

MIND TO MIND

*Creative writing that explores the abstract side
of our profession and our lives*

Carol Wiley Cassella, M.D., Editor

Editor's Note: For January's education-themed issue, this month's *Mind to Mind* presents three essays reflecting the global experience of anesthesia residency training.

Pulmonary Pathophysiology in Another Galaxy

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A long time ago in a galaxy far far away...

Case studies from popular culture have previously been reported to be helpful teaching tools for conveying and integrating complex physiological principles.¹ A most enigmatic case that has puzzled some anesthesiologists and respiratory physiologists for decades is Darth Vader, "the chosen one" from the Star Wars franchise; his continuous need for a whole-body armored suit that supports his breathing as well as his characteristic breath sounds indicate that complex pulmonary pathophysiological principles are at stake. Although the Star Wars movies apparently take place "a long time ago in a galaxy far far away" and people there have something called "midi-chlorions" in their cells (a fusion of mitochondria and chloroplasts?), we assumed that the respiratory physiology of Darth Vader was similar to that of *Homo Sapiens* on Earth, in an attempt to decipher the nature of his pulmonary disease and use him as a case for teaching pulmonary physiology and pathophysiology to medical students in our ward.

In Star Wars Episode III, the 22-year old Jedi Knight Anakin Skywalker turns to the dark side of The Force, motivated by a wish to save his wife from dying in childbirth. After assuming the identity of Darth Vader, he suffers traumatic amputations of both lower limbs and his left upper limb during a light saber duel with his Jedi Master Obi-Wan Kenobi on the volcanic planet Mustafar. Since these injuries are inflicted by a light saber, they are instantly cauterized and blood loss is minimal; however, he is incapacitated at a volcanic shore and suffers severe third degree burns as the lava

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sets him on fire. Soon thereafter, Darth Vader's new mentor, the Emperor, arrives at the scene, and evacuates him in a medical capsule. In hospital, Darth Vader is placed in a whole-body armored suit that contains a mobile life support system that supports his breathing.

In Star Wars Episode IV–VI we learn that Darth Vader has to wear the whole-body armored suit at all times as he serves as the right hand of the Emperor in the following 22 years. Darth Vader can only remove his mask in his personal quarters, which appear to be some sort of hyperbaric chamber, and when his skin is consequently revealed he is clearly pale and outworn. Throughout the films, it is furthermore evident that his respiratory frequency varies depending on his activity level; during resting conditions, for example when he is relaxing in his hyperbaric chamber or having a casual conversation with the Emperor, it is 13 (mean; SD, 1) breaths per minute, and it increases to 16 (mean; SD, 2) breaths per minute during his normal everyday activities (such as torture and execution of employees and/or enemies); when he is stressed (for example, when the plans to the Death Star are missing in Star Wars Episode IV), his respiratory frequency increases to 25 (mean; SD, 3) breaths per minute, while it is 29 (mean; SD, 10) breaths per minute during exercise (fast walking, combat, duels et cetera). As the 44-year old Darth Vader finally fulfills his destiny as “the chosen one” by overthrowing the Emperor in Star Wars Episode VI, thus bringing balance to The Force, he suffers fatal injuries due to electrocution. His son, Luke Skywalker, then detaches him from the mobile life support system by removing the mask, and Darth Vader's breathing pattern then becomes increasingly shallow; after 53 seconds he slides out of consciousness and dies.

Darth Vader may be considered an example of acute and chronic respiratory failure following severe burns and thermal lung injury, in this case resulting from exposure to volcanic clouds of hot gas and particles, so-called pyroclastic density currents.² The treatment with a whole-body armored suit containing a mobile life support system immediately upon arrival to hospital is evidently maintained over a period of 22 years. Together, the facts that this system supports Darth Vader's breathing both during in- and expiration, that equalization of pressure between the suit and surroundings clearly take place every time the mask is removed, and that his respiratory frequency varies in accordance with his activity level, may indicate that it is an advanced bilevel positive airway pressure (BPAP) system. We thus propose that Darth Vader's chronic respiratory failure involves both obstructive and restrictive elements due to chronic alveolar inflammation, fibrosis, and perhaps thoracic deformities, so that he requires continuous oxygen supplementation as well as positive airway pressures to support his breathing and prevent airway collapse.

From the perspective of the medical community in our part of the universe, life-long BPAP treatment may seem somewhat unconventional. Apart from regional and historical differences in medical practice, this may reflect the priorities of the Emperor: notwithstanding that the BPAP system is used to treat Darth Vader's illness, it is also part of a practical, characteristic whole-body armored suit that concurrently serves to expose Darth Vader as an easily recognizable, archetypical villain that frightens people from rebelling during the Emperor's totalitarian reign. In any event, and although the clinical course and treatment arguably

differ somewhat from that typically encountered in our intensive care unit, Darth Vader provides examples of direct and indirect causes of acute lung injury, and may serve as an alternative and entertaining platform for a plenary discussion with medical students of various aspects of the pathophysiology of acute and chronic lung injury.

References

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