

# **GO PRONE With Shithilaasana: Can Transcranial Doppler Ultrasound Confirm If Good Lobe/Segment Down Turns SARS-CoV-2 Inflamed Bad Lobe/Segment Into Zone-1 With Dead Space Ventilation Shutting Off Blood Flow Through Microemboli-Throwing Pulmonary Arteriovenous Channels Functionally Opened By SARS-CoV-2 In Bad Lobe/Segment?**

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**Corresponding Author:**

Dr. Deepak Gupta,  
Anesthesiologist, Self - United States of America

**Submitting Author:**

Dr. Deepak Gupta,  
Anesthesiologist, Self - United States of America

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# GO PRONE With Shithilaasana: Can Transcranial Doppler Ultrasound Confirm If Good Lobe/Segment Down Turns SARS-CoV-2 Inflamed Bad Lobe/Segment Into Zone-1 With Dead Space Ventilation Shutting Off Blood Flow Through Microemboli-Throwing Pulmonary Arteriovenous Channels Functionally Opened By SARS-CoV-2 In Bad Lobe/Segment?

Author(s): Gupta D

## My opinion

Physiologically, humans just like animals involuntary adjust their postures and positions so that they can easily breathe without giving much thought as to how they are adjusting and adapting their postures and positions to keep that ease in their breathing. Although respiratory physiology may seem too complex even to the scientifically and academically trained minds, respiratory physiology has been the talk of the town since SARS-CoV-2 first struck the global village more than a year ago. Although "Go Prone" is turning into a lifesaving mantra against COVID-19 pandemic [1-4], the question remains why "Go Prone" [5-6]. The reason is simple: We are humans who spend almost 0% of our time in prone position, which may be even less than the time we spend in right/left lateral position mostly during sleep because we are two-legged upright walking humans and thus prone to primarily stay in standing (~40% of our time), sitting (~40% of our time) or supine (~20% of our time) positions [7] thus exposing our inferior (caudal) lobes/segments of lungs in standing and sitting positions and our posterior segments of lungs in supine positions to the physiological compressive atelectasis due to gravity thus making those lobes/segments susceptible to turn bad during acute respiratory distress syndrome especially when SARS-CoV-2 inflamed lung zones may be further functionally opening up microemboli-throwing arteriovenous channels therein to create paradoxical embolism related heightened risk of catastrophic deaths with COVID-19 [8]. An interesting tidbit may be that standing position related physiological compressive atelectasis may be less than sitting

position related physiological compressive atelectasis because, despite being in Zone-3, inferior (caudal) lobes™/segments™ alveoli may expand better during standing position as compared to during sitting position with intraabdominal organs moving caudally away from intrathoracic organs during standing position instead of moving cranially towards intrathoracic organs during sitting position. However, if like our domesticated pets [9-10], we were four-legged animals afflicted with acute respiratory distress syndrome from SARS-CoV-2, we would have had our ventral lobes/segments of lungs suffering from inflammation-prone gravity-induced compressive atelectasis and thence the mantra would have been "Go Supine" meaning belly-up instead of being on all fours so that we as four-legged animals would have breathed better in supine belly-up position during COVID-19 pandemic. Interestingly, humans evolve to lie supine when great apes evolved to learn sleeping in deeper states while lying supine thus allowing evolution of higher cerebral functions as compared to monkeys who had evolved into sleeping only in lighter states while sitting upright on their hairless ischial callosities [11-15].

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Next, the question arises how to prove it. It has already been shown that a lot many COVID-19 patients are suffering from "happy hypoxemia" syndrome [16-20] who may be benefitting with their awake state prone positioning improving their oxygenation thus avoiding or delaying the need for non-invasive or invasive mechanical ventilation among them. If oxygenation is improving with prone positioning due to bettered ventilation-to-perfusion ratios in the good lobes/segments which are down as Zone-3 [21-24], the bad lobes/segments which are up

as Zone-1 become irrelevant for oxygenation but may remain preciously important to shut off blood flow across microemboli-throwing pulmonary arteriovenous channels in the bad lobes/segments which are now up as Zone-1 (Figure 1). This can be easily proven with transcranial color duplex/doppler sonography [25-30] to confirm if microemboli showers in the intracranial arteries observed among COVID-19 patients during supine positions are decreasing or even completely disappearing once those patients are turned into prone positions.

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There may be other questions worth investigating. How do various bronchopulmonary segments' anatomical volumes as assessed by computed tomography change between standing, sitting, supine, lateral and prone positions because anatomically total lung volumes on either side may not change significantly when the postures or positions are changed but anatomically lung lobes volumes on either side change significantly when the postures or positions are changed [31-36]? Does 'Prone' warrant too many pillows for support when some yoga poses like Shithilaasana [37] can easily ensure awake state prone positioning without needing any pillow or support although it remains to be seen how long one can remain comfortable with 'Prone' while awake or asleep because whether awake or asleep, most of the times humans' brains are accustomed to turn around in various positions to avoid developing pressure sores [38]? Does the firmness of the mattress matter too [39-45] during 'Prone' because it remains to be seen if sinking within the too-soft mattresses or if unsupported within the too-firm mattresses have any effects on ventilation-to-perfusion ratios of healthy or sick patients turning from supine to lateral to prone positions? How long can severely diseased COVID-19 patients survive on Zone-2 ventilation-to-perfusion ratios because there will be dead space ventilation in non-dependent Zone-1 whereby Zone-1 is not perfused thus no gas exchange across collapsed arteriovenous channels while dependent Zone-3 alveoli already damaged by SARS-CoV-2 make alveolar ventilation impossible turning engorged arteriovenous channels detrimental to oxygenation levels [46-55]? Do pulmonary arteriovenous malformations develop primarily on the ventral lobes/segments in the four-legged animals who walk on all fours unlike pulmonary arteriovenous malformations developing on the inferior (caudal) lobes/segments in the upright walking two-legged humans? Is diffusing capacity of lung for carbon

monoxide no longer better in supine positions than in sitting and prone positions in sick patients like acute respiratory distress syndrome with SARS-CoV-2 because it seems like diffusing capacity of lung for carbon monoxide maybe better in supine positions than in sitting and prone positions at least in healthy volunteers [56-57]? Â

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Few things to remember is that prone position is not anatomically better but only functionally better during COVID-19 pandemic because our lungs are primarily stuck in supine/sitting/standing positions all our lives whether we are healthy or sick. Therefore, overdoing the prone position (say ~40%/~60%/~80% of time) may potentially undo its functional benefits in the not-so-sick COVID-19 patients wherein overdone prone positioning may start damaging the anterior segments of lungs by compressive atelectasis thus thereafter opening pulmonary arteriovenous channels in the anterior segments to make the case for nullifying the overdone prone positioning's effects by turning them into supine positioning. However, among the already too-sick COVID-19 patients with already damaged posterior segments of lungs, there may be better hope with prone positioning without worrying about it being overdone for these patients so as to cautiously nurture the only remaining good lobes/segments to sustain adequate ventilation-to-perfusion ratios thus allowing the damaged posterior segments time to recover so that COVID-19 patients can be back on their feet again.

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The bottom-line is that it is appropriate to 'Prone' without forgetting to rolling back into supine position at regular intervals (or any other positions/postures which can bring the radiographically-diagnosed good lobes/segments down into Zone-3) so that none of the lobes/segments ever goes too bad to recover while the innate body mechanisms fight to keep the COVID-19 fighters alive and bring them back on the road to recovery. Â Â Â

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## FIGURE 1

