



## E40 Hanging Games: An Unusual Case of Accidental Hanging in a Child

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**Learning Overview:** The goal of this presentation is to show that in cases of hanging, immunohistochemical markers should be used in order to reach the diagnosis of vitality of the ligature marked skin.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by showing a rare case of accidental hanging of children and the use of new immunohistochemical markers to determine the vitality of the ligature mark.

Hanging is a form of ligature strangulation in which the force applied to the neck is derived from the gravitational forces of the body or a part of the body. Accidental hanging in childhood, although rare, has been reported worldwide. Hanging is an important cause of homicidal and suicidal damage in adults, but in children, it is usually accidental. According to available data, strangulation ranks fourth for causes of accidental deaths in children, following roadside accidents, drowning, and burns.

Some studies have shown that 80% of deaths by accidental hanging involved children under ten years old. The most common tools associated with these accidents are clothes or personal items, while young children explore the environment, unconscious of potential dangers. In cases of accidental hanging, it is more common to find an incomplete hanging; that is, when a part of the body is in contact with the ground. From the external examination, it is possible to identify the vitality characteristics of the ligature mark, such as small petechiae, serous vesicles, and hemorrhagic crests. During the autopsy, the hemorrhagic infiltration of the subcutaneous tissue and the neck muscles could be evident.

This case concerns a 9-year-old boy who was found hanged in the garage of his country house, partially suspended with the handle of a sack around his neck. According to the circumstantial data, the local prosecutor called the forensic team to investigate the crime scene in the suspect of *culpa in vigilando* of his parents. Indeed, the child was found unconscious, with his head in the handle of the sack, by his brother. The latter called their mother, who moved the son from the handle to try to resuscitate him, uselessly. During the crime scene investigation, the aforementioned sack was examined. This sack was on a wooden platform and had four blue jute handles. The handle where the mother found the child, according to the police data, was a distant 104cm from the upper edge of the platform below the sack. The platform had a height of 12.5cm.

The body of the boy was found in a sitting position, with the legs touching the ground. The child was 136cm tall. Ligature marks encircling the neck with bruises were described at the external examination. Other injuries were not present on the corpse, and only subconjunctival petechiae were described. Traumatic injuries were excluded after external examination and Computed Tomography (CT) scan investigation. The autopsy showed diffuse hemorrhagic infiltration of the neck muscles, pleural and pericardial petechiae, and marked pulmonary emphysema. No fractures of the hyoid bone or laryngeal cartilages were found. A routine histopathological study was performed using Hematoxylin-Eosin (H&E) staining. The microscopic observation of the brain specimens showed the presence of vasogenic and cytogenic edema; the lung specimens demonstrated massive endo-alveolar edema. The histological analysis of other organs was unremarkable. The skin specimens from the ligature mark presented the formation of intra-epidermal mild leukocytes reactions. Also, immunohistochemical investigation of skin samples was performed using antibodies anti-tryptase, fibronectin, TNFalpha, IL-6, IL-8, IL-10, MCP-1, IL15, IL1beta, CD45, CD4, CD3, CD8, CD68, CD20, CD15, and Langerhans cells to confirm the vitality of reactions in the ligature mark. The police investigation was oriented to an escape of the child from the house to the garage, probably for a joke. The prosecutor complied with this theory, supported by the forensic evidence of a rapid death by asphyxiation, and declared the parents innocent.

### Accidental Hanging, Ligature Mark, Immunohistochemical Markers