



G27 The Contrecoup Phenomenon: Do Classical Concepts Trump Witness Accounts?

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After attending this presentation, attendees will be able to: (1) describe major biomechanical theories attempting to explain the contrecoup phenomenon; (2) predict likely sites of cerebral contusion in blunt head trauma as a function of the biomechanics of the injury and physical properties of the brain and skull; (3) summarize relevant literature of the reliability of witness accounts; and, (4) stratify likely head trauma scenarios in a case as a function of witness accounts versus knowledge of the contrecoup phenomenon.

This presentation will impact the forensic science community by discussing how the forensic pathologist is often called upon to interpret head trauma as a function of biomechanics, and speculate on relative likelihood of different scenarios, based on the anatomical findings. To the extent that witness accounts may contradict more likely scenarios based on those anatomical findings, it is important for the forensic pathologist to be able to weigh the reliability of both the anatomic findings and that of witness accounts. The two cases presented highlight this controversy, as the biomechanics of the contrecoup phenomenon are discussed in parallel with literature addressing witness account reliability.

It has long been recognized that cerebral contusions tend to occur opposite the point of impact after a fall. Orbitofrontal and inferior temporal contusions, in particular, often result from a fall on the back of the head. This empirical fact has led to complex theories involving the physical properties of the brain and cerebrospinal fluid, angular acceleration, and the elaboration of shearing forces to account for this so-called contrecoup phenomenon, a subject which continues to be debated. Nevertheless, the forensic pathologist is left with the practical implications of such a lesion and is occasionally called upon to offer an opinion about the nature of an injury that may assist law enforcement officials to piece together crimes and even assign culpability to one individual or another.

Here, two cases of individuals who died as a result of bar fights are presented. In the first case, several witnesses noted that, during the course of an altercation, a 42-year-old man suffered a severe blow to the face, and fell, hitting the back of his head. He immediately lost consciousness, went into cardiorespiratory arrest and was pronounced dead on arrival to an emergency department. At autopsy, he had a severe anterior frontal contusion, bilateral subdural hemorrhage, generalized brain swelling, central herniation, and cerebellar tonsillar herniation.

In the second case, a 30-year-old man was followed from a bar by several individuals who collectively attacked the man with a series of punches and kicks, according to witnesses. At least one of the assailants was also wielding a baton. Importantly, none of the witnesses to the attack noted a fall on the back of the head. The victim arrested at the scene and resuscitation attempts were unsuccessful, and he was pronounced dead on arrival at a nearby emergency department. Despite the reported events, at autopsy, he had a linear skull fracture centered on the right occipital region extending to the skull base, indicating some type of impact to the back of the head. Examination of the brain revealed a large anterior frontal contusion with cerebral swelling, central herniation, and cerebellar tonsillar herniation. The combination of impact injury to the back of the head with a large frontal contusion indicates a contrecoup-type injury. Furthermore, no significant soft tissue injury to the face or forehead was present, making a coup-type injury a less likely cause.

These two contrasting cases raise the issue of the contrecoup phenomena, particularly the reliability of general understanding of the contrecoup phenomenon versus witness accounts. Studies evaluating the accuracy of witness accounts have shown a large variability in the reproducibility and accuracy of recounted events. Details pertaining to physical characteristics and action sequences are commonly evaluated and are more frequently erroneous, despite other aspects of the account remaining reproducible over time. Ultimately, it is concluded that angular acceleration of the brain accompanied by blunt, and essentially, instantaneous impact occurred in both cases. Moreover, a blow to the occipital region of a stationary head is unlikely to account for a large frontal contusion, thereby emphasizing the mechanism of contrecoup injury over witness reports.

Contrecoup, Contusion, Witness