

Medical Engineering Laboratory

Drawing on his fifteen-year career as an orthopedic surgeon, associate professor Takehito Hananouchi conducts research in the medical engineering field at this laboratory. His work has primarily focused on his areas of expertise in prosthetic joint surgery, computer aided surgery, rehabilitation and biomechanics.

Research content includes the following:

- 1) Using portable 3D scanners for diagnosis and trial treatment of locomotory ailments

Comparatively inexpensive handheld 3D scanners have become popular, and there are increasing examples of their use in medical treatments. We are reviewing how precisely three-dimensional images can be created and what kinds of clinical applications there might be.



Portable 3D scanner

- 2) Using wearable triaxial ground reaction force sensors in kinematic analyses of articular range of motion simulations for prosthetic hip joints

Japan is expected to face the increasingly critical issue of an extremely aged society (meaning 20 percent or more of the population is elderly, defined as age sixty-five or older). The Japanese Orthopaedic Association has been conducting nationwide efforts on fundamental measures regarding what it suggests should be called “locomotive syndrome,” in which people require care for locomotory ailments (bones, muscles, nerves, etc.) or are at high risk of such. With that in mind, we have been having people in normal health and people in normal health simulating locomotive syndrome use wearable triaxial ground reaction force sensors to accumulate data and establish the activity

parameters people with locomotive syndrome should strive for.



Wearable triaxial ground reaction force sensors

3) Patient-specific instrumentation research pertaining to prosthetic hip and knee joint surgery

An important point in prosthetic joint surgery is how accurately the prosthetic joint can be positioned, and patient specific instrumentation (PSI) is one way of ensuring precision with computer technology. We are conducting research on how to employ that technology.



PSI and bone model

Featured published articles

English peer-reviewed papers

- 1) Hananouchi T, Giets E, Ex J, Delpont H. Patient-specific Instrumentation for Acetabular Cup Orientation: Accuracy Analysis in a Pre-clinical Study. *Journal of Contemporary Orthopaedic Research* 2014 Vol. 1 No. 1 pp. 35-47
- 2) Hananouchi T. Sagittal gap balancing with the concept of a single radius femoral component in posterior cruciate sacrificing total knee arthroplasty with patient-specific instrumentation. *International Orthop.* (2014 in press)
- 3) Hananouchi T, Yamamoto K, Ando W, Ohzono K. Effect of a Modular Femoral Neck System on Femoral Anteversion and Range of Motion before Implant

Impingement. Journal of Contemporary Orthopaedic Research 2014 Vol. 1 No. 1 pp. 26-34

4 Iwana D, Nakamura N, Miki H, Kitada M, Hananouchi T, Sugano N. Accuracy of angle and position of the cup using computed tomography-based navigation systems in total hip arthroplasty. Computer Aided Surgery 2013; 18(5-6):187-94

5) Hananouchi T, Yasui Y, Yamamoto K, Toritsuka Y, Ohzono K. Anterior Impingement Test for Labral Lesions Has High Positive Predictive Value. Clin Orthop Relat Res. 2012 Dec;470(12):3524-9.