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Title: Perimortem skeletal sharp force trauma on postmortem CTs

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While ethical discussions about identified human bone collections are on the rise, digital skeletal repositories are of increasing importance in forensics. In addition, there is a global trend within anthropology towards anonymized open access radiological databases. However, the validation of osteological methods on the virtual modality is essential. The paucity of research in this area has led us to analyze the usefulness of CT data in conjunction with skeletal sharp force lesions. Furthermore, little data exists so far on the association between soft- and hard-tissue lesions caused by sharp force, on anatomical injury patterns and on the overall rate of sharp force lesions penetrating to the bone.

We collected 41 cases of fatal sharp force trauma from the IRM Bern database and analyzed the pertaining postmortem CT (PMCT) on 2D and 3D, and carried out intra- and interobserver, as well as intermodality agreement tests. We investigated possible correlations between the manner of death (suicide/homicide) and various parameters (sex, age-at-death, presence and number of injuries and affected anatomical regions).

All agreement tests (intra- and interobserver, as well as intermodality) resulted in Cohen's kappa (κ-) values between 0.474 and 1 (moderate to perfect). We found that only 11.4% of all sharp force injuries in our sample penetrated to the bone, differing between the manners of death (3% in suicides, 15.3% in homicides). Overall, bone lesions were most frequent on the thorax. We obtained significant results (P-value <0.05) for the manner of death correlating with age-at-death, and with the number of soft- and hard-tissue injuries.

The insight gained from PMCT is mutually beneficial for all disciplines involved in forensic cases, stressing the added value of collaboration.