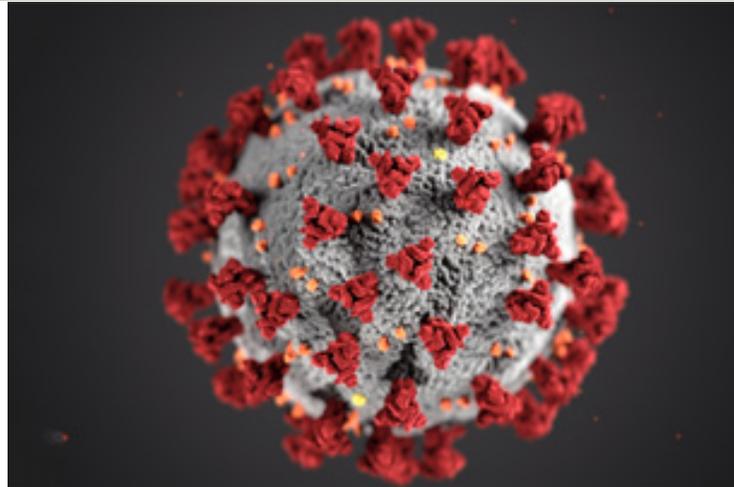


New BaleDoneen Publication Links Microvascular Disease to Higher COVID-19 Risk



Why do some patients become severely ill with COVID-19 while others have milder cases or no symptoms at all? A new peer-reviewed BaleDoneen publication proposes an intriguing theory. Published in *Medical Hypotheses* in June, the paper suggests that the people who are hardest hit by the new coronavirus may also have a very common — and often undiagnosed — underlying health problem that makes them much more vulnerable to severe or fatal COVID-19 infection: microvascular disease (MVD).

Authored by Bradley Bale, MD, Amy Doneen, DNP and Dave Vigerust, PhD, the publication argues that MVD impairs the body's innate immunity, leaving people who have it less able to mount a vigorous immune system defense against SARS-CoV-2, the virus that causes COVID-19. As a result, people with MVD may fall prey to the most severe complications of COVID-19, which is now known to attack the body from head to foot, causing everything from heart attacks and strokes to pneumonia, chronic kidney disease, blood clots and even "Covid toes." Here is a closer look at the new research and you need to know about the potential link between MVD and COVID-19.

What is microvascular disease?

Although MVD is very common, many

patients have never heard of it. Over the years, it's had more aliases than a career criminal, including "small vessel disease," "Syndrome X," "microvascular dysfunction" and "nonobstructive artery disease." As discussed more fully in the new BaleDoneen publication, "[Microvascular disease confers additional risk to COVID-19 infection.](#)" MVD is a disorder of the small arteries, such as arterioles and capillaries. By some estimates, there are up to 45,000 miles of these vessels in the body, some of which are too tiny to see.

MVD is found at higher rates in older adults, as well as those with diabetes, high blood pressure and cardiovascular disease (CVD). These are the same patients who face a much higher threat of severe or fatal outcomes if they catch

the new coronavirus. A common denominator of this high-risk group is that they frequently have atherosclerosis (plaque in the arteries). Research has shown that the extent of atherosclerosis is directly related to the extent of MVD. Therefore, there is a high probability that the patients with higher mortality rates from COVID-19 have MVD.

Unlike coronary artery disease, MVD is not caused by plaque buildup. Instead, the endothelium, which acts as a smart barrier between your blood and the arterial wall, becomes dysfunctional. This leads to reduced flow of oxygen- and nutrient-rich blood to the tissues in the body's organs, including the brain, heart, lungs, liver and

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Is It Safe + to Go to the Dentist During the COVID-19 Pandemic?



After months of only handling emergencies, America's dental offices are starting to reopen. All 50 states now allow dental providers to offer all procedures, including routine checkups and teeth cleaning, according to the American Dental Association (ADA). To combat the spread of SARS-CoV-2, the virus that causes COVID-19, dentists and hygienists are taking many new precautions to protect patients — and themselves — from exposure. To guide this effort, the ADA and the CDC have issued new infection control guidelines for dental practices. However, many patients still wonder if it's safe to get dental care, especially in the parts of the country where rates of the new coronavirus are rising.

Although the new safety procedures can make going to your dental provider feel different than in the past, taking excellent care of your teeth and gums remains one of the best ways to protect your overall health — and reduce your risk for heart attacks, strokes, dementia and other life-threatening conditions. To help you weigh the risks and benefits of getting dental care during the pandemic, we talked to an expert: Patti DeMatteis, ASDH, RDH, co-owner of Dental Hygiene Excellence and managing partner of the Heart Attack and Stroke Prevention Center of Central Ohio. Here are her answers to common questions and concerns of patients.

How risky is dental care?

Dental procedures, including teeth cleaning, are considered potentially high risk. That's because COVID-19 is primarily spread through exposure to respiratory droplets from an infected person, either by inhaling the droplets or by touching surfaces or objects that are contaminated with the virus and then touching your mouth, nose or eyes. Because dentists and hygienists work inside the patient's mouth, using high-speed instruments that can create vaporized aerosols, there is a significant risk of spraying viral particles around the treatment room and onto the providers themselves. Ultimately, dental providers may be at far greater risk of being infected by their patients than vice versa.

To protect both patients and staff, dental offices have upgraded their air filtration

systems, upgraded personal protective equipment and use new dental devices to minimize the release of possibly pathogenic aerosols in the dental environment. For example, to keep the patient's mouth as dry as possible during dental and hygiene procedures, our practice and many others have started using a high-volume suction device called Ivory Releaf in addition to the standard low-volume suction devices we were using before the pandemic. The Releaf has a leaf-shaped mouthpiece that is placed in the patient's mouth to suck up fluid before it vaporizes into the air.

Before using the Releaf on our patients, we tested it by using it on our staff. When I recently had a dental cleaning, performed by a hygienist and the hygiene dental assistant in our practice, the additional aerosol management measures worked so well that my face was totally dry afterwards. We have also implemented many other protective practices that will be discussed more fully below. As a result, I felt completely safe during my cleaning — and during a recent crown procedure.

What steps should dental practices take to protect patients and staff from COVID-19?

Even before the pandemic, dental providers were already required to use strict hygiene practices, such as [standards developed by the Occupational Safety & Health Administration \(OSHA\)](#). These include sanitizing surfaces and equipment with [EPA-approved disinfectants](#) specif-

ically designed for use in the healthcare setting. In response to the COVID-19 pandemic, a wide range of new safety precautions are now in place. When scheduling your dental cleaning, checkup or procedure, ask about the following infection control measures, many of which are advised by the [CDC](#) and the [ADA](#):

- **Staggered appointments.** To help ensure safe social distancing between patients, the CDC advises dental providers to limit "clinical care to one patient at a time [per clinician] whenever possible." In facilities with multiple treatment rooms, it's possible that other patients will be receiving care from other providers in other rooms during your visit. However, your provider should not go back and forth between rooms. The office should also build in adequate downtime between patients to allow clinicians to thoroughly sanitize and disinfect rooms and equipment between patients.

- **Screening for COVID-19.** Ask if the dental providers have been tested for the coronavirus and what the results were. Also ask what steps your provider takes to screen patients. In our practice, we ask patients to wear a face covering when they arrive, take their temperatures and use a symptom questionnaire to screen for signs of the disease. We also ask if they have been told to self-quarantine after exposure to an infected person. However, it is possible for people who are not yet showing symptoms of the

Ready in just 40 minutes, this delicious vegan soup is naturally gluten-free. And this tasty recipe is low in calories while high in flavor, heart-healthy nutrients and immunity-boosting antioxidants. Many studies link a diet high in fruits and vegetables to lower risk for heart attacks, strokes, cancer and many other chronic diseases. For a flavor variation, feel free to substitute other fresh summer vegetables of your choice for the ingredients listed below. Also experiment with different herbs to create savory flavors that are sure to make this soup a family favorite. Serves six to eight.

INGREDIENTS

- 1 tablespoon olive oil
- 1 large onion, diced
- 3 garlic cloves, minced
- 1 cup dry white wine
- 1 tablespoon of finely chopped fresh thyme (or 1 teaspoon dried)
- 6 cups vegetable stock
- 1 cup cherry tomatoes, halved
- 2 tablespoons tomato paste
- 1 cup peas
- 1 cup fresh or frozen corn kernels
- 1½ cups fresh green beans, ends trimmed and sliced into 1-inch pieces
- 1 medium zucchini, chopped
- Pepper to taste
- Chopped fresh herbs of your choice, such as parsley, chives, basil or oregano, for garnish



PREPARATION

Heat olive oil in large pot over medium heat. Add onion and sauté until soft and translucent (about 5 minutes). Add garlic and sauté for one minute, until fragrant. Add wine and rosemary. Increase heat and simmer uncovered until the liquid has reduced by half (about 4 minutes). Reduce heat and add vegetable stock, tomatoes, tomato paste, peas and corn. Simmer over medium heat for 10 minutes, stirring occasionally. Add green beans and simmer for 5 minutes. Stir in zucchini and simmer for 5 minutes more, until vegetables are tender. Remove from heat and season with pepper to taste. Ladle into soup bowls, garnish with fresh herbs — and enjoy!

Adapted from Connoisseurveg.com and Knivesoverforks.com.

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virus to transmit it, so even the most rigorous screening will not eliminate all risk.

- **Reducing exposure to other patients.** Many practices have abolished the waiting room and removed all shared objects, such as magazines. In our practice, patients are asked to remain in their cars until the previous patient has left. After we sanitize the room, we telephone the patient to let him or her know that we are ready. We also have a virtual payment process so patients don't need to interact with front office staff at all.

- **Measures to minimize aerosols.** The CDC has advised dental providers to take all possible steps to avoid the release and spread of airborne pathogens. Along with using the Releaf device discussed above to keep our patients' mouths dry during aerosol-releasing procedures, our practice also reevaluated the types of equipment we use. For example, while we continue to use the ultrasonic scaler, we stopped using a tooth polishing tool that produces

a high volume of spray. Some practices use a different type of external suction device that goes around the patient's face, such as Xuction.

- **Doubling down on PPE.** Many practices now use a shield positioned in front of the patient to block some of the aerosols and some use other types of shielding between patients and providers as well, or a combination of measures. As advised by the CDC, our providers wear eye protection, face shields, N-95 masks, full body surgical gowns, gloves and other PPE (personal protective equipment). Practice recommendations also advise providers to change PPE between patients to help avoid cross contamination.

- **Improved air quality.** Since it's impossible to eliminate all airborne particles during dental care, the CDC advises providers to work with a HVAC professional to increase filter efficiency to the highest possible level without impeding air flow. The agency also suggests that providers consider using a portable HEPA air filtra-

tion unit during and immediately after aerosol-generating procedures. Another option the agency has recommended is using a technology called upper-room ultraviolet germicidal irradiation to zap bacteria and viruses.

- **Pre-rinses and home care.** To reduce the viral load in our patients' mouths, we have them use disinfectant pre-rinses containing peroxide or iodine before their dental care. We ask patients who use [Perio-protect trays](#) for the treatment of periodontal disease to wear the trays to their appointment to help reduce harmful pathogens in the mouth. We also tell all of our patients to use [the salt-water gargle and nasal lavage advised by the BaleDoneen Method to help abate COVID-19](#) before their appointment. Recent evidence suggests this simple technique can significantly reduce the spread of respiratory infections, including those caused by coronaviruses, a discovery that may have important implications in combating the transmission of COVID-19.

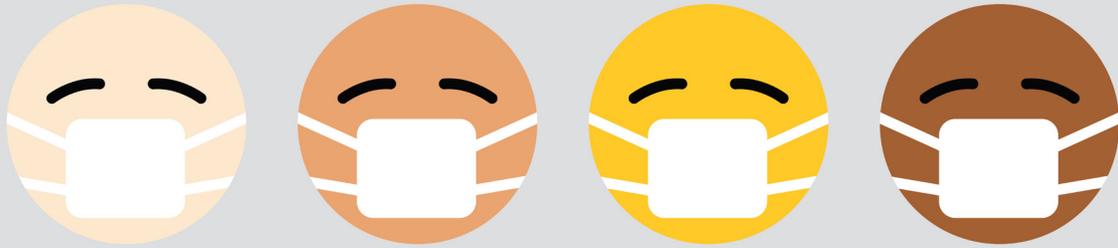


PHOTO BY VISUALS ON UNSPLASH

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kidneys, all of which can be damaged by COVID-19 complications. Moreover, the number and total volume of the tiniest vessels — capillaries — is decreased in people with MVD, as compared to people without it.

What’s the potential link between MVD and COVID-19?

In response to injury or infection, cells in the affected area mobilize immune system troops to battle the invading pathogen by releasing signaling molecules as a call to arms, along with chemical attractants. These substances summon the body’s defenders, including neutrophils, to the affected area, launching an immune system response called the inflammatory cascade.

Normally, neutrophils are one of the first responders. These immune cells fight infection in two ways: by gobbling up microorganisms and by spraying them with toxins. This includes the release of the enzyme myeloperoxidase (MPO), which combines with hydrogen peroxide (H₂O₂) to create hypochlorous acid (HOCl), a powerful virus-killer that plays a key role in innate immunity. However, to do their job, neutrophils must first travel to the infection site via the arterial system.

As reported in the BaleDoneen paper, recent evidence from COVID-19 patients shows that on average, in those with severe disease, levels of neutrophils are significantly higher

than in those with mild disease. However, MVD in the lung can impede HOCl production by neutrophils in several ways. First, MVD reduces tissue perfusion of the lung, potentially decreasing the number of these immune system soldiers that actually reach the battleground of diseased tissue. Second, microvascular endothelial cells produce H₂O₂, which is the primary substance regulating expansion of blood vessels to increase flow. MVD can result in decreased H₂O₂ production, leaving less of this compound available to combine with MPO to create virus-killing HOCl.

Why does COVID-19 cause some people to have heart attacks?

The BaleDoneen hypothesis also suggests that some of the MPO released by neutrophils would not have any H₂O₂ with which to combine. Moreover, the higher level of neutrophils in severely ill patients may result in higher levels of MPO in their blood. A number of studies have shown that elevated blood levels of MPO are an independent predictor of increased risk for heart attacks.

Rates of heart attacks and acute cardiac injury are reportedly higher in the same group of COVID-19 patients who have the highest risk for severe illness or death: older adults and those with certain co-morbidities. Some of that elevated cardiovascular risk may result from higher cardiometabolic demand

in patients with coronary MVD. In other words, decreased flow of oxygen- and nutrient- rich blood to the heart muscle may raise these patients’ heart attack risk.

This hypothesis also aligns with the observation that children are at low risk for COVID-19 complications, while early observations report increased risk in people ages 40 to 69. As we recently reported, [rates of heart attacks and strokes are on the rise in younger adults](#) (those under age 55). Some of the main culprits are America’s increasingly unhealthy lifestyle and the obesity epidemic. As rates of CVD are rising in younger people, so too is MVD, since the two conditions often occur in tandem and have similar risk factors.

What can I do to avoid developing microvascular disease?

The same optimal lifestyle measures advised by the BaleDoneen Method to protect the health of your heart, brain and large arteries will also help safeguard your smaller ones. To learn more, read our blog posts, [“5 Healthy Lifestyle Steps that Lower Stroke Risk 90%,”](#) [“10 Lifestyle Moves that Could Lower Your Dementia Risk by 35 Percent”](#) and [“AHA for Life: A Proven Plan to Prevent Heart Attacks, Strokes and Dementia.”](#) Also discuss your risk factors and ways to reduce them with your healthcare provider.