



Pathology Biology Section – 2011

G68 Study of Lethal and Non-Lethal Filmed Hangings: New Insight Into the Pathophysiology of Hanging

Anny Sauvageau, MD*, Office of the Chief Medical Examiner, 7007 - 116 Street, Edmonton, AB T6H 5R8, CANADA

After attending this presentation, attendees will have a better understanding of the pathophysiology of hanging, of the effect of the type of suspension and ischemic habituation on the agonal sequence, and on the appropriate scientific answer to the time to die by hanging.

This presentation will impact the forensic science community by providing new insight into the pathophysiology of hanging, based on the ongoing study of the working group on human asphyxia.

Introduction: Contemporary understanding of the pathophysiology of hanging is still largely based on old writings and experimentation from the end of the 19th century and beginning of the 20th. Apart from a few animal studies that gave very limited information on the pathophysiology of hanging in human, there was little new development on this issue until the creation of the Working Group on Human Asphyxia in 2006. Here presented are the newest results from this ongoing study.

Material and Methods: Fourteen lethal filmed hangings (nine autoerotic accidents, four suicides, and one homicide) were analyzed, as well as three non-lethal filmed hangings by an autoerotic asphyxia practitioner.

Results and Discussion: *Lethal filmed hangings:* In the fourteen lethal filmed hangings, the following sequence of agonal responses was observed: rapid loss of consciousness in $10 \text{ s} \pm 3 \text{ s}$, mild generalized convulsions in $14 \text{ s} \pm 3 \text{ s}$, decerebrate rigidity in $19 \text{ s} \pm 5 \text{ s}$, beginning of deep rhythmic abdominal respiratory movements in $19 \text{ s} \pm 5 \text{ s}$, decorticate rigidity in $38 \text{ s} \pm 15 \text{ s}$, loss of muscle tone in $1 \text{ min } 17 \text{ s} \pm 25 \text{ s}$, end of deep abdominal respiratory movements in $1 \text{ min } 51 \text{ s} \pm 30 \text{ s}$, and last muscle movement in $4 \text{ min } 12 \text{ s} \pm 2 \text{ min } 29 \text{ s}$.

Effect of the type of suspension: A comparison of time delay for agonal responses in complete suspension and incomplete suspension do not reveal impressive differences. These results suggest that the type of suspension may not be an important factor in the timing of agonal responses and therefore in the time to irreversible damage and death.

Effect of ischemic habituation: Considering that autoerotic practitioners might develop over time a certain ischemic habituation over time, it is theoretically possible that these cases present a deceleration of the sequence. On the other hand, since they often play for a longer period with the hanging process before the final hanging, it could be argue that on the contrary, their hanging sequence will be accelerated. Overall, the time delays for the early responses to hanging seem to be relatively similar between both groups, with the exception of an accelerated start of deep abdominal respiratory movements in the autoerotic practitioners. As for the late responses to hanging, they seem to be decelerated in autoerotic practitioners.

Non-lethal filmed hangings: In the three non-lethal filmed hangings, a loss of consciousness was observed in 8 to 16 seconds, followed by convulsions in 9 to 26 seconds. Decerebration rigidity was observed in one non-lethal filmed hanging (at 20 seconds). The ligature, which was not tied tightly to the shower rod, then detached from it, causing the fall of the man and the interruption of the hanging. Upon interruption of the hanging, the man quickly regained consciousness and seemed to present a full recovery without any noticeable symptoms.

Estimation of the time to irreversibility and to die by hanging: The scientific basis for the generalized assumption that death by hanging occur in three to five minutes will be reviewed. There is no forensic study to sustain this estimate of five minutes to die. In fact, this number seems to be based on three types of studies: a series of near-hanging victims in emergency medicine, studies of carotid endarterectomy, and physiopathological studies of brain ischemia. Though this estimation of the time is certainly precise and accurate enough for the needs of clinicians, it will be demonstrated that scientific evidence are not strong enough to be used in court. So how long does it take to suffer irreversible damage by hanging or by strangulation? The only honest and scientifically valid answer is not known.

Asphyxia, Hanging, Pathophysiology