



### **G86 Causes of Death in Hanging: A Review of Physiopathological Hypotheses From 1970 to 2010**

*Renaud Clement, MD\*, 1 Rue Gaston Veil, Nantes, FRANCE; and Lelie Meresse, MD, Chu de Nantes 1 Rue Gaston Veil, Nantes, FRANCE*

After attending this presentation, attendees will understand some principles of hanging physiopathological theories.

This presentation will impact the forensic science community by the fact that hanging knowledges are based on historic experimentations and few clinical observations

Filmed hangings have been used as a powerful tool in understanding the pathophysiology of human asphyxia. Before these new developments, most of our contemporary body of knowledge was in fact based on old writings from the end of the 19<sup>th</sup>-century and beginning of the 20<sup>th</sup>-century. In the present communication, the literature from 1970 to 2010 will be reviewed. It is important to understand the origin of our current theories and the models that were used to develop them and to inquire as to their validity. The exact mechanism of death has yet to be elucidated. For this study, medicolegal textbooks written in English and French were reviewed. The reading focused on the pathophysiological hypothesis accepted or rejected by contemporary authors: occlusion of the trachea, occlusion of vessels, and pneumogastric nerve stimulation. Experiments supporting the this studies positions were compiled, as well as their clinical observations. Thirteen medicolegal textbooks with a specific chapter of hanging were eligible. For each author, the principal mechanism of hanging death proceed to vascular occlusion. They base their positions on historic experimentations performed by Brouardel, Hofmann, and Minovici (for example). Polson and Di Maio reported their own observations to implicate vascular occlusion leading to death in hanging. Respiratory asphyxia could be mixed in as a possible mechanism of death, but it plays a minor role for all authors. Cardiac inhibition caused by the stimulation of pericarotid nerves during hanging is a theory that is accepted by seven authors as a possible cause of death. One author suspects this mechanism as a contributive role of death and five reject it. Nine authors provide a clinical description of hanging, and describe the loss of consciousness, convulsions, and apparent death. The onset of the loss of consciousness occurs earlier than 10 seconds. For all authors, the delay to convulsions is evocated without precision. The time of apparent death varied from three to five and ten to twenty minutes. The timing of three phases is not well estimated by authors. The description of convulsions and respiratory movements are lacking in evidence in all medicolegal textbooks. This historical review supports the fundamental scientific principle that just because a theory is accepted does not guarantee that it reflects the truth. In hanging deaths, respiratory asphyxia by occlusion of the airway was considered the principal cause of death for several decades before the theories of vascular occlusion and cardiac inhibition were gradually accepted. Current studies being carried out on filmed suicidal and autoerotic hangings demonstrate that respiratory obstruction is not the primary pathophysiologic phenomenon leading to death. Despite a long history of being investigated, the pathophysiology of hanging still needs to be revisited and studied in the 21<sup>st</sup>-century.

**Hanging, Respiratory Asphyxia, Occlusion of Neck**