

Contusion Mechanics: A Minimum Tolerance Test

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ABSTRACT

Objectives of Study: *Overall goal is to obtain data to test the feasibility of a large-scale study of contusion mechanics.*

Specific Objectives:

- 1) *Identify impact characteristics most correlated to contusion threshold.*
- 2) *Identify and solve technical problems and data analysis issues prior to larger study commencement.*

Problem Addressed: *Studies involving post mortem contusions do not present quantitative data useful for forensics purposes in the living. Identifying key quantifiable impact variables that relate well to contusions will help elucidate this problem. Matching contusion mechanics to that of the investigative statements will give insight to otherwise convoluted cases.*

Methodology: *As a limb rested on a mount under a PVC pipe a mass was dropped down. The mass landed on an impactor resting on the surface of the skin. A force plate under the limb mount recorded the translated impact force. A variable potentiometer secured to the impactor measured its displacement during impact. The impactor's tip was 'painted' before each trial to mark the area contacted by the skin. Various impact characteristics were calculated from the data. Only one impact per limb region was conducted. We examined the impact area for contusion formation 24 hrs post impact. A 1 (characteristic) by 2 outcome (bruise/no bruise) logistic regression was calculated for each characteristic. Threshold was defined as the magnitude at which 50% of the time a bruise occurred.*

Data to be Included:

- *Logistic regression tables for impact variables relating significantly to contusion threshold.*
- *Typical impact profiles.*

Summary of Current Results:

- 1) *The experiment is feasible to hold on a larger scale.*
- 2) *Transmitted force impulse and impact ($F*d$) energy were significantly categorized with the dichotomous outcome condition (bruise/no bruise).*
- 3) *Contusion thresholds for transmitted force impulse and $F*d$ were found to be 5.9Ns and 3.2J respectively.*