An Osteopathic Perspective on COVID-19: Is There a Missing Link to Treatment?

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CLINICAL PRACTICE

Abstract

As the COVID-19 pandemic progressed across the globe, clinical reports and autopsies on patient deaths proved that the pulmonary complications were the result of an acute respiratory distress syndrome caused by an excessive inflammatory response; a cytokine storm. Through literature research and review it has become apparent to the author that the lymphatic system is a vital, somewhat overlooked, missing link in the treatment of COVID-19 pulmonary infection.

The major challenges the whole world is facing now have been a shortage of supplies such as PPE, or personal protective equipment, and intensive care facilities to treat the overwhelming numbers of COVID-19 cases, in under-developed countries as well as developed countries. Osteopathic manipulative medicine (OMM) and osteopathic manipulative treatment (OMT) have been proven, for over a century, to be very effective in the treatment of pulmonary diseases and previous pandemics. Osteopathic professionals must challenge the present paradigm of modern medicine which, only too often, relies less on the body's own capacity to regulate itself, to compensate, and to heal, and more on outside intervention such as medications and vaccinations.

Osteopathic physicians are needed to step forward and discuss, explain, teach and train the importance of the lymphatic system as a major component of the circulatory as well as the immune system which plays a vital, pivotal, role in fighting diseases such as the COVID-19 coronavirus. A "viral infection protocol" (VIP), as discussed in this article, needs to be promoted as a mainstream adjunct, along with all of the other modalities of modern medicine, to health professionals and the public, in the event that the health care systems are overwhelmed.

The VIP treatment is easy to train and to certify practitioners, with proven results in other pulmonary infections and epidemics. It may prove invaluable in preventing clinical deterioration of masses of patients, who then would require more expensive, less available, and more dangerous technological interventions. From the Falcon Clinic for Health, Wellness and Recovery.

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Introduction

Osteopathic manipulation has historically been central to, and a defining aspect, of the medical practices of DOs since 1892 when Dr. Andrew Taylor Still opened the first school of osteopathy. Surveys in recent years however, have shown that most DOs in the United States do not use osteopathic manipulative treatment (OMT) in their practice at all. The reasons for this are varied. These include the concepts not being reinforced in their residencies, lack of mentorship, and criticism of there not being adequate research or support from evidence-based studies.^{1,2,3} Moreover, many osteopathic medical students and practitioners assume that OMT is used only for musculoskeletal conditions.³

We are in the midst of the COVID-19 pandemic, which is challenging health care systems all over the world. There are over 100 vaccine trials taking place throughout the world right now. Dexamethasone and remdesivir have shown some promise in lowering the morbidity of patients on respirators. Yet so far, 6 months since the World Health Organization designated the rising infections a pandemic, we have no vaccine or medications effectively treating or stopping the spread of the COVID-19 virus.

Treatments against the coronavirus, SARS-CoV-2, which is the

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causative agent of the COVID-19 pandemic, might not be enough to reverse these highly pathogenic infections.⁴ This opens the possibility to other therapies or modalities which might attack the pandemic infection at different physiological levels.

It has become apparent to this author that any rational medical treatment of COVID-19 infections must address the detrimental changes to the body's lymphatic circulation and velocity of capillary flow in the pulmonary circulation. Intervening earlier in the infection, the body has a better chance of forestalling a deterioration of the patient's oxygenation, acid-base balance, and CO2 retention, which in turn leads to a cytokine storm, collapse of the alveoli with accumulation of exudate and fibrin products, coagulopathy, hypoxia, cardiac arrhythmia, and ultimately, death.

Early Reports of a Novel Coronavirus Infection

First reports of a highly contagious virus affecting citizens in Wuhan, China came out in December 2019.⁵ By January, the first case in the United States was reported in the state of Washington.⁶ On March 11, 2020, the World Health Organization deemed the spread of the virus as a pandemic.⁷ The virus was soon dubbed the SARS-CoV-2 virus and the pandemic named the COVID-19 pandemic.⁸

Reports on biopsies and autopsies declared that people were dying from a novel coronavirus.⁹ Serendipitously, two patients, initially operated on because of a diagnosis of lung cancer, tested positive for the COVID-19 infection.¹⁰

There continues to be a paucity of autopsy reports from China and European countries, such as Italy and Spain, which were hit hard by the pandemic. There also were few autopsies in the United States because of the same fear of contagion and possible spread of the COVID-19 virus.¹¹

The CT scans of those early Wuhan patients' lungs showed "ground-glass opacity (GGO)" suggestive of acute respiratory distress syndrome (ARDS).¹⁰ It was felt that these were the first cases to show early imaging and histological changes of COVID-19 infection.

From the report: "Pathologic examinations revealed that apart from the tumors, the lungs of both patients exhibited edema, proteinaceous exudate, focal reactive hyperplasia of pneumocytes with patchy inflammatory cellular infiltration, and multinucleated giant cells."¹⁰ The lung damage is particularly noticeable and viscous secretions can be found seeping through the air sacs.

ACE 2 Receptors and COVID-19

The COVID-19 virus, SARS-CoV-2, enters the human body through a number of portals involving the upper respiratory tract, including the mouth and nose, and also possibly the eyes. Researchers have found a receptor, the ACE2 receptor, which allows the coronavirus to preferentially attach and eventually stick to cells in the lungs.

Other organ systems, through symptoms, tissue samples and autopsies, have been found to be attacked by the virus. These sites include the eyes, the olfactory system, the heart, and gastrointestinal system. This may explain why some patients exhibit symptoms of conjunctivitis, as well as loss of smell and taste.¹²

ARDS

Clinical reports and subsequent autopsies on patient deaths from the SARS outbreak in 2003 and MERS epidemic of 2015 showed that these coronavirus infections were a result of acute respiratory distress syndrome, or ARDS.^{13,14} A more recent characterization of ARDS, developed by the European Society of Intensive Care Medicine in 2011 in Berlin and now called the "Berlin definition,"¹⁵ includes the following:

ARDS is an acute form of diffuse lung injury occurring in patients with a predisposing risk factor, meeting the following criteria:

- 1. Onset within 1 week of a known clinical worsening respiratory symptom;
- 2. presence of bilateral opacities on chest X-ray;
- 3. diagnosis of respiratory failure;
- 4. presence of hypoxemia.^{16,17}

Therefore, the autopsy and histology slide reports cited above from Wuhan provided the first clues that those patients died from hypoxia and alveolar collapse, as a result of ARDS.^{18,19,20}

Inflammation of the Alveoli and the "Cytokine Storm"

The signs and symptoms of acute inflammation overlap in pneumonia and acute respiratory distress syndrome (ARDS). This sometimes makes it difficult, early on, to tell the difference between them.

The epithelium of the upper and lower airways is the first site of defense and contact with inhaled agents. The breech of the body's natural physical barriers and its defense mechanisms, such as the immune system, leads from a cascade of events to a cytokine storm.

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The Cytokine Storm

The first reference to the term *cytokine storm* in the published medical literature appears to be by Ferrara et al²¹ in 1993 in a discussion of graft vs. host disease: a condition in which the role of excessive and self-perpetuating cytokine release had already been under discussion for many years.²² It is believed that cytokine storms were responsible for the disproportionate number of healthy young adult deaths during the 1918 influenza pandemic. In the 2019 coronavirus pandemic, a number of deaths due to COVID-19 are now being attributed to cytokine release storms.²³

A recent article in *The Wall Street Journal* discussed that "an immune system gone haywire may be doing more damage than the coronavirus itself in patients with the severest forms of COVID-19."²⁴ The theory behind this "cytokine storm" is that pathogens somehow trigger an overreactive immune response, leading to the release of cytokines.

Cytokines are small proteins involved in cell signaling and are central to our immune responses.^{25,26} They are produced by a variety of immune cells, including macrophages, B lymphocytes, T lymphocytes and mast cells, as well as endothelial cells, fibroblasts, and various stromal cells.^{27,28} The prevailing "cytokine storm" theory is that an inflammatory response is initiated by an infection of the COVID-19 virus as it attaches to ACE2 membrane receptors and infects lung cells.^{29,30,31,32}

Slowing of the Velocity of Blood through the Capillaries

Blood return through capillary venules and into the veins is not simply the direct result of a pressure wave generated by ventricular contraction down through the circulatory system. Instead, venous return depends on skeletal muscle action, respiratory movements, and constriction of smooth muscle in venous walls.³³

Approximately 24 liters of fluid per day flow through and are filtered by capillaries in the average human body. About 21 liters return to the venous end of the capillaries, as described by the principles of Starling's Law. The remaining 3 liters of fluid, bathing cells in the vicinity of the capillaries, is picked up by minute vessels of the lymphatic system with their one-way valves. These valves assure that there is a unidirectional flow of lymphatic fluid back into the veins and the right side of the heart. A major function of the lymphatic system, therefore, is to return the fluid (lymph) to the blood. It is the body's own "sewer system," making sure that fluid that had filtered out of the capillaries is eventually returned, making it a closed system. Lymph may therefore be thought of as recycled blood plasma.³⁴ Historically, interstitial edema is thought to be largely the result from an increased leakage of fluid and proteins from the capillaries and venules into the interstitium, or extracellular space. However, in inflammatory situations such as with viral or bacterial infections, mediators of inflammation, released in the vicinity of lymphatic vessels, have been shown to directly affect the lymphatic smooth muscle and alter lymphatic pumping.³⁵

Those lymphatic smooth muscle cells are pivotal to the role lymphatic vessels play in achieving tissue fluid homeostasis.³⁶ It is apparent from both experimental and clinical studies spanning several decades that inflammation has been shown to be a critical component in the pathophysiology of interstitial as well as gross lymphedema.³⁷

The Lymphatic System: The Missing Link to Our Present Perspective on Treatment of COVID-19?

The capillaries leak proteins, especially albumin, between contiguous endothelial cells on a regular basis. The resulting colloidal osmotic pressure from these leaked proteins draws fluid into the interstitium and thus, into the alveoli.

A cascade of events is triggered by a COVID-19 infection, resulting in a slowing of the flow of blood through the capillaries, leading to further leakage of protein and fluid, furthering of the "cytokine storm," and deposition of fibrin and other proteins into the alveoli. Finally, the lymphatic channels are prevented from drawing the interstitial fluid away from the alveoli and back into the venous system.

This finely tuned lymphatic drainage system, or "sewer system," now no longer functions normally. The destruction of this previously closed system now results in the pulmonary manifestations of COVID-19 infection, the resultant "cytokine storm," deposition of fibrin products into the alveoli, hypoxia and CO2 retention, and the ultimate development of ARDS and death.

Challenges to Treatment of COVID-19 Infection

The public is clamoring for treatments now to fight the infections and complications of the COVID-19 pandemic. Doctors in China, Europe and the United States are trying all sorts of drugs and treatment protocols to try and save people from needing those ventilator supports, and from dying. Some of these are novel interventions, have not been tried before, are remedies that have not yet passed clinical trials nor met FDA approval.³⁸

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Medications like hydroxychloroquine (an anti-malarial agent also used to treat lupus and rheumatoid arthritis), remdesivir (an antiviral drug), lopinavir and ritonavir (both anti-HIV drugs), and dexamethasone have been or continue to be evaluated in research trials.^{39,40} Convalescent plasma from patients who have recovered from the COVID-19 infection is also being researched as an additional alternative treatment.^{41,42}

Some of these approaches, such as dexamethasone and remdesivir, have shown encouraging, statistically significant outcomes. They need to be tested in larger, randomized, double blinded clinical trials in order to scientifically assess their effectiveness, and in what level of exposure or stage of infection.

Preparing for the Next Pandemic

Globally, there is an extremely limited supply of medication, disinfectants, personal protective equipment, monitors, and machines with which to handle the thousands, and millions of potential cases that may develop ARDS from the COVID-19 infection. This will become dramatically more apparent if there is a second global "surge" of cases, especially in the fall of 2020. It will be glaringly apparent in poorer countries with less access to technical medical supplies, poorly funded healthcare, or too few medical professionals to provide for their people.

Is there anything we can do to avoid this course? The answer is a qualified "yes," depending on how everyone, from world leaders to local elected officials, decides to respond. We need bold and timely leadership at the highest levels of government in the developed world; these governments must recognize the economic, security, and health threats posed by future pandemics and invest accordingly. The resources needed must be considered in light of the inevitable costs of failing to invest in such an effort.⁴³

Osteopathic Manipulative Medicine: Can We Rise to the Challenge?

The COVID-19 pandemic is a challenge to the basic foundation and philosophy of the osteopathic medical profession. The tenets of osteopathic medicine, as approved and adopted by the American Osteopathic Association,⁴⁴ state that:

- 1. The body is a unit; the person is a unit of body, mind, and spirit.
- 2. The body is capable of self-regulation, self-healing, and health maintenance.
- 3. Structure and function are reciprocally interrelated.

4. Rational treatment is based upon an understanding of the basic principles of body unity, self-regulation, and the interrelationship of structure and function.

It is believed that the osteopathic concept, originally developed by Dr. Andrew Taylor Still and refined as the four tenets of osteopathic philosophy, possesses key elements of the effective treatment of serious viral respiratory diseases, including the present COVID-19 pandemic. Quoting Dr. Still,

"I have successfully treated many cases of pneumonia, both lobar and pleurotic, by convecting the ribs at their spinal articulations....I carefully adjust misplaced ribs....The osteopathic prognosis for speedy relief of influenza is good when the osteopath has been called to the case within reasonable time."⁴⁵

An Overview of Osteopathic Techniques Used During the 1918 Influenza Pandemic

The osteopathic medical literature during and after the 1918 influenza pandemic documented techniques which evolved into what, today, can be called a "viral influenza protocol" (or VIP treatment), a series of manual techniques for viral upper and lower respiratory infections.

The central components, with variations, include:

- 1. Rib Raising
- 2. The Thoracic Pump
- 3. The Liver Pump
- 4. The Spleen Pump
- 5. The Pedal Pump (Dalrymple Treatment)

Rib Raising

Rib raising is an osteopathic manipulative treatment technique used to address restricted excursion of the rib cage and to modulate sympathetic nervous system (SNS) activity.⁴⁶ According to one description with the patient supine, the operator standing at the patient's head, raises the ribs by grasping the muscle folds of the pectoralis major and the serratus anterior muscles, gently leans back, thereby elevating the rib cage, enhancing the action of his or her fingers.⁴⁷

The most impressive historical example of the successful application of rib raising—as well as of the thoracic lymphatic pump—occurred during the 1918 influenza epidemic. According to statistics in Georgia W. Walter's *The First School of Osteopathic Medicine: A Chronicle*,⁴⁸ the estimated nationwide mortality rate for

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patients who received conventional medical care during this epidemic was 30% to 40%. By contrast, for the 110,120 patients who received such osteopathic care during that epidemic, the mortality rate from influenza was 0.25%.⁴⁹

The Thoracic Pump

The Swedish anatomist Olof Rudbeck in the 1650s stated that lymphatic circulation is an integrated system that is separate from blood circulation.⁵¹ Over the ensuing centuries protocols of movement and massage which indirectly addressed concepts of circulation and lymphatic drainage were developed.^{52,53,54}

Dr. Still developed a medical system designed to facilitate natural healing processes by finding and correcting anatomical deviations that interfere with the free flow of blood and lymph and with the so-called "nerve force" in the body. He created an approach to manual medicine, in which for the first time, the lymphatic system held an important place—though for him the lymphatics were still a "mystery to solve."⁵⁵ Dr. Still admitted, "Possibly less is known of the lymphatics than any other division of the life-sustaining machinery of man.⁵⁶

In 1920, Dr. C. Earl Miller popularized a "thoracic pump" technique to treat many types of infections including pneumonia. He wrote that "too little attention is given to the lymph and its function." He also agreed that "the normal circulation of body fluids is absolutely essential to normal activities of body function, as well as the health and well-being of the individual."⁵⁷

There are many variations of techniques for thoracic pumping depending on circumstances and the comfort of the patient. The principle of thoracic pumping is to rhythmically compress the upper ribs into exhalation or vibrating them while the patient goes through excursions of exhalation to inhalation.

A variation taught to this author involves progressively following the ribs more and more into exhalation (easily up with each inhalation to allow the lungs to fill with air) and when at the point of end exhalation, holding the ribs down as the patient starts to inhale. During inhalation the ribs, which were momentarily held in exhalation, are suddenly released "like popping a cork from a champagne bottle," and air is allowed to rush into the lungs again.

Hepatic Pump - Supine position

There are many variations of the hepatic pump technique, from supine to lying in the left lateral decubitus position. One such variation is: The physician stands at the right side of the patient, facing slightly caudad, with his or her right hand beneath the lower ribs. The left hand is set atop the anterior lower ribs. Using a gentle, rhythmic motion the anterior ribs are pressed lightly downward and caudad at an angle of about 45 degrees. Reciprocally, the posterior lower ribs, at about the level of the liver are stretched upward and cephalad at an angle of about 45 degrees. The rate of rocking or light compression is about 100-120 times per minute. This pumping action is repeated 50-70 times.

Splenic Pump - Supine Position

This technique is identical to the supine liver pump, except that all of the directions are reversed to reflect the fact that the spleen is located on the left side of the body. Some contraindications of the thoracic and splenic pump include osseous fractures, certain stages of carcinoma including metastases, enlarged or tender spleen as with infectious mononucleosis, osteoporosis, skin disorders, such as lacerations and burns, or cellulitis at the point of physician contact with the patient.

Pedal Lymphatic Pump

The physician stands at the feet of the supine patient. The physician grasps the feet and introduces a gentle, rhythmic dorsiflexion. The umbilicus is used as a landmark to appreciate a wave of motion transmitted from the feet into the abdomen. This results in a massaging of the intestinal lymphatic vessels as well as the liver, spleen and diaphragm. As the rebound wave returns to the feet, the dorsiflexion is continued, thereby creating an oscillatory pump.⁵⁸ The rate of rocking is about 100-120 times per minute. This pumping action is repeated 50-70 times.

Summary and Perspective

The COVID-19 pandemic is a colossal challenge to our scientists, our medical providers, our health policy experts, and especially to prevailing paradigms being used in testing or approving treatments against it. The urgency to contain the pandemic can also provide an opportunity to integrate perspectives or protocols of treatment that have been used in the past with various degrees of success.

Researchers and our health professional colleagues don't hesitate to throw whatever new drug, concoction, blood transfusion, breathing exercise, supplements or diet "against the wall," during this horrible pandemic, to "see what sticks." If our worst fears become reality, the COVID-19 pandemic will not be a "war," rather it will be a "slaughter," as more people of all ages succumb to a second or third "surge" of new infections or re-infections.

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The global economy, while not yet collapsing, has declined precipitously, and may take years to recover. Employment, property values, supply chains in the food and manufacturing industries, have all suffered immeasurably. Inflation, clean water and proper medical care before December 2019, were already at or below the breaking point in many underdeveloped parts of the world and are now worsening.

Ventilators and oxygen, suction equipment and PPE material, and ICUs and intensive care personnel would be in short supply in the event this pandemic stretches out for months or continues to grow. The scales would tip away further if there were a "second surge" of even more COVID-19 cases in the fall of 2020 simultaneously with the seasonal influenza.

The osteopathic manipulative treatment techniques and their therapeutic effects on the lymphatic system have withstood the test of time for more than a century. These OMT techniques are based on sound anatomical and physiological science. They are not some whimsical ideas dreamt up, to be thrown up against some allegorical wall to "see if they stick," that is, if there is any merit to them.

The osteopathic profession never could, during the 1918 influenza epidemic, nor can it now muster enough physicians to treat most of the patients who have confirmed or suspected cases of COVID-19. Even with a vaccine (which we are told wouldn't be ready for at least a year or more), or medication (of which we presently have no truly effective choices), it would not provide enough treatment quickly enough for the entire population of the United States, or Europe, let alone countries and continents such as Central and South America, India, China, Russia, or Africa.

I suggest that we, as a profession, collectively promote the osteopathic paradigm of healing to our medical colleagues, and researchers, and legislators. We need to teach, without apology, the importance of the lymphatic system as a central component of the circulatory and immune systems in health and disease. We need to review the various OMM/OMT protocols and rationale for viral illnesses and teach them to all levels of medical providers. We should be ready to train whole cadres of providers for implementation of the simplified VIP treatment. This should include mid-level providers, physical therapists, massage therapists, chiropractors, and possibly even the general public.

The VIP is easy to administer, with minimal training, and is much cheaper than using ventilators, extracorporeal membrane oxygenation (ECMO), and might mitigate the need to use other expensive medicines. Offered early in the course of COVID-19 infection it might lessen the need for ventilators in the first place. With proper training resources, the VIP could be offered across cultures and economic barriers to treatment, offering help and hope in those areas of the world, to those who otherwise may not have vaccine, an effective affordable medication, an ICU team and specialists, or enough PPE materials.

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