

D12 Basic Research on the Development of Crash Dummy Skin for Risk Evaluation of Fracture and Skin Injury

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After attending this presentation, attendees will better understand techniques for evaluating the dynamic mechanical properties of soft tissue.

This presentation will impact the forensic science community by providing a physical model of personal injury evaluation that accounts for the dynamic mechanical properties of soft biological tissue.

It is known that the presence of soft biological tissue such as skin and muscle has a large effect on the presence or absence of bone fracture resulting from a dynamic load such as impact from a blunt object; however, this effect has not been quantified since data quantifying the dynamic mechanical properties of soft tissue is unavailable. In addition, the dynamic properties of soft tissue are essential to evaluate damage due to external forces. The Hybrid III 50th Percentile Anthropometric Test Dummy (ATD) is commonly used to measure human injury in vehicular accidents. This is used not only in automotive frontal collision tests, but also in human body damage evaluations that were caused by impacts, drops, falls, vibration, etc.; however, the mechanical properties of the simulated soft biological tissue in this model have not been reproduced with high accuracy. The next-generation dummy has a much higher human being enhancement degree than existing dummies, and the soft biological tissue will be incorporated; therefore, substitute materials reproducing a soft biological tissue must be examined. This study seeks to quantify impact properties and dynamic viscoelastic properties for the development of alternative substitute materials which can reproduce the dynamic mechanical properties of soft biological tissue.

This study used urethane gel as a physical material of ATD skin. The surface of the urethane gel was covered in a simulated epidermis. The dynamic viscoelasticity was measured using a rheometer. Two-axis loading of this simulated skin revealed good correlation with the dynamic viscoelasticity measured from the human skin of 20-year-old men.

Dummy Skin, Dynamic Viscoelasticity, Human Body Damage Evaluation