H34 The Contextual Nature of "Excessive Force": Alcohol-Induced Osteopenia, Fracture Prevalence, and Healing Rates Among In-Custody and Homicide Deaths From the Harris County Medical Examiner's Office

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After attending this presentation, attendees will better understand the mechanism by which alcohol affects bones, and what those effects are. In addition, they will understand the impact of alcohol-induced bone disease on fracture incidence rates in a medico-legal setting.

This presentation will impact the forensic science community by reviewing the consequence of chronic ethanolism on bone health, and non-destructive techniques by which bone quality can be assessed.

The effect of chronic ethanolism on the skeleton is well documented in the medical literature. Although the exact mechanism is unknown, excessive amounts of alcohol appear to inhibit the bone building capabilities of osteoblasts, leading to a noticeable decrease in bone density and a concomitant decrease in the mechanical strength of bone. Published rates of alcohol induced bone disease among chronic ethanol users vary from 25-100%, depending upon the type and size of the study. Comorbidity factors such as liver disease, smoking and malnutrition exacerbate this loss in bone capability, but are not uniformly present. This decrease in bone density and altered mechanical properties, including reduced load capabilities, increases fracture prevalence among chronic ethanol users, especially those diagnosed with clinical grade osteopenia and osteoporosis. The inhibition of osteoblast activity will also affect the healing rates of the fractured bones in the form of delayed union and non-unions. Chronic ethanol users with bone fractures may require increased time for healing, altering the rate at which the characteristic markers such as sub-periosteal bone deposition and callus formation will appear.

Four cases of in-custody or unlawful death examined by the Harris County Medical Examiner's Office in Houston, Texas are presented as examples of increased fracture incidence rates due to osteopenia among alcoholic individuals. These four cases consist of three men and one woman, all 50 years of age or older, with a known history of long-term excessive alcohol consumption. Each individual suffered multiple fractures, and the cause and manner of death is classified as blunt force trauma and homicide for each case. In addition, one of the individuals suffered fractures several weeks before death occurred, allowing some degree of healing to take place.

Using radiographs and physical examination, the ribs from these four individuals are compared with individuals whose bone quality appears in the normal range (control group). The control group includes three individuals (2 males and 1 female, all 50 years of age or older) who have no known history of alcohol abuse. The weight, cortical bone quality, and trabecular bone density was assessed in each rib. Ribs were selected due to their availability and propensity to fracture in cases of interpersonal violence.

The difference in weight, cortical quality, and trabecular density was remarkable between the chronic ethanol users and the control group. The ribs taken from the ethanol group are lighter in weight and have an almost translucent quality to them. The trabecular bone located in the rib head and neck area is notably decreased in the ethanol group when compared to the control group. In the case of the individual with antemortem fractures, the degree of bone repair visible on the ribs was also less than is expected from the reported interval between injury and death.

The results of the study show that there is a qualitative difference between the bone strength of individuals with a history of chronic ethanolism, and individuals lacking such a history. The standard police procedures for controlling individuals who are resisting arrest or proving a danger to themselves and others may therefore, in ethanol abusers, cause a greater number of fractures and can lead to the death of the individual. This has prompted a reexamination of the concept of "excessive force" for individuals with known histories of alcohol abuse. In cases such as these, a proper evaluation by a physical anthropologist of the bone quality of the decedent will prove invaluable in determining whether or not excessive force was used to cause the injuries that may have led to the death of the individual, or if the injury was related to severely compromised bone quality. Bone quality and history of drinking should also be considered if the timing of antemortem fractures is of importance in a case involving a known alcoholic.

Alcoholism, Osteopenia, Fracture Incidence

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