

# Capturing the Salient Issues in Forensic Biomechanics Analyses

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## Editorial

A common experience among biomechanics experts is receiving a call from an attorney who has made an assessment of what s-he regards as the important expert issue(s) in a case and how biomechanics will strengthen the case. In civil plaintiff's work, we many times get a call from the attorney because an opposing biomechanics or related field expert has been already retained by the defense. In civil defense work, we typically receive the call first and the attorney would like a biomechanics analysis to examine a match or mismatch between the human body loading and the actual claimed injury of the plaintiff(s). Another, common question that we address for both the plaintiff and the defense is whether the use of protective equipment such as a three point restraint system or a helmet would have eliminated or reduced the trauma during a traffic accident. Finally, we are asked to address liability in some cases; the reason for an accident such as a trip and fall or a fall within an elevator. This demands an Injury Causation Analysis (ICA) which may include an analysis of: 1) an equipment failure, 2) a physical hazard such as a floor disparity or 3) the motor response of the plaintiff (appropriate or inappropriate).

My experience has been that it is wise to initially cast a broad net in examining the physical and biomechanical/medical evidence and this can be communicated to the attorney during the first conversation. The best and most experienced attorneys will provide you with the information required to make a complete biomechanical analysis. It is the experience of many biomechanists that there are other biomechanical issues which arise after a more comprehensive review of case materials. More questions are generated and when these issues are addressed, the biomechanics analysis is more complete and less likely to lead to erroneous opinions.

A case study serves as an example. A past case involved the traumatic amputation of parts of two fingers on one hand of a health care provider allegedly occurring while he was trimming a juniper bush with a hatchet. Interestingly, the plaintiff did not want the hand surgeon to attempt reattachment of the phalanges at the medical center. Furthermore, the plaintiff's personal and professional life circumstances made the disability insurance claims representative suspicious and we were asked by the attorney client to determine if the plaintiff's rendition of the accident was reasonable.

Several cuts appeared on the two fingers of the plaintiff's struck hand adjacent to the actual amputations indicative of "anticipation cuts" in self-inflicted injury. The actual amputations were complete without tissue retaining the more distal phalanges. Finally, the amputations (with a closed hand gripping a juniper branch) did not line up in a fashion that would have permitted the explanation of a single blow by a hatchet. One amputation could not have occurred at all with a closed hand because the transection site on the finger would not have been exposed to a hatchet strike. The attorney reasoned that there must have been several hatchet blows that resulted in the amputation of parts of two fingers and was wondering if this made more sense from the standpoint of self-inflicted trauma rather than simply an accident.

The plaintiff's claim was that as he slipped on the hillside and fell to one knee (trimming juniper bushes), he inadvertently struck his two left hand fingers several times while holding on to a juniper branch

leaving parts of his fingers on the branches. His fingers were later recovered by the local fire department within the bush, placed upon ice, and subsequently the plaintiff and his fingers were transported to ER by EMS personnel. Clearly, one of the key issues was whether it was possible during the slip and fall for the plaintiff to strike his hand several times. After running the simple vertical fall equation for time and adding some extra time for the foot slip, it was clear that the several strike hypotheses did not add up. There simply was not enough time for two or more strikes to the plaintiff's left hand. However, other issues were pointed out to the attorney which turned out to be important factors in putting the entire puzzle together and in making a stronger case for insurance fraud. First, the flexor withdrawal reflex (elbow flexors of the struck hand) would most probably permit only one strike to the left hand. Secondly, the cuts of the fingers observed by the hand surgeon on call indicated clean transections of the phalange bone shafts and the exposed bone evidence indicated the use of a sharp serrated instrument rather than a hatchet. The bone morphology of chicken drumsticks (although longer) were similar enough to permit our testing. Our testing of fresh chicken drumsticks with a serrated steak knife produced the same type of cuts as described by the hand surgeon at the medical center. Furthermore, using the same type of hatchet as the plaintiff to strike secured drumsticks laying on top of a wooden block produced very different bone shaft damage with comminuted fractures and some irregular crushing of bone at the impact site. Furthermore, this health care professional had access to injectable local anesthetics to perform nerve blocks of the radial and median nerves prior to what we believed to be strong evidence of self-inflicted injury.

A final experiment involved our attempts to trim similar juniper bushes with an exemplar hatchet. Holding the flexible branches tight with one hand did not prevent the branches from simply moving downward with the overhead hatchet strikes we performed as first described by the plaintiff; sometimes requiring up to 40 strikes to cut through one branch. Clearly, a reasonable individual if s-he did not understand this problem before attempting to trim a juniper bush would clearly realize that a hatchet was not the tool of choice after a few swing attempts.

This complete review of evidence and follow-up with data collection trials provided a comparison of the plaintiff's scenario with our self-inflicted injury scenario; the latter in our opinion providing a more accurate description of this incident.

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