

REVIEW ARTICLE

A REVIEW OF COVID-19 RECOVERY AND THE BENEFITS OF AN OSTEOPATHIC APPROACH

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ABSTRACT:

COVID-19 continues to be a major societal disruptor that threatens the wellness and health of millions of people worldwide. We rightfully celebrate the over 20 million survivors in the United States, yet, what constitutes actual recovery, as many face continuing repercussions of their illness? This paper reviews COVID-19, focusing on its sequela of acute respiratory distress syndrome (ARDS) and the accompanying intensive care unit stay, treatment options and its increased morbidity. Outlined is the importance of long-term, comprehensive care for post-infection patients, as well as the numerous barriers to adequate care. We suggest looking to doctors of osteopathic medicine to bridge the gaps in multifactorial care, including psychological and physical dysfunction. Osteopathic medicine is discussed as a potential benefit during this pandemic by reviewing its effectiveness in a previous pandemic. However, additional work must be conducted to improve awareness of needed care and delivery of that care.

INTRODUCTION

Coronavirus disease 2019 (COVID-19) has rapidly made its presence known and has continuously changed how we live, learn and work. As we continue to undertake acute cases, we must also look toward life and health after COVID-19. The recovery process, however, remains largely unknown in circumstances of long-term complications. This paper examines how an osteopathic approach for the recovered patient can mitigate barriers of access and fragmented cross-specialty needs and provide osteopathic manipulation therapy (OMT).

Preparation should be taken to ensure awareness and education regarding long-term physical and mental complications of COVID-19. The multitude of complications may potentially fragment care, thus worsening hardships of geographic location, transportation and cost preventing patients from getting the care they need. We can reduce these barriers by educating and preparing doctors of osteopathic medicine in terms of potential complications, the comprehensive care needed and OMT techniques to incorporate.

One of the manifestations of COVID-19 to note is its decompensation into acute respiratory distress syndrome (ARDS).

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Treatment of ARDS is often invasive and complex, resulting in muscular, lymphatic and neurovascular complications. Numerous OMT techniques have been developed over the last century that can be utilized to target these complications. As examples, muscle energy techniques directly manipulate primary and secondary musculature, improving breathing mechanics; treating myofascial binding to promote circulation of white blood cells and cytokines by opening lymphatic and blood flow; and parasympathetic and sympathetic functions are targeted by techniques like suboccipital inhibition and rib raising, respectively, further improving breathing effort.

CORONAVIRUS DISEASE 2019

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), responsible for COVID-19, had its novel appearance in the city Wuhan of the Hubei province in China.¹ Like other strains of beta-coronaviruses before it, such as severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS), COVID-19 has become a household name since its initial report to the World Health Organization on December 31, 2019. A year later, in January 2021, there have been more than 20 million confirmed cases and over 360,000 deaths in the United States alone.²

Unfortunately, important questions regarding the virus's spread linger. At this time, viral RNA is measured to determine the presence of infection. However, there is no set level that deems a person "infectious." Scientists have found evidence that increased

viral load is connected with increased transmissibility as well as illness severity.^{3,4} Yet, complicating matters further, some asymptomatic patients have been found to have an elevated viral load, despite lack of presentation, and are the source of secondary infections. There is still much to be discovered regarding how the virus presents itself in its various manifestations.

Fortunately, most cases have been mild and patients recover, on average, within two weeks. Symptoms seem to appear at exposure day four or five and are divided into mild, defined as pneumonia without hypoxia; severe, which comes with hypoxia and involves >50% of the lung; and critical, which is complicated by respiratory failure, shock and multi-organ dysfunction.

Comorbidities, such as diabetes mellitus or hypertension, obesity defined as a BMI >30, age over 65 and male sex, are linked to increased severity, extending recovery up to six weeks. In those critical patients that require ventilation, mortality rates rise markedly.³ In all cases, predominant symptoms include fever and pneumonia.⁴ In critical cases, complications include the development of ARDS, arrhythmias and myocardial injury. To narrow down our approach, we will focus on ARDS. Dyspnea develops relatively late in the course of the illness—typically a week from initial presentation—and within two to three days of the onset, ARDS rapidly develops.

ACUTE RESPIRATORY DISTRESS SYNDROME PRESENTATION AND SEQUELAE

By definition, ARDS is “bilateral lung infiltrates and severe progressive hypoxemia in the absence of any evidence of cardiogenic pulmonary edema.”⁵ This is caused by an immense inflammatory response that damages the lungs’ epithelial and endothelia and allows edema to occur. In the case of COVID-19, this further compounds the reduced respiratory function present from pneumonia and requires swift responsive action.

The care of ARDS has evolved over the 10 months that the United States has faced the infection. Recommendations have varied from use or avoidance of bilevel ventilation, early- versus delayed-intubation, whether it is safe to use a high-flow nasal cannula and when to initiate mechanical ventilation regarding specific patient selection,⁹ while prone positioning, neuromuscular blockade and optimizing positive end-expiratory pressure have been recommended for adjunctive treatment.¹⁰ In cases of refractory hypoxemic ARDS, extracorporeal membrane oxygenation (ECMO) is advised.

Though recovery from ARDS is possible, many patients have longstanding morbidities. These patients face diminished quality of life and impairments in both cognition and mental health.¹¹ Executive function is the most common cognitive impairment, with 49% of patients exhibiting reduced ability to focus attention, multitask and plan. Severe depression, post-traumatic stress disorder and anxiety are also common. Of note, cognitive impairment can cause psychiatric impairment and vice versa. Further findings show a decline in vitality and social function in regard to relationship maintenance.¹²

The diaphragm, the main muscle in respiratory effort, is highly sensitive to injury. Inactivity of the diaphragm—as in mechanical ventilation—greatly impairs function, which is seen following the extubation.¹³ Within 24 hours of mechanical ventilation use, 64% of patients were diagnosed with diaphragmatic dysfunction, defined as <11 cmH₂O change in endotracheal pressure with phrenic nerve stimulation. With COVID-19, patients are typically intubated for 1–2 weeks or longer,⁶ increasing concern for dysfunction development. Diaphragmatic atrophy is also associated with inflammatory cell injury, a principle finding in ARDS.¹³

In cases of refractory hypoxemic ARDS where ECMO is used, unique complications may arise. ECMO, an artificial lung and circulatory system pump, has been shown to reduce ARDS mortality,¹⁴ but is an exceedingly invasive procedure. In these cases, vascular ischemia, peripheral artery disease and lymphatic disruption have been observed. Gangrene, infection and amputation may then follow.

Many complications remain as impediments for at least five years and resolve slowly.¹⁵ Increasingly concerning is that nearly a third of patients do not return to work and many of those who do return require a gradual transition. The large majority of those remaining unemployed are members of the older population. As we look toward COVID-19 recovery, this fact is important to keep in mind, as most severe and critical cases are observed in these older patients.

NEED FOR LONG-TERM CARE AND POTENTIAL BARRIERS

The need for extensive, long-term care is clear. Care must be initiated early,¹⁶ be “easily accessed, individualized, involve caregivers, provide more information about recovery...” and be integrated across multiple formats.¹⁷ It is also important to keep in mind that ARDS is just one manifestation of COVID-19 with still others to discover and discuss—again underscoring the need for comprehensive care.

The foundational barrier in achieving sufficient care after discharge is a lack of understanding complications and awareness of their commonalities. Impairments may go unchecked and/or worsen, leaving patients and families feeling isolated. Compounding the issue is the prevalence of mental illness among recoverees’ straining treatment requests.¹⁸ Physicians may then be unable to recognize and connect symptoms to a post-intensive care syndrome. At this time, there are no screening or assessment tools and no established best practices.

Multidisciplinary care is needed, encompassing physical, mental and cognitive health. Multiple appointments across different locations are often required. If a patient has limited transportation or suffers from a lack of geographic availability, as is commonly found in rural and underserved areas, he or she may opt out of seeking these services.¹⁹ Cost of care is also an important consideration with inadequate or non-existent health insurance. This group often delays seeking treatment due to cost, leading to poorer health states, delayed diagnoses and lower life expectancies. As a significant portion of post-ARDS patients do

not return to or need a gradual transition back into the workforce, the cost of care can weigh heavy in the mind.¹⁶

Another frequently cited barrier is the inability to find a provider with whom a patient feels as though he or she can trust and with whom he or she can communicate.¹⁹ These are vital for initial assessment, identifying gaps in care, working through obstacles or frustrations in the recovery process, monitoring progress and offering support and empathy to patients. Community engagement improves trust development, allows for greater cultural competency and connects community resources.²⁰

As we work toward transitioning into a stage of recovery, it is of the utmost importance to know the potential complications of the disease, the need for long-term care and the potential barriers to access. Though there are numerous interventions to consider and implement, our focus of this paper will be the use of doctors of osteopathic medicine and the applications of OMT.

PROPOSED INTERVENTIONS

Primary care doctors of osteopathic medicine can alleviate the fragmented care burden due to their training in recognizing and management of acute and chronic conditions, assessing mental health needs and performing OMT. Reviewing 100,000 cases from the 1918 influenza pandemic reveals that physicians implementing OMT reported only 2.5% of the losses of those performing traditional practices of the time.²¹ It is important to mention that there were no sound reporting systems at the time, making these numbers unverified.

Subsequent studies have offered support of the claims, however. One study saw a decreased length of stay when OMT was used adjunctively to antibiotics in pneumonia patients.²² Additionally, patients who received OMT following a coronary artery bypass graft reported reduced thoracic pain improving respiratory muscle movement and respiratory effort.²³ Another study showed improved peak expiratory flow in pediatric asthma patients from 7 L/min to 9 L/min following the use of OMT.²⁴

Studies have also demonstrated a subjective improvement. One group of participants felt a significant improvement in breathing effort after OMT, specifically with rib raising, compared to standard pulmonary rehabilitation.²⁵ Positive patient perception has also been shown in domains such as effectiveness, cognition, fatigue, emotion, comfort, recovery and therapeutic relationship, with most patients satisfied with their treatment.²⁶ Whether it be the physical treatment itself or the time spent with the patient during the treatments, there is evidence that OMT leads to positive outcomes.

There are multiple techniques in considering treatment for patients recovering from COVID-19. For physical recovery, doming of the thoracic diaphragm encourages the muscle back to its initial shape and, thus, back to baseline function.²⁷ Posterior rib raising and muscle energy both improve accessory respiratory muscle movement. Rib raising normalizes the sympathetic nervous system, enhancing chest wall mobility, while muscle energy directly treats the muscles by resolving the dysfunction.

Impairments in the lymphatic and parasympathetic nervous systems should also be included. Lymphatic techniques include thoracic inlet myofascial release, supine thoracic diaphragm release and the thoracic or pedal lymphatic pumps to mobilize lymph throughout the body. Studies show improved lymphatic delivery of antibodies and cytokines via lymphatic-focused techniques. Suboccipital inhibition is used to target the vagus nerve normalizing parasympathetic tone. In its normalization, the number of goblet cells and secretion thickness is reduced.²⁸ While not an exhaustive list, physicians should consider each patient's individual needs and structural dysfunction, providing tailored treatment to maximize benefits and provide care that could improve outcomes, minimize complications and increase patient satisfaction. However, several factors are limiting widespread use. As of 2016, only 8.5% of the 953,695 physicians in the United States are osteopathic physicians,²⁹ and one survey found that over half of these physicians use OMT on less than 5% of their patients.³⁰ Even when patients do receive osteopathic manipulation, it is often solely for musculoskeletal complaints, rather than to improve internal organ function. In one medical center, most OMM consults over a six-month time frame were for musculoskeletal complaints and newborn feeding difficulties.³¹

While many barriers to care should be addressed and further data collected to uncover additional benefits of OMT during this pandemic, physicians must consider the benefits of osteopathic medicine when treating patients who have recovered from the immediate effects COVID-19. The tenets of osteopathic medicine focus on the mind, body and spirit, all of which are affected by this disease and hospitalization process.

DISCUSSION

Given the current pandemic weighing in on an already stressed environment, implementing OMM into regular practice may prove difficult at first. This is especially true in a busy office setting. In spite of this, one should institute how this implementation is to be taken on. It has been shown that a 10-minute office visit resulted in improved breathing of asthmatic patients.³² The study also found that simple, repeated techniques to be performed at home further improved breathing. This points toward appointments of 10 minutes in weekly to bi-weekly intervals, alongside home treatments, would be sufficient for most patients. The time between appointments may be increased with the assessment of patient comfort and improvement.

This process, however, must be taken with care to continue protecting health care personnel. The U.S. Centers for Disease Control and Prevention (CDC) regularly update recommendations regarding patient care. These include implementing telehealth when possible, masking and universal protocol for each person entering a facility, limited entry into facilities, screening for signs and symptoms of COVID-19 and assigning patients to exam rooms with doors closed to maintain physical distancing.³³ These measures should continue to be followed, despite a prior infection, given the possibility of re-infectivity. Though the CDC reports a lower risk of re-infectivity in the first 90 days based on prior studies of HCoV-OC43, continued suspicion and vigilance is vital in protecting personnel.

TABLE 1.

Osteopathic techniques to lessen structural issues

TECHNIQUE	DESCRIPTION ³⁵	INDICATION
<i>Doming of the thoracic diaphragm</i>	Place hands below the costal margin and pressure on the diaphragm is held throughout inhalation, encouraging its natural shape.	Improves muscle to return to baseline function
<i>Posterior rib raising</i>	Apply pressure to rib heads via the pads of the finger in a rhythmic motion.	Indirectly treats accessory respiratory muscle function via sympathetic normalization
<i>Intercostal muscle energy</i>	Place the patient in correct positioning regarding inhalation and exhalation dysfunction, target dysfunction rib, and encourage movement toward the restriction.	Directly treats accessory respiratory muscle function
<i>Thoracic inlet myofascial release</i>	Apply whole-hand contact, applying enough pressure to engage the myofascial, induce movement in three planes to gauge restriction and until tightness releases.	Lymphatic mobilization with antibody and cytokine delivery
<i>Thoracic diaphragm release</i>	Apply whole-hand contact, applying enough pressure to engage the myofascial, induce movement in three planes to gauge restriction and until tightness releases.	Lymphatic mobilization with antibody and cytokine delivery
<i>Thoracic lymphatic pump</i>	Administer rhythmic pressure overlying the sternum in an inferior motion allowing for passive recoil.	Lymphatic mobilization with antibody and cytokine delivery
<i>Pedal lymphatic pump</i>	Administer rhythmic pressure at the feet in a superior motion allowing for passive recoil.	Lymphatic mobilization with antibody and cytokine delivery
<i>Suboccipital inhibition</i>	Place pads of the fingers just inferior to the nuchal line in a way that gently lifts the head, so its weight rests entirely on the fingers, held until relaxation is achieved.	Pulmonary goblet cell and secretion thickness normalization via to parasympathetic system
<i>Demonstrations of these techniques can be found at https://www.acofp.org/acofpimis/acofporg/apps/OMT/index.html</i>		

Policies and protocols should also be established regarding potential exposures. In this, further exposures are mitigated. During scheduling, ensuring patients are educated on symptoms to watch out for before arriving for their appointment is also needed for this mitigation.

Newly recommended is establishing a post-vaccine protocol, advising staggered scheduling for vaccination and scheduling vaccination before 1–2 off days.³⁴ These recommendations are made due to the possibility of mistakenly considering post-vaccination signs and symptoms as developing active COVID-19 infection, thus reducing unnecessary isolations and affecting patient care and stressing an already stressed system.

CONCLUSION

While challenges persist, comprehensive care for post-COVID-19 patients provided by osteopathic physicians could lessen structural and psychological issues. Encouraging education over and reviewing the suggested techniques and sharing these techniques with fellow primary care providers will prepare the field for these upcoming encounters. It is important to note that

this paper largely deals with the conceptual and is based on prior pandemics. More research is needed to assess how these patients may best be aided in their recovery. As COVID-19 continues to leave its mark on history, we must work to alleviate the mark it leaves on our patients.

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