

Anesthesia, Sleep and Death: From Mythology to the Operating Room

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IS SLEEP REALLY THE BEST METAPHOR FOR GENERAL ANESTHESIA?

Sleep is a common metaphor used by anesthesiologists to describe general anesthesia. However, the same sleep-related words may potentially connote one notion to anesthesiologists and a different one to patients. This can lead to misunderstanding or a failure to reassure, like in the following dialogue:

Anesthesiologist: "I will put you to sleep"

Patient: "Yes, but will I wake up?"

This short dialogue summarizes the duality of the metaphor linking sleep and anesthesia. Reading between the lines, the dialogue says:

Anesthesiologist: "I will anesthetize you"

Patient: "Yes, but will I die during the procedure?"

Anxious patients may often express their disguised fear of death before a general anesthetic using the sleep analogy. Sleep and death are terms that are occasionally interrelated in the modern language. If a patient can be put to sleep during a general anesthetic, the same words can be used for a sick animal being put to death to spare it further pain.

A study of Greek mythology reveals that ancient Greeks also wrestled with these concepts, as is shown especially by the legend of Hypnos and Thanatos or the legend of Endymion. The lives and adventures of these personified abstractions were a form of analysis of the relationship between sleep and death. This interrelation is still present in the common language in the form of a metaphor linking sleep and death. This leads inevitably to 1 closely related question: what are the roots of the relationship between sleep, death, and general anesthesia?

HYPNOS AND THANATOS: THE WORRYING SIDE OF SLEEP

In the ancient Greek world, the worrying relationship between sleep and death took the form of an allegory. As early as Homer's *Iliad* and Hesiod's *Theogony*, the 2 gods Hypnos (Sleep) and Thanatos (Death), sons of Nyx (Night)¹ were twin brothers.²⁻⁶ While Hypnos was a benevolent god, Thanatos was merciless and brought misery and sorrow. The twin brothers were commonly represented in vase painting and sculpture as winged deities, namely, as messenger gods. This is why they were commonly associated with Hermes, the god of travel, in representations of death. Thanatos wore a sword to symbolize the cutting off of human life. A common conception was that at the time of death the soul was separated from the body and had to go to the underworld. This was the world of the dead, the realm of Hades. It was the role of Thanatos to convey the soul of the dead to this underworld. They would reach it after crossing the Styx, the river that marked the boundary between the world of the living and the world of the dead, transported by Charon, the ferryman of the Styx.

Interestingly, Hypnos is commonly associated with Thanatos in the transfer of the soul, as is the case for the famous vase painting by Euphronios, now in the Museo Nazionale Etrusco di Villa Giulia, in Rome, representing Thanatos and Hypnos carrying the body of Sarpedon, son of Zeus and one of the heroes of the Trojan War. This raises the question of the reason for this association between Hypnos and Thanatos. Sleep and death of course have in common unresponsiveness and immobility of the body. Death can be envisaged as too prolonged a sleep. In this concept, sleep is a possible transitional state between normal, awake life, and death.

The positive side of sleep is that it overcomes the fatigue of the body and that it brings loss of awareness to the mind. This is why ancient Greek mythology associated Hypnos with the Lethe, the river of forgetfulness, which flowed in Hypnos' underworld cave, where the god spent his time sleeping. The parallel between the underworld realm of Hades, where the Styx flowed, and the underworld cave of Hypnos, where the Lethe flowed, is worth stressing. Indeed, the Lethe or forgetfulness could have a good side but at least in certain concepts, like this of the Pythagoreans, the river was also seen as dangerous, being the opposite of *A-letheia* (*Aletheia* was the personification of Truth). Thus, the Pythagoreans advised the souls of the dead to avoid drinking the waters of the Lethe if they wanted to reach a world that would not be one of perpetual misery and oblivion.

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ENDYMION: THE RESTORATIVE SLEEP

The ancient Greek myth of Endymion was also a way to raise the question of the frontier between sleep and death.⁷ Selene, the Moon goddess (thus, a night goddess), fell in love with the beautiful mortal Endymion, son of Zeus. According to one of the versions of the myth, she convinced Zeus to allow Endymion to live forever, youthful but perpetually asleep, in a cave. There, she would be able to visit him every night. Obviously, this was a way to stress that sleep preserves the body. But Endymion's immobility raises the question of the difference between perpetual sleep and death. Actually, in another version of the myth, Endymion sleeps with his eyes wide open, which might have been an attempt to differentiate perpetual sleep from death. The modern correlate of this would be to say that Endymion was in a coma, halfway between life and death.

Finally, it is worth noting that in antiquity, just like today, death could be conceived as a perpetual sleep. Some funerary inscriptions of the Roman period consider Hypnos a protector of the tomb or a "psychopomp" (a guide of the soul to the land of the dead). Although certain mythological traditions present him as a dangerous deceiver, most consider Hypnos a sweet and benevolent god, who consoles souls. He brings sleep with his wings or with a rod drenched in the water of Lethe, the river of oblivion. He was also sometimes associated with medical deities like Hygeia, daughter of Asklepios, god of medicine. As already noted, Hypnos spent his time asleep, and interestingly, he was said to lie among poppies and other soporific plants.^{8,9}

THE DUALITY OF THE SLEEP METAPHOR RELATED TO MODERN ANESTHESIA

This short summary illustrates the porosity of the frontier between wakefulness, sleep, and death, in ancient mythology. Today, this allegory is no longer an operative tool for analyzing and understanding the nature of the human or physical world. The physiology of natural sleep is better known, and sleep is considered beneficial for health, memory, and the immune system. But interestingly, the metaphor of sleep still permeates the vocabulary of modern anesthesia. Both doctors and patients use it, although with different purposes.

Induction of anesthesia creates a state of reduced responsiveness often described in the common language by anesthesiologists and patients as "sleep." Indeed, natural sleep and hypnosis of general anesthesia share common behavioral characteristics: depression of consciousness, unawareness of environment, amnesia, and immobility. On a neurophysiologic level, sleep and anesthesia-induced unconsciousness also share a similar pattern of "communication breakdown" of the brain. In the same way, sleep-wake pathways could in part mediate onset and offset of general anesthesia. Furthermore, anesthetics could functionally interact with sleep homeostasis in a drug-specific manner and could repay sleep debt after sleep deprivation.¹⁰ Those similarities easily explain why sleep vocabulary is still commonly used to describe general anesthesia. By using the sleep metaphor for general anesthesia, anesthesiologists try to reassure their patients. Indeed, sleep has

a positive connotation and is refreshing, and by nature, it is temporary and reversible. Using the sleep vocabulary, anesthesiologists refer implicitly to a spontaneous awakening. But the patients are often not completely reassured and exhibit their anxiety when they ask, "Will I wake up?" With this question, patients use the same vocabulary as their physician, but refer in a subtle way to the other metaphor, when sleep makes reference to death. If natural sleep has lost its bad reputation, it remains that anesthetic sleep still worries patients; this time for specific reasons linked to distinct physiological characteristics between sleep and anesthesia and to the perception of anesthetic risk.

At the physiological level, sleep has a circadian and homeostatic regulation contrary to anesthesia, which is drug induced. If waking up after sleeping happens spontaneously, return to normal wakefulness after anesthesia depends on the elimination of agents. Whereas natural sleep is easily reversible with sufficient external stimulation, patients are supposed to stay unresponsive to pain during anesthesia.¹¹ Those characteristics are worrying for patients: anesthetic sleep appears to be much deeper than natural sleep, and maybe to share some similarities with death.

Moreover, some objective reasons may have led to this collective fear. Anesthesia is a still young medical discipline, and modern IV anesthetics like barbiturates began to be used in the 1930s. At hypnotic doses, most anesthetics are responsible for apnea and peripheral vasodilation. Without adept ventilatory and hemodynamic support, anesthetized patients would die, in fact. For this reason, in early stages of modern medicine, IV anesthesia was considered a high-risk procedure. A good example of this unpopularity is the greatly exaggerated rumor about thiopentone anesthesia at Pearl Harbor, according to which, "i.v. anaesthesia was the cause of more fatal casualties among the servicemen (...) than were the enemy bombs."¹² In reality, the excess mortality that can be attributed to IV anesthesia was in the order of 4 or 5 cases, because of relative overdosage in patients with hemodynamic shock and inadequate ventilatory support.¹² But mortality directly related to anesthesia was already considered unacceptable and therefore causes much emotion.

Today, improvements in anesthesia safety have made anesthesia-related deaths rare events. This progress is the consequence of improvement in cardiovascular management, airway management, and development of standardized procedures. The risk of death directly related to anesthesia has decreased 10-fold in 20 years to about 1 death in 100,000 anesthetic procedures, despite the increasing baseline risk status of patients and patient complexity.^{13,14} New recommendations are regularly published to improve anesthetic management. So can patients be reassured? Yes, but maybe not entirely. Quite recently, the concept of relative overdosage has reappeared.¹⁵ Some studies have pointed out the possibility of a statistical association between cumulative deep hypnotic time and mortality in the year following surgery.¹⁵⁻¹⁷ This point needs to be further explored, because no causal link has been identified so far. But these studies show that anesthesiologists are still working to "separate the twin brothers" Hypnos and Thanatos. ■

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