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Title: Perimortem skeletal sharp force trauma on postmortem CTs

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### Abstract

The study of skeletal sharp force lesions is an important step of a forensic anthropological analysis. However, most forensic literature on traumatic lesions focuses on injuries detected on soft-tissue. The links between the type and location of violent skeletal lesions, and skeletal injury patterns are not well explored.

Here we address this topic by presenting a tomographic study of sharp force lesions in an identified forensic sample. Our study includes 41 cases of fatal sharp force trauma from the database of the Institute of Forensic Medicine (IRM) in Bern. For each individual we: 1) studied the available postmortem CT data and evaluated the reliability of CT data in revealing these lesions by means of intra- and interobserver agreement tests; 2) explored the possible association between manner of death (suicide vs. homicide) and other parameters (sex, age-at-death, presence and number of injuries and affected anatomical regions).

Agreement ranged between moderate and perfect (Cohen's kappa values between 0.474 and 1). Only 11.4% of sharp force injuries penetrated to the bone, differing between the manners of death (3% in suicides, 15.3% in homicides). Bone lesions were most frequent on the thorax (59.2%), head and neck region (38%) and upper extremities (2.8%). No bone lesions were visible on the abdomen and the lower extremities. Self-inflicted bone lesions were found exclusively on the thorax, while soft-tissue injuries were most frequent on the head and neck. A statistically significant association linked manner of death with age-at-death and number of injuries.

Our data are relevant for studies attempting to reconstruct violent interactions from skeletal remains in any context featuring sharp force trauma (forensic, bioarchaeological or genocide). Since only 11.4% of sharp force trauma leave traces on the skeleton, investigators need to be aware of the deriving bias.