A Pilot Study: Body Damping and Bone Fracture

Ozan Akkus[1], Hiroki Yokota[2], Alexander Robling[2], Nelson Watts[3]
[1]Department of Biomedical Engineering, Purdue University,
[2]Department of Biomedical Engineering,
Indiana University/Purdue University at Indianapolis,
[3]Bone Health and Osteoporosis Center, University of Cincinnati

The objective of this pilot project is to establish a potential linkage of mechanical damping capacity of a body to a likelihood of bone fracture. A recent set of clinical data collected by Drs. A. Bhattacharya and N. Watts indicates that a group of human subjects with high incidence of bone fracture have a low damping factor (zeta value). This intriguing dataset suggests a potential, non-invasive diagnostic tool for evaluating susceptibility of bone fracture. However, since fractured bone apparently presents a high zeta value, the mechanism underlying an observed low damping factor in the fracture group is unknown. In order to resolve this apparent discrepancy between damping capacity and fracture susceptibility, we propose to test a hypothesis: Low damping of bone surrounding tissues such as muscle and body fat leads to high incidence of bone fracture.

To test the hypothesis, the following specific aims will be investigated using a mouse tibia loading model:

- Determine zeta values and bone fracture loads in a group of mice with and without surrounding tissues.
- Examine a potential correlation between zeta values and fracture loads when the surrounding tissues are present.

Loading experiments will be conducted in Dr. A. Robling's lab at IU School of Medicine with assistance of Dr. H. Yokota at IUPUI, and data analysis will be conducted in Dr. O. Akkus' lab at Purdue University. Dr. N. Watts at U. of Cincinnati will provide assistance in data interpretation. If successful, the results will be used to develop an inter-campus NIH proposal that is expected to contribute further investigating the mechanism for a non-invasive clinical tool.

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