



Adrenal

Shinrin-yoku, yoga and other strategies in the fight against COVID-19

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In March 2019, the world changed when the World Health Organization declared coronavirus disease 2019 (COVID-19), a novel coronavirus, a pandemic. Countries around the world locked down their borders, isolated their citizens and hospitals, and healthcare workers (HCWs) had to adapt very quickly to the changing needs of their patients. The added stress of working in a health care environment during infectious outbreaks has been shown to take its toll on HCWs. In a review of 44 studies on the psychological impact of epidemic and pandemic outbreaks, Preti et al found between 11%–74% of HCWs reported post-traumatic stress symptoms (PTSD), with symptoms lasting beyond the outbreak in 10%–40%.¹ During the initial COVID-19 outbreak, 70% of HCWs suffered distress, 50% had depressive symptoms, and 44% reported anxiety.² This appeared to be more severe in women and in professional staff. Additional stressors, such as child and eldercare disruptions, social isolation or entrapment, financial distress, and relationship dysfunction, have plagued many of us during this crisis.

The acute stress response is mediated by the hypothalamic-pituitary-adrenal axis (HPA), causing an increase in serum cortisol. Acute self-limiting cortisol elevation in response to stress is beneficial. However, during chronic stress, there is a degree of cortisol resistance resulting in dysregulation of the HPA axis and daily cortisol secretion. Maladaptive secretion of cortisol under chronic or repetitive stress conditions can be challenging to capture as plasma, salivary, and urine cortisol levels only measure a snapshot in time. However, hair cortisol concentrations (HCC) have the advantage of providing retrospective data by examining different segments of hair. In Stalder's meta-analysis, they found overall

stress-exposed groups exhibited a 22% increase in HCC and increased by 43% in those groups where there were ongoing stressors.³ It was therefore not surprising to see that Rajcani et al found a significant increase in HCC corresponding to the first wave of the COVID-19 pandemic compared with the pre-COVID period in 67 nurses.⁴

I believe, as surgeons, we are not immune to having some degree of cortisol dysregulation during this ongoing pandemic. As such, I looked into the literature to find non-medical ways of reducing one's serum cortisol levels in order to help manage the 'subclinical' Cushing's state we find ourselves in. I would encourage each of you to personally explore and examine these therapies and incorporate some of them into your daily lives going forward.

Exercise Versus Yoga

The benefits of exercise are well known to physicians. For those of you who exercise regularly know very well, the B-endorphin 'high' from exercise is a welcomed relief from the day-to-day stresses in our busy lives. The endocrine response to acute exercise is related to both intensity and duration. Exercise increases serum cortisol, allowing for the availability of metabolic substrates, protects from the immune cellular response at the tissue level, and maintains vascular integrity.⁵ Inactivation of cortisol into cortisone is protective of the deleterious effects of high cortisol levels. However, over-training impairs this inactivation. In other words, excessive exercise as a mechanism of coping during COVID is likely adding to an already chronically high cortisol level. Yoga, on the other hand, has been shown to not only increase B-endorphins but also decrease cortisol levels, reduce inflammatory cytokines, such as interleukin-6 and tumor necrosis factor-alpha, improve biomarkers of neural plasticity, and improve the quality of life.^{6,7} The added advantage yoga has on increasing one's flexibility, as well as the mindful mediation of quieting the mind, has become an invaluable tool to me, particularly after a long day in the operating room.

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Shinrin-Yoku and Greenspace Interventions

Shinrin-yoku is a Japanese tradition of stress reduction and literally translates into “forest-bathing.” In other words, walking in the forest and breathing in the fresh air. In a recent systematic review that included 22 articles and a meta-analysis (8 articles), Antonelli et al evaluated the stress-reducing effects of “forest-bathing” and found that in all but 2 studies, the cortisol levels were significantly lower in the Shinrin-yoku groups compared with urban environment groups.⁸ Most interesting was that the data also saw a reduction in cortisol levels in a sub-group analysis of ‘forest-watching’ compared with visiting an urban environment. Although the sun and microbiome exposure, as well as the calming sounds of nature while walking in the forest, likely plays some role in stress reduction, observing the forest and/or natural environment seems to also influence cortisol levels. The degree to which HPA can be influenced by visualization alone of a forest requires further investigation.

Since not all of you live within 100 kilometers of a national park, I looked deeper into whether greenspace exposure (gardening, visiting urban parks, outdoor active, and passive activities) has an effect on cortisol levels. It appears that greenspace interventions can also reduce cortisol and stress levels, yet most studies on this topic are limited by data collection methods and heterogeneity of the study design.⁹ Although more research is needed, the current data would suggest that greenspace exposure is associated with numerous health benefits, enough to encourage policymakers and urban planners to create, design, and maintain accessible greenspaces in urban centers.

Nomophobia

The digital world has, in many ways, been beneficial to us during the pandemic. It has allowed us to stay connected to family and loved ones, allowed us to switch to digital learning platforms, and, for many, enabled us to work safely from home. Yet, the dependency on the digital world also has added to our chronic stress. Cal Newport, in a recent article in *The New Yorker*, talked about how history has shown us that technology can provide superficial conveniences that are poorly matched to human nature. He goes on to say that we are in a chronic state of anxiety because of a workflow pattern based on constant messaging and emails. Although at first, digital meetings were a way to stay connected and productive, they have become, at times, invasive and exhausting. The constant ‘connectivity’ does not allow much time for oneself. Nomophobia is the fear of being without access to a working smartphone and was first described in 2015. It appears that between 60%–80% of professionals have some degree of moderate to severe nomophobia. Severe nomophobia, however, leads to a 14-times higher rate of problematic phone/internet use. With the digital world encroaching more and more on our daily activities, a balance between leisure-time internet use and work-time use must be found. An online cross-sectional survey of 446 individuals found that those with a work-time internet use between 5–28 h/wk reported a higher perceived quality of life than those who exceeded 28 h/wk. They also found that addictive/problematic internet use was associated with higher leisure-time utilization, and ideally this should not exceed 4 h/wk.¹⁰ The onus is on the surgical leadership to recognize the added burden of the digital work-time environment that this global pandemic has created and find ways to contain the work-time utilization for its members. Many organizations have done so by limiting the number of internet meetings during a given week and have given their employees the ‘right to disconnect.’ As this pandemic subsides, it is important to be cognitive of the fact

that many of these digital ‘tools’ will remain, thus making it even more important for each of you to find ways to maintain a healthy balance of internet use.

Music, Art, and Canine Therapeutic Interventions

There are many other activities that have been utilized to decrease stress and cortisol levels. Music therapy has been shown to not only decrease salivary cortisol in dental patients but, in a recent systematic review, has been shown to decrease stress and anxiety in critically ill patients.¹¹ Both art and canine therapeutic interventions have been shown to decrease cortisol levels in HCWs as well as help reduce stress in university students, palliative-care patients, and military personnel suffering from PTSD.

In summary, it is important for each of us to recognize that this past year has brought unprecedented stressors into our already stressful lives. The “sub-clinical Cushingoid” state we find ourselves in needs to be addressed now and going forward. The onus is on you to take care of yourself in order to be able to take care of your patients and family. The added stressors that the pandemic has brought may ease up, but the stressful career we have chosen will continue. Consider taking up yoga and/or mindful meditation. Bring music back into your life. Do not underestimate the value of the family pet. Learn to draw or paint. Putter in your garden. Get outside and bathe yourself in a forest or a greenspace. And, once in a while, take some time to disconnect from that smartphone and learn (or re-learn) to enjoy and appreciate the simpler things in life.

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