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## Further Observations on the Speed of Death in Hanging

**ABSTRACT:** Given that most fatal hangings are suicidal and occur in locations that have been selected to conceal this activity (thus maximizing the chances of a lethal outcome), there has been very little corroboration of the speed with which unconsciousness and death may occur. A 35-year-old male is reported who committed suicide by hanging immediately after talking to his spouse. Police investigations confirmed her reliability as a witness indicating that lethal anoxia in this case had occurred within a very short time (most likely in less than 1 min) of suspension. The speed with which death may result from hanging not only gives an insight into fatal pathophysiological mechanisms, but also provides useful information for situations where a lethal outcome is to be avoided, or is not intended. For example, individuals at risk of suicide who are being monitored in institutional facilities need to be constantly under direct visual surveillance as significant hypoxia can be rapidly induced, parents and caregivers with infants and children in potentially unsafe sleeping environments need to realize how swiftly death or irreversible anoxic brain damage may occur from neck compression, and those who engage in recreational asphyxia should be informed just how quickly a fatal outcome may ensue.

**KEYWORDS:** forensic science, asphyxia, hanging, sudden death

The speed with which death occurs in nonjudicial hanging has been the subject of conjecture, as very few cases have been witnessed. In recent papers suicidal hangings have been filmed providing detailed time courses for individual cases (1,2). The following report provides further support for rapid demise under these circumstances by a witness at a scene.

### Case Report

A 35-year-old male was speaking to his wife immediately before walking into a shed at their home address. He had a history of back injury and depression, and had been expressing suicidal ideas. He had also been drinking alcohol that day. His wife took only "a few steps" toward the house and then followed him into the shed within a minute of their conversation because of her concerns about his mental state. Inside the shed she found him hanging lifeless from a strap that had been previously looped around a rafter and used for other purposes. She managed to cut him down and attempted resuscitation to no avail.

At autopsy a dark red parchmented ligature mark was present around the neck with the point of suspension over the left occiput. Layer dissection of the neck revealed streaky bruising of the lower ends of the sternomastoid muscles bilaterally with focal bruising of adipose tissue around the upper end of the right carotid sheath. There were also fractures of both superior horns of the thyroid cartilage. The hyoid bone was intact and there were no conjunctival or facial petechiae. No other injuries were present and there were no underlying organic diseases present that could have caused or contributed to death. Toxicological analyses revealed a blood alcohol concentration of 0.153% and high, but not lethal, amounts of

the prescribed antidepressant drug, venlafaxine. Death had been rapid due to neck compression from hanging. A full police investigation found the witness to be credible with no evidence of suspicious or unusual circumstances. The case was also the subject of review by pathologists and attending police who confirmed that the described sequence of events by the witness was convincing, and also plausible, particularly given that the strap used for suspension had already been in position.

### Discussion

In reports by Sauvageau and Racette (1), and Yamasaki et al. (2) the details of filmed suicidal hangings were presented. In the paper by Sauvageau and Racette the reported victim lost consciousness at 13 sec, began convulsing at 15 sec, and had cessation of respiration at 2 min. As no report on toxicological analyses was provided, it is not possible to state whether or not there had been any contribution to the lethal episode from prescription or illicit drugs (1). In the second paper the asphyxial process was also rapid, lasting only 2 min 43 sec (2).

Experimental studies on both humans and animals have also indicated that consciousness may be lost quite rapidly when sustained pressure is applied to the neck (3,4). However, there are very few reports corroborating these data in practice. In the current case, a reliable witness reported that the victim had been alone in the shed, where he was found hanging, for a very short time. Death had, therefore, apparently resulted from neck compression soon after the victim entered the building. The role of alcohol and venlafaxine in the terminal episode is difficult to determine, as it is possible that alcohol and certain drugs may contribute to terminal mechanisms and also influence the speed of death or the time taken for loss of consciousness. For this reason toxicological analyses should always be performed in such cases.

The mechanism of death in hanging may be quite complex involving a variety of different processes. Cerebral hypoxia usually results from interruption of blood flow to the brain due to

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arteriovenous occlusion and does not require airway obstruction (5). In fact, it has been estimated that it requires 3 and 7.5 times the amount of pressure to occlude the trachea compared to the carotid artery and jugular vein, respectively (6). This has been recognized for many years, with Taylor noting in the mid-nineteenth century that airway obstruction is not required in fatal hanging, and that death may result from compression of the great vessels in the neck (7). The recording of noisy “wheezing” respiration in Sauvageau and Racette’s case would be in keeping with continued airway patency (1).

Airway obstruction may occur from direct tracheal compression or from lifting of the tongue and surrounding soft tissues upward into the oropharynx. The typical finding in a hanging death of protrusion of the tip of the tongue from the mouth with parchenting from drying results from this cephalad displacement. Another possible lethal mechanism is significant bradycardia from compression of the carotid sinus, and this may occur in both hanging and strangulation. Whether padding of the neck influences the speed of development of hypoxia is unclear, however in a typical case it is possible that death results from a combination of all of these factors. In long-drop hangings far greater soft tissue and bone trauma may be found, ranging from fracture-dislocation of the odontoid peg in judicial executions to decapitation (8).

Individuals who suffer significant cerebral hypoxia from neck compression pass through several stages beginning with dyspnea, followed by loss of consciousness with occasional gasping, and then convulsions with loss of bowel and bladder control. Finally there is complete cessation of respiration with irreversible hypoxic brain damage. During this stage there may still be intermittent cardiac activity and muscle movement for some minutes. Decorticate and decerebrate rigidity both occur with limb flexion and extension (1,2). The time taken for each of these phases is quite variable and is influenced by a number of factors, including the victim’s age, presence of drugs and/or alcohol, health status (including pre-existing natural disease), and the type of neck compression and degree of respiratory compromise (9). Unfortunately the pathological manifestations of asphyxia are not pathognomonic with the “classical” findings of cyanosis, facial congestion, petechiae, fluid blood, and right heart engorgement now being referred to as an “obsolete diagnostic quintet” (5,10).

In addition to helping to elucidate the nature of the terminal stages of hanging, the significance of these case studies lies in the fact that they provide practical evidence for the rapidity with which lethal asphyxia can occur. While this may be recognized by many in forensic pathology practice, and has been cited in textbooks, these observations are often anecdotal and unreferenced as there is a paucity of “direct, unbiased evidence” in this area (9). Because of this it has been suggested that “it is difficult to estimate the additional period of time before death” (11).

An understanding of the potential rapidity of death from hanging is also not often widely appreciated by others, in particular those who are responsible for the care of individuals in custody, parents and caregivers looking after infants and children who may be in potentially dangerous environments, and those who engage in recreational asphyxia. For example when “suicide watches” are being carried out in institutions, such as prisons, not only is removal of all possible materials that could be used as ligatures required, but

constant monitoring of at risk individuals is necessary, given the speed with which irreversible cerebral hypoxia can be induced. These cases also demonstrate to parents and caregivers who may be looking after infants and children in potentially unsafe sleeping environments (12), how rapidly death may occur from neck compression, for example from a curtain cord adjacent to a cot. The findings also serve as a warning to those who engage in recreational asphyxia, as excessive neck pressure for a quite short period of time may cause loss of consciousness with dire results. This would also explain why individuals have died before they can extricate themselves from situations that initially appear to be not all that dangerous, such as low-suspension hanging from ligatures looped over the top of doors (13). Dissemination of information, such as this from the mortuary, is an example of how “preventative pathology” may make forensic practice more relevant in a wider context (14).

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