Treating long COVID patients: the potential role of osteopaths

Since the very beginning of the COVID-19 pandemic it has been evident that many patients report prolonged and significant disability lasting for months after their initial infection. Despite a large amount of research internationally, much is still unknown about the pathophysiology of 'long COVID' or how to treat it successfully. Nevertheless, many osteopaths will see long COVID patients in their clinics and they need to keep up to date with the developing evidence on the best ways to advise and treat these patients. In this article, Rosalba Courtney, Zoe Steele and Imogen Collyer take a look at some of this evidence and how osteopaths may be able to help long COVID patients.

PREVALENCE OF LONG COVID

It is now well-known that many patients with post-acute COVID symptoms experience a vast array of multisystem effects that impact on their ability to work and function normally in daily life (Davis et al, 2021). The condition – most commonly known as 'long COVID' – is estimated to affect between 10% and 30% of people who become infected with SARS-CoV-2, with one in seven patients still symptomatic at 12 weeks (Davis et al, 2021; Rivera-Izquierdo et al, 2022). In Australia it is predicted that tens of thousands of individuals with long COVID will require treatment in the coming years (Hensher & Angeles, 2022).

Long COVID seems to affect individuals across all age groups and levels of severity of initial infection, including children and those with mild disease (Yong, 2021). However, persisting symptoms are most prevalent in patients who have been hospitalised with severe COVID-19, and in those who also have comorbid diabetes, obesity and/or hypertension (Pérez-González et al, 2022).

SYMPTOMS

There are numerous potential debilitating long COVID symptoms. Surveys of patients with post-COVID sequelae showed that they experienced an average of 55 symptoms, which could be categorised into six broad patterns (Yelin et al, 2022):

- Cognitive-emotional;
- Pain manifestations;
- Pulmonary;
- Cardiac;
- Anosmia/dysgeusia:
- Headache.

The most frequent symptoms are fatigue, breathlessness and cognitive dysfunction presenting as brain fog and memory issues as well as mood disturbance, anxiety and depression (Davis et al, 2021).

Fatigue

The fatigue of long COVID can be brought on by both physical and mental exertion and can be extremely debilitating. Clinically, there are many similarities between long COVID and myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS). Around 50% of long COVID patients fit the criteria of ME/CFS, with symptoms such as sore throat, tender lymph nodes, headache, muscle aches, joint stiffness, unrefreshing sleep, difficulty concentrating or worsening of symptoms after mild exertion (Mancini et al, 2021). Similar to ME/CFS, individuals with long COVID experience long-lasting 'crashes'

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when their level of effort or activity goes beyond their threshold of tolerance.

Postexertional fatigue with pronounced exercise intolerance affects around 78% of those with long COVID. The effects of the fatigue and effort intolerance on ability to work can be profound, with 20% reporting that they have not been able to return to their regular occupations (Yelin et al, 2022). Labour shortages in the health and education sectors due to long COVID are now frequently highlighted in the media. This signals an emergent threat to economies worldwide and highlights the potential cost of disability related to the symptoms of long COVID.

PATHOPHYSIOLOGY

The pathophysiology of long COVID is still not completely understood. However some of the drivers of ongoing pathology have been established (Yong, 2021):

- Residual organ/tissue damage;
- Ongoing inflammation;
- Persistence of virus;
- Autoimmunity;
- Dysautonomia.

Residual organ/tissue damage

Residual pathology affecting the organs or tissues can be multisystemic but predominately affects the lungs, heart and circulatory system, as well as the brain and nervous system (Mancini et al, 2021; Yong, 2021; Xiang et al, 2022).

Pathological inflammation

Long COVID patients show increased levels of cytokines and other proinflammatory markers (Yong, 2021). This ongoing inflammation is one of the factors that contributes to organ damage. However, it is worth noting that unresolved inflammation does not necessarily match the severity of symptoms such as fatigue and/or dyspnoea (Mehandru & Merad, 2022). Inflammation of the endothelium is one of the factors that produces hypercoagulability of blood and microclots that contribute to stroke and ongoing pathology of the lungs (Xiang et al, 2022).

Persistence of virus

The persistence of inflammation long after the initial infection may be due to lingering virus, evidence of which can be found for up to six months in some patients (Yong, 2021). This might explain why even individuals with mild and asymptomatic COVID-19 can develop long COVID. Elimination of residual virus through activation of a more robust immune response is also thought to explain why 58% of long COVID patients report reduction or cessation of their symptoms after subsequent vaccination (LongCovidSOS, 2021). The more evolved humoral/cellular immune response produced by vaccination is associated with increased levels of a particular antigen called the nucleocapsid antigen. Increased levels of this antigen following vaccination, rather than antigen to the spike protein of SARS-CoV-2, are correlated with symptom reduction in long COVID patients (Mehandru & Merad, 2022; Varnai et al, 2022).

The risk of contracting COVID, and especially the risk of developing severe disease, is reduced in individuals who are fully vaccinated, further reducing

> "The fatigue of long COVID can be brought on by both physical and mental exertion and can be extremely debilitating"

their risk of long COVID (Antonelli et al, 2022). The severity and life impact of long COVID symptoms on patients 120 days after their initial SARS-CoV-2 infection is less in vaccinated individuals (Tran et al, 2021).

Autoimmunity

The presence of Epstein-Barr virus viraemia, pre-existing autoimmune disease such as diabetes, and latent viruses associated with specific autoantibodies increases the risk for long COVID (Su et al, 2022). Acute COVID infection can trigger the formation of self-tissue antigens that persist after initial infection and these are thought to contribute to lingering symptoms, particularly in patients with concurrent autoimmune conditions (Mehandru & Merad, 2022). Thus, additional measures of caution, including education about vaccination, should be taken to prevent COVID-19 infection in persons with autoimmune disease.

Dysautonomia

Dysautonomia with various degrees of tachycardia, circulatory disturbances and orthostatic intolerance is common in patients with long COVID (Dani et al, 2021).

Increased sympathetic nervous system activity is part of the normal inflammatory and immune response and plays a role in helping the body to fight SARS-CoV-2 infection. The problem that occurs in long COVID is that the sympathetic nervous system remains somewhat overactive and dysregulated after the initial acute infection (Barizien et al, 2021). Also, SARS-CoV-2 appears to be neuroinvasive, bypassing the blood-brain barrier and propagating towards the central nervous system. It can directly damage areas of the brain such as the nucleus of the solitary tract involved in regulation of the autonomic nervous system as well as directly injuring the vagus and other cranial nerves (Barizien et al, 2021).

HOW OSTEOPATHS CAN HELP

Osteopaths can potentially play an important role in providing education, support and rehabilitation advice as well as manual therapy for patients with long COVID. However, the multisystem effects and complexity of long COVID symptoms mean that patients need multidisciplinary treatment and practitioners should be aware of the limitations of their scope of practice and should work with other health professionals for appropriate diagnosis and treatment.

Long COVID is also unpredictable, and the trajectory of the illness varies according to the extent of lingering infection, psychological factors, autoimmune and inflammatory responses and many other factors (Décary et al, 2021). Questionnaires help practitioners track improvements or deteriorations in a patient's condition and are useful when communicating with other health professionals (see box above). Measuring and monitoring long COVID symptoms is necessary to provide appropriate individual treatment plans and track progress.

Safety

Safety needs to be the first concern when dealing with long COVID. This means that patients should have been cleared of more serious cardiac and respiratory sequelae of COVID-19 and subsequent long COVID. It is also difficult to predict which patients will succeed in recovering their abilities to work, study and exercise, and practitioners need to be humble in promising recovery and should encourage patients to be patient (Décary et al, 2021).

Advice and education

It is essential to consider postexertional malaise (PEM) when advising patients about managing activity and rest. Lessons learnt about the importance of pacing as a strategy in the management of patients with ME/CFS can be applied in the management of long COVID (Décary et al, 2021). The three key aspects of pacing are:

- **Stop** – before reaching a point of overexertion as this will interfere with recovery;
- **Rest** – often and before symptoms appear;
- **Pace** – plan to space out daily physical and cognitive activities to avoid triggering symptoms.

Other triggers that can lead to 'crashes' include large meals, caffeine, alcohol, extremes of temperature change and psychological stress. Symptom diaries and behavioural techniques to manage triggers and stress levels are useful tools for helping patients understand how to begin getting some control over their health and energy management.

While most patients are aware that stress management and adequate sleep are important for healing, they may not be aware of the huge role these factors play in the immune and inflammatory processes that drive physiological dysregulation and neuroinflammation in long COVID and the need to prioritise them (Brusaferri et al, 2022).

Stress is an important contributor to dysregulation of the autonomic nervous system and low vagal tone. Strategies that improve vagal tone, such as stress reduction, slow breathing and mindfulness, can reduce the inflammation and physiological dysregulation that drive dysautonomia (Puhlmann et al, 2019; Balint et al, 2021; Brusaferri et al, 2022).

A single night of partial sleep deprivation can reduce natural killer cell activity to 72% of its normal level

Measuring long COVID symptoms

Outcome measures such as the Yorkshire Rehabilitation Scale (C19-YRS) (O'Connor et al, 2021) and the post-exertional malaise subscale questions from the DePaul Symptom Questionnaire (Cotler et al, 2018) can be useful to capture and accurately quantify the spectrum of symptoms in patients with long COVID.

Where primary symptoms are related to dyspnoea or difficulty breathing, the Nijmegan Questionnaire can be used to determine the source of the symptoms (Twomey et al, 2022). In addition to the C19-YRS and the Nijmegan Questionnaire, the Self-Evaluation of Breathing Questionnaire is a validated and useful tool to measure perceptions of breathing discomfort related to breathing work or air hunger (Twomey et al, 2022).

(Irwin et al, 1994). The proinflammatory effects of sleep deprivation are also well known. Reducing a normative eight hours of sleep by 25% and 50% will increase inflammatory cytokines in even healthy, asymptomatic individuals and the effects are probably greater in individuals with a propensity to inflammation (Mullington et al, 2010). Many patients have undiagnosed obstructive sleep apnoea (OSA) or some other form of sleep-disordered breathing (SDB). OSA, and less obvious forms of SDB, such as upper airways resistance syndrome, are important causes of sleep disruption, insomnia (Broderick et al, 2014; Amdo et al, 2016), autonomic dysregulation (Harper et al, 2012), chronic stress and systemic inflammation (Gold et al, 2003; Franco et al, 2012).

REHABILITATION STRATEGIES FOR LONG COVID

Rehabilitation programs that utilise various combinations of self-regulation strategies, breathing exercises, cardiopulmonary rehabilitation and autonomic conditioning are starting to be investigated for long COVID (Besnier et al, 2022; Tabacof et al, 2022; Twomey et al, 2022). Despite the early nature of the research some are proving to be beneficial and are starting to play an increased role in the management of long COVID (Putrino et al, 2021; Twomey et al, 2022) (see box below).

Dysfunctional breathing presenting as a disordered breathing pattern, hyperventilation at rest, excessive ventilator response to exercise and breathing distress is common in long COVID patients. One study found that it was present in 88% of long COVID patients with unexplained dyspnoea (Mancini et al, 2021). Rehabilitation primarily focused on the cardiopulmonary system is particularly helpful in these patients (Twomey et al, 2022). Correction of dysfunctional breathing might help to reduce symptoms and psychological distress, improve exercise intolerance and support recovery (Koniukhovskaia et al, 2021; Mancini et al, 2021; Motiejunaite et al, 2021).

Osteopathic manual therapy

Osteopaths working with patients who have long COVID are ideally placed to use a multifaceted approach to treatment that includes manual therapy. There is some evidence to suggest that the addition of manual therapy in the form of myofascial release of the rib cage and neck improved heart rate and subjective sense of ease of breathing after a single treatment (Fereydounnia et al, 2022).

Research is currently underway to investigate how the addition of osteopathic manual therapy (OMT) supports rehabilitation in patients with long COVID in terms of fatigue and functional capacity (Curi et al, 2022). Previous research has shown that when used in conjunction with breathing retraining OMT improves breathing symptoms, breathing pattern and hyperventilation (Courtney et al, 2019).

A number of studies have found that OMT supports more balanced function of the autonomic nervous system (Rechberger et al, 2019) and OMT has been explored as treatment for various manifestations of dysautonomia (Cromeens & Gamber, 2010). Treatment focusing on the craniocervical area and cranium has been found to help with dysautonomia in patients with postural orthostatic tachycardia syndrome (Goodkin & Bellew, 2014) and may be helpful in the dysautonomia of long COVID.

The importance of cardiac and respiratory clearance in patients with long COVID cannot be overstated. Osteopaths who employ manual therapy techniques must be mindful that after mild or severe COVID-19 infection there may be an increased risk of vascular incident (deep vein thrombosis and pulmonary embolism) in adults and in children over the age of 12, or in patients with comorbidities (Katsoularis et al, 2022).

EVIDENCE-BASED APPROACH

Emerging research will help to determine the role osteopaths can play in the management of long COVID. As this research evolves, so will the role of the osteopath, and practitioners are encouraged to be flexible in their approach and to use the best available evidence across the allied health disciplines.

Multistep rehabilitation protocol

The rehabilitation protocol used at Mount Sinai Hospitals long COVID clinic by Dr David Putrino and colleagues starts with an initial evaluation by a physician for cardiac and other organ pathologies. Patients are then given behavioural strategies for managing and controlling symptom attacks. This is followed by coaching in breathing techniques. Some patients are also referred for nutritional advice and psychological therapies. Finally, patients are referred for autonomic rehabilitation that uses breath control, isometric exercise, submaximal aerobic exercise with gentle progression and pacing while they are continually monitored for their exertional tolerance (Putrino et al, 2021).

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