H111 The Value of Craniocervical Magnetic Resonance Imaging (MRI) Following Non-Fatal Strangulation

Jakob Heimer, MD, Universitat Zurich, Zuerich CH-8057, SWITZERLAND; Carlo Tappero, Institute of Forensic Medicine, Zurich, SWITZERLAND; Dominic Gascho, Universitat Zurich, Zurich CH-8057, SWITZERLAND; Patricia Flach, PD, Kantonsspital St. Gallen, St. Gallen, SWITZERLAND; Thomas Ruder, PD, Northland District Health Board, Whangarei, NEW ZEALAND; Michael Thali, MD, Universitat Zurich, Zurich CH-8057, SWITZERLAND; Sabine Franckenberg, MD, Diagnostic and Interventional Radiology, Zurich 8091, SWITZERLAND*

Learning Overview: After attending this presentation, attendees will be updated on the current state of magnetic resonance imaging following non-fatal strangulation.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by allowing a well-founded idea of when MRI following non-fatal strangulation is worth logistic and financial efforts.

Introduction: Manual strangulation is a form of assault frequently encountered in the context of domestic violence targeted against women. Manual strangulation results in a wide range of health impairments, including death. At the same time, external findings are often absent or scarce. To reveal possible internal injuries not observable in external documentation, MRI was introduced to the forensic examination of strangulation survivors a decade ago. Both Yen et al. and Christe et al. described various findings related to the assault, and suggested MRI to be a worthwhile asset in the medicolegal investigation.[1,2] The University of Zurich has offered MRI to every victim of manual strangulation since 2011. Based on a database of 114 completed MRI examinations at the time, this study present results on the value of craniocervical MRI following manual strangulation.

Methodology: All cases were routinely examined including a full documentation of case history and photographic documentation of external findings. Cases were then invited to undergo craniocervical MRI and were issued a gratification card for free transport to the clinical examination center. MRI was conducted as fast as possible with dedicated sequences. Radiologic images were evaluated by a clinical radiologist and a forensic radiologist. Case data was grouped into external findings (hematoma, abrasions, swelling), subjective findings (localized pain, difficulty swallowing and/or breathing, loss of urine and/or feces, loss of consciousness) and MRI findings (sub-cutaneous, intramuscular, and peri-laryngeal fluid accumulations, lymph node hemorrhage).

Results: The case group consisted of 94 women and 24 men with a mean age of 32.5 years. The most prevalent methods of attack were both-handed (41.1%) and one-handed (41.2%), followed by chokeholds (12.3%), and manual ligature strangulation (4.4%). More men than women were victims of chokeholds. Visible external findings were present in 106 (93%) cases. Subjective findings were reported by 95 cases (83.3%). MRI yielded positive findings in 49 (43%) cases, with a total number of 75 radiologic findings. In 7 cases, MRI was positive while no external findings were delimitable. MRI findings of (peri-)laryngeal structures were significantly associated with reported difficulty swallowing and chokeholds. In only one case did cranial MRI yield a positive result, but an association with the assault could not be safely established.

Discussion: The additional value of craniocervical MRI in victims of non-fatal strangulation is limited to victims of severe attacks and reported subjective symptoms, when no or few external findings are delimitable. For a low sensitivity-reproduction of superficial fluid accumulations, logistical and financial efforts of MRI appear not to be justified. The stark contrast to the number of findings of previous studies calls for a common definition and standardization of radiological findings. The acquisition of cranial MRI is not feasible, unless it is routinely indicated by the presence of neurological symptoms.

Reference(s):

1. Yen, Kathrin et al. Clinical Forensic Radiology in Strangulation Victims: Forensic Expertise Based on Magnetic Resonance Imaging (MRI) Findings. *International Journal of Legal Medicine* 121.2 (2007): 115-123.
2. Christe, Andreas et al. Life-threatening Versus Non-Life-Threatening Manual Strangulation: Are There Appropriate Criteria for MR Imaging of the Neck?" *European Radiology* 19.8 (2009): 1882-1889.

Domestic Violence, Strangulation, Magnetic Resonance Imaging