



H13 IL-15, CD-15, and Tryptase as Markers of Wound Vitality in Compressed Neck Skin: When Conventional Macroscopic and Histological Findings Fail

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Learning Overview: The goal of this presentation is to expose two cases of hanging suicide in which autopsy and conventional histology were not conclusive in determining the vitality of the ligature mark by analyzing and drawing attention to the use of an immunohistochemical investigation, especially regarding IL-15, CD-15, and tryptase.

Impact on the Forensic Science Community: Though most hangings are suicide, homicide and subsequent hanging of the victim are described. This presentation will impact the forensic science community by presenting two cases in which autopsy and conventional histology were not conclusive in determining the vitality of the ligature marks, while immunohistochemistry techniques provided a substantial contribution to the ligature marks vitality estimation.

In forensic practice, it is necessary to distinguish between hanging and simulated hanging. To differentiate between these two occurrences, forensic pathologists have to distinguish antemortem from postmortem ligature marks. Conventional macroscopic and histologic findings may be unreliable; this particularly applies to soft ligature marks, where vital tissue reaction signs are often deficient or absent. Hemorrhagic infiltration is typically considered to be evidence of vital reaction, but Red Blood Cell (RBC) extravasation can also occur after circulatory arrest. The presence of inflammatory cells is the only solid standard histologic finding indicating antemortem origin, and immunohistochemistry is the method of choice to help assess for this in forensic pathology.

Two cases of hanging are presented herein in which the macroscopic findings and conventional histology were not sufficient to enable discrimination between antemortem versus postmortem ligature marks.

Case 1: A 29-year-old man was found hanging partially suspended by trousers tied to the bars of the armored door of his cell on the same night he was incarcerated. His cellmate declared that he had not noticed anything. Crime scene investigation was conducted with the presence of the forensic pathologist; there was a small skin abrasion of the left side of the neck (i.e., a barely defined ligature mark only on the left side of the neck). Simulated hanging was suspected. Autopsy external examination revealed conjunctival petechial hemorrhages. Two parched skin abrasions were observed in the frontal and lumbar regions; others skin abrasions were detected on the hands. Internal examination of the neck showed small hemorrhages of both thyrohyoid muscles and of the thyroid cartilage. No fractures were found. Histologic hematoxylin- and eosin-stained sections showed scant erythrocytes in the subcutaneous tissues of the left site of the neck; no others evidence of vital reaction was noted. In order to thoroughly evaluate the case, immunohistochemical investigation of neck skin samples was performed utilizing antibodies against IL-15, CD-15, and tryptase. A positive reaction was achieved for all the antibodies used. The results of the forensic examination, together with immunohistochemical investigation, confirmed the vitality of the skin wound reaction. The cause of death was certified as mechanical asphyxia due to suicidal hanging.

Case 2: A 61-year-old man was found hanging by two belts attached to a shower box. The ligature was removed by his brother, who called the police. The autopsy was performed the next day. Two ligature marks, horizontally oriented, were present above the level of thyroid cartilage. There were no petechial hemorrhages. Dissection of the neck showed only limited extravasation of blood in the suprahyoid muscles. The laryngo-hyoid apparatus was intact. Histologic examination of the skin of the ligature furrow did not show the presence of erythrocytes in the tissues, so immunohistochemical studies were performed utilizing antibodies against tryptase and IL-15. Positive staining was observed in the sample, confirming a vital tissue reaction within the ligature mark. The death was attributed to suicidal hanging.

Presented here are two cases in which autopsy and conventional histology were inconclusive in determining the vitality of ligature marks, but immunohistochemistry provided substantial contribution to wound vitality estimation. Tryptase, IL-15, and CD15 can prove to be useful and reliable forensic studies for determining vital tissue reaction in ligature marks.

Hanging, Vitality, Immunohistochemistry