and acid reflux, change in heart rate (tachycardia), blood pressure, blood sugar levels, difficulty swallowing or loss of gag reflex, light-headedness/fainting, wheezing, loss of voice, taste and appetite, nausea and vomiting, and a tendency toward deep vein thrombosis.[6,8]

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Autoimmune systemic disease and long-COVID

The medical community has recorded an increase in autoimmune diseases and disorders attributed to post-COVID infection, according to neurologist Dr Adam Loavenbruck. One study observed autoimmunity in 83% of those with LC, and 62% of those also had polyautoimmunity.[2,13,14] Neuropathic systemic Sjögren's disease, postural orthostatic tachycardia syndrome (POTS), inflammatory arthritis and neuropathies, myalgia, burning mouth syndrome, systemic lupus erythematosus, vasculitis, inflammatory bowel disease, type 1 diabetes mellitus, and more were associated with an acute COVID-19 infection.[14,15]

Every organ's control and function is a reflex managed by X. One example is running. X messages the brain, 'I need to cross the street quickly.' The brain then messages the leg muscles regarding how quickly to move. This potentially life-saving communication runs up and down the vagus nerve's superhighway. For every action, there is a reaction. When X is damaged, the reaction tends toward uncertain/precarious.

Medical emergencies in the dental practice

A malfunctioning parasympathetic nervous system can lead to unexpected medical emergencies. Envision a lightbulb unexpectedly dimming or nearly exploding with intense brightness due to an electrical wire's damaged neutral line.

Erratic and uncontrollable changes to heart rate and blood pressure can rapidly increase or decrease, creating syncope, high or low blood pressure, excessive sweating or inability to, difficulty breathing, anxiety, agitation, and throat control.

Anticipation, preparation, and prevention for health and success

As someone living with LC, I can attest that patients with LC often experience ongoing health challenges and changes. Appointment considerations must address updating medications and health history at every appointment.

Stress, anxiety, lack of sleep, and pain are often present. When combined with LC, medical emergencies are more likely. For patients experiencing parasympathetic disharmony following a COVID-19 viral infection, the struggle is real. The common challenges and likely symptoms include shortness of breath, chest tightness, pain and

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palpitations, impaired memory, sleep, painful joints, mouth dehydration, depression, malaise, fatigue, difficulty swallowing, lack of gag reflex, neuralgia from the 5th cranial nerve, neuropathy, the challenge of balance and movement, and in processing and comprehending information and options regarding the proposed treatment and consent.[13,14,15]

These conditions necessitate diligent monitoring and support for those suffering from LC. Offering shorter appointments, striving to keep patients comfortable, and extending patience and empathy to your patients are imperative for a successful outcome.[16] Some living with LC symptoms may be unaware of the cause. Therefore, be vigilant. The best way to avert LC is to protect yourself and your patients, stay informed, and stay healthy.[1,16]

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