Title: Translational Research on New Minimally Invasive Medical Devices

Abstract

Recent advances shown in the minimally invasive medical applications include a lower-profile structure, multifunctional capability, improved biocompatibility, and hybrid design of the various biomaterials. New medical devices such as stents, cardiac valves, shunts, and micro sensors require new structure produced via rigorous design process. Numerical analysis, computational structural modeling, and experimental validation are used to optimize the device design considering multiple parameters, including hemodynamics, tissue mechanics, device migration and radial force, collapsibility and deployment, pulsation of blood flow, and so on. This presentation shows recent outcomes on translational medical device research for minimally invasive procedure and interrelated design/manufacturing efforts. Four novel devices will be introduced; (1) a stent graft to control noncompressible hemorrhage in torso, (2) an organ perfusion stent graft for successful flow separation in donation after cardiac death, and (3) an electronic stent to monitor in-stent restenosis progression, and (4) low-profile shunt for treating fetal hydrocephalus. These newly developed devices could provide a significant impact on patients and their quality of life, as well as on the decrease of the healthcare dollars spent for the disease and injury treatment.

Bio

Dr. Youngjae Chun is an Associate Professor, Dept. of Industrial Engineering with a secondary appointment in Bioengineering Dept. at the University of Pittsburgh. Dr. Chun obtained his PhD in Mechanical Engineering at UCLA in June 2009 working on the development of endovascular devices to treat vascular diseases using smart materials through minimally invasive surgery. Dr. Chun's current research interests include designing/manufacturing the metallic medical devices, investigating biocompatibility, analyzing the mechanical and physical behaviors, and testing biomedical devices. In current research, Dr. Chun combines the comprehensive knowledge from diverse fields such as material processing, MEMS/Nano fabrication, biomedical science, and surface engineering that is crucially important to successfully fulfill the goal of interdisciplinary projects of metallic biomaterial-based medical devices for vascular repair.