A135 Identification of Peri-Mortem Cranial Trauma After Cremation: How Easy Is It?

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After attending this presentation, attendees will have learned how much of a cranial peri-mortem fracture really survives after cremation and where the pitfalls in distinguishing it from a heat-related fracture may be.

This presentation will impact the forensic science community by demonstrating how traumatic fractures survive cremation, how they may change, and how they may differ from heat-related fractures even after the cremation process through the analysis of 32 cadavers subjected to autopsy, then cremated.

Twenty male and 12 female cadavers between 22 and 90 years of age, were followed and analyzed from the autopsy room to the crematorium. The mean age of the male sample was 58.6 years and of the female sample was 65.9 years. All subject died of head trauma: 30% from traffic accidents; 52% from falls from a height; and, 18% from gunshot injuries. This study focused only on the skull. The advantages of this study were the standardization of all the samples due to the fixed oven temperature and time of cremation (1,200°C for 90 minutes), known demographic (age, sex, weight, and height), clinical information, availability of detailed autopsy reports (injuries and cause of death), and photographs.

Moreover, both during the autopsy and after the cremation, photos of the bone fragments and their edges were accurately taken from different angles with a metric reference. In each case, all fragments were counted both during autopsy (from zero to 25 fragments, with a mean of 6) and after the cremation (from 44 to 106 fragments, with a mean of 78). After a recomposition of the skull fragments according to the bone of origin (parietal, frontal, etc.), the fracture visible at the autopsy, which had been photographed, was searched for among the burned fragments. If the original fracture could not be found, it was classified as "a;" if it could be recognized but had been greatly altered, it was classified as "b;" if it was found to be superimposable in its shape, it was classified as "c."

Results showed that only 20.8% of peri-mortem fractures were of type "c" (i.e., recognizable and of the same shape); 25% were of type "b," and 54.2% were classified as "a." One interesting finding was that if beveling due to the trauma was present during autopsy, it preserved its general shape even after the cremation but was smoother at the edges. As already reported in literature, saw marks were always clearly visible, confirming that the saw action on the bone is demonstrable even after the cremation at extreme temperatures. It also seems that fire-induced fractures generally produce straight, sharp, and acute angles at fracture edges whereas pre-existing traumatic fractures are modeled by fire, creating generally smoother and rounder edges.

In conclusion, this study has shown that in more than half of the cases, the original peri-mortem fracture could no longer be seen. Where the fracture can be detected, in 25% of the cases it is visible but severely altered, and in the remaining cases it is very similar in shape but not superimposable since the margins are rounder and smoother.

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