



## Pathology Biology Section – 2003

---

### **G84 Application of Biomechanics to the Interpretation of Pathology Data**

*Robert O. Andres, PhD\*, Ergonomic Engineering, Inc., 20 Gulf Road, Pelham, MA; and Joseph H. Davis, MD\*, 8905 Southwest 115 Terrace, Miami, FL*

The presentation will demonstrate how biomechanical analysis aids in the interpretation of pathology data resulting from a fatal fall.

A female university student was found dead in the early morning on the pavement four stories below her dormitory window. Both the university and the local police conducted investigations of the incident. An autopsy was performed. The autopsy report and photographs were provided to a consultant forensic pathologist in anticipation of wrongful death litigation. The complaint alleged that the student had accidentally fallen from a "loft" built by a third party and out of the bottom of the swung open window in the room. The "loft" was a bed raised upon two by fours, above the height of the window, to provide more floor space.

The body displayed multiple blunt trauma consistent with the fall, fractures of skull, spine, sternum and ribs with posterior displacement of the lumbar spine. Striated abrasions of the anterior inferior thorax and upper abdomen were prominent. The initial problem was how to correlate these injuries with egress from the window, the windowsill and a 30-inch concrete overhang located above the first story presumed by police as undisturbed.

A 3-dimensional mock-up of the loft and the window was created to investigate possible fall mechanisms. A subject with the same anthropometric characteristics as the deceased was labeled with reflective markers before testing began. Sagittal plane kinematic data were acquired and evaluated with a Peak Performance Technologies Motion Analysis System (Englewood, CO). The position of the whole body center of gravity (CG) was derived in the sagittal plane. There were no accidental fall scenarios that resulted in the CG extending beyond the window ledge; the only possible scenario involved the subject crawling over the ledge and out the opening. An evaluation of the fall trajectory was consistent with this latter scenario – there was no evidence of a push or other source of substantial horizontal velocity. The striated abrasions were consistent with the scenario supported by the biomechanical analysis. The fractures were also consistent with the fall distance.

In this case, the pathologist required further data than originally provided at autopsy to decipher the mechanisms of injury and death. The biomechanical analysis provided the necessary data to interpret the autopsy findings.

**Biomechanical, Fall, Autopsy Interpretation**