



### H135 Determining the Difference Between Blunt and Sharp Force Traumas in Human Head Hair

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After attending this presentation, attendees will understand how hair can be utilized as a reconstructive tool at crime scenes to assist in narrowing the cause of death when the victim's body cannot be found.

This presentation will impact the forensic science community by creating standards for microscopic hair analysis, thus allowing cases to be solved more efficiently with the use of hair as evidence.

Hair has been proven to be a useful specimen for evaluating past drug use and in distinguishing between animals and humans via the measurement of the medulla.<sup>1</sup> In addition, numerous studies have been published on traumatic deaths of the sharp and blunt force varieties. In sharp force trauma, homicides and suicides are the most common cause of death from stabbing or cutting inflictions.<sup>2</sup> On the other hand, blunt force trauma involves direct and indirect stress propagations that are typical of car accidents or beatings.<sup>3</sup> Recently, research was completed to show that patterns are exhibited in the hair post-trauma; however, this study was unable to define specific characteristics and was unable to link statistics to this pattern-based analysis.<sup>4</sup>

During this research, trauma recreation was completed for both sharp and blunt force trauma with the use of varying weapons on hair in attempt to define traits that are unique to each type of trauma. Statistics can then be applied to provide measures of consistency and repeatability of this experiment. Each hair was photographed and evaluated under crossed polars before and after recreation with a photomicrograph. One strand of hair was then taped onto a wooden circular post meant to mimic a human skull.<sup>5</sup> Cuts were inflicted for sharp force with the following weapons: a box cutter, glass, serrated and non-serrated knives, scissors, and flathead and Phillips-head screwdrivers. Blows were administered for blunt force trauma with a metal baseball bat, a crowbar, a hammer, a hollow copper pipe, a metal pipe, jagged and smooth rocks, and a piece of wood. Based on the makeup of these weapons, it was expected that sharp force implements would leave behind a smooth straight pattern, while blunt force weapons would exhibit a jagged pattern due to a more forceful blow needed to break the hair. This was completed for the three common race categories of hair studied in forensic science (Caucasoid, Mongoloid, and Negroid) to evaluate the similarities and differences in the trauma patterns both across and within races.

Based on the 90 hairs evaluated to date, a majority of sharp force cuts exhibited smooth characteristics with the exception of the serrated knife, which appeared as jagged due to the uneven cutting edge of the knife. The blunt force weapons exhibited much more variability, with most being smooth or a combination of smooth and jagged. The screwdrivers displayed the most combination of traits, which is not surprising as they have both a sharp edge for cutting and a blunt force component due to compression. Additionally, damage was only evident away from the break in blunt force trauma, which provides an important method to differentiate between the two traumas. Further, when damage was present, color changes under the polarized light microscope were sparse. Comparison across trials of the same race showed much more consistency within the same weapon for Negroid and Mongoloid compared to Caucasoid.

Future research will attempt to study the influences hair dyes, shampoos, and age may have on breakage characteristics. Furthermore, hair samples will be acquired from actual traumatic fatalities to compare to the above recreations, then blind samples will be given to volunteers to determine if they can differentiate sharp and blunt force trauma via the established pattern types.

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#### Hair, Trauma, Pattern Analysis