KEYNOTE TALK

Wednesday, October 9, 2019 at 9am
(Sand Harbor II)

Bone Microstructural Imaging in Osteoporosis – Recent Developments and Translational Studies

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Abstract: Osteoporosis is a common age-related disease characterized by reduced bone density and increased fracture-risk. Nearly 40 percent of women and 13 percent of men suffer one or more fragility fractures in their lifetime, and the fracture prevalence will further rise with continued increase in life-expectancy. Osteoporotic hip fractures reduce life expectancy by 20 percent and add an annual healthcare cost of nearly 19 billion dollars in the United States only. Early and accurate diagnosis of osteoporosis and assessment of fracture-risk is fundamental to handle the disease, and bone imaging plays an important role to accomplish this goal. Dual-energy X-ray absorptiometry (DXA) measured bone mineral density (BMD) is clinically used to characterize osteoporosis. It is known that BMD explains 60-70% of the variability in bone strength and fracture-risk, and the remaining variability comes from collective effects of other factors such as cortical and trabecular bone distribution, and their micro-structural basis. Accurate and robust measurement of effective cortical and trabecular bone microstructural features, associated with bone strength and fracture-risk, is of paramount clinical significance. State-of-the-art imaging modalities for bone microstructural assessment include magnetic resonance imaging (MRI), high-resolution peripheral quantitative computed tomography (HR-pQCT), flat-panel cone beam CT (CBCT), and whole-body multi-row detector CT (MDCT). Different research groups have applied various methods for characterization of bone microstructure related to cortical porosity and thickness, trabecular volume, network area, spacing, number, star volume measure, structure model index, connectivity number etc. Our research group has developed unique methods for *in vivo* clinical CT-based assessment of cortical porosity and trabecular plate-rod and longitudinal-transverse micro-architecture. This talk presents the principles and basis of these methods, experimental results evaluating their fidelity, generalizability, and impact on translational and clinical research studies.

Speaker Bio-Sketch: Punam Kumar Saha received his Ph.D. degree in 1997 from the Indian Statistical Institute, where he served as a faculty member during 1993-97. In 1997, he joined the University of Pennsylvania as a postdoctoral fellow, where he served as a Research Assistant Professor during 2001-06, and moved to the University of Iowa in 2006, where is currently serving as a tenured professor of Electrical and Computer Engineering and Radiology. His research interests include image processing and pattern recognition, quantitative medical imaging, musculoskeletal and pulmonary imaging, image restoration and segmentation, digital topology, geometry, shape and scale. He has published over 100 papers in international journals and over 300 papers/abstracts in international conferences, holds numerous patents related to medical imaging applications, has served as an associate editor of Pattern Recognition and Computerized Medical Imaging and Graphics journals, and has served in many international conferences at various levels. Currently, he is an Associate Editor of the IEEE Transactions on Biomedical Engineering and the Pattern Recognition Letters journals. He received a Young Scientist award from the Indian Science Congress Association in 1996, has received several grant awards from the National Institute of Health, USA, and is a Fellow of the International Association for Pattern Recognition (IAPR) and American Institute for Medical and Biological Engineering (AIMBE).